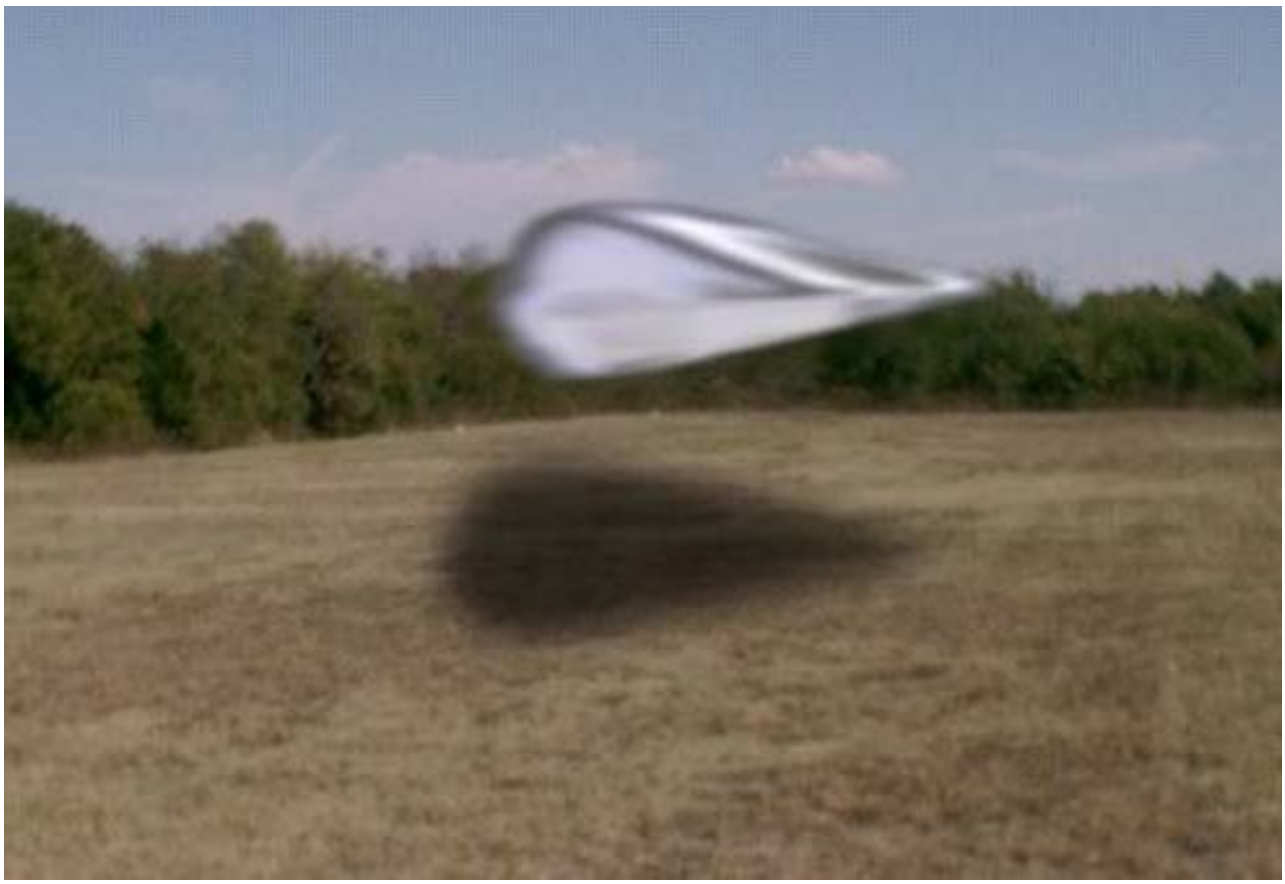
The UFO Technology Hackers Manual

Final Edition
By Michael McDonnough



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The UFO Technology Hackers Manual

Preface

This book is not a rehash of information covered in other books.
Most of the information disclosed within has never appeared in book form before this writing however,
if you have read,

How To Build A Flying Saucer And Other Projects In Speculative Engineering (by TB Pawliki), this book starts where that author ends his, at the Solid State UFO. I will bring you up to speed on the state of the art in spacecraft drive potential. All information is compiled from publicly available government archives.

Within the unknown and the unexplained, lie the parameters for a new paradigm. As scientist, inventors, and hackers, we must go forth bravely into this new territory. If we were to turn away, to return to our comfortable ignorance we may never do what we all dream, to advance science, technology, and human discovery to the next level.

The reason for my writing this book is to bring, to the attention of the general public, information about space drive capabilities that human technology can accomplish that are way beyond what we are being told about in our schools, and our media outlets. These technologies must be known to the general public so that they will have the knowledge to "DEMAND ACCESS" to these capabilities. Soon, all mankind can go forth into Space and explore the New Frontier for ourselves. These freedoms are being denied us by reinforcing our ignorance and misleading us with rehashed old technology that is too expensive, dangerous, and technically complicated to be used by common folks like you and I.

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WHAT IT IS TO HACK

What does it mean to hack? A lot of you folks may have picked up this book because of the title. To me, Hacking is to search for answers to questions you may have on a subject of interest that you are not allowed access to. That may be because you're not in the click allowed access to the information. After all no one teaches a class in UFO TECHNOLOGY. So, to find out anything on the subject one must search for ones self.

After I had exhausted all conventional means at my disposal namely books, magazines, and online searches I decided to pack my stuff, and head to the nearest patent depository, which for me was the one at the big downtown library in Dallas, TX. (This was in 1997 since then most of the patents discussed in this book have been made available online.)

The patent depository is a huge microfiche filing system with a CD-ROM catalog that's setup in a system using patent title reference and category reference. The title reference is the most difficult to use for my purpose. I started out with trying to figure out what a UFO drive system might be called. I tried out Electromagnetic Space Drive, This brought me to Electromagnetic Devices. From there I had to comb through 1000,s of devices.

With 1000,s of listings to search, and with people wanting to get on the CD-catalog machines, I had to come back with some blank disks. When I returned early the next day to copy the listings, I found out about the categorizing system the classifications, these classifications help to narrow the search, by grouping the inventions into like system categories. I picked some of the electromagnetic power systems and electrostatic energy systems and started with those classifications and I found what I was looking for in (60/200.1 class).

When I read the patents disclosed in this book, I could hardly contain my excitement. Here before me, were systems that could explain all of the basic science behind so called UFO's, which in fact are Electromagnetic and Electromotive Spacecraft. I read everything I could find about UFO's in libraries and bookstores for years, and didn't discover as much as I learned from reading the disclosed patent documents in just a few days.

So read on and see for yourself. There is no more relevant information on real, do-able UFO Technology than you will find in this book, and in the disclosed patent documents anywhere that I could find in years of searching.

In this next section of the book I will explain in more direct, non-technical terms how I think these inventions can be combined and exploited for our use. I will propose the design for a ship or spacecraft that fits all the parameters of a so called "UFO", and all with technology we can achieve today using existing, or expected materials and power systems.

Simply put, all of these patents, when combined, form the basis for a spacecraft of solid-state design, which can be used in all environments including in atmosphere, deep space, and under oceans. They even explain how they move about unnoticed by conventional radar systems.

SOLID STATE ELECTROMAGNETIC SPACE DRIVES

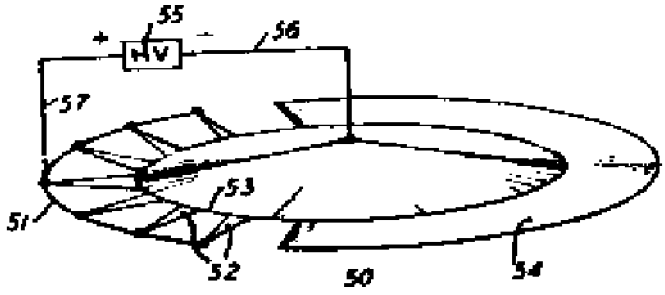
Any Spacecraft engineer worth his pay will tell you that the best choice, for a deep space drive engine, is a High Specific Impulse Electromagnetic Drive. It is important in a Space Drive that it does not eject any part of its mass into space to achieve acceleration. To do so, would create a continued loss in efficiency through the expelling or burning of fuel. This would add to the mass requirements and reduces the potential payload of the ship, making it impractical and dangerous to achieve any deep space travel objectives.

SUGGESTIONS FOR A QUICK THUMB THROUGH

Most of the options available at the present time are best summed up in the "Background of the Invention" section of each of the patent documents in this book. The core group of related patents is discussed in detail in appendix B. of this book. To look at the math behind these inventions, go to the "Detailed Description of Preferred Embodiments" section of each patent. You will find them very technical and thorough, as is required by the Patent Office. Personally, I was never good in math, but I know the truth when I see it. To make this info available to as many people as possible, I'll attempt to explain these inventions in as non-technical terms as possible.

SPACE DRIVE SYSTEMS OPTIONS

Both of the drive systems shown are Solid State Electromagnetic, and Electromotive. Thomas Townsend Brown did the earliest work on electromotive force, for use in a drive system. He was a physicist, who co-discovered with his teacher, that a transducer would lose weight when charged with a significant direct current. He patented a number of inventions based on his discovery. One of the drawings for his first invention is shown below this drawing shows his Electrokenetic Transducer tethered to a center hub that provides power to the transducer. One can easily imagine what this device could do if the power supply were shrunken in size and placed within the disk. If charge could be controlled, and moved about the disk, the disk could change direction as quickly as flipping a switch.



Much of the information about this invention is covered in other books so, I won't spend too much time going into this system however it serves to date the field of science from which the other drive systems originated.

Inherent in the design of electric spacecraft is the fact that only a negligible amount of the ships mass is converted into energy to power the ships drive systems as is described further on in this book. This feature makes them the most efficient systems possible with existing technology.

The speeds possible with the systems described here are approaching super-luminal velocity. Both systems approach the 90+% efficiency level I feel would be required for long continued use, as in interstellar flights.

Compare this to conventional rockets that can only achieve flight efficiencies of around 30%, and speeds of only 500 to 600kps.

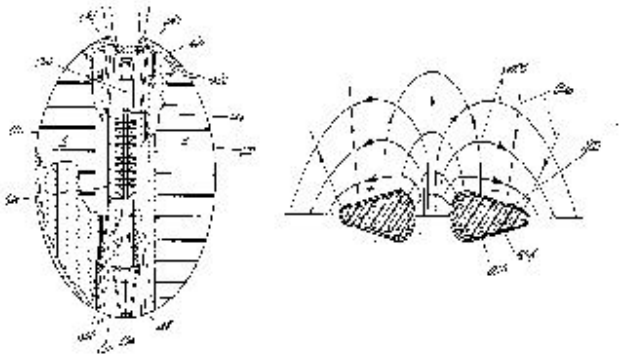
This means that a flight to Mars for instance would take a conventional rocket from 6 to 9 months, depending on orbital intersection, and cost millions of dollars worth of dangerous cryogenic fuels that are not only expensive but difficult to maintain in storage.

With the Electromagnetic Energy Propulsion System, invented by James Taylor, this same flight would take only 45 minutes to 1 and 1/2 hours, the same amount of time as some of us take to commute to and from work.

As with most electric drive systems the Taylor Drive would only convert a small portion of its atomic pile into energy to power the flight. So when the next multibillion-dollar defense bill comes up, tell your law makers you want that money for their old, antiquated rocket systems to be diverted into solid state drive systems that are already in the patent office.

Mass production of these systems will inevitably bring the cost down on all future spacecraft and defense aerospace appropriations. This is most likely the prime factor for this technology being ignored, at least publicly.

I feel it's criminal that this technology has not been widely exploited.
In fact, I believe that some of them are being exploited secretly by our own government. The super-secret project to find a replacement for the aging SR-71 Blackbird, rumored to be given the code name "Aurora" in a house appropriations bill. This project was funded with 460 million dollars in 1981. This just happens to have been 1 year after James E Cox disclosed his discovery of the dipolar force field propulsion system in his paper entitled Electromagnetic Propulsion Without Ionization at the ATAA/SAE/ASME 16th Joint Propulsion Conference in Hartford, Conn.



If you look at patent # 4,663,932 (sheet 6 of 16) in the art you might notice the resemblance of his discoid designed craft to some of the artist renderings of the Aurora Spycraft.

This I feel was no accident. Consider this, if the government knew of this patent, (And they did as the inventor has related to me) wouldn't they want to use the Dipolar Force Field Propulsion System as the means of propulsion for their new Spycraft?

It would give them a distinct advantage over conventional rocket powered interceptors. James Cox's system has the added advantage of radar invisibility. This advantage also was disclosed at this same 16th Joint Propulsion Conference. These conferences are crammed with government contract engineers.

Since this concept dates back to the early 1980's, and the Government took 5 years to award the inventor his patent, What do you suppose the government could have done with this man's invention (in the Interest of National Security of course) during those 5 years? After all, consider the advances in aircraft in the few years of WW 2. How long would it take to go to full production of a design invented 17 years ago? These ships could be into their 3rd or 4th generation by now.

If we were allowed a look inside Area*51, would we in fact find that the supposed alien technology being worked on there was actually human designed. Is the UFO Technology actually funded by taxpayer money. Then secreted away where we can obtain no commercial value from this significant advantage that we in fact funded.

There is another related issue that I wonder about. The assignee of the

T.Townsend.Brown patents was the Whitehall-Rand Corp, Washington D.C. Do you suppose this is the same Rand Corp. that does all this government research work? Do you suppose this is the same Whitehall Corp. that has a contract with the government for an all-electric high altitude research craft that also goes by the name "Aurora"? The Whitehall-Rand Corp. is no longer on the books. They owned all of T.T. Brown's patents but did not exploit them. This seems a bit strange to me. A Company invests in one of the most significant patents in propulsion physics of its time and does nothing with it. That is dubious at best.

UFO TECHNOLOGY BACKGROUND INFO

In US patent # 5,269,482 entitled Protective Enclosure Apparatus for Magnetic Propulsion Space Vehicle, the inventor Ernest J. Shearing describes the basic science and relevant theory behind a number of electromagnetic and electrostatic types of propulsion systems.

This patent shows the inventors through knowledge of the art. Most of us are unaware of this field of science. So the question on my mind is, where does one obtain this knowledge? It does not appear in any textbooks I have ever read.

So it seems that there is a small core group of Scientists working on the technology associated with EM Spacecraft development, as is apparent from the subject matter coming out of these ATA/SAE/ASME Annual Joint Propulsion Conferences. Information about these conferences does not appear in any of the aerospace magazines that I searched in the library.

The only reference to them I could find was online at one of the WWW pages that cover the Aurora Spyplane. On this web page the author describes the conference discussion about the structural problems involved in a Mach 5.5+ vehicle. This would indicate that the Aurora project was successful. I think they will find that the time tested saucer shape will be found the best possible airframe configuration because of it's inherent strength and aerodynamics.

As a Tech-Hacker I find it interesting, that only an elite few are privy to this science and technology. When my interest is peaked on a subject I just can't let it go, even if I'm not included in the clique allowed officially to pursue it.

Information as important as space drive technology should not secreted away from the public. When only privileged individuals are allowed to exploit this technology, it is a matter of Global Importance for us to snatch it from the grasp of this self appointed Elite. They cannot be the only ones to posses such technology. It must be given to the common man for the betterment of all mankind.

I feel that anyone bold enough to seek out new worlds should have access to the information necessary to obtain this noble goal.

In my opinion no one has the right to block the assent of mankind into space, no matter what self-serving reason they use to qualify themselves as our judges. Only God may judge the worthiness of those brave souls willing to risk all to discover New Worlds.

Our history books should reflect the reality of this and other relevant inventions in the full light of day. The men who invented these technologies deserve their due credit and historic record for these significant contributions to human science. Secrecy hides the very flower of creation, allowing evil to exploit the good works of men for the profits and power of the few. These systems could empower all humankind to travel the stars.

I think there is no problem that humankind cannot solve using our inherent creativity. After all, we are closer to the source of all creativity, our Creator, than any other creature we know of. It is written,

"Ask and it shall be given unto you."

"Seek first the Kingdom of God"

TRACKING THE SUPERFAST AND RADAR INVISIBLE

Whether you are a critic, a true believer, or just don't know everyone must have wondered "why so few good photos or videos have captured detailed

pictures of these crafts?" I think if we consider the speed capabilities available with drive systems as described in the patents in this book, and the fact that they are solid state, with no moving parts to fail, crashes would be rare. The field effect around the craft is also likely to cause problems with electronic cameras causing these systems to deliver fuzzy pictures.

It is very likely that if they don't wish to be seen, they simply will not be seen. Overcoming this limitation is only now becoming technically feasible.

One possible approach I have considered to capturing good pictures or video of these craft is by hooking up a camera or CCD to a fast computer controlled tracking gimble on a motorized mount. Then set the system up to respond to control signals from a passive magnetic field shift sensor array. A good candidate for this is a ring type Hall Effect sensor assembly patented by AT&T. It should be possible to obtain some good footage with such a system.

ELECTROMAGNETIC FLUX DISPLACEMENT DETECTION

One important area of research that I think will become apparent in this age of stealth and UFO's is the use of passive (as opposed to active) detection and tracking. All Electromagnetic Spacecraft have one thing in common. They can't hide their "Electromagnetic Signature". Part of the advantage they enjoy, is the force field they create can be tuned to absorb and even use radar energy for propulsion.

This field while great for absorbing offending radar signals causes the ship to displace the local magnetic field in quite a significant way. So the only effective method of detection is with Flux Shift Sensitive Electronics namely, Hall Effect Sensors.

There is always some EM field shift created by conventional aircraft.
This is mainly due to radar bounce off the skin, and from friction with the atmosphere creating static electric build-up. The capacitance of the skin of the aircraft makes it likely to cause some activity on a passive sensor array.

The system would likely need to be calibrated so as not to trigger during common aircraft induced EM field shift events.

A system could even be designed to distinguish between Dipolar Force Fields and EM Propulsion engines, by going somewhere that these systems are in operation, Area 51 perhaps, to calibrate the sensors.

DEPLOYMENT OF A SENSOR GRID

If a grid of these types of sensors is placed in a wireless networked string to the West of Area 51, just as close as is legally possible to the test range, about a half-mile apart. I believe we would eventually get a good calibration.

An East to West takeoff course is very likely due to the Earth's rotation. Possibly another string of sensors would need to be set up to the North to detect a polar take-off. If this course of action is made impossible by the government taking even more land for the test range, or by extreme vertical take-off and landing, then simulators could be used to calibrate the sensors.

Once calibrated these devices could be placed all over the country by groups such as M.U.F.O.N. to their field offices and linked together over the Internet to give Flight Paths and identify Hot Spots, as well as to record the different types of Electromagnetic Signatures. That way we can distinguish between Earthly Technology, and Off World Craft.

Countries that have reason to fear attack by stealth could deploy passive sensor grids like these to detect inbound Stealth Attackers. Conventional stealth aircraft also have a unique signature due to a higher skin capacitance caused by their radar absorbent paint.

Now such a system is in use around the world for detection of Stealth aircraft. Instead of the method I described as above from volume one this method uses beam deflection in microwaves transmitted from one tower to the next. As the microwaves are deflected from the electromagnetic wake of stealth aircraft the Doppler shift in the signal of the microwaves is detected. The technology is much like ordinary cell phone technology except these have added Doppler shift sensitive electronics added in order to triangulate on the stealth aircraft. The same technology should also work for UFO technology.

PERSONAL OBSERVATIONS & SIGHTINGS

In this section I'm going to give you some background on my observations and myself. I was raised on airbases in many parts of the world. My father was in the Airforce as a Courier and as such was exposed to highly classified information. During much of the Vietnam conflict he was stationed at the Pentagon. This duty often had him flying into Vietnam with an attaché case cuffed to his wrist and jumping off of a helicopter while under gunfire. My dad often spoke to us of his personal sightings and those of fellow Airmen.

Several times during this time in history my father would go off on TDY to Taiwan, Thailand or Vietnam often returning with gifts from these lands. During one such away mission when I was about 8 years old I experienced a number of recurring dreams. The most vivid almost super-real occurrence was the one where I awaken to a green glow all around me in the room. I get up out of bed and put my slippers on. Then I quietly slip out the back door wearing my pajamas and slippers and go out to a field near by my house. I remember it all so vividly. I remember the feeling of the sharp rocks under the soft vinyl of my slippers, and the songs of the night birds. I even remember the cold feeling of the dew from the grass on the cuffs of my pajamas.

In this let us say very vivid dream I go out to this field and as I approach this culvert a small car like one from an amusement ride comes up out of the this large culvert. The car comes to a stop and a bar rises up and I get into the car. I then sit down and the bar comes slowly down and makes a click when it locks into place. I know instinctively to hold on tight to the bar. The little car then goes down into the culvert.

As it descends into the culvert the floor seems to open up and the little car heads down at a steeper angle. As the car descends there are lights along the top of this tunnel to light up the way. I remember to pop my ears as I descend because the altitude is different. As the car rolls to a stop it enters into a cavern, the bar comes up as the car stops and the lights come on in this cavern. As I step out into the cavern I remember there is a lot of futuristic looking technical gear everywhere.

Then the little doctors who I remember as being smaller then me would come up to me and lead me further into the cavern. I don't know why I think of them as little doctors but that is what they seemed like to me. I never see their faces, as they always seem to be beside me. They would rest their hands on my shoulders and guide me around. They would show me things that would be in the future, and even what I would look like at certain points in my life.

I cannot relate anymore of this as it is a private matter but I decided to add this chapter since it seems to be of significance. I know that after this dream happened several nights in a row I seemed to remember less and less of the dream. Also I had physical marks on my arms and legs like bruises and I also had nosebleeds in the morning when I woke up.

After this series of dreams I had some other problems I had never had before. Like sleep walking and talking. My parents were both disturbed by this and looked very worried when they talked about it. I still have no idea why I never told them about these dreams.

SIGHTINGS

My first sighting was of a glowing disk shaped craft that was above the Airbase in Alaska. There were sirens blowing and it woke me from my sleep, I guess I was 9 years old at this time. It was the classic glowing disk shaped craft. There were searchlights in the air around the ship. The ship seemed to hover for duration in one place, and then almost instantly it was some 1000 feet away.

There it would hover again, then it would move over 500 feet up. It continued to do this for several seconds moving suddenly then hovering somewhere else, possibly, it was avoiding a weapons lock from below, or maybe just to take pictures from another angle, I don't know. Then just as suddenly, it tilted up about 45 to 50 degrees and flew away in a streak of light. Soon afterwards the base quieted down. The next day I expected to here all about it, but no one said anything, so I didn't dare bring it up.

My next observation was about 3 years later in a different area of the country. Our whole family was outside Bar-b-q-ing during a warm summer night. Suddenly I noticed 4 equidistant lights at approximately the compass points. They seemed to be on exact collision course. I shouted to my brother and sister who then got my dads attention. We were all looking up when the 4 lights came together. Instead of crashing, they all seemed to join together for a moment, and then they suddenly flew off in the directions they came at a fantastic speed, disappearing almost instantly.

The next time I observed one of these UFO devices was many years later, as an adult. In fact this occurred in Dallas TX while I was there doing the research for this book. I was in the Club District known as Deep Ellum. It was very early in the morning around 3 AM. I noticed a row of squad cars and white vans moving in on what was likely a drug bust.

It was a police helicopter flying over that drew my attention upward. I then noticed about one thousand feet above and a few hundred feet behind the helicopter that there was a movement. I tracked the object visually long enough to get a pretty good view. It was a classic saucer shaped UFO, it was darkly finished most likely with some type of stealth paint. It moved with the jerky sudden course changes that indicate that it operated electromagneticly. It seemed to be scanning the area of the impending drug bust. Since it was darkly colored, I could only see it for a little while (when it was overhead) because the stars weren't visible behind it. This observation lasted only about one minute, but it seemed much longer.

Several months later I had to take a temporary job, for security reasons I will not include specific details. My co-worker and I were walking near the North Dallas Tollway area headed to a store, where we were to be picked up by our boss. I looked up just in time to notice a silvery disk moving across the sky. I quickly got my coworker’s attention. We were both looking up at the disk when it quickly dodged behind a small cloud nearby.

We watched for quite a while expecting it to come out the other side of the cloud, but the disk must have gone off at 90 degrees straight away from our line of sight because it never reappeared. 1 or 2 minutes later on the same relative flight path, a small black unmarked helicopter, with a camera pod gimble underneath, came flying over at less than 3000 ft. We kept on walking to be picked up for work, and we soon arrived at the store and stood near the pay phones.

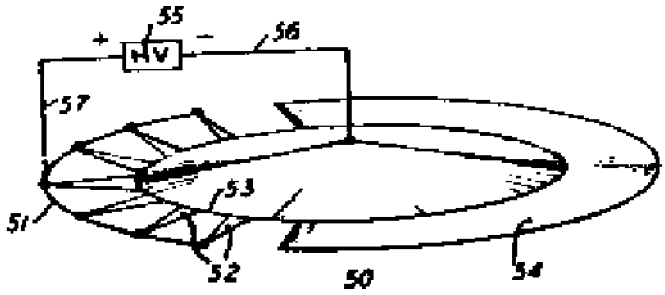
My coworker stood on one side, as I stood on the other. The phone by my coworker rang. He picked up the phone but no one answered. Then the phone by me rang. I felt that I shouldn't pick it up. It rang about 12 times then stopped. That was my last encounter as of this writing.

SIMPLIFIED EXPLANATIONS OF THE PATENTS

Now we move on into the meat of the subject the patents that I feel are key to this issue, and provide solid proof that we as humans can figure this technology out for ourselves without specific need of an alien influence.

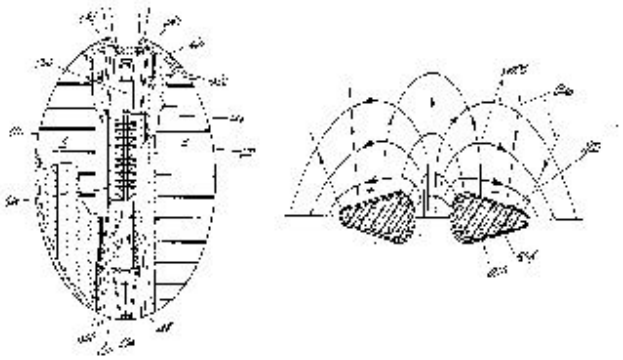
The main purpose for my writing this book was mainly to expose the general public to the information contained in the patents included (in this book). Having read the patents, I know that many readers would have never even opened these pages if the patents disclosed were not explained in simpler terms then they appear in the patent disclosure documents.

Patent attorneys and scientists have their own language it seems. Most folks with a high school education level will kind of glaze over when I try to explain the relevant points involved with this field of science. So please bear with me on this.



(1). Electrokenetic Transducer T. Townsend Brown Patent #2,949,550. This patent I explained somewhat earlier in the book, so I won't elaborate too much further. It suffices to say that, he was the father of electromotive and electrogravitational forces as they apply to Electromagnetic Space Drive Systems.

While studying the magnetic properties of high voltage capacitors, he noticed that when sufficient charge is applied to a transducer, the transducer would lose weight in proportion to the charge. He theorized that if the overall weight of the capacitor materials could be reduced, without reducing the K value of the capacitor, (that is how much charge it will hold without arcing through) He could get that sucker to fly with a sufficient charge.



(2). Dipolar Force Field Propulsion System. James E. Cox patent # 4,663,932 this propulsion system was first publicly postulated by its inventor back in 1980 at the ATAA/SAE/ASME, 16th Annual Joint Propulsion Conference in Hartford Conn. in the paper entitled

"Electromagnetic Propulsion Without Ionization".

This invention is very involved in its technical explanation. To sum it up quickly though, this drive system is best for lifting payloads in atmosphere at very high speeds, with almost complete absorption of outside microwave radiation, making it practically invisible to radar. I feel that vehicles based on this design should replace the aging space shuttle fleet, as it would not be as vulnerable to the tragic explosion that took out the STS Challenger. It is also much cheaper and easier to maintain being of solid-state construction.

The principle behind it is pure genius. The system is much like a rail gun for a dipolar gas field, but it is much more than this. The system exerts electromagnetic force on the incoming gas field, lining up the dipoles in the gas. At the same time, the system injects energy in the form of high-energy photons, or microwaves, into the gas field raising the number of electrons in each atom to a state just below its ionization level. Then these highly excited gas molecules are hit with a high density electromotive force field at 90 degrees creating a Lorenz Force on the dipoles pushing them at near light speed out the back of the engine. Even though the volume of the gas isn't very high, the exit velocity is. This creates a thrust to weight ratio that calculates out to 1,000,000 pounds of thrust. Compare this to a fighter jet engine like those used in the BritishTornado, which creates only about 29,000 pounds of thrust.

I'm certain that this propulsion system is currently being deployed at the present time in some configuration, probably in the shape of a disk or the manta ray, and has been in operation for many years. Area 51 near Nellis Airfield in Nevada is touted as the place where we keep alien crafts that were downed by our government. I think this incredible story may just be a smokescreen to block civilian aviation from using these advanced propulsion concepts.

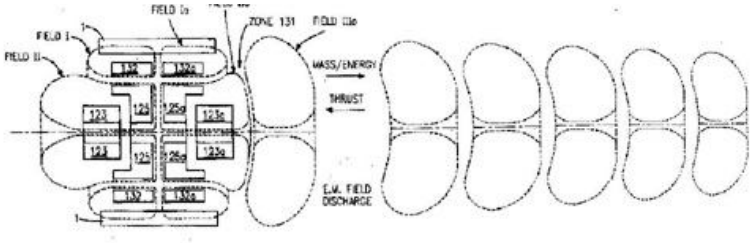
This also serves to draw attention away from the fact that humans likely designed this technology, and places it in the realm of science fiction and conspiracy theory.

It is obviously the prime choice for the development of a replacement for the aging SR-71's job of high altitude reconnaissance. With its advantages of high speed, low noise, and radar invisibility, it is the perfect choice for the job.

I have conferred with James E. Cox on this very subject and he informs me that he has showed his technology to some Pentagon brass and they said they would look into it but never returned with any answers or a contract. If you read his patent you will notice that James like myself has a number of idealistic views made apparent when reading his patent. My thinking is that perhaps the government took notice of this and decided to just use the technology under their National Security clause and not pay the inventor or take a chance that he might be to idealistic for their purpose to bring into the program.

In the recent blockbuster movie Independence Day, Area 51 was housing a ship of alien design. This ship was instrumental in defeating the hostile aliens. By using their own advanced technology against them, we were able to defeat them.

What if the truth is that the aliens are not that advanced? That we have these technologies today and our government is keeping them from us. A government that is afraid of losing control over its people. After all, if we were to scatter out into space, it would be damned hard for them to collect taxes now wouldn't it.



(3). Electromagnetic Energy Propulsion Engine *James R. Taylor, patent # 5,197,279. The Taylor engine uses a very different means to propel the craft. This drive system is most suitable for use as a deep space drive, because it requires no gas field or solid propellant. This drive system only requires that it remain at a superconductive temperature, and has high-density electric power supply available for producing the required magnetic field. This engine is very much like the impulse engines from Star Trek.

*Now deceased and his patent is now public domain.

It works by shearing off electromagnetic bubbles at very high frequency. This creates ripples on the fabric of space-time on which to ride. All this is accomplished by producing two opposing high-density electromagnetic fields in opposition to one another, then Canceling out one field, and at the same time shearing off the opposing field with a torriodial wound coil. Then the computer control introduces an eddy current into the now turned off field coil to prevent a back EMF from forming.

All of this is a little confusing for someone with no engineering background in the field. It suffices to say that what we have here is a solid-state device very similar to what we might expect to find in a UFO, or as I stated earlier A star trek impulse engine.

"Scotty, tell me you have the impulse engines on line" "Aye captain we have impulse power" "Take us ahead then Mr.Scott Full Impulse"

The inventor estimates that with existing or anticipated superconductors, and with existing or anticipated power supplies, that the speed possible, with engines of this design, would be in the order of 29,900kps. This is roughly 10% of Light Speed. Not too shabby when compared to rockets.

This system only requires a 10kev electric cell, which is available right now from General Electric. If the craft uses the new high temp superconductor materials available today it would not even require liquid Helium which is expensive and difficult to maintain in storage.

Cheap and plentiful liquid Nitrogen could be used. It’s easy to cool so it can be recycled and used again and again. The Taylor Drive doesn't have the radar invisibility of the Dipolar Force Field system so a combination of these 2 systems could be deployed where their advantages are best exploited. The Dipolar system, in or near atmosphere and close orbit then, switching to the Taylor Drive for between world travels. I will discuss this in greater detail later in the book.

The only technical problem we must overcome with these new high temperature superconductors is that of brittleness and magneto-restrictive forces breaking down the field drive coils. Once this is solved we can use the

high temperature superconductive elements without making major design changes.

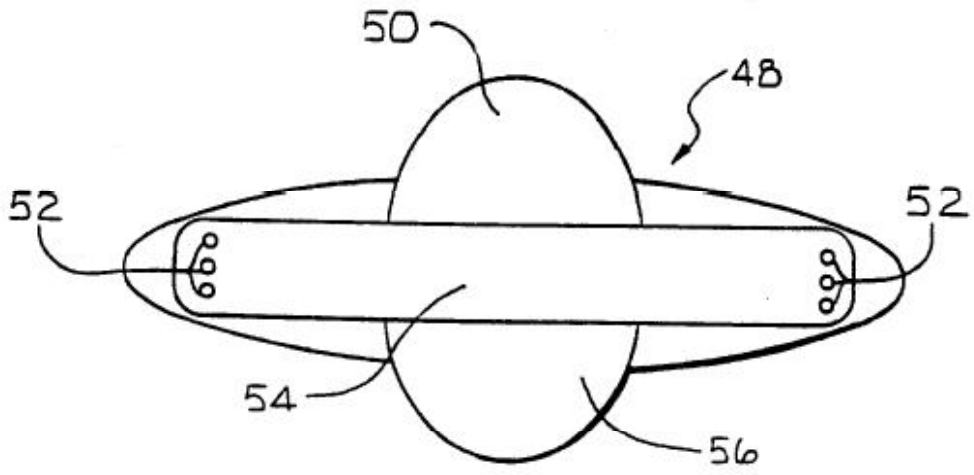


FIG. 3

(4). Protective Enclosure Apparatus for Magnetic Propulsion Space Vehicle. Ernest J. Shearing patent # 5,269,482. Finally any of these drive systems would be dangerous to the crew of the ship, due to the high acceleration possible, and because of the power of the magnetic fields used. The engine areas would of course be shielded to help concentrate the fields and to protect the passengers from EM radiation.

Gravity and acceleration must also be countered to protect the crew. That is the purpose of this invention. This is accomplished by means of a superconductive Dewar Vessel. This vessel has a chamber made of superconductive material, surrounded by suspended magnets of the same material. The system has accelerometers for each of the X, Y, and Z-axis.

When gravity or acceleration changes are detected, the system sets up an opposing field to cancel out those changes. This invention makes these propulsion systems safer and more capable because the crew is protected from the inherent dangers of fast direction changes. This makes them more maneuverable, as I have seen first hand. If the crew were subjected to the forces of acceleration possible with these engines, we would have a hard time scraping them from the walls of their ships.

So it appears we now have all of the necessary components available to be on par with "other space-faring worlds". All With human engineered technology! I'm certain we will find that the solid-state electromagnetic spacecraft is the preferred mode of travel in the galaxy.

Bearing this in mind, why should we waste our time and our resources on dangerous chemical rocket systems, costing billions of dollars, and not paying off in the same way as efficient, clean, solid state propulsion systems? Since the cost involved with a solid-state system is in the construction and not in their operation, they are the most practical choice for a continued use space vehicle configuration.

If you have an engineering background in high potential electromagnetics you will find the inclusion of the complete patent disclosure documents very helpful. I recommend that even the novice reader at least read the description of the preferred embodiment, section of each document. I further recommend that the reader review the entire patent collection for a complete understanding of the relevant science, and math behind each invention. The purpose of my breakdown of the information is to help the novice like myself to see the potential of these systems. I think the advanced reader will find interesting new engineering possibilities with these components plugged into you own designs.

WE COULD REALLY DODGE THE TAX MAN

When we are capable of economical space flights that make us invisible to radar, it must scare the hell out of the shadow-government. Why else would they create these multi-billion dollar boondoggles like the Delta Clipper, a

VTOL spacecraft that uses rehashed old technology, right out of an old Buck Rogers movie?

I mean come on; they're going to spend our tax dollars on technology that is so out dated, its laughable. While at the same time they're developing advanced solid-state systems for themselves. What a rip off, they have pulled the wool over the eyes of an entire planet. All this just to distract us from the truth that Human Space Flight Capability has advanced to the point where any intelligent, well-financed individual or country could achieve interstellar flight with a highly reliable, and relatively safe means of propulsion.

I would expect that many encounters with other world craft have shown that their missions were civilian, and merely for the purpose of cruising, checking out the scene as it were. On worlds without oppression, these advances are likely exploited by anyone who's interested in traveling to other star systems. This of course would be a frightening factor to imperialistic forces seeking to enslave everyone with taxes on every square inch of ground. After all, if everyone could just go where they wanted who would want to prop up their system.

What if you could have your own place, on any handy piece of rock, in space? There is no better way to beat the taxman than to have truly your own property, out of their grasp and free to exploit in any way you choose. Think of the freedom we would have with the ability to go from place to place, without having to buy expensive fuel all the time! We could all be truly rich.

In the next section of this book, I will disclose some of my own ideas that were not possible before I knew about these systems.

SUCCESS WITH TERRA-FORMING

The reason I started out by first envisioning the Comet Catcher Ship is that I believe that comets are the key to successful terra forming and colonizing. The obvious reasoning behind this is the composition of the comets themselves. They are formed of the necessary elements for terra forming being made of mostly carbon dioxide and water, in the form of ice (which is the simplest to use and most abundant form of these elements in the solar system) ready to ship. They also have predictable orbits making them easy to

intercept and reposition. Well perhaps not easy, but thanks to the Taylor Engine, it's technically feasible at least.

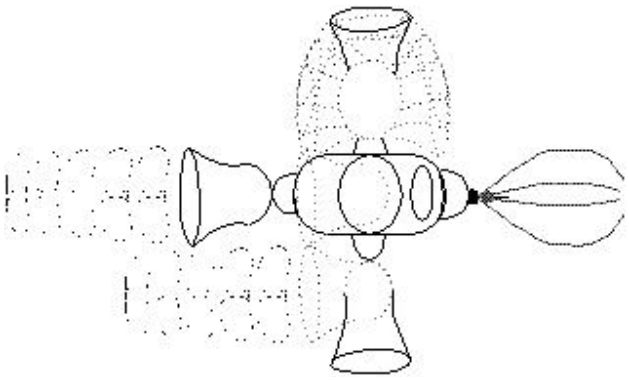
With abundant carbon dioxide and water available, robot systems can grow blue green algae for food and oxygen for colony builders, when they arrive in other vessels. This would only be science fiction were it not for the fact that these drive systems are feasible now. Use your imagination now that you know about this technology plug these systems into your own designs, to help create this reality.

Secrecy is the only thing holding us back from our goal to live, work, and explore the universe around us, without restriction. The science fiction of our youth has born the fruit of a new level of technology.

If we don't learn to use our minds to get off this world we will never survive as a species. We need space; we need new frontiers to explore. The human population needs room to grow. Space is the only place we can go. The only thing stopping us is the controlling elite. National security should never override the survival needs of the entire human race.

THE COMET CATCHER SHIP

One of my first design ideas using the systems described in this book I call The Comet Catcher. I realize the fantastic size and cost of the ship I am proposing is astronomical but it would facilitate a rapid move toward terra-forming Mars, and to defend the Earth from comets.



This ship is equipped with five Taylor engines in all. The power supply for each engine inside that engine's housing. The one main engine always

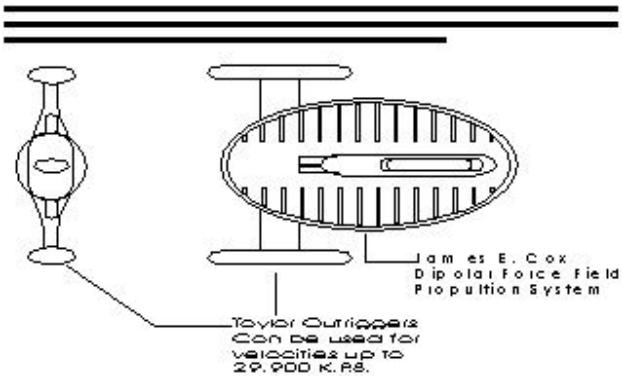
remains fixed to the rear of the ship. The other four engines are mounted one on each side of the ship as shown. These side engines can activate to the side providing rotational thrust to realign the comet, and then they can swivel backward to add to the thrust of the ships main drive. The front of the ship is equipped with a one hundred meter long bore tip to anchor the ship to the comet. The bore tip heats up and rotates to accomplish this. Then four Nitinol™ (shape memory alloy) grapples extend out to their "memory shape" to provide a more secure grip on the comet.

When all five engines are rotated to the rear and activated simultaneously, they provide a total thrust of at leased 5,760,000 lbs.
This should be sufficient to change the comets course. When the comet nears its destination the bore heats up rotates back out, then the side-mounted engines rotate forward, then activate briefly, releasing the ship. If all else fails, the bore tip can be jettisoned with explosive bolts. The bore would probably come loose with no problem, but I would probably use a ceramic composite bit that wouldn't hurt too much to lose.

For any serious Spacefaring, Colonizing, responsible, humans a device like this would only make sense. After all if you have advanced enough to create these kinds of drive systems, you have advanced enough to defend your world against comet collisions. Talk about missile defense, what about comets, you can't shoot them down with missiles, you got to go out and redirect them before they even get close. Sling them somewhere they can do some good like impacting on Mars. Mars needs all the frozen gasses and water it can get. Enough impacts might even heat the core back up, and get a good magnetic field going. Who knows our great, great, grandchildren might just need the extra real estate. What do you think? Send me your ideas and I'll publish the good ones in my next book.

USING THE DESIGNS IN COMBINATION

As an example of the potential of these systems, I have envisioned the combination of the 2 drive systems. One possibility is shown below.



It entails using the Dipolar Force Field Propulsion systems for atmosphere take-off, and for stealth flight exploiting this system for it's advantages. Then, when the efficiency of this system drops off in Interstellar Space, due to the lack of a propellant gas field, the ships deep space drives kick in. At this point, the Dipolar Field can be maintained at minimal power with main power diverted to the Taylor engines. This will give the ship the capability to reach all of the outer worlds in this system in less than 1 day's time. You may notice the physical similarity of the ships design with Star Trek's Enterprise; only this one has no warp drive, yet.

For now though, we haven't even exploited our local system to its fullest advantage. Perhaps when we mature as a species, we will discover ways to physically slip the bonds of our solar system and be a truly spacefaring world and people.

Terra forming is the transplanting of life throughout the galaxy. To bring life with us where ever we go. To me, it’s a holy mission. I think it's the purpose of the most advanced species on the planet to at least extend natures kingdom into our local solar system.

If some one tells you we need population control ask them, which one of their kids they would like to kill off. That may sound harsh, but the human species cares for their young. There is no reason that we can't extend the human family into space.

Of course, if there were someone who could control things, just long enough so that they could stake out all the choice land areas in the solar system, that would be one reason to want to hide the fact that we have the technical ability to go out into space in an economical way.

Can you imagine the gall of some group of self appointed judges that would retard human growth in this way? I think this may well be the truth. If there is no one who has exploited and used UFO technology already then it would mean that all of the UFOs that have been spotted in our skies for these many years are all alien. I simply do not believe that is the case.

In several space shuttle mission videos that have been recorded over the years there have been numerous images taken of these UFO craft. These were done seemingly with the knowledge of the camera operators as they are seen to pan and focus the cameras to get a better view of the objects.

In the now famous STS81 mission there is even a video segment that appears to capture a rail gun firing at one of the UFOs.

Even with this mounting evidence the government and official line is and always has been to deny until there is no denying anymore due to their cover-up being exposed completely.

Bio-field Resonance

Humans need lots of life around us. We thrive in lush overgrown surroundings. Plants give off a bio-field also called Chi, or Prana, it is essential to all life, so is all the oxygen they give off. Our space stations and colonies need to be just overgrowing with plant life, to give us the necessary bio-field energy for our health and well being.

We need the symbiotic relationship we get from the microscopic life forms that turn rocks and used plants back into soil. We also need the plants themselves. I think it would help our astronauts survive better in space. It might also help if we set up a (Schumann's) Earth Resonance Field of 7.8hz, with a left-hand polarization, in all manned spacecraft. Folks might just not suffer from bone loss as badly.

THE FEARS AND REALITIES OF THESE TECHNOLOGIES AND WHY THEY ARE PROBABLY GOING TO REMAIN SECRET

There is a secret project underway to develop these technologies in miniature. I can't for security reasons give any specific details that would tend

to incriminate me, but I will tell you that this project is taking place in central Texas. The devices under development are very small and maneuverable, silent, stealthy craft, employing the drive systems in this book. They can be remote piloted, or they can be programmed to follow computer guided instructions, as well as GPS guidance. Seen from a distance, they display all of the behavior of EM drive systems.

They will probably be deployed as reconnaissance drones, but could carry weapons payloads. They can fly low at night silently, and would not be easy to detect. They are so small nuclear power cells must be the power source for them. These were likely technology purchased from the former Soviet Union. They developed several high-powered tiny radioisotope power-cells for use to power their spy satellites.

I have since done considerable research into the technology of direct atomic to electric energy conversion and have discovered technology that can literally squeeze the beta-electrons out of an isotope at a faster then normal rate. This in effect creates a beta-current of very high-energy electrons that can be directed into an energy conversion system to capture the electric energy very efficiently for use in micro-scale or macro-scale applications.

The company I have formed to develop this technology is now my primary focus. This technology will enable things like the "Back to the Future 2 Hover boards" to be built using technology like the Taylor engine in a scaled down version using our tiny stimulated isotope decay power-cells in their construction.

The system would require a bit more space than the one in the movie, but something of a workable size could be made with high temperature superconductive materials. They could be charged overnight for a few hours play during the day. A Dewar cooling system could be used to cool the superconductors. There are small efficient cooling systems, being employed in thermal imaging cameras that could be adapted for this use.

We are developing a type of isotope power cell that could operate one of these devices for years without need for a recharge. The isotope is relatively cheap and very plentiful.

The dipolar force field system could be made in miniature scale, making a super fast stealth craft for reconnaissance or warhead delivery systems using less than $50,000 worth of equipment. It could deliver small nuclear warheads so fast that no retaliatory strike could be mounted. This fact is the main reason that I feel the government will never officially acknowledge these technologies existence. Because of the radar invisibility factor involved, I'm sure these miniature crafts will be very popular with weapons designers in the future.

A simple version of this technology is postulated next. The test system is only for short range and doesn't have any stealth feature incorporated in its design. It also has no internal power generation ability, cooling system, or coolant-recycling system employed.

Instead the system is cooled with liquid nitrogen, which is also allowed to boil off into the channel coil for added thrust. The power is provided by a Tesla coil tuned to a resonance frequency of nitrogen. The main coil is in the launch base. There is a small secondary coil inside the test ship, which is powered by a nickel metal hydride battery pack. The battery pack feeds the coil as well as the internal control system, and the xenon flash tubes. The test system isn't very efficient, but should be capable of limited flights. The body is designed into an airfoil shape that will only allow a strait up flight path against gravity. Some kind of parachute recovery system could also be employed, probably set off by the loss of velocity at the flight apex.

DIPOLAR FORCE FIELD TECHNOLOGY TEST SHIP

Materials: yttrium, copper, and boron superconductor material for windings, capacitors, and wiring for the channel coil. High alumina, high fire ceramic powder. You will need an 8 square feet capacity high temp kiln, carbon fiber for frame, an electrodepositing setup, two tunable Tesla coils, one large one small. You will also need 4 x 3 inch coiled xenon flash tubes with transformers and capacitors, self adhesive reflective Mylar. And some type of lightweight thermal insulated material formed into the ring tank cryo storage unit. Also required are, materials for the launch base, control systems, and power supply for the launch base.

HISTORY IS NOT WHAT IT SHOULD BE

There are serious gaps in our technical history. The most glaring discrepancies are in the fields of energy and space drives. Go to your library in your city or school and look up books or periodicals on these subjects. I've done this quite recently and found that in the area of space drive systems there seems to be serious gaps in our technical history. Most of the information covered is about 1950's, and 60' vintage, with a little from the 70's, and 80's thrown in on top. It's as if the 1990's have produced a single significant advance noteworthy enough to mention in the area of space drive technology. Advances have been so slow in these areas when compared to other technical areas it is as if the required science and mathematics to make these significant advances is just in not there.

Energy technology has fared almost as badly. Most of our current energy production systems are based on inventions conceived in the 60's, and 70's.

They seem to redirect the educational system away from the real solutions to that public education is just not enough to build young minds into new Einsteins. Are the needed advances really that slow and plodding? Technical advance isn't like that unless it is deliberately retarded by some means.

By diverting mainstream science away from the true progress, they make enough folks lose interest in the science and that way no explanation for this slow progress is required. I find this very strange especially considering the amount of money and talent that aerospace and energy have been pulling from our country. Most of the science and mathematics required to unlock the potential of human space flight does not follow the status quo type of thinking. Advances in basic science are redirected by funding what sells, is expensive and complex and not funding any technical exploration that is deemed not worthy due to being to inexpensive of a solution and is driven off in contempt.

This Intellectual predigests shuts down any idea that does not follow the accepted norm. Any intelligent but not well accepted avenues of research are simply not funded. If the offending scientist continues to demand that his

theories receive proofs he will likely be driven from his research and sidelined permanently.

The European, Russian, and Chinese investment in space drive technology Have also been significant as well. With all of these folks working in this field for nearly 50 years, they just don't seem to grok the significance of a solid-state drive system. We just take the same basic principles, reorganize them, add new control systems, or new construction materials to them, but no new directions, or new ways of doing things.

No one seems to be working in the field of solid-state electric drives at all. All of the work shown about electric drives seems to indicate that they can only produce enough power to adjust the attitude of small satellites. This is simply not true. None of the systems they tell the public about can lift a payload into space. Well we know better than this now don't we?

There is this report in the dipolar force field patent about the ATAA/SAE/ASME 16th annual joint propulsion conference in Hartford Connecticut. I could find no information about these annual conferences in any periodical reference in the library. These are the groups that are working on the most advanced systems under development. I find it remarkable that our news press can find no stories of interest, to the public, from these conferences. I did however find some information online that referred to the 31st annual conference. This report came from a web page about the Aurora Spyplane. The report referred to a topic of discussion about the problems associated with the structural integrity of mach 5.5+ airframes. There is only one airframe, which can stand up to the stresses involved.

The commonly spotted airfoil designs the flying saucer shape. The saucer can handle the high speed turns that these drive systems can accomplish. Because this shape is the best possible solution to the stress problems associated with these drives (not to mention the best shape for the Bifeld-Brown effect). I think they will have to release the information eventually. Our modern history should contain the names of T. Townsend Brown, James E. Cox, and James R. Taylor, John Searl and many more as major contributors to our scientific advancement.

Much like the great Nikola Tesla inventor of alternating current electricity is only a footnote in our history books. These men would go unnoticed for their

contributions because of the secrecy and cover-up involved in their work. It is my hope in writing this book is that others will follow my lead. That they will investigate the often-secretive areas of energy and space drive technologies for themselves, to bring some light into these areas.

DEMAND THESE TECHNOLOGIES, AND YOU SHALL RECEIVE

Imagine for a moment if you will, what you could offer your children as far as a future if mankind were in the business of manufacturing spacecraft for family use, much in the same way that we now manufacture high-end motor homes for the general public?

Production cost with solid-state drive systems would drop as demand increased. I think a new space race is in order, the race to make it affordable to the consumer. This race will become even more economical when we start mining minerals from the Moon, which incidentally, is very high in titanium and aluminum. Both are essential for large-scale production of solid-state spacecraft. The Moon is also very high in He3 an excellent isotope power source for atomic to electric conversion technology

The flood of new opportunities that will open up when this technology becomes more a part of our reality is staggering. (The Jetsons for real.) Think about the possibilities, solid state drives are going to be the premier mode of travel in our future.

Aircraft as we now know them will seem antiquated and dangerous by comparison. The demand will grow with the printing of this book. Folks can't ask for something if they aren't allowed to know about it, or to know that the opportunities to possess the technology exist. Scientists cannot advance in this field if education of the basic science and mathematics is redirected into avenues that are known to have flaws built in to make advance impossible.

When personal power generators are commonplace there will be no need for the controlling power monopolies. I think a revolution of technology is in order. A revolution to place more personal power and far superior technology into the hands of anyone who can afford a nice summer home, or a high end motor home. There will also be spin-off technologies from the need to have habitats in space to go to.

Mining opportunities will open up all over, as the whole solar system becomes our home. Imagine owning your own Asteroid that's miles across, where you can hallow out the minerals you don't need to sell off and buy the things you do need.

Imagine a permanent home for your family or clan. Imagine a place where no one could demand taxes from you. You could be the sovereign of your own little world. You would be able to accumulate real wealth. You would be truly free at last.

Until this time has come I for one am going to start my exploration of intellectual and personal freedom by helping to colonize the oceans. This is my current occupation and goal.

Many others and myself are working with the founder of New Utopia, Lazarus Long to build a colony out in the Caribbean based on this idea of freedom to accumulate wealth and intellect. We are going to have a spaceport where you can launch alternative technology into space. There will be no income or corporate tax so the profits we gather from this effort will go to our children and not to a corrupt establishment.

After that we are going to colonize and terra form Mars and the Moon. We are not going to wait for someone to give us permission. We are just going to develop the technology in the private sector and launch it into space in spite of the official obstacles.

GIVE ME REAL OPPORTUNITY OR I'LL GET IT MY SELF

As a child, I dreamed up and drew spacecraft. I looked with hope to the future. One of my first significant memories was of my Dad waking me up to watch the first man walk on the moon. For many years after that, I thought there would be real employment opportunities in space for me when I grew up.

After all it was in the 1950's that writers predicted we would be living, and working in space by the year 2000. What happened to this future?

How did we get so sidetracked on this subject?

Well let me tell you, there exist in this world a controlling elite that would like to continue having their advantage of control over the rest of us. If we were to come and go into free space, they would lose that control, now wouldn't they?

People must be trapped and conditioned to be controlled. That is, your current condition whether you know or accept this fact. To stop this condition you need two things, (1) stop believing in your conditioning and except no limitations, (2) take this information and find others to help you obtain these technologies. Link up with like minds through any means possible and we will see the future we all strive for, to be truly free. Also you might consider investing in companies like my own that are working to free us all from centralization, control and limitation.

If you move to New Utopia you are also more likely to be one of the first citizens to be able to explore space in your own electric space vehicle.

Do you remember the first time a civilian went into space? How many children looked on in horror, as the first teacher in space was cremated in the upper atmosphere? It has been over a decade before there was any talk at all of putting a civilian up in space again, enough time for the ruling factor to sway public opinion about the rights to open space, and to establish ownership.

The space shuttle was an accident waiting to happen. It was designed in the 50's and 60's. This antiquated technology should not even be flying when you consider the fact that we have detected, and observed solid-state flying devices in our atmosphere since the 30's and 40's, perhaps even longer. Why has this technology not been developed and deployed?

I think eventually we will find that there is a great effort under way to develop these technologies, in secret, so the folks who now have it can keep those advantages to themselves. I looked for years in all the aerospace magazines and books I could find, but to no avail. Not even in the simplest form. It's as if the electromotive force were never discovered by Bifeld and Brown back in the 40’s and 50’s. These men went through great pains and personal sacrifice to demonstrate clearly that this discovery was not just electrostatic wind.

Brown placed his transducer in a vacuum chamber, and it still worked with no visible medium for an electric wind to push upon. I never learned of this discovery when I went to school. Even though it is a very relevant advance in electromotive principle it simply was omitted from our science books.

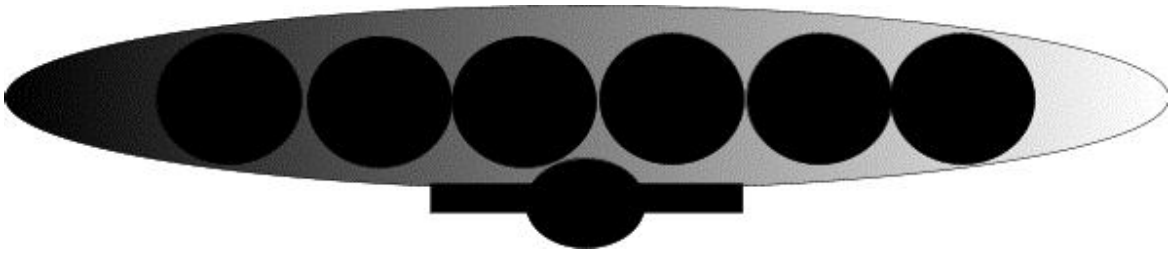
Of course the fact that the results of the vacuum test of the electrokinetic transducer were classified secret for years by the US government might have had something to do with it.

I had seen these craft as a child, and had no preprogrammed response not to see it as a form of travel that I desired to understand. No teacher I ever ask even tried to explain these craft, so I found it necessary to hack the information for myself.

While I'm on the subject of electromotive force, the inventor T.T. Brown sold the rights to all of his patents to the Whitehall Rand Corporation. His Patent is the corner pin of electromotive space drives.

The Corporation that bought these patents could have used this information to produce, lifting bodies for the first Moon launch. This device is perfect for the reduced gravity of the moon. The Eagle could have built up sufficient charge from their power cells to power an Electromotive Transducer to aid in the lift-off from the Moon on their return trip to Earth.

They could have used this system to produce small Semi-dirigibles like the one shown on the next page. Since the system produces no sound, it is perfect for use in a small, remote controlled observation craft. As shown below if the craft is painted flat black, and if that paint is conductive and is pulsed to create a harmonic of any outside microwave radiation, it could be very stealthy, and inexpensive to operate.



This crude drawing shows what is very probably the most common remote piloted type of observation craft using the airfoil design. It is cheap to build

and operate, and if filled with hydrogen, instead of helium it could be remote detonated if detected, then explained away as a piece of fallen space junk.

If no one is aware of a technology, the few who are can use it, without fear of discovery. It is very likely there are 1000's of these small observation craft, which can silently, and slowly scan an area, for the purpose of gathering intelligence. Of course the folks who have these advantages would not like this fact to become common knowledge. The forces that operate them would do so without fear that anyone would notice them, if someone did, who would care. Anyone reporting them is treated like a Village Idiot or UFO nut.

All of the basic science involved in electromagnetic spacecraft is described in Ernest Shearing's patent. The Protective Enclosure Apparatus for Magnetic Space Vehicles. The inventor mentions in the Description of Related Art section, column 2 in the beginning of the text, that there exist several types of craft that use electromotive force as a means of propulsion. Why else would we need this protective enclosure, after all we tend to invent things as a response to perceived need.

In the before mentioned patent on sheet 4 of 6 in figure 7 a typical circuit for an electromagnetic spacecraft is shown as below.

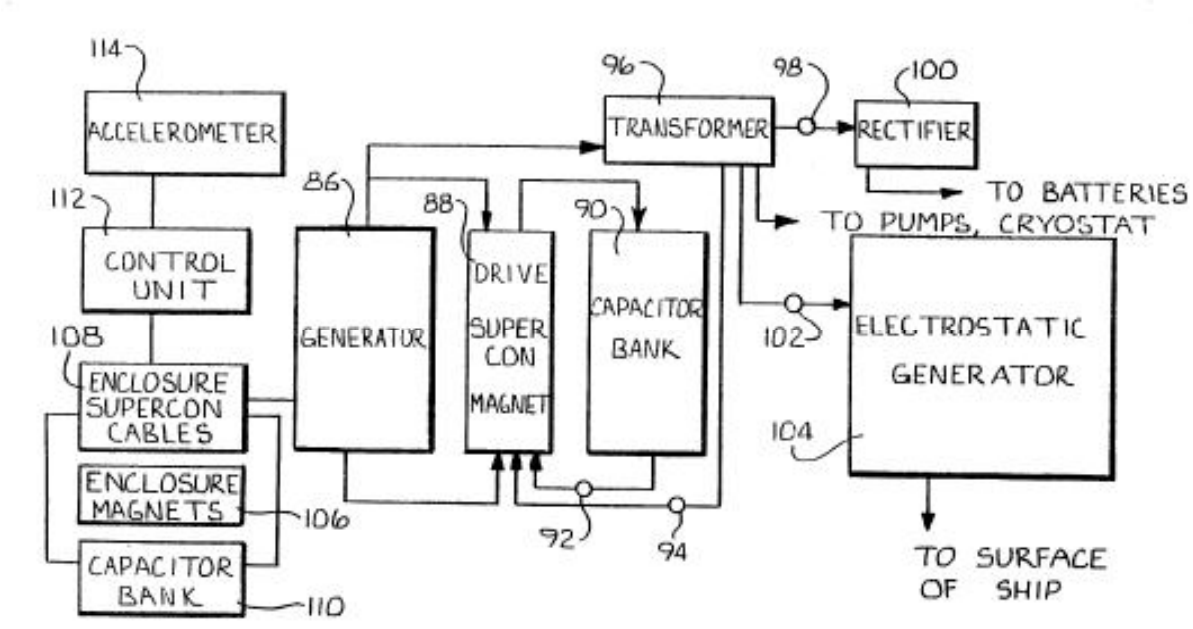


FIG. 7

This demonstrates an advanced level of thought on a subject that most of us know nothing or little about. If you analyze the chart you begin to comprehend the nature of the solid-state drive as is related to the other patents herein disclosed. This simple drawing demonstrates the bulk of the theory behind these different drive systems.

All of this tends to indicate that these drive systems are in a much higher level of development than most of us would have ever guessed. There are certainly a number of people, who know a great deal. Only they don't talk to the press or write about it, except for among their peers.

My conclusion is that there is a small core group working in this field. They have the required real direction in math and science required to progress in this sector of technology. Silent but steady progress is underway. What will happen when more minds are made aware of this information? This is my main driving goal at present. The basic science for this has been in development since the 1950's, but most of us have not been aware of it because we weren't supposed to know or understand this.

By simply denying the existence of other world craft, and denying that they also have these advanced forms of space travel the shadow government, and the forces that secretly control it, have made this whole avenue of scientific thought just disappear. Until now that is. My colleagues and I are starting to band together to find others like us and setup the needed commercial endeavors to fund this area of scientific exploration.

Denial, Disinformation, and Deceit, are these the types of behavior that our government should use against the very people who financed their whole operation? The big question on my mind is when were they going to let us in on these great advantages in transportation and energy? Ever?

How long were they going to keep it a secret? Is it because it's more significant tactically, and strategically than our aging nuclear stockpile? Would they become obsolete, and no longer provide those lucrative maintenance contracts to their boondoggle manufactures?

In a world that is driven by greed, and the lust for power it seems folks will do most anything to protect their multi-billion dollar profits at our expense of course.

STEALTH AND SPEED

The inventor envisioned the first drive system disclosed in this book back in 1980. He disclosed at the joint propulsion conference that his system was capable of complete microwave absorption. This makes any craft employing this drive system the most stealthy high altitude space plane ever conceived. The drive has an available thrust of 10 to the 6th power pounds that is about 1,000,000lbs of thrust. That is a lot of power. I find it hard to believe that the government would not pursue this technology. How they have managed to hide their research in plain sight for all this time is a careful study in the black art of thought diffusion on a massive and continuing scale.

Also important in it's selection as a Spyplane drive system is the lower jet velocities at higher volumetric flow rates, making it very quiet, another stealth advantage. It also has the advantage of being able to operate efficiently at very high altitudes because the field that extends from the vehicle can exert pressure on the surrounding gas field outside the craft. Think of the advantages of being able to remain stationary and making no sound. Would that be a desirable feature in a high altitude recon craft?

It's a safe bet that the government has already replaced the aging SR-71 Blackbird with these Electromagnetic Aurora Spycraft.

From my online research I discovered that most folks that talk about the technology involved in the Aurora don't have a clue. They are talking about scram jet variations and such. This is a total red herring in my opinion. The shadow-government probably watches those Internet sites and just laugh every time they see these totally off base conclusions.

I'm sure that international agreements against using nuclear power plants in aircraft is another reason that Area 51 doesn't admit that they have electromagnetic spy-craft. Aside from the obvious reason of significantly more advanced stealth abilities.

If they can say nothing, and get people to believe they are in the slow process of back engineering exotic alien technologies, that gives them a little more time before we all wake up and start to catch on.

I personally think all of these Smoke Screens should be lifted. The truth is dangerous I guess, but the truth should be released to the General Public. You might note that I spelled that with capitol letters. That is because you the General Public are the ones with the real power. You are in charge. You just arm yourselves with the truth and get rid of anyone who can't tell the truth. No one should hold a position in government, if they must lie to the people who put them in authority to begin with.

Imagine what you could do with a vehicle that can go 10% of light speed. You could travel to any point in the solar system, within a days travel time. For about the cost of an expensive summer home or a Winnebago. What if Winnebago manufactured a Space Camper? I would buy one for certain.

The only thing that makes this Science Fiction is the fact that common people don't have access to this technology. Therefore it stays in the realm of science fiction, even though it's science fact. It's just that the knowledge is suppressed somehow. These so called UFO's are really the private and military craft of the self appointed elite from this world, and God only knows who else has this knowledge.

NON AIR BREATHING ELECTROMAGNETIC PROPULSION

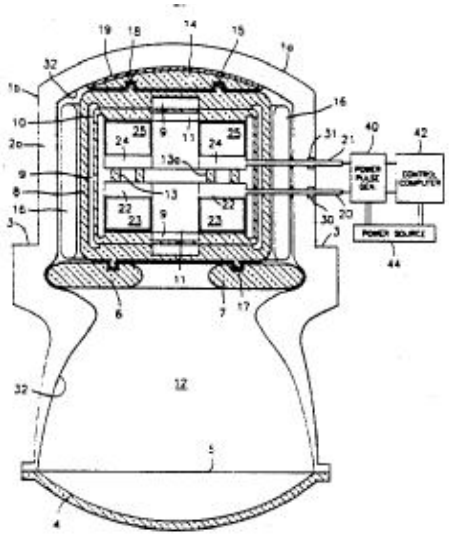
The late James Taylor's Engine System

This drive system was said by the inventor to be capable of around 1,440,000lbs of thrust, making it possible to achieve flight speeds in space of 29,900kps that's roughly 10% of the speed of light.

That is pretty amazing to me. It's nothing short of an Impulse Drive right out of Star Trek™. When I plug this drive system into my designs, it makes it possible for me to envision some serious space exploration, and research within our solar system within my lifetime.

You don't have to understand all of the technical information disclosed in this patent to be able to envision the possible applications for this system. You will notice in figure 7 of the patent document art that the drive system is shown incorporated into the familiar saucer shaped airfoil design.

Figure 2. shows the drive in a conveniently shaped outrigger design, so it can be bolted on to practically any existing spacecraft in the place of a rocket nozzle. Instead of the big, heavy, and dangerous liquid hydrogen, and oxygen tanks, needed to provide fuel for a rocket, we will only need to provide, an electric power cell for the outrigger engine.



This will give existing shuttles a little longer service time and when redesigned they will be able to provide more cargo space than current shuttles. They will only be limited by their current airframe design within atmosphere. Once out of the atmosphere, they will be capable of much faster flights with these new engines plugged into them.

To produce the necessary electric power for the Taylor Engine, we could use a fissionable reactor, or a magneto heterodyne power cell as the inventor envisions. The only cryogenic coolant required would be liquid nitrogen, if we were to use the new high temperature superconductor materials, like Yttrium Copper Boron for all of the windings, wiring, and capacitors.

This drive system doesn't have the inherent radar invisibility that is possible with the Dipolar Force Field Propulsion System, so it will probably be released for civilian aviation use long before the later is released. With its

superior thrust to weight ratio, and greater deep space application, I don't think any one will care about this limitation.

As the newest and most powerful engine design currently envisioned by Earth Science the Taylor Drive will probably go down in history as the most important advance in space drives in the 20th century.

I believe we will have civilian use of solid-state electric spacedrives within my lifetime.

NATIONAL SECURITY AND THE STATUS QUO

I think the main reason that the general public hasn't been made aware of the Dipolar Force Field Drive System is the inherent National Security problem created by the possible deployment of small stealthy ships, or warheads with ultra-high speed capabilities.

Any small government on Earth could develop devices like these. So long as they have the ability to produce or obtain small nuclear power cells like the ones my company is developing, and obtain the necessary materials to construct the acceleration coils.

The widespread application of this technology would create a lot of new players in what is right now a very small field. This, I'm sure, is a frightening possibility for those now in control of space.

I'm not for keeping the status quo intact. That is the problem of the Globalist elitists that now dominate the lives of men. They already have a huge advantage over the rest of the human race by controlling most of the resources and information on the planet. They also have had exclusive use of this technology for many years in my opinion.

The people in control always seem to manage to block others from the technological advantages that they enjoy until they have exploited it to its fullest and have gone on to a higher level of technology, leaving the rest of us in their dust. My main driving factor is the survival of the human race, not just the elite and their servants. All humanity deserves the right to advance and go beyond the bounds of Earth, if it is their spirit’s direction to do so.

FUEL BURNING SYSTEMS VS ELECTROMAGNETIC AND ELECTROMOTIVE SYSTEMS

Liquid fuel burning systems in cars have been around about as long as liquid fuel burning rockets. Unlike these systems, electromotive and magnetic spacecraft are relatively new. They are more efficient, making the rocket systems obsolete.

Much the same is true for autos. There are people making huge amounts of money from the burning of fossil fuels. This is the only option for most of us.

You can find electric cars, even very efficient ones with comparable performance rates as fuel burners, but it's difficult and expensive. I believe that's what the Oil Barons want, and they are used to getting what they want.

So it is with Spacecraft. There are companies with billions of dollars at stake, willing to do most anything to protect those profits. Our government acts like their lapdogs, ready to jump into bed with them for money or retirement employment, as a consultant for their company. They are securing their future by lying to their people or perhaps they really don’t know and are just inept. It's time we take control of the access to technology on this planet. The Internet is the way in which this will come about. Funding of course can and often still will be limited to those who are headed in the officially right directions with their research. The needs of the many out-weigh the controlling whims of the few!

The method of control is in suppressing cheaper, and better technologies, for travel in space, as well as power production and in controlling the educational system so that the required math and science to develop these systems is omitted from education. Only those who seek the truth will ever find it as things are today.

Producing your own limitless electric power should be a survival instinct not a luxury of the rich. The same is true of space technology. It shouldn't be the exclusive domain of the superrich and their government lackeys, with their contacts within the government these Aerospace and Energy industry giants can suppress better, and more efficient methods, at least on the outside.

It is my belief that they also secretly develop the really superior technology for themselves. This is done under the guise of National Security as I have stated. This serves to secure their exclusive control of key sectors of technology. All of this is done at our expense. It's much like being duped into building a slave camp, thinking how lucky you are to have a job, only to find out you are the slave the camp is being built for.

They get the money, and the creative talent to rip us off right from us. Then sell us crap, and tell us it's gold. All of this is being done with our tax dollars, costing our children a deficit they cannot afford. If we were to build things in a more friendly and reasonable world we would make them last. If energy technology, and transportation were allowed to advance at the same rate as computer technology, we would all be able to obtain our energy and space independence, not just this self appointed elite.

All of this is being done without our knowledge, and they never intended to let us in on the deal. Our investment will only pay-off for those seeking to dominate us.

We aren't supposed to gain from this research, just to pay for it, and remain ignorant slaves, to a system set up to take advantage of us so long as we remain useful, and well brainwashed into accepting our limitations.

Only the elite few will ever know, unless people make a fuss and take what is rightfully ours, the technology to access the local universe. So if you are one of the lucky ones, and have the good fortune to read this work, I urge you to make some noise, and demand access to Spacecraft, and Energy technologies, that are personally empowering, and efficient.

I have few illusions about the success of this book. It would be lucky for the human race if most people knew of our true level of technology. The fact is, most folks would rather not know. It would shatter the illusions that they have been taught to believe in. My only hope to obtain my goals is that enough people will read my work and the work of others like myself and expand on it. Then we will see a real difference in what people will expect to receive from technological development.

The elite few of whom many I am sure think they deserve the right to rule the rest of us, want to maintain control by hiding their advantages behind the guise of National Security Interest. The real issue however is the security of their exclusive advantages over the rest of us.

We need to have access to space in a free and unrestricted manner and the energy technology that makes this possible. If we do not we will not survive as a species I believe. Control of the birthing of mankind into space is not in the best interest of mankind. So whom you might ask does this give advantages to. This is a question that has been on my mind for many years now. What humans would want to retard the growth of their own species?

It is important to consider that they might not be humans acting in the best interest of humanity at all. Perhaps forces or consciousness control them mentally or physically that are not at all human or working only to make certain that mankind stays on this planet. It is something to consider.

This is something that is so important that it needs to have the light of truth brought to bear upon it. Risk anything to defend the truth, because when the truth is gone only darkness rules. I cannot be personally influenced otherwise. When you are in the truth, the darkness flees you, and the light becomes your constant companion.

Being a relative nobody, and not being connected, to any source of worldly influence other than the truth, makes me the person to do this work I suppose.

Those on the side of truth always win, in the end. It must be the will of our Creator that the Children of Heaven control the heavens including the void. Those who think it's their right to control the void, fear the assent of humankind into space.

I'm not a scientist. I don't have the discipline or the formal education necessary to obtain the credentials. I'm just a Reality Hacker who wants the technology for efficient space travel to come down to the common man, like myself. Hopefully, some day I can buy a really cool space camper for myself, and go cruising the stars.

U.NAUTHORIZED F.ACTS IN O.PERATION

I may seem to some to be a bit of a paranoid. Some of my friends and family have called me obsessive, because I've been saying for years, that there is someone using this superior technology and not letting us in on the fun.

These folks will do most anything they deem necessary to hide the empowering truth. Mankind I believe has the technical sophistication to achieve economical and ultra-high velocity space flight. The advantage is so significant that the elite ruling class don't want to chance to lose it.

You can't find a book in your library that covers these advanced devices. You can't take courses in school to prepare yourself to advance science in this field. The basic theory and math behind these drive systems and advanced nuclear to electric power conversion technologies is omitted from any textbooks covering the subjects. It's as if there is this great chasm to cross, in order to find this information.

When I was a child, I grew up with movies and television shows that pictured humankind and starfolk alike, using flying saucers as the principle means of travel in space. They even explained the rudimentary principles behind the operation of these crafts.

In science class it was a different story. We were taught that this was pure fantasy, and that the devices described in the movies used implausible Anti-Gravity drives that could never be achieved. They never considered the use of superconductive electromagnetic systems as a principle means of propulsion. Rockets were shown to be the only possible method for space travel in my lifetime, or so they said.

I knew better than this, mainly because I had seen these spacecraft, and they were solid objects, not phantoms, or apparitions as they would have us believe. They seemed to me to be an electromagnetic device.

My first science experiment at age 8 was an electromagnet. I wrapped a bell wire around a nail, and attached the wire to a lantern battery. That electromagnet was so strong, it could pick up 4 or 5 nails it's same size. I

also liked to play with permanent magnets, making them influence each other through solid objects, using the attraction and repulsion powers of the magnets.

In observing the high speed, almost instant course changes in UFO's, I deduced that they were actually sophisticated electromagnetic devices that changed direction by flipping a switch. These deductions are from the mind of a 9 year old. My mind had not been programmed to not believe. I looked at the so-called UFO's as a do-able technology that seemed no one was willing to try to duplicate.

This was very frustrating for me as a child as I understood even at this tender age that mankind would never make it very far from this planet by pushing through this envelope of atmosphere with rocket ships. We would need to tap into the electromagnetic field of the Earth, the planets, and the stars in order to travel very far into the universe.

Taking millions of pounds of fuel with you, and burning it up as you go, is like building a campfire with the only wood around then trying to carry it into the desert with you for heat. There is plenty of heat in the desert, just as there is plenty of energy in the universe. One doesn't need to take fuel with them. The stars contain limitless reserves of energy.

For instance our Earth resonates at what is called Schumann's Resonance (7.8hz). The Earth pumps out energy at this frequency constantly. If we were to tap into, and collect this power, it would solve all of our energy needs. We live on a huge Polarized Energy Grid. Unfortunately we don't use it; instead we burn toxic fossil fuels, and use dangerous radioactive elements in a crude, and inefficient manner to create steam to run turbines. All of the systems we use were out date when I was born, but we still use them today.

We need leaders with enough vision, and backbone to stand up to powerful business interests that discourage us from exploiting, the limitless reserves of energy we have all around us. Most of our so called leaders are but puppets to their masters. They are paraded in front of us, so that we have someone to blame, and throw rocks at when the system fails, and it will fail, as it isn't a sustainable system.

The designers, and exploiters of this system intend for it to crumble, as soon as they are finished with it, leaving the common folks like you and I, holding the bag with nothing to fall back on, and nowhere to go.

Meanwhile they perfect star travel, and move into underground cites, built into the perfectly spherical fused rock caverns created by underground nuclear test blasts. Thus avoiding all the calamities they created, and profited from on the surface. The only places that will remain, are what they refer to as, Regional Biosphere Areas. These are areas of intense growth that they will protect with troops, and will not allow us to enter. These Biosphere Regions, will be the only preserves of life left on this planet. The cites, and all their inhabitants, will be destroyed, in what they call a Population Downsizing. Much like these businesses downsize so that fewer people are necessary. The Globalist Elitist Forces are preparing to get rid of all these now useless people.

When robots run all the factories, and agro-businesses, the problem will be what to do with all these now unnecessary workers. There isn't going to be some utopian world, were we all have leisure, and live like the rich. The fascist solution is obvious.

The forces of darkness are preparing to destroy most of the human race, whittling us down, to a controllable number. Then tagging the remaining few, with telemetric bio-implant chips, so we can be controlled, and monitored via satellite.

In order to accomplish this task though, we all have to cooperate, by staying in one place. So they need to control the application of inexpensive space travel. This includes the information on how to obtain efficient space travel and energy. The common man must not obtain economical space flight capability, in order for this Fascist Dream to become a reality.

If we were to discover, the means to escape their trap, and demanded access to these technologies, their long-term goal, of domination of the world, and the limitation of mankind to an Earth bound creature could well be foiled.

It is necessary to control access to the information about these technologies, so that no one will know that the option to leave this world exists. It is also difficult to obtain, the key materials for the large-scale production of

superconductive electromagnetic spacecraft and super efficient energy systems.

This might all seem to like paranoid delusion to some. I believe it is the sad truth. This is the conclusion of a great deal of research on my part. These conclusions are not mine alone. Others have come to similar conclusions. Not everyone has had the same exposure to information necessary to come to these same conclusions.

I'm never offended when folks just don't want to agree with me, after all if the reality of our situation is as offensive as I say it is, then it's a pretty scary one to look at. We are all trained not to give our attention to evil.

This is just what evil wants, it thrives in darkness. While we all look away, they have their way with us and ravage our planet, and we pretend it didn't happen. Think only positive thoughts, and look only at positive happy pictures of what you want reality to be. What a bunch of suckers. After all, it's much easier to look at what we are told is reality then to scratch the surface and discover it's only a cheap paint job.

That's what it means to be a Reality Hacker. Don't accept the obvious, and the comfortable, they are traps set for the lazy, and the complacent.
Hack-On

SECRECY AS THE TOOL OF EVIL

The really evil thing I see, behind keeping these technologies a secret, is what we could have accomplished by now if more minds had access to this information. The secrecy employed retards the growth of the whole human race. There are creative minds on this world that might have exploited these technologies in ways we can't even imagine yet. These opportunities are lost forever, due to the secular, and secretive nature of our society.

The human mind is a collective organism. We are capable of advancing as a people, only when we are all, given access to ideas, as they become available. After all why do we have schools but to give everyone, the same basic advantages? Truth nourishes the mind. We all need this form of nourishment, to advance on the physical, mental, and spiritual levels.

Secrecy denies the Creative Spirit. By denying the Creative Spirit, we deny our selves the right to exist. After all we don't simply exist to feed our faces, and have babies.

We are creative creatures, driven to explore the vastness of the universe. We are capable of stewarding a planet, and Terra-forming other worlds for our use. Why should we squander our resources paying to see science fiction movies, when we could invest those same resources and create science fact, to rival the best sci-fi ever conceived.

If we took all the money we have spent on sci-fi movies, and bought into these solid state drive systems and advanced nuclear to electric conversion technologies, and really developed them, where would we be right now. These movies just serve to placate an inner need, to see these things become a reality. There are those who mock the truth, by entertaining us with the very notions we most desire most, while secretly developing the real thing in their hidden desert strongholds.

UNDERGROUND BASES IN THE U.S.

Not long ago I was surfing the World Wide Web, and came upon a page that discussed underground bases. http://www.mt.net/~watcher/phils.html the author of the story Phil Schneider claimed to be a contractor for the government and had been doing work constructing these bases for the last 30 years. The contractor said he believed that these bases were being constructed to help the U.S. survive a nuclear war. These bases were said by the author, to be connected by Mag-Lev Trains. Later he discovered that, they were only going to be occupied by an elite few. The author also discusses a firefight that ensued, between the construction crew digging a tunnel, and some Grey Aliens they accidentally discovered. This event was the reason for his change in awareness. The crew was debriefed, and sworn to secrecy. He then realized the premise they were working under, had been a lie.

The places that he said hid these underground bases were as follows, Mercury NV \ Page AZ \ Dulce N.M.\ Dougway UT. The interesting thing, that I discovered, when examining these locations on the U.S. map, is their

positions on the planet. The first three are positioned in an almost straight line, just below the 37th parallel. The second interesting thing I discovered is that the first three, are all about 420mi. apart. The Dougway sight is also about 420mi. from Page AZ. forming a giant T. I then started looking for a site to the South of Page AZ., and discovered, that the giant Yuma Proving Grounds lay in just the right spot, to form a large cross across these western states.

All of this author's words are impossible to verify now, because the author it seems, was assassinated in his motel room, while touring with his book on the subject. He was reported to be found, with a piano wire still wrapped around his throat. Dead men tell no tails, or do they?

WRAP-UP

To close this second edition, I would like to make a few statements. I am personally dedicated to the truth, no matter how terrible, no matter what the consequences of my telling of it.

Secrecy, and Deception should not be necessary to carry on statecraft, if so then statecraft should be abolished in it's current form, and allowed to evolve, as we evolve. The State should not retard the progress of the people. There is no excuse for retarding the growth, and technological advancement of the human race.

It states in the bible that God commands his people to "Go forth, be fruitful, and multiply. This is becoming increasingly difficult because of space constraints here on Earth. Only the Sea is left for us to expand out into at this time

This entire Universe is the Kingdom of God not just this Earth. Space is aptly named because there is practically endless room for us to grow. The Moon is composed of most of the metals we will need to create spacecraft and space colonies. I think our Creator arranged this fact on purpose. We are encouraged to be Creative, and to explore.

Comets extend far out into space providing pre-positioned water and Carbon dioxide for our use, should we venture out into the solar system. This fact also I believe was arranged, and is no accident of nature, but rather is further encouragement to go forth, be fruitful, and multiply. Our only constraint is evil, and selfish individuals whom God may be soon judging.

The meek should inherit the Earth,
for only the bold may inherit The Stars.

Michael McDonnough

Appendix A. U.S. PATENTS # 2,949,550

Aug. 16, 1960 T. T. BROWN 2,949,550

ELECTROKINETIC APPARATUS

Filed July 3, 1957 2 Sheets-Sheet 1

FIG. 1

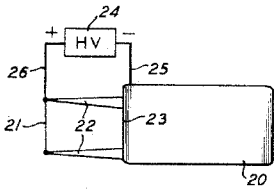


FIG. 2

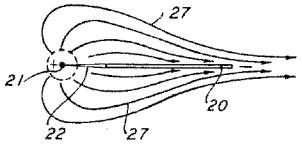


FIG. 3

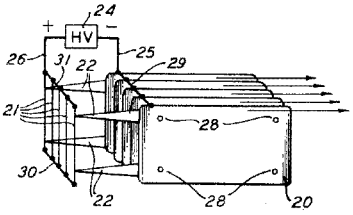


FIG. 4

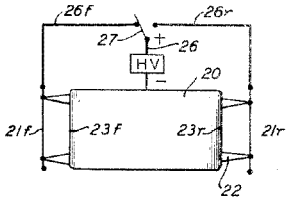
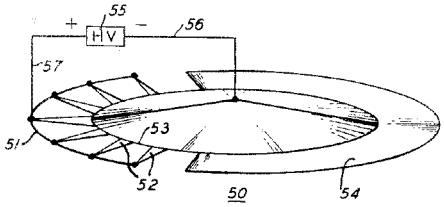


FIG. 5



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Aug. 16, 1960 T. T. BROWN 2,949,550

ELECTROKINETIC APPARATUS

Filed July 3, 1957 2 Sheets-Sheet 2

FIG. 6

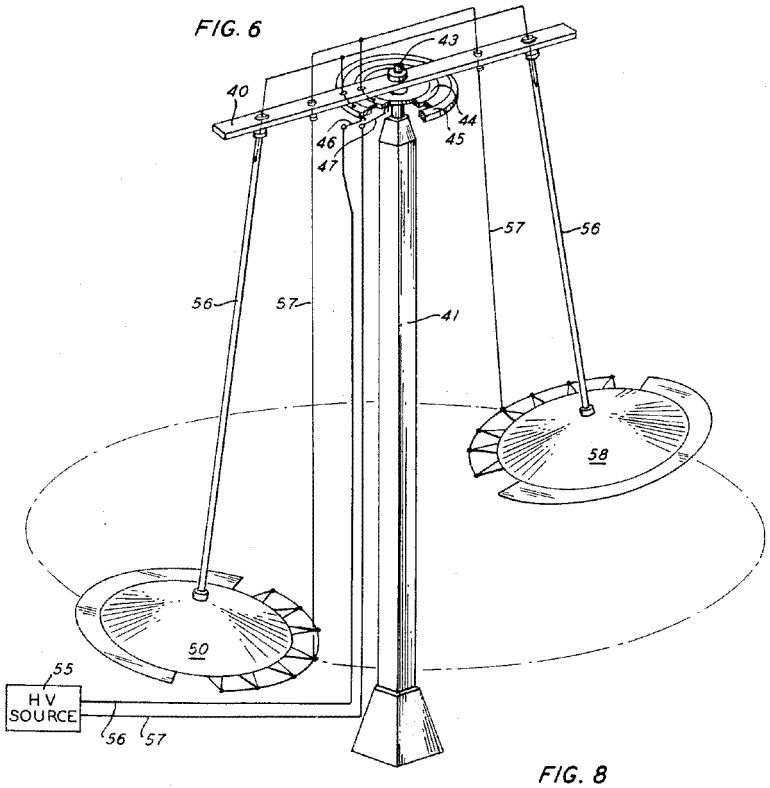


FIG. 8

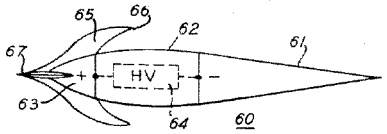
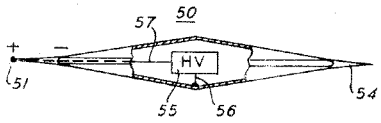


FIG. 7



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United States Patent Office 2,949,550 Patented Aug. 16, 1960

2,949,550

ELECTROKINETIC APPARATUS

Thomas Townsend Brown, Umatilla, Fla., assignor to Whitehall-Rand, Inc., Washington, D.C., a corporation of Delaware

Filed July 3, 1957, Ser. No. 669,830

12 Claims. (Cl. 310—5)

My invention relates to electrokinetic apparatus, and more particularly to a method and apparatus for utilizing electrical potentials for the production of forces for the purpose of causing relative motion between a structure and the surrounding medium.

This invention was disclosed and described in my application Serial No. 293,465, filed June 13, 1952, which application has become abandoned. However, reference may be made to this application for the purpose of completing the disclosure set forth below.

The invention utilizes a heretofore unknown electrokinetic phenomenon which I have discovered; namely, that when a pair of electrodes of appropriate form are held in a certain fixed spaced relation to each other and immersed in a dielectric medium and then oppositely charged to an appropriate degree, a force is produced tending to move the pair of electrodes through the medium. The invention is concerned primarily with certain apparatus for utilizing such phenomenon in various manners to be described.

Priorly, intervening electrokinetic apparatus has been employed to convert electrical energy to mechanical energy and then to convert the mechanical energy to the required force. Except for the insignificantly small forces of electrostatic attraction and repulsion, electrical energy has not been used for the direct production of force and motion.

Since any conversion of energy from one form to another is accompanied by losses due to friction, radiation or conduction of heat, hysteresis, and the like, as well as serious reductions in the availability of the energy by increases in the entropy of the system, it is apparent that great increases in efficiency may be achieved through the use of the direct production of electrical energy and force and motion made possible by my invention. Likewise, the elimination of the machinery for the intermediate conversions results in great savings in first costs, maintenance, weight and space, the latter two being of great importance in self-propelled vehicles including mobile vehicles such as aircraft and space craft.

It is therefore an object of my invention to provide an apparatus for converting the energy of an electrical potential directly into a mechanical force suitable for causing relative motion between a structure and the surrounding medium.

It is another object of this invention to provide a novel apparatus for converting an electrical potential directly to usable kinetic energy.

It is another object of this invention to provide a novel apparatus for converting electrostatic energy directly into kinetic energy.

It is another object of this invention to provide a vehicle motivated by electrostatic energy without the use of moving parts.

It is still another object of this invention to provide a self-propelled vehicle without moving parts.

It is a feature of my invention to provide an apparatus

for producing relative motion between a structure and the surrounding medium which apparatus includes a pair of electrodes of appropriate form held in fixed spaced relation to each other and immersed in a dielectric medium and oppositely charged.

It is another feature of my invention to provide apparatus which includes a body defining one electrode, another separate electrode supported in fixed spaced relation by said body, and a source of high electrical potential connected between the body and the separate electrode.

It is also a feature of my invention to provide apparatus having a body which is hollow and a source of potential contained within the body.

It is another feature of my invention to provide apparatus having a body and an electrode connected to the body, which combination comprises a vehicle.

It is also a feature of my invention to provide apparatus which comprises a plurality of assemblies, each including a body and an electrode secured in side-by-side spaced relation to each other.

It is another feature of my invention to provide vehicular apparatus which includes a pair of electrically conductive body portions joined by an insulating portion, whereby said electrically conductive portions constitute the electrodes.

Other objects and advantages of my invention will be apparent from a consideration of the following specification, read in connection with the accompanying drawings, wherein:

Figure 1 is a side elevational view illustrating diagrammatically a simple form of apparatus embodying and functioning in accordance with the principles of my invention;

Figure 2 is a plan view of the apparatus shown in Figurue 1;

Figure 3 is a perspective view illustrating the manner in which a plurality of devices of the character illustrated in Figure 1 may be interconnected for joint operation;

Figure 4 is a diagrammatic view similar to Figure 1 illustrating a modified form of the invention providing a means for reversing the direction of the propulsive force produced;

Figure 5 is a perspective view illustrating diagrammatically a self-propelled device utilizing the principles of this invention;

Figure 6 is a perspective view of one illustrative embodiment of this invention showing a pair of electrokinetic propulsion devices suspended from a rotatable arm which arm is supported at its midpoint;

Figure 7 is a side elevational view of a mobile vehicle with parts broken away to show the interior construction;

Figure 8 is a side elevational view illustrating diagrammatically the arrangement of parts used in an alternative form of mobile vehicle.

Referring to the drawings, I have illustrated in Figure 1 a simple form of apparatus which is readily adaptable for use in demonstrating the principles of my invention, and which is utilized in this application as a simplified representation to facilitate an understanding of the principles involved. The apparatus illustrated in Figure 1 constitutes one electrode which is preferably in the form of a body member **20**, said member preferably comprising a relatively thin flat plate. A second electrode **21** in the form of a wire or other suitable form of electrical conductor is held as by means of insulated supports **22** in fixed spaced relation to the body **20**, the wire **21** being disposed in the plane of the body **20** and preferably substantially parallel with a leading edge **23** of the body **20**. A source **24** of high voltage electrical potential is provided and connected as shown at **25** and **26** to the two electrodes **20** and **21**, respectively.

I have discovered that when apparatus of the character just described is immersed in a dielectric medium, as for example, the ordinary air of the atmosphere, there is produced a force tending to move the entire assembly through the medium, and this force is applied in such direction as to tend to move the body **20** toward the leading electrode **21**. This force produces relative motion between the apparatus and the surrounding fluid dielectric. Thus, if the apparatus is held in a fixed position, the dielectric medium is caused to move past the apparatus and to this extent the apparatus may be considered as analogous to a pump or fan. Conversely, if the apparatus is free to move, the relative motion between the medium and the apparatus results in a forward motion of the apparatus, and it is thus seen that the apparatus is a self-propulsive device.

While the phenomenon just described has been observed and its existence confirmed by repeated experiment, the principles involved are not completely understood. It has been determined that the greatest forces are developed when the leading electrode is made positive with respect to the body **20**, and it is accordingly thought that in the immediate vicinity of the electrode **21** where the potential gradient is very high, free electrons are stripped off of the atoms and molecules of the surrounding medium. These electrons migrate to the positive electrode **21** where they are collected. This removal of free electrons leaves the respective atoms and molecules positively charged and such charged atoms and molecules are accordingly repelled from the positive electrode **21** and attracted toward the negative electrode **20**. The paths of movement of these positively charged particles appear to be of the nature represented by the lines **27** in Figure 2.

It appears that upon reaching or closely approaching the surface of the body **20**, the positively charged atoms and molecules have their positive charges neutralized by the capture of electrons from the body **20** and in many cases, it may be that excess electrons are captured whereby to give such atoms and molecules a negative charge so that they are actually repelled from the body **20**.

It will be appreciated that the mass of each of the individual electrons is approximately one two-thousandths the mass of the hydrogen atom and is accordingly negligible as compared with the mass of the atoms and molecules of the medium from which they are taken. The principal forces involved therefore are the forces involved in moving the charged atoms and molecules from the region of the positive electrode **21** to and beyond the negatively charged body **20**. The force so exerted by the system on those atoms and molecules not only produces a flow of the medium relative to the apparatus, but, of course, results in a like force on the system tending to move the entire system in the opposite direction; that is, to the left as viewed in Figure 1 of the drawing.

The above suggested explanation of the mode of operation of the device is supported by observation of the fact that the dimensions and potentials utilized must be adjusted to produce the required electric field and the resulting propulsive force. Actually I have found that the potential gradient must be below that value required to produce a visible corona since corona is objectionable inasmuch as it represents losses through the radiation of heat, light and molecular charges in the medium.

My experiments have indicated that the electrode **21** may be of small diameter for the lower voltage ranges, i.e. below 125 kv. while above this voltage, rod or hollow pipe electrodes are preferred. These large electrodes are preferred for the higher voltages since sharp points or edges are eliminated which at these elevated potentials would produce losses thus diminishing the thrust. For example, electrodes to be operated at potentials below 125 kv. may be made from small gauge wire only large enough to provide the required mechanical rigidity while electrodes to be operated at potentials above 125 kv. may be hollow pipes or rods having a diameter of ¼ to ½ inch.

In Figure 3, I have illustrated the manner in which a plurality of assemblies, such as are shown in Figure 1, may be interconnected for joint operation. As may be seen from Figure 3, a plurality of such assemblies are placed in spaced side-by-side relation. They may be held fixed in such spaced relation through the use of a plurality of tie rods **28** and interposed spacers (not shown) placed between adjacent plates **20**. The assembly of plates **20** may be electrically interconnected by a bus bar or similar conductor **29** to which the negative lead **25** is connected. In a similar way, the plurality of positive leading electrodes **21** may be held in appropriately spaced relation to each other by fastening their ends to pairs of bus bars **30** and **31**, to the latter of which the positive lead **26** is connected. The assembly of leading electrodes **21** may be held in spaced relation to the assembly of body members **20** by an appropriate arrangement of the supports **22**.

In Figure 4, I have illustrated diagrammatically an arrangement of parts for producing a reversible action; that is, permitting the direction of the propulsive force to be reversed. The apparatus is similar to that shown in Figure 1, differing therefrom in utilizing a pair of leading electrodes **21***f* and **21***r* spaced by means of spacers **22** from the front and rear edges **23***f* and **23***r* of the body member **20** in a manner similar to that described with reference to the supports **22** in Figure 1. The source **24** of high voltage electrical potential has its negative terminal connected to the body **20** as by means of the aforementioned conductor **25**. The positive terminal is connected as by means of the conductor **26** to the blade **27** of a single-pole, double-throw switch, serving in one position to connect the conductor **26** to a conductor **26***f* which is in turn connected to the forward electrode **21***f* and arranged in its opposite position to connect the conductor **26** to a conductor **26***r* which is in turn connected to the reverse electrode **21***r*.

It will be seen that with the switch **27** in the position shown in Figure 4, the apparatus will operate in the manner described in connection with Figure 1, causing the assembly to move to the left as viewed in Figure 4. By throwing the switch **27** to the opposite position, the direction of the forces produced are reversed and the device moves to the right as viewed in Figure 4.

In Figure 5, I have illustrated the principles of the invention as embodied in a simple form of mobile vehicle. This device includes a body member **50** which is preferably of the form of a circular disc somewhat thicker in its center than at its edges. The disc **50** constitutes one of the electrodes and is the equivalent of the body member **20** referred to in connection with Figure 1. A leading electrode **51** in the form of a wire or similar small diameter conductor is supported from the body **50** by a plurality of insulating supports **52** in uniform spaced parallel relation to a leading edge portion **53** of the body **50**. A skirt or similar fairing **54** may be carried by the body **50** to round out the entire structure so as to provide a device which is substantially circular in plan. A source of high voltage electrical potential **55** is provided with its negative terminal connected as indicated at **56** to the body **50** and its positive terminal connected as indicated at **57** to the leading electrode **51**.

The device operates in the same manner as the apparatus shown in Figure 1 to produce a force tending to move the entire assembly through the surrounding medium to the left as viewed in Figure 5 of the drawing.

Referring now to Figure 6, there is depicted an illustrative embodiment of this invention in which a pair of mobile vehicles, such as depicted in Figure 5, are shown suspended from the terminals of arm **40**, which arm is supported at its midpoint by a vertical column **41**. High voltage source **55** is shown connected through wires

56 and 57 which extend to the ends of arm 40 by way of suitable rotatable contacts 44 and 45 and brushes 46 and 47 adjacent point 43 in the center of arm 40. Mobile vehicle 50 is shown suspended from one end of the lever arm 40 by means of conductors 56 and 57. A similar vehicle 58 is shown suspended from the other end of the rotatable arm by conductors 56 and 57. It is, of course, understood that these bodies may be suspended by any convenient structure such as wires or rods which wires or rods may support conductors 56 and 57 in any suitable manner.

In this illustrative embodiment the vehicles were caused to rotate at a speed of 17 feet per second with 50 kv. applied to conductors 56 and 57 from source 55. It is, of course, understood that these figures are merely by way of illustrative example and, as might be expected, the speed of the vehicles increases exponentially with the applied voltage.

When the apparatus is to be used for propelling a mobile vehicle, it is, of course, necessary that the source 55 of high voltage be contained within and carried by the vehicle. This may be accomplished by using the apparatus in the manner shown in Figure 7, wherein the high voltage source 55 is contained within the hollow central portion of the body 50, the conductor 56 being connected to the body and the conductor 57 being suitably insulated from the body 50 and extended externally thereof and into connection with the leading conductor 51.

The apparatus of my invention may be used to propel vehicles of shapes other than that described in connection with Figures 5 and 7. For example, in Figure 8 I have illustrated the way in which the invention may be utilized in the propulsion of a vehicle of torpedo-like shape. As is shown in Figure 8, I use a body member which is indicated generally by the reference character 60 and which is formed of three parts, to wit, an afterbody 61 formed of electrically conductive material, a hollow central body portion 62 formed of insulating material, and a nose portion 63 formed of electrically conductive material. A source 64 of high voltage electrical potential is contained within the hollow central body portion 62 and has its terminals connected, respectively, to the nose portion 63 and afterbody portion 61, the positive terminal being preferably the one which is connected to the nose portion 63. Thus, the afterbody 61 functions as the aft electrode 20 described with reference to Figure 1 and the nose portion 63 corresponds to the leading electrode 21.

The nose portion 63 may be equipped with a plurality of suitably shaped fins 65. These fins may be extended aft of the junction between the central body 62 and the nose portion 63, as shown at 66, to provide ionizing elements which are spaced more closely to the afterbody 61 and which functions in a manner analogous to the smaller diameter electrode 21. Also, the fins may be shaped to conform to the aerodynamic requirements and may, if desired, be movable in whole or in part for the purpose of permitting the machine to be maneuvered.

I have shown the nose portion 63 as being provided with a needle-like point 67. By using such a nose form, which at present appears to be the best suited for flying speeds approaching or exceeding the speed of sound, I am able to produce an ionization of the atmosphere in the immediate region of this foremost portion of the mobile vehicle. I believe that this ionization facilitates piercing the sonic barrier and minimizes the abruptness with which the transition takes place in passing from subsonic velocities to supersonic velocities.

From the foregoing it will be observed that I have provided an electrokinetic method and apparatus for the production of forces suitable for causing relative motion between a structure and the surrounding medium. It will be observed that the methods and apparatus described herein are particularly adaptable for use as a propulsive means for self-propelled vehicles. I wish to emphasize that the high voltage power source referred to herein may be of relatively simple construction and relatively low capacity. For example, potentials of the order of 30 to 70 thousand volts may be adequate for use with this apparatus, the particular voltage employed dependent, of course, upon the size of the vehicle or apparatus. It will be appreciated that the elimination of moving parts in the apparatus will represent a tremendous saving in first cost and maintenance cost of the apparatus also the direct production of the motive forces from the electrical force represents a high efficiency so that greater propulsive forces and speeds may be obtained with apparatus occupying small space and of light weight.

While I have shown and described various embodiments of my invention, it is appreciated that the principles thereof may be extended to many and varied types of machines and apparatus. The invention therefore is not to be limited to the details illustrated and described herein.

Certain of the physical principles embodied herein are disclosed and described in my application Serial No. 669,727, filed July 3, 1957, which is directed to the generation of high voltages by means of electrokinetic apparatus.

In my application Serial No. 669,831, filed July 3, 1957, electrokinetic principles are employed in conjunction with apparatus somewhat similar to that disclosed and described in the instant application to produce a novel transducer.

I claim:

1. Thrust producing apparatus comprising an electroconductive body having a relatively large, substantially smooth area thereof exposed to the surrounding medium, an electrode supported on said body, insulated therefrom and shaped to produce a concentrated electrostatic field when electrically charged with respect to said body, and power means connected between said body and electrode to impress high voltage thereon whereby to cause relative movement of an ionizable dielectric medium surrounding said electrodes.

2. Thrust producing apparatus comprising an electrode having a substantially flat exposed surface, an elongated electrode extending along one edge of said surface and equidistant therefrom and supported in fixed spaced relationship with respect to said edge of said surface and substantially in the plane thereof, and power means connected across said electrodes to impress high voltage thereon whereby to cause relative movement of an ionizable dielectric medium surrounding said electrodes.

3. Thrust producing apparatus comprising a substantially flat hollow electrode, an electrode supported in fixed spaced relationship with respect to an edge of said flat electrode and substantially in the plane thereof, and power means within said hollow electrode connected across said electrodes to impress high voltage thereon thereby causing relative movement of an ionizable dielectric medium surrounding said electrodes.

4. Thrust producing apparatus comprising a substantially flat electrode having a pair of electrodes supported in fixed spaced relationship with opposite edges of said flat electrode and substantially in the plane thereof, a high voltage source with one terminal connected to said flat electrode and switching means connected to the other terminal of said source, and adapted to connect said other terminal selectively to one or the other of said electrodes whereby to cause relative movement of an ionizable medium surrounding said electrodes selectively in one direction or the other depending on which of said electrodes is connected to said source.

5. Thrust producing apparatus comprising a group of flat electrodes each having a continuous edge, said flat electrodes being supported in spaced parallel relation and electrically interconnected, a group of elongated electrodes, each supported in fixed spaced relationship with respect to one of said edges, said electrodes being electrically interconnected and a high voltage source con-

nected across said groups of electrodes whereby to cause relative movement of an ionizable dielectric medium surrounding said electrodes.

6. Thrust producing apparatus comprising a disc-shaped electrode, an electrode arranged in an arc of less than 180° spaced from an edge of said disc electrode and substantially in the plane thereof and power means connected across said electrodes to impress a high voltage potential thereon whereby to cause relative movement of an ionizable dielectric medium surrounding said electrodes.

7. Apparatus for producing relative motion between a vehicle body and the surrounding medium comprising a vehicle body having a conducting nose portion, a central portion and a conducting afterbody having a relatively large surface area and a source of high voltage connected between said conducting nose portion and said conducting afterbody whereby the application of said voltage to said conducting nose portion and said conducting afterbody cause relative motion between said body and the surrounding medium.

8. Apparatus for producing relative motion between a body and the surrounding medium comprising a body portion, an elongated electrode mounted on and insulated from said body portion and a source of potential having its positive terminal connected to said electrode and its negative terminal connected to said body portion whereby said electrical potential is converted directly into a motive force.

9. Apparatus for producing relative motion between a body and the surrounding medium in accordance with claim 8 wherein said body portion includes an electrical conducting surface and wherein said electrode is mounted in fixed spacial relation to said body.

10. Apparatus for producing relative motion between a body and the surrounding medium in accordance with claim 8 further comprising a rotatable arm, said body being connected to said rotatable arm.

11. Apparatus for producing relative motion between a first and a second body and the surrounding medium comprising a first conductive body portion, a second conductive body portion, each of said body portions having a relatively large surface area and having an elongated electrode mounted thereon in fixed spacial relationship, a source of potential connected to each of said bodies and each of said electrodes and means for supporting said bodies in rotatable relationship.

12. Apparatus for producing relative motion in accordance with claim 11 wherein said supporting means comprises an arm, and a support for said arm, said first and said second bodies being connected to the ends of said arm.

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Appendix B. U.S. PATENT # 4,663,932

United States Patent [19]

Cox

[11] **Patent Number: 4,663,932**

[45] **Date of Patent: May 12, 1987**

[54] **DIPOLAR FORCE FIELD PROPULSION SYSTEM**

[76] Inventor: **James E. Cox**, 5455 Romaine St., Los Angeles, Calif. 90038

[21] Appl. No.: **401,526**

[22] Filed: **Jul. 26, 1982**

[51] **Int. Cl.**[4] **F03H 5/00**

[52] **U.S. Cl.** **60/200.1**; 60/202; 313/359.1; 315/5.41

[58] **Field of Search** 60/202, 203.1, 200.1; 313/359.1, 361.1, 362.1; 315/111.01, 5.41, 5.42

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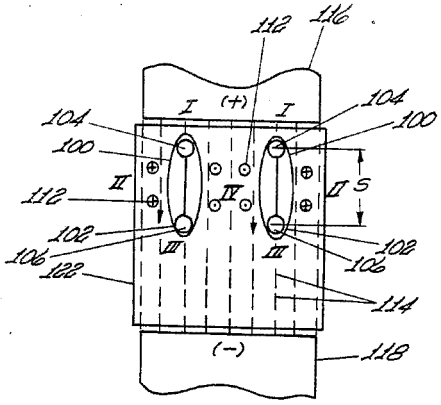
Primary Examiner—Louis J. Casaregola
Attorney, Agent, or Firm—Daniel J. Meaney, Jr.

[57] **ABSTRACT**

A dipolar force field propulsion system having a alternating electric field source for producing electromotive lines of force which extend in a first direction and which vary at a selected frequency and having an electric field strength of a predetermined magnitude, a source of an alternating magnetic field having magnetic lines of force which extend in a second direction which is at a predetermined angle to the first direction of the electromotive lines of force and which cross and intercept the electromotive line of force at a predetermined location defining a force field region and wherein the frequency of the alternating magnetic field substantially equal to the frequency of the alternating electric field and at a selected in phase angle therewith and wherein the magnetic field has a flux density which when multiplied times the selected frequency is less than a known characteristic field ionization potential limit; a source of neutral particles of matter having a selected dipole characteristic and having a known characteristic field ionization potential limit which is greater than the magnitude of the electric field and wherein the dipoles of the particles of matter are capable of being driven into cyclic rotation at the selected frequency by the electric field to produce a reactive thrust, a vaporizing stage which vaporizes said particles of matter into a gaseous state at a selected temperature, and a transporting system for transporting the vaporized particles of matter into the force field defined by the crossing electromotive lines of force and the magnetic lines of force.

21 Claims, 53 Drawing Figures



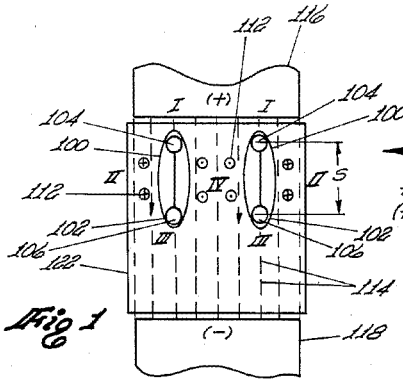


Fig 1

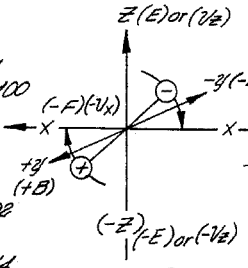


Fig 2

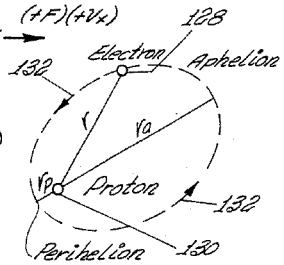


Fig 3a

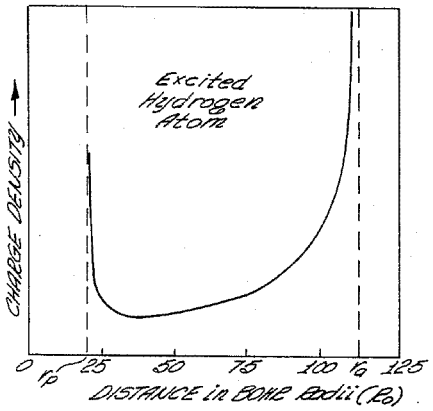


Fig 3b

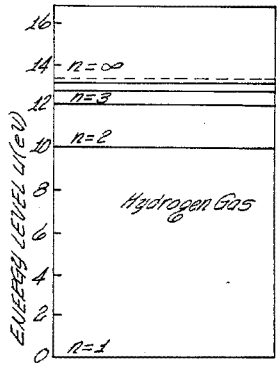


Fig 4

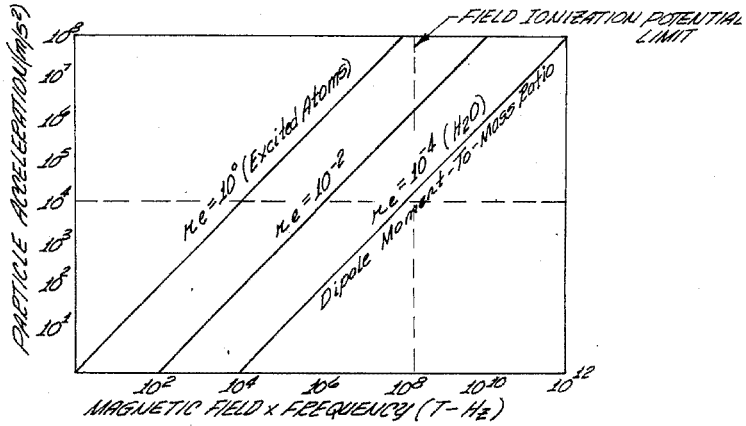


Fig 6

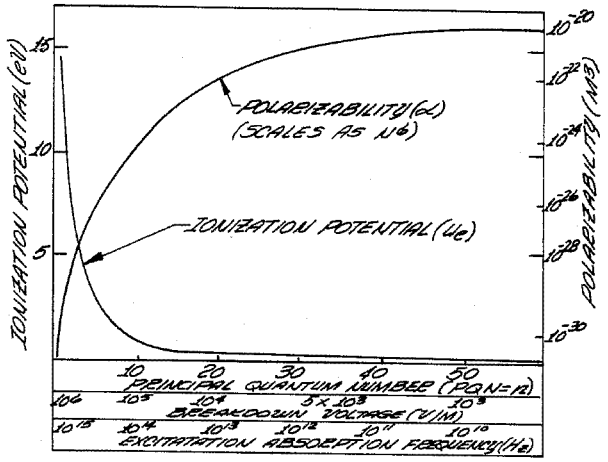


Fig 5

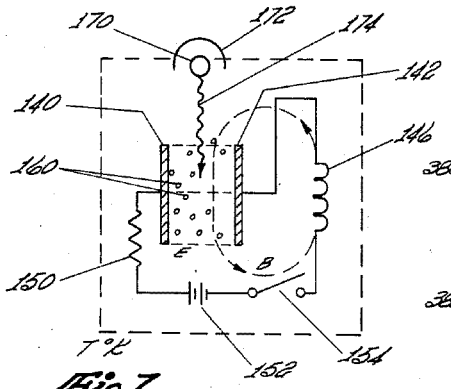


Fig 7

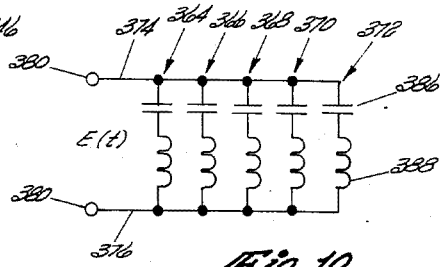


Fig 10

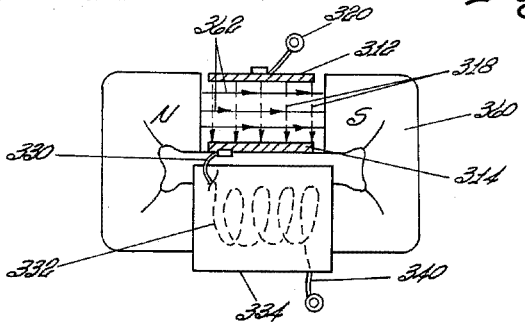


Fig 9

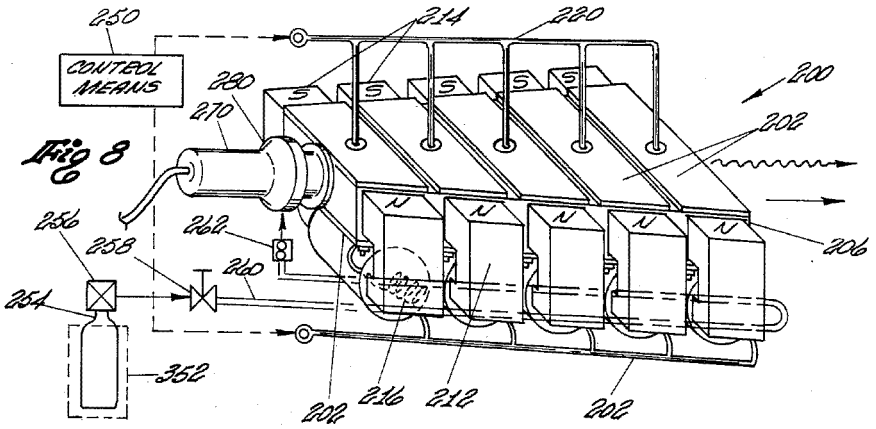


Fig 8

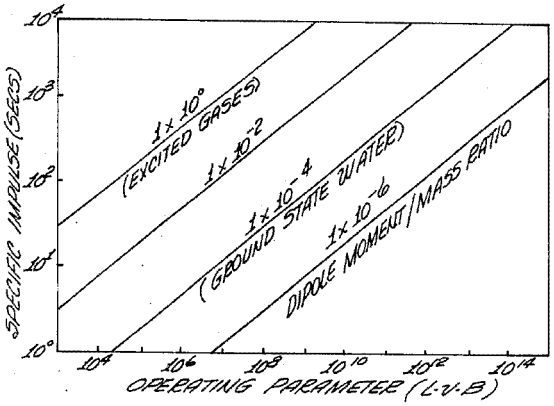


Fig 11

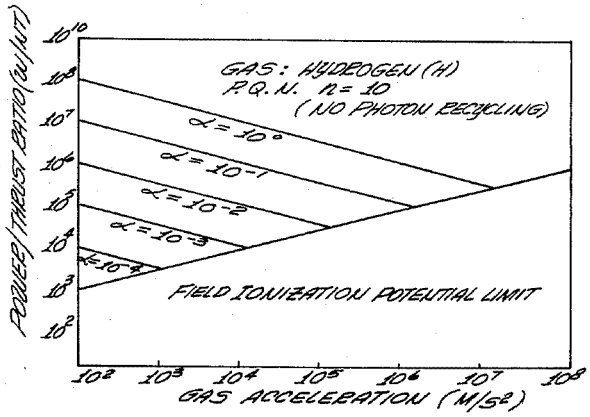


Fig 12

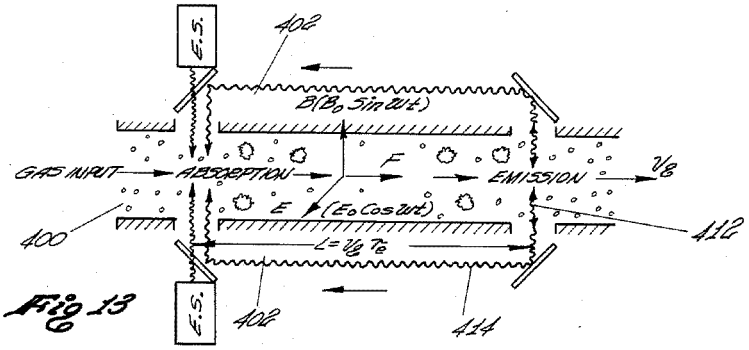


Fig 13

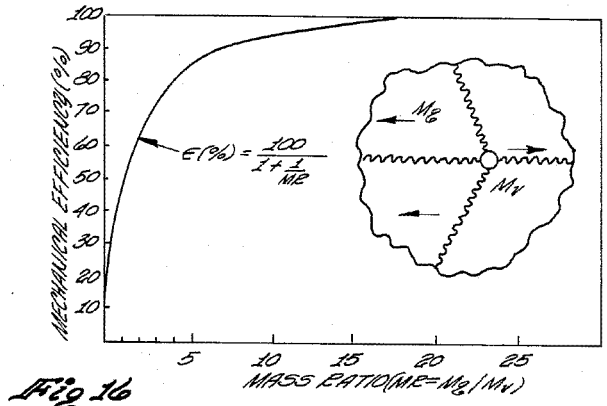


Fig 16

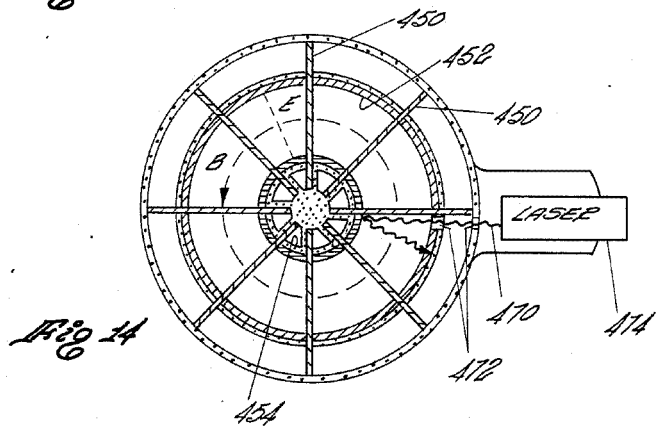


Fig 14

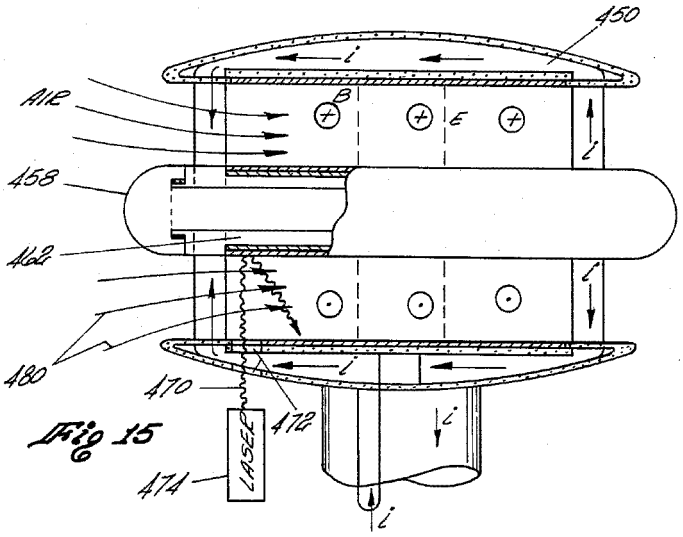

450
AIR
458
462
480
470
472
474
LASER
B
E
i

Fig 15

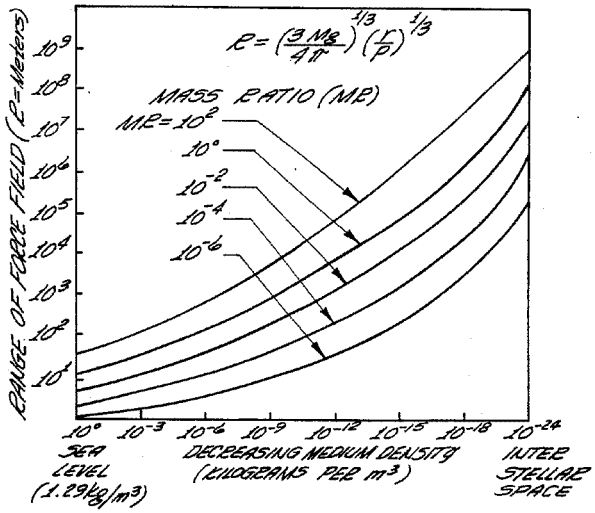

$R = \left(\frac{3M_B}{4\pi}\right)^{1/3}\left(\frac{r}{p}\right)^{1/3}$
MASS RATIO (MR)
MR=10²
10°
10⁻²
10⁻⁴
10⁻⁶
RANGE OF FORCE FIELD (R=Meters)
10⁹
10⁸
10⁷
10⁶
10⁵
10⁴
10³
10²
10¹
10° SEA LEVEL (1.29 kg/m³)
10⁻³
10⁻⁶
10⁻⁹
10⁻¹²
10⁻¹⁵
10⁻¹⁸
10⁻²⁴ INTER STELLAR SPACE
DECREASING MEDIUM DENSITY (KILOGRAMS PER m³)

Fig 17

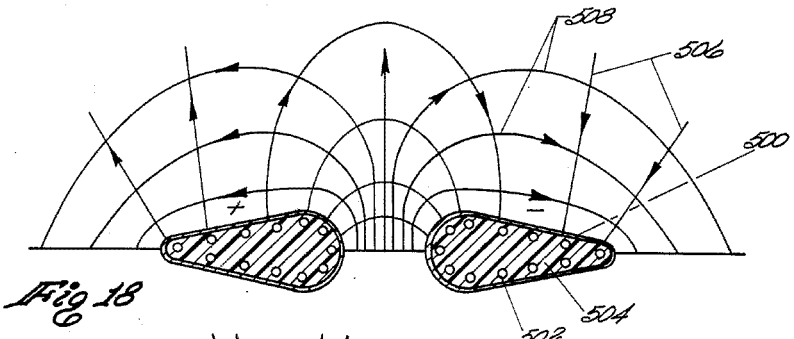


Fig 18

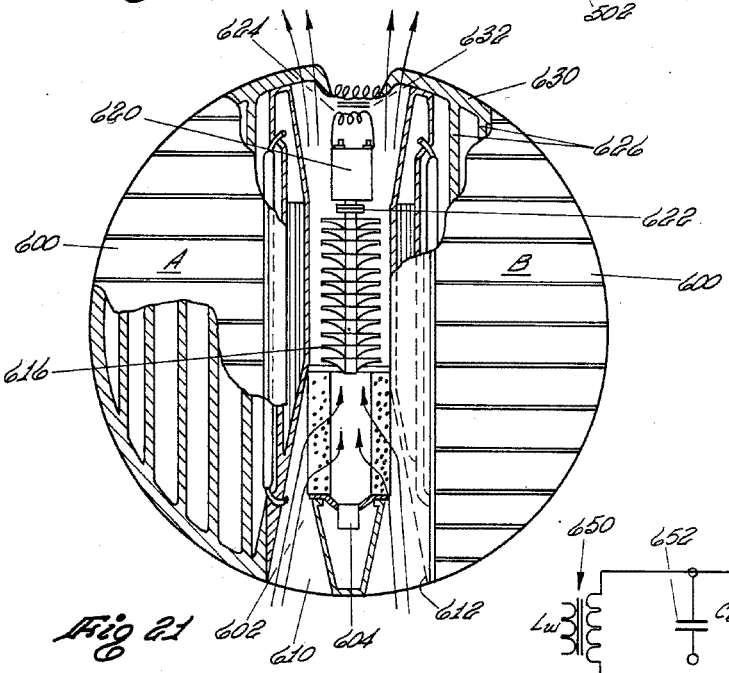


Fig 21

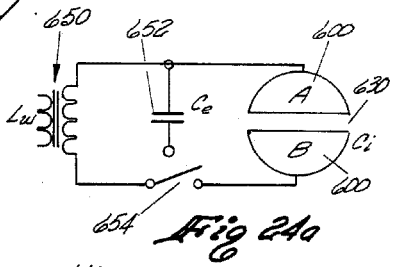


Fig 24a

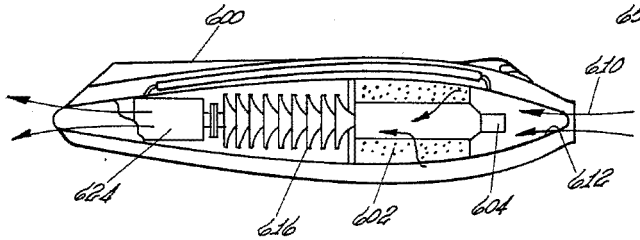


Fig 22

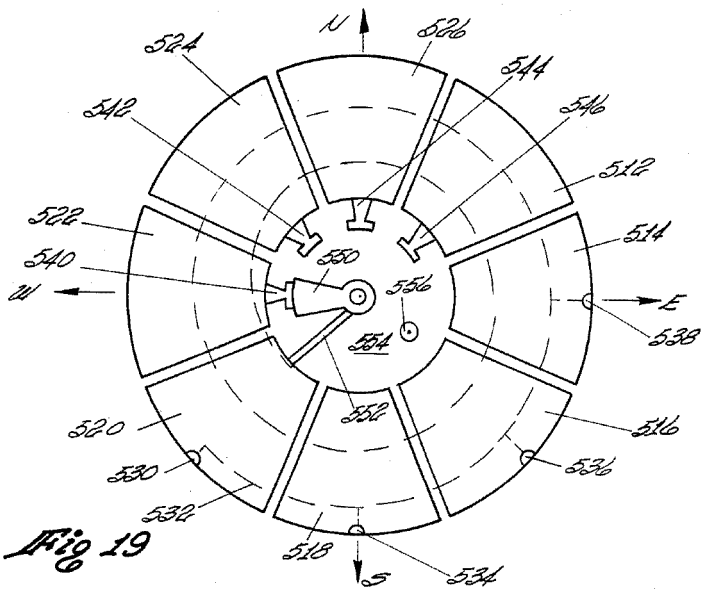


Fig 19

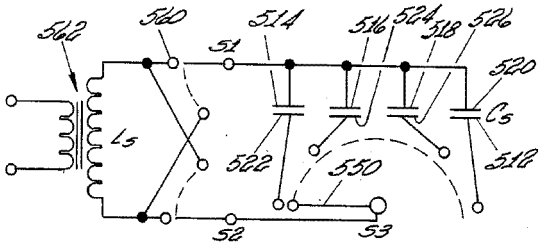


Fig 20

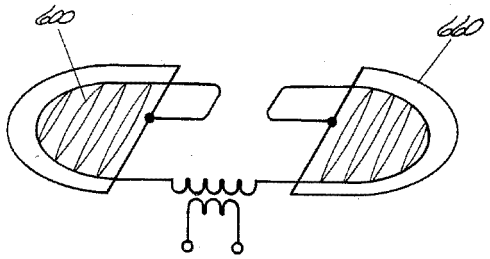


Fig 24b

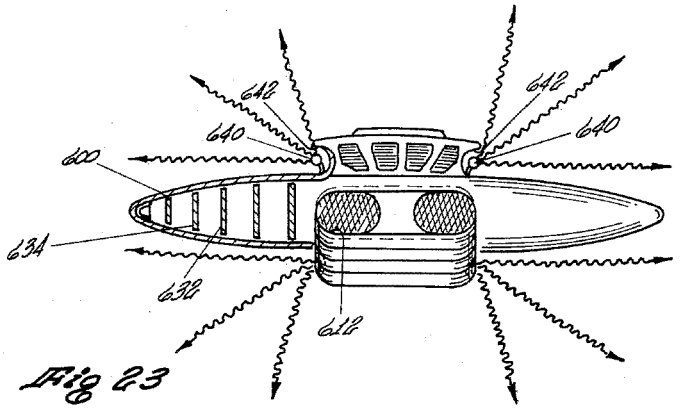


Fig 23

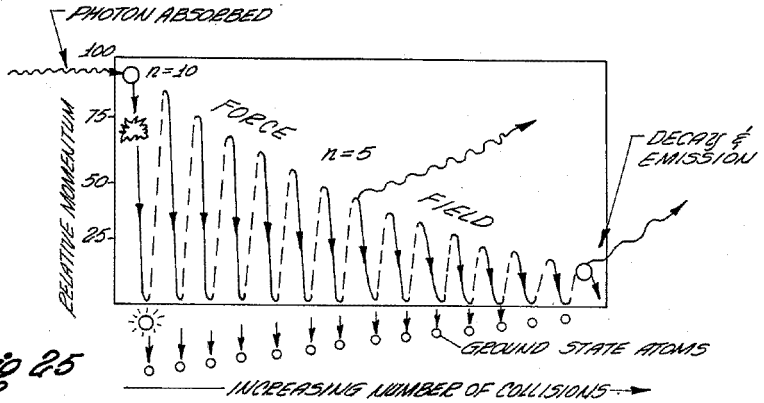


Fig 25

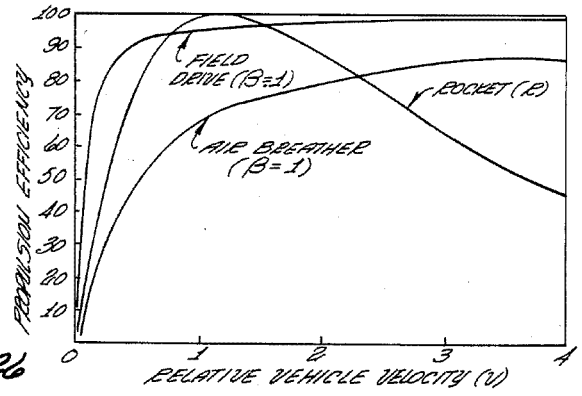


Fig 26

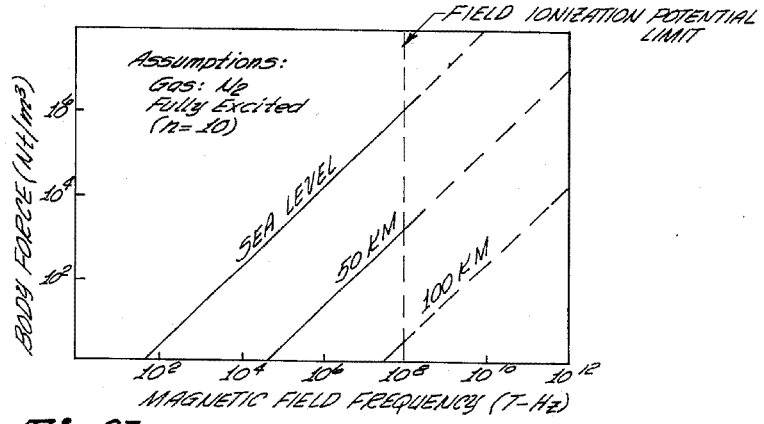


Fig 27

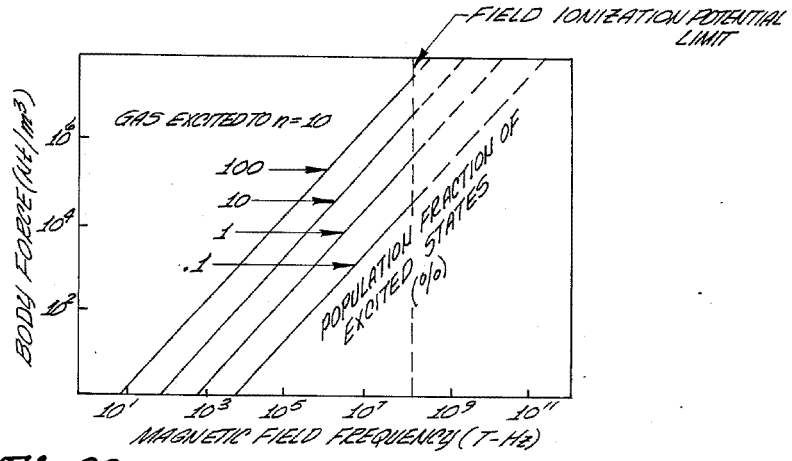


Fig 28

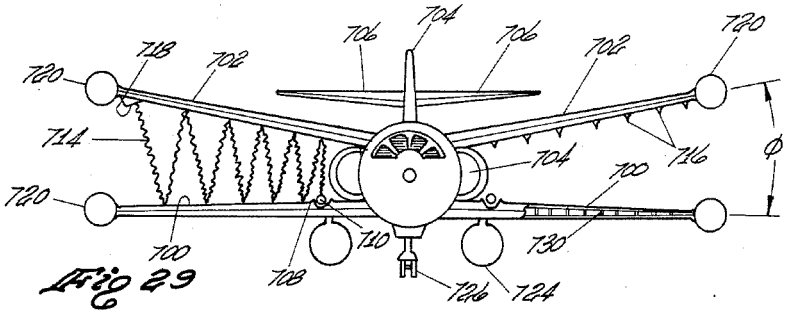


Fig 29

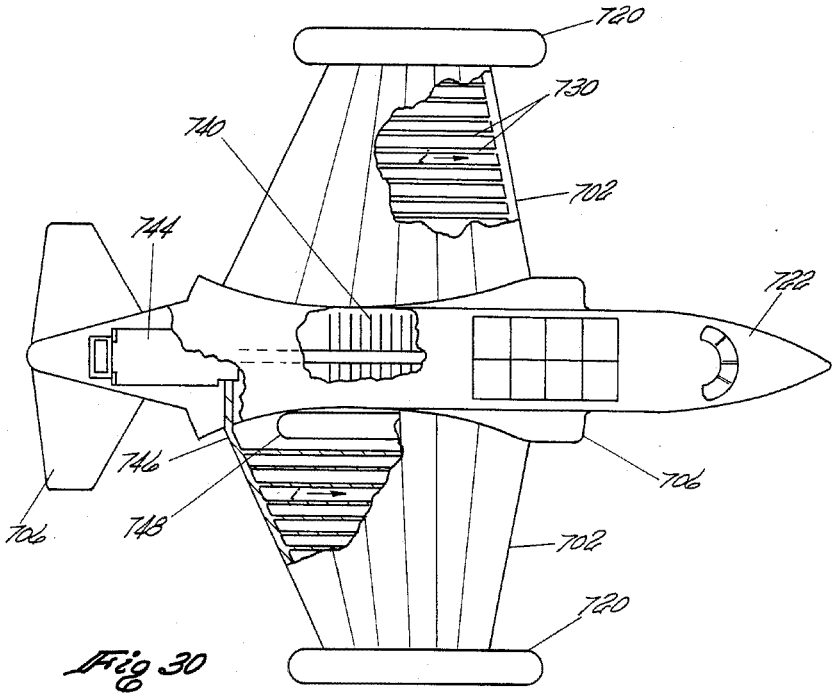

720
730
740
708
744
722
746
706
748
706
702
720

Fig 30

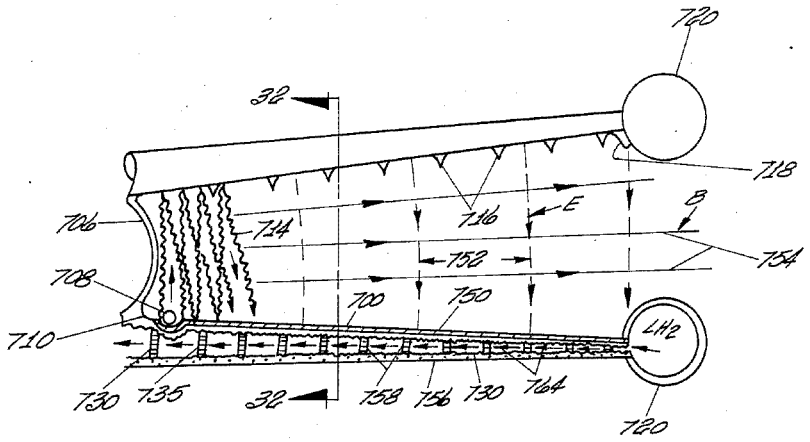

720
32
718
706
714
716
E
G
752
754
708
700
750
710
LH2
730
735
32
758
756
730
764
720

Fig 31

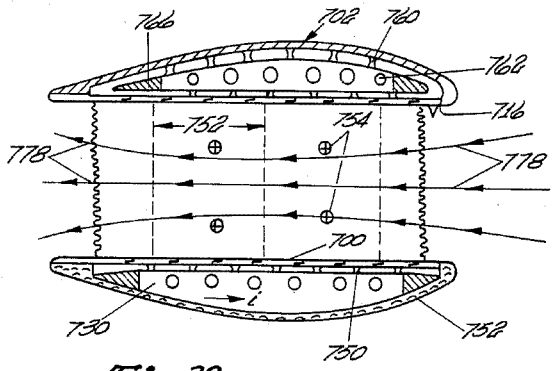


Fig 32

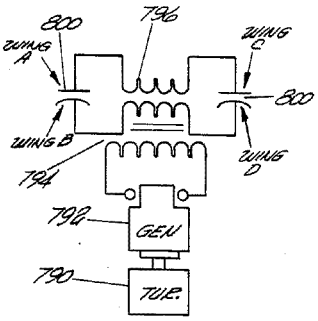


Fig 34

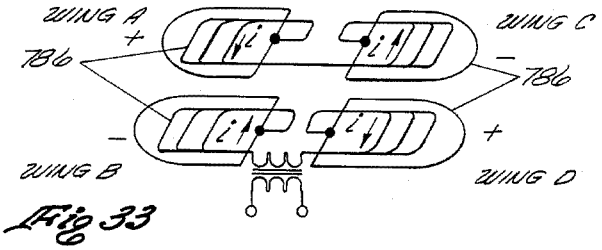


Fig 33

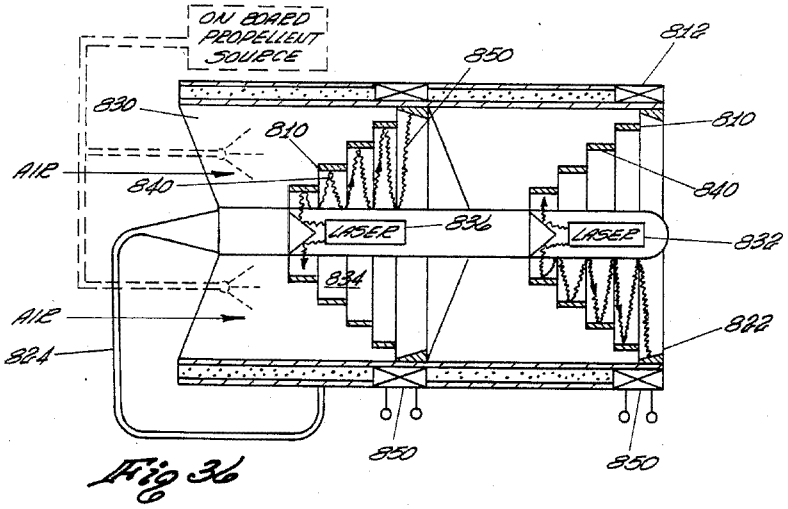


Fig 36

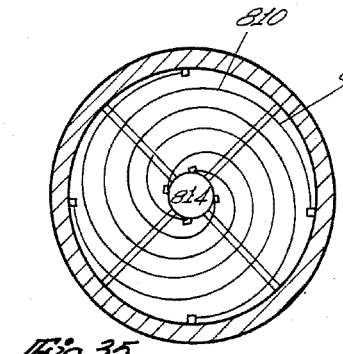


Fig 35

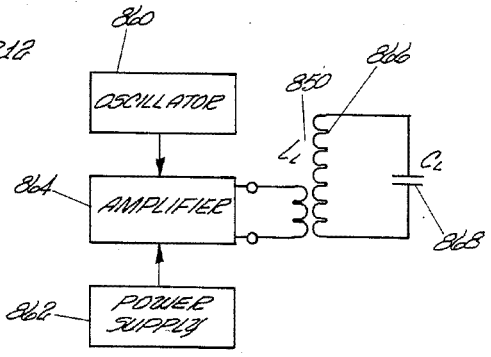
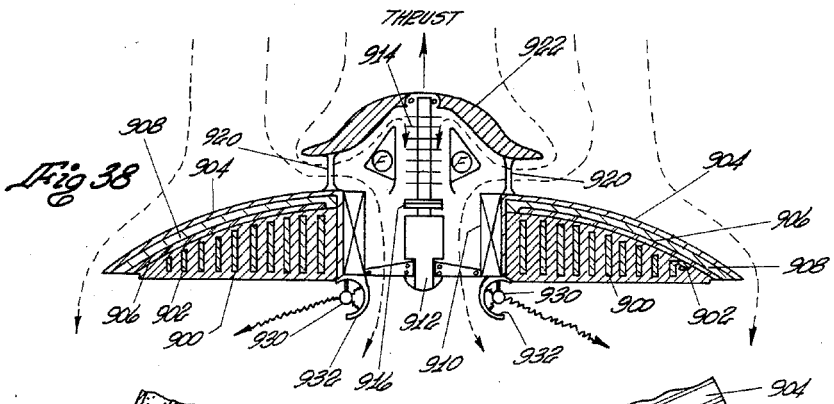


Fig 37



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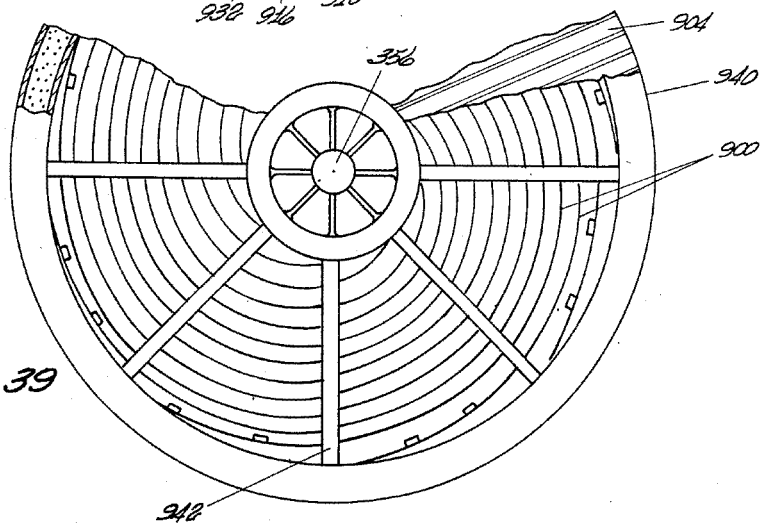


Fig 39

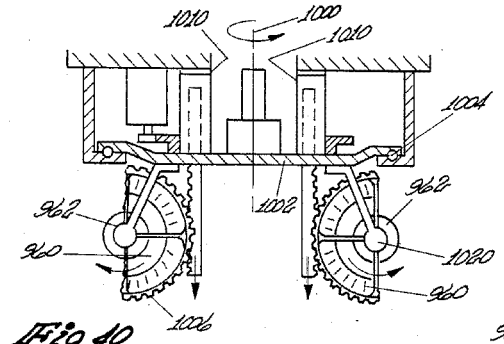
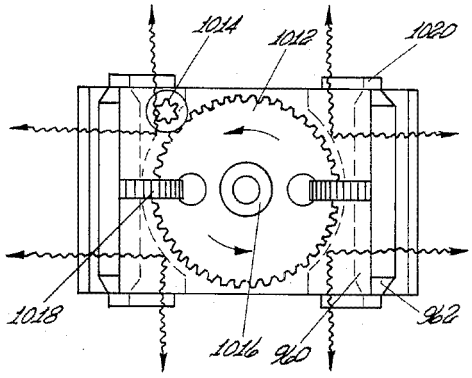


Fig 40



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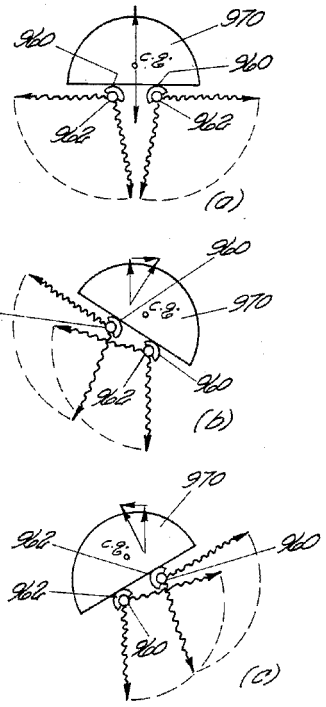

Fig 42

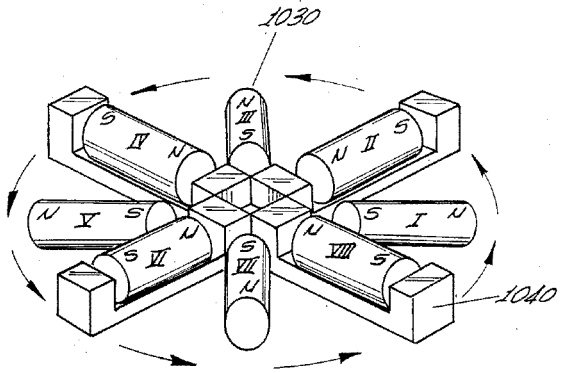

Fig 43

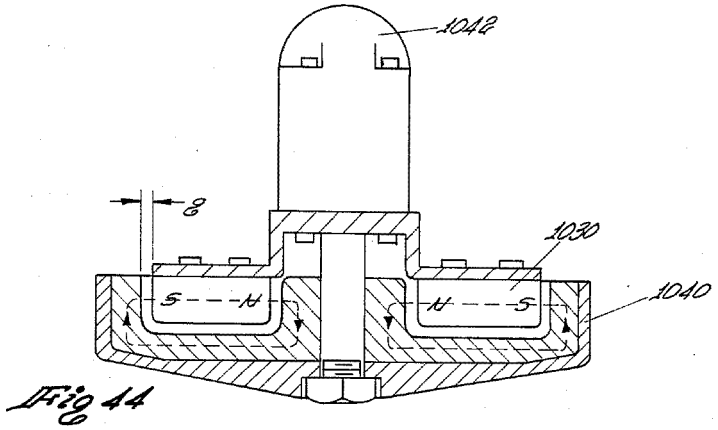

Fig 44

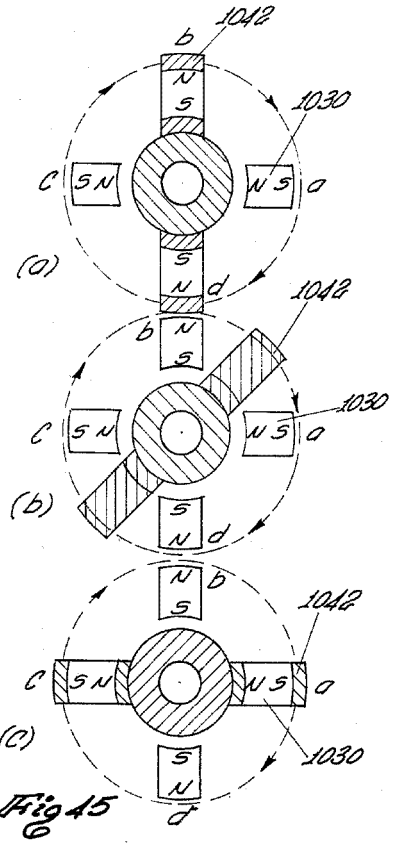

Fig 45

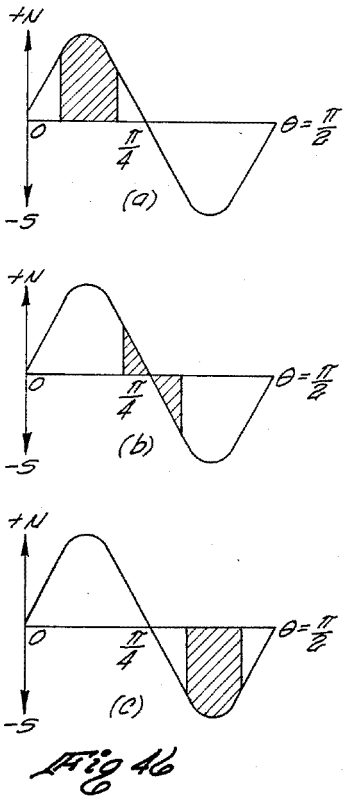

Fig 46

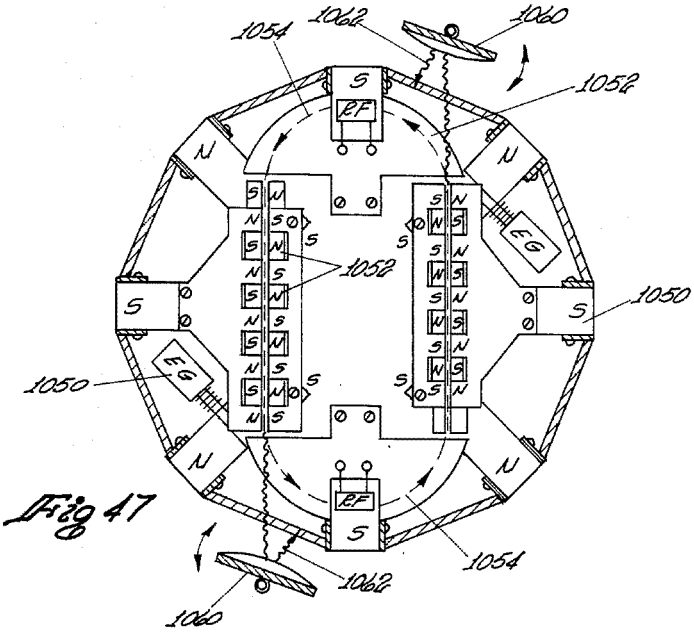
1054
1062
1060
1058
1050
1050
1054
1062
1060
EF
EG

Fig 47

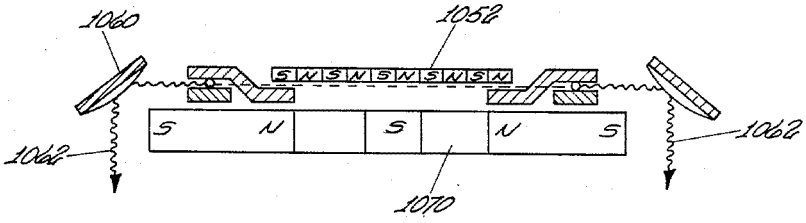
1060
1058
1062
1062
1070

Fig 48

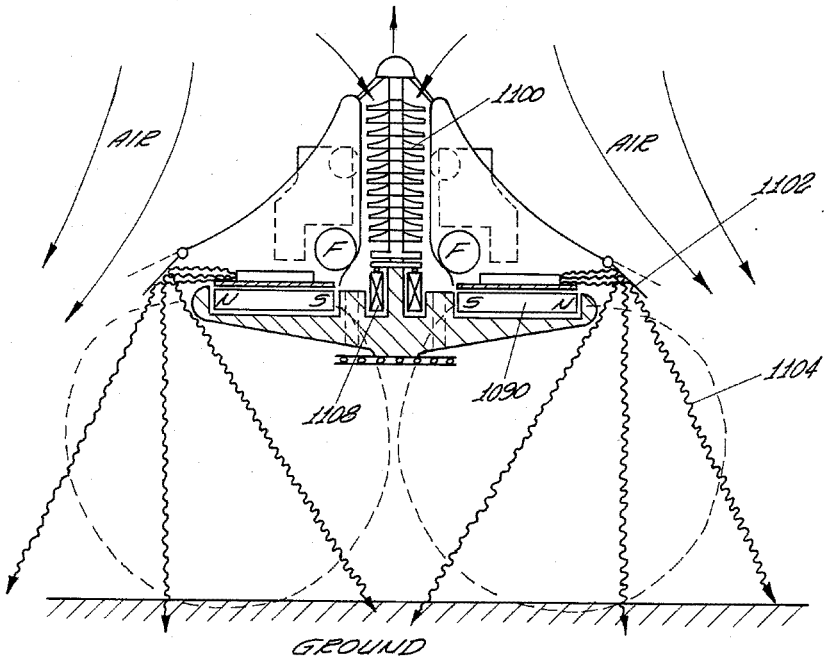
AIR
AIR
1100
1102
1104
1108
1090
GROUND

Fig 49

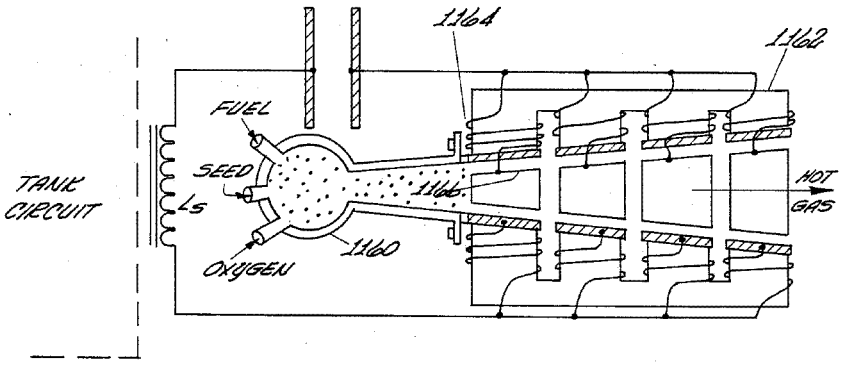
1164
1162
FUEL
SEED
TANK CIRCUIT
Ls
1166
1160
OXYGEN
HOT GAS

Fig 50

DIPOLAR FORCE FIELD PROPULSION SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates in general to a system and method for producing a reactive force on an aerospace vehicle to cause rotation or vibration of dipoles of neutral particles having a selected electrical dipole characteristic and more particularly to a dipolar force field propulsion system for a aerospace vehicle utilizing a crossed electric E field and a magnetic B field for establishing a spatial force field region wherein a control means establishes a predetermined spatial and time relationship between the alternating electric field, alternating magnetic field and dipole rotation for a selected frequency to produce an reactive thrust.

2. Description of the Prior Art

In spacecraft propulsion systems, the use of chemical rocket engines which use combustion of chemical fuels to produce a large amount of thrust necessary to lift loads from the earth's surface is known. The term "thrust" is defined to mean the amount of propulsive force developed by a propulsion engine and is typically related to a rocket engine that is used for boosting a space vehicle from the earth's surface into orbit. The known space propulsion systems must have sufficient thrust to raise the spacecraft from the earth's surface and that thrust must be greater than the weight of the vehicle to be lifted from the earth's surface and placed into orbit.

Once the spacecraft has been boosted into space or orbit, the required spacecraft thrust is minimal compared to the thrust required for lifting the vehicles from the earth's surface.

When a spacecraft is in space or in orbit, it is desirable to have the ratio of thrust produced to the rate of consumption of the fuel to be high as possible and this is generally referred to as "specific impulse." In space or in orbit, a spacecraft propulsion system having a high "specific impulse" capability is highly desirable.

Thus, it is known in the art of space propulsion systems that the chemical rocket engines are capable of providing the requisite thrust necessary to lift large payloads from the earth's surface into orbit.

Once the spacecraft and its payload is in orbit, it is desirable for the spacecraft propulsion system to be able to change the orbit, speed and/or orbital position of the spacecraft with a "specific impulse" propulsive force.

A number of propulsion systems have the capacility of providing "specific impulse" thrust for changing the orbit, speed and/or orbital position of a spacecraft.

One such known propulsion engine is generally referred to as "electrostatic propulsion systems" wherein the thrust is created by electrostatic acceleration of ions created by an electron source in an electric field. Electrostatic propulsion systems have very high specific impulse but have limited thrust capacilities. Where an excessively large amount of thrust is required, the size and weight of the electrostatic propulsion systems become excessive. Examples of known electrostatic propulsion systems are disclosed in U.S. Pat. No. 3,866,414; U.S. Pat. No. 3,537,266 and U.S. Pat. No. 3,095,163. Electrostatic propulsion systems include electrostatic engines such as ion engines as evidenced by the above-described United States patents.

Another type of known space propulsion systems are generally referred to as "electric arc" engines. Electric arc engines or propulsion systems use an electric arc to heat a propulsion gas which is then passed to a standard rocket nozzle to provide thrust. Electric arc propulsion systems are capable of generating considerable amounts of thrust and have specific impulse thrust greater than those of chemical engines. However, the specific impulse thrust levels of electric arc engines are lower than the specific impulse thrust of electrostatic propulsion systems. Typical electrothermal or electric arc propulsion systems are disclosed in a book by Robert Jahn entitled "*Physics of Electric Propulsion*", McGraw Hill, 1968.

Another known type of spacecraft propulsion system is generally referred to as electromagnetic propulsion systems which includes magnetohydrodynamic (MHD) thruster or magnetoplasmadynamic (MPD) thruster. The MHD or MPD thrusters are capable of providing both high thrust density and high specific impulse. The MHD or MPD thrusters utilize a propellant gas which is ionized to form a plasma which is accelerated by magnetic and electric fields and is then passed through an expansion nozzle to provide thrust. In a MHD thruster or MPD thruster, the plasma is a body of gas which comprises a substantial number of free electrons and ions, but has an overall neutral electrical charge providing a plasma which is electrically conductive. The known MHD or MPD thrusters utilize the interaction of magnetic fields produced by electrical currents and conductors on the spacecraft with an electrically conductive environment to produce a reaction thrust. Several typical MHD thrusters or MPD thrusters are disclosed in U.S. Pat. No. 3,735,591; U.S. Pat. No. 3,662, 554; U.S. Pat. No. 3,535,586; U.S. Pat. No. 3,505,550; U.S. Pat. No. 3,371,490; U.S. Pat. No. 3,527,055; U.S. Pat. No. 3,343,022 and U.S. Pat. No. 3,322,374.

It is also known in the art to combine a jet propulsion power plant with a magnetoplasmadynamic generator to produce a hybrid propulsion system. One such propulsion system is disclosed in U.S. Pat. No. 3,678,306.

The use of a controlled fusion device which generates electrical energy utilizing an ionized gas plasma in a space propulsion system is disclosed in U.S. Pat. No. 3,324,316.

The design of plasma propulsion systems having special magnetic fields for controlling the specific impulse characteristics of the plasma propulsion device is disclosed in U.S. Pat. No. 3,191,092.

In addition to the above described space propulsion systems, the inventor of the present application published an article entitled "Electromagnetic Propulsion Without Ionization" which appeared in the AIAA/SAE/ASME 16th Joint Propulsion Conference which was held on June 13, 1980 to July 2, 1980 in Hartford, Conn. The paper presented at the above-described 16th Joint Propulsion Conference disclosed the concept of electromagnetic propulsion without ionization. Specifically, the paper disclosed that when an alternating electric field is applied to a polarized or polarizable material, the dipole of the material can be made to rotate at high frequency. If an alternating and synchronized magnetic field is supplied at right angles to the electric field, a Lorentz force is generated which propels the dielectric fluid without the necessity for ionization and the consequential energy losses arising from the ionization process. The thrust so generated is proportional to the polarization, the frequency of the dipole rotation and

the magnetic field strength. The propellant selected for use as the polarizable material is characterized by having a high permanent molecular dipole movement-to-mass ratio and is accelerated by Lorentz forces to useful exit velocities. A spacecraft having the induced dipole electromagnetic propulsion system is accelerated by Newton's Third Law of Motion, or the reactive thrust principal.

SUMMARY OF THE INVENTION

The present invention relates to a novel, unique and improved dipolar force field propulsion system. In the prefered embodiment of the present invention, the dipolar force field propulsion system includes means for generating an alternating electric field having its electromotive lines of force extending in a selected direction. The alternating electric field varies at a selected frequency and has an electric field strength of a predetermined magnitude. A means for generating a rotating or alternating current magnetic field is provided with the electromagnetic lines of force extending in a direction which is at a selected angle relative to the selected direction of the electromotive lines of force. The electromagnetic lines of force cross and intercept the electromotive lines of force at a predetermined location to define a spatial force field region. The frequency of the alternating magnetic field is substantially equal to the selected frequency of the alternating electric field and has a predetermined phase angle therebetween. The magnetic field has relatively high flux densities in the order of a fraction of one tesla or more. The propellant material is a source of neutral particles of matter having stabilized, electrically induced or permanent dipoles having preselected internal breakdown characteristic which is greater than the magnitude of the applied electric field. The dipoles of the matter are capable of being driven into controlled rotation at the selected frequency by the alternating electric field and crossing the alternating electromagnetic field. A means for vaporizing the matter into a gaseous state yet below the thermal ionizational level thereof and for transporting the vaporized material in the gaseous state into the spatial force field region which is defined by the crossed electromotive lines of force and electromagnetic lines of force. The alternating cross field formed by the electromotive lines of force and the electromagnetic lines of force cause the dipoles to rotate at the selected frequency and to produce an acceleration force which is substantially normal to the plane of the electromotive and the electromagnetic lines of force to produce a reactive thrust. A control means which is operatively coupled to the means for generating the alternating electric field and to the means for generating an alternating magnetic field and which is responsive to the dielectric properties of the vaporized matter located in the spatial force field region having a well-defined relation between the electric field, electromagnetic field and dipole orientation for any selected frequency.

The known prior art space propulsion systems have inherent limitations in terms of providing sufficient thrust based upon the mass and weight of a propulsion system on the earth's surface in order to lift a spacecraft from the earth's surface and to place the same into orbit or space. The primary limitation can be characterized specifically by the mass of propellant required, by weight, to the mass of payload to be placed into space. Known spacecraft propulsion systems utilizing a chemical engine generally require propellants wherein the aggregate weight of the propellant is twenty to thirty times the aggregate weight of payload to be lifted from the earth's surface and to be placed into orbit.

The known electrostatic propulsion systems or ion propulsion systems and the electric arc propulsion systems are limited to operation in the vacuum of space and provide satisfactory high "specific impulse" thrust but are unsatisfactory for providing a substantial amount of thrust as required for liftoff of a spacecraft. In order to generate sufficient thrust for lifting of a payload from the earth's surface into orbit, the size, weight and complexity of the spacecraft propulsion systems limit the desirability of using the same in such a spacecraft and to provide the necessary "specific impulse" thrust required for changing orbital speed, direction and/or position.

In the known MHD or MPD propulsion systems, it is necessary to provide sufficient energy in order to ionize the propellant. The energy required to ionize the propellant, which is typically easily ionizable gas, reduces the overall efficiency of the propulsion systems and requires substantial cooling systems in order to obtain the proper operating conditions to increase the reliability and lifetime of such propulsion systems.

In the known MHD propulsion systems, it is necessary to include a seeding propellant which is injected into the hot gases wherein the seeding material is generally a low ionization potential compound such as, for example, potassium or cesium.

The present invention overcomes the inherent limitations and problems associated with the known spacecraft propulsion systems.

One advantage of the present invention is that a unique, novel and improved dipolar force field propulsion system utilizes a propellant in the form of a vaporized gaseous matter which is in an unionized state. The reactive thrust can be developed by controlling the operating characteristics of the crossed alternating electric field and alternating current magnetic field which defines the spatial force field region adapted to have the vaporized polarizable material, which is not ionized, transported thereto.

Another advantage of the present invention is that the electronic excitation level of the polarizable dipole material can be increased either prior to or after the vaporization thereof into a gaseous state to improve the operating efficiency of the dipole force field propulsion system.

A yet further advantage of the present invention is that a means are provided for generating a reactive thrust which is adapted for propelling a spacecraft from the earth's surface, into orbit and subsequently into space wherein the initial thrust and specific impulse can be provided which are equal to or greater than those provided by the known spacecraft propulsion systems.

A still yet further advantage of the present invention is that a unique and novel method for propelling a spacecraft with a reactive thrust derived from using a propellant comprising neutral particles of matter having an electric dipole characteristic and a breakdown characteristic which is greater than the magnitude of an applied electric field.

A still yet further advantage of the present invention is that the phase angle between the alternating electric field and the alternating magnetic field can be varied so as to control the magnitude of the reactive thrust produced by the rotation of the dipoles of material.

A still yet further advantage of the present invention is that a unique and novel spacecraft having a "X-wing" configuration which includes means for exciting the energy level of the polarizable or dipole material to an excited level wherein the excited atoms of material when used as a propellant is capable of rendering both thrust and specific impulses of thrust at controlled levels which is directly proportional to the excited state of the gaseous material.

A still yet further advantage of the present invention is that the propulsion efficiency of the inductive dipolar force field propulsion system increases as a function of mass ratio and can approach acceptable operating efficiencies.

A still yet further advantage of the present invention is that the excitation power can be a microwave source having a selected frequency which can be located either internal or external to the spacecraft. Under certain idealized conditions, the frequency of the microwave radiation source can be precisely selected relative to the frequency of rotation or absorption characteristics of the dipole material such that substantially all of the microwave radiation transmitted to the spacecraft from an external source can be fully absorbed without reflecting any part thereof.

A still yet further advantage of the present invention is that a MHD electric power generator can be utilized on board of the spacecraft to generate the electrical energy required to produce the electric and magnetic field which is utilized to establish the spatial force field area for producing the reactive thrust from the interaction of the crossed electric field and magnetic field on the induced dipole material occupying this region.

A still yet further advantage of the present invention is that cryogenic cooling of superconductive magnets can produce extremely high, dense magnetic fields in the order of one tesla or more. By controlling this field strength as well as the switching rate or frequency of the magnetic fields, both the efficiency of the dipole propulsion system and the amount of thrust produced can thereby be determined.

A still yet further advantage of the present invention is that a electromagnetic propulsion system utilizing the teachings of this invention can produce in the order of 10^6 pounds of thrust level using known or anticipated power sources and known superconductive magnetic materials.

A still yet further advantage of the present invention is that a shuttle aircraft can be designed utilizing a hybrid propulsion system wherein the lift and thrust are accomplished by aerodynamic, electromagnetic and chemical rocket propulsion systems so as to exploit the characteristics of each system at an optimum time during trajectory of spacecraft travel.

A still yet further advantage of the present invention is that the spacecraft propulsion system disclosed herein is capable of utilizing the earth's atmosphere as a propellant having an appropriate excitation level required in order to initiate the polarization dipole reactive thrust generation for purposes of lifting a spacecraft from the earth's surface into orbit. Once the spacecraft has been propelled into orbit and then into deep space, the dipole force field propulsion system is capable of utilizing matter in interstellar space as a propellant without the necessity of ionizing the same in order to develop the reactive thrust necessary to propel a spacecraft into deep space.

A still yet further advantage of the present invention is that the dipolar force field propulsion system provides a method for accelerating neutral particles of matter without the creation of an ionized or plasma state. As a result, a force density can be established in a gas over a large distance without the restriction of skin depth or Debye lengths. This property, in addition to the recycling of excitation radiation and rebounding collision processes, offers the potential for the creation of a class of more efficient propulsion systems for aerospace vehicles.

A still yet further advantage of the present invention is that the dipolar force field propulsion system operates at lower jet velocities at large volumetric mass flow rates. Therefore, greatly reduced noise levels are possible. The field extends beyond the structure of the aerospace vehicle itself to move the mass and thereby permits operation in more rarified environments, such as higher altitudes, where pressures and temperatures are lower, permitting high Rydberg excitation states to exist.

A still yet further advantage of the present invention is that the aerospace vehicle's structure can be designed such that electronic control of thrust direction can be achieved which can be changed instantly with the flick of a switch. The use of electronic switching can provide increased maneuverability and faster response reaction times. Further, electric power can be provided to the aerospace vehicle by super conductive radio frequency generators or by the process of magnetohydrodynamics, or by beamed power from ground or orbiting power stations. The existance of an excited gas field around the vehicle can be used in absorbing offending external microwave beams as well.

A still yet further advantage of the present invention is that it appears that the ejection of electromagnetic momentum will provide for some capability of producing a small thrust in the vacuum of space itself.

A still yet further advantage is that the apparatus and method disclosed herein can be used for accelerating particles of matter and have wide potential applications for isotope separations, particle beam devices, chemical accelerators, nuclear devices, molecular beam devices and the like.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects and advantages of the invention, together with the various features and advantages, can be readily understood from the following more detailed description of the prefered embodiment taken in conjunction with the accompanying drawing in which:

FIG. **1** is a diagramatic representation of electrodes for establishing an alternating electric field in the presence of a alternating magnetic field to define a spatial force field region for inducing rotation of a dipole to produce a reactive thrust;

FIG. **2** is a vector diagram of the Lorentz forces acting on each charge at the end of a dipole;

FIG. **3***a* is a diagramatic representation of the elliptical orbit generated by an electron relative to its nucleus showing the aphelion point and the perihelion point of the orbits;

FIG. **3***b* is a graph of the charge density of the atom plotted as a function of electron distance in Bohr radii (R_o) depicting the variance in charge density as a function of radius of the orbit;

FIG. 4 is a plot of the electronic energy levels of hydrogen gas as a function of the principal quantum number (n) of an excited hydrogen atom;

FIG. 5 is a graph of the polarizability of an atom at various levels of excitation and reduced ionization potential and depicting the excitation frequency and breakdown voltage of the dipole material;

FIG. 6 is a graph showing the particle accelerations which can be obtained for dipolar molecules in a plurality of excited states;

FIG. 7 is a diagramatic representation of a simplified dipolar force field propulsion system utilizing the teachings of the present invention;

FIG. 8 is a schematic representation of one embodiment of the present invention having a plurality of stages, each of which have linear spatial force field regions and utilizing a lasar as a source of excitation of the gas, and cryogenic cooling to increase the efficiency of the dipolar force field propulsion system;

FIG. 9 is a diagramatic representation is one view of one of the stages of the dipolar force field propulsion system illustrated in FIG. 8;

FIG. 10 is an electrical schematic diagram of the electrical component connections which includes therewith a representation of the capacitance effect of the vaporized propellant located in the spatial force field region;

FIG. 11 is a graph of a specific impulse versus operating perimeters for various dipole moment/mass ratios;

FIG. 12 is a graph of the thrust/power ratio versus velocity for the propellant in the vaporized and unionized state;

FIG. 13 is a pictoral representation of dipolar force field propulsion system having an elongated rectangular channel having a spatial force field region between plates for establishing the electromotive lines of force and wherein the magnetic lines of force of the magnetic field cross the electromotive lines of force of the electric field within the spatial force field region and wherein the vaporized gas is first passed through an excitation source which raises the electronic energy level thereof to a substantially higher level and wherein the excited atoms deactivate or decay to a ground state producing emission as the propellant passes through an outlet nozzle and the emissive radiation so generated is fed back through a mirror reflective system back to the input excitation source;

FIG. 14 is a pictoral representation, partially in sectional view, showing a high frequency torroidal dipolar force field propulsion system utilizing the teachings of this invention;

FIG. 15 is a front end view partially in cross section showing the construction of the various structural members which define a torroidal shaped spatial force field region;

FIG. 16 is a graph representing the mechanical efficiency plotted as a function of mass ratio of the atoms utilized as the dipolar propellant matter relative to vehicle mass;

FIG. 17 is a graph of range of force field plotted as a function of decreasing medium gas density for a number of different mass ratios;

FIG. 18 is a diagramatic representation, in cross section, showing the details of wing construction of an aerospace vehicle showing in particular the structure of the magnetic field and electric field for establishing an external spatial force field region using atmospheric gas as the propellant;

FIG. 19 is a top plan view illustrating a method of thrust directional control employing segmented electrically conductive plates and a switching mechanism for the wing construction of FIG. 18;

FIG. 20 is a schematic diagram of the equivalent circuit of the wing illustrated in FIG. 19;

FIG. 21 is a top view, partially in cross section, of a discoid shaped vehicle having a rotating nuclear bed reactor and a single wing showing the construction thereof adapted to provide an external force field region;

FIG. 22 is a side view, partially in cross section of the discoid shaped vehicle of FIG. 21;

FIG. 23 is a front plan view, partially in cross section, of the discoid vehicle illustrated in FIG. 21;

FIG. 24*a* is a simplified electrical schematic diagram showing the internal and external capacitive arrangement of the discoid vehicle of FIG. 21;

FIG. 24*b* is a simplified electrical schematic diagram showing the internal and external capacitive inductive elements of the discoid vehicle of FIG. 21;

FIG. 25 is a graph illustrating the microscopic collisional processes between excited and ground state dipolar atoms forming the propellant matter;

FIG. 26 is a graph of the comparative propulsion efficiency of three known spacecraft systems versus the relative vehicle velocity of the spacecraft;

FIG. 27 is a graph of the body force developed in a gaseous atmosphere plotted as a function of the magnetic field frequency for several different altitudes;

FIG. 28 is a graph of the body force plotted as a function of the magnetic field times frequency product for various levels of excitation states of a vaporized gas utilized as a propellant;

FIG. 29 is a front plan view of an "X-wing" space-shuttle aircraft utilizing the teachings of the present invention;

FIG. 30 is a top plan view, partially in section, showing the "X-wing" shuttle spacecraft of FIG. 29;

FIG. 31 is a pictoral representation, partially in section, showing the details of the construction of the upper and lower wing of the "X-wing" shuttle spacecraft of FIG. 29;

FIG. 32 is a sectional view taken along section lines 32—32 of FIG. 31;

FIG. 33 is a schematic diagram showing the inductance and capacitance of the wings of the "X-wing" shuttle spacecraft of FIG. 29;

FIG. 34 is a schematic diagram of an alternating current power source for supplying electrical power to the inductive and capacitive components of the aircraft of FIG. 29;

FIG. 35 is a side view, partially in cross section, showing a two stage inductive dipolar force field propulsion system;

FIG. 36 is a front plan view of the two stage inductive dipolar force field propulsion system of FIG. 35 showing the spiral coil winding in detail;

FIG. 37 is a simplified block diagram showing the overall electrical power circuit for the inductive dipolar force field propulsion system of FIG. 35;

FIG. 38 is a diagramatic representation partially in cross section of a vertical takeoff and landing vehicle (VTOL) using the inductive dipoler force field propulsion system;

FIG. 39 is a partial top plan view of the VTOL spacecraft illustrated in FIG. 38;

FIG. **40** is a pictoral representation partially in section showing a means for controlling the region of the excitation of gas molecules in the atmosphere beneath the VTOL spacecraft to bring about thrust and direction control;

FIG. **41** is a top plan view of the VTOL spacecraft illustrated in FIG. **40**;

FIGS. **42***a*, **42***b* and **42***c* depict the effect of controlling the excitation source for increasing the level of excitation of gas atoms in the atmosphere in the vicinity of a VTOL vehicle to provide thrust for causing the vehicle to be lifted and directionally controlled from earth, and adapted to be turned to the right or to be turned to the left, respectively;

FIG. **43** is an isometric view showing a means for producing an alternating magnetic field using D.C. superconductive magnetic coils;

FIG. **44** is a pictoral representation partially in cross sectional view, showing fixed magnets in a rotating ferrite slotted disc;

FIGS. **45***a*, **45***b* and **45***c* are a series of pictoral representations showing the ferrite rotor in various angular positions relative to the magnets;

FIGS. **46***a*, **46***b* and **46***c* are graphs showing the resulting field polarity and magnitude with the ferrite rotor in various angular positions as illustrated in FIGS. **45***a*, **45***b* and **45***c*, respectively;

FIG. **47** is a top plan view of the magnetic configuration of a spacecraft utilizing the inductive dipolar force field propulsion system of the present invention as a means for generating a reactive thrust adapted for propelling a spacecraft utilizing a wiggler magnet arrangement as a means for accelerating an electron beam and producing a controllable continuum of vacuum ultraviolet radiation for excitation of the ambient gaseous atoms to an electronic excited state;

FIG. **48** is a pictoral representation of the front plan view of the magnetic configuration illustrated in FIG. **47**;

FIG. **49** is a pictoral representation, partially in cross section, showing an embodiment of a VTOL vehicle which is adapted to utilize gaseous atoms in the atmosphere as a propellant and for exciting the same with a source of radiant energy in order to cause the VTOL to hover near the earth's surface; and

FIG. **50** is a diagramatic representation of an MHD plasma energy source having pumped mutually coupled LCR circuits which is adapted for use in the "X-wing" spaceshuttle illustrated in FIG. **29**.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Before commencing with a detailed description of the preferred embodiment and alternate embodiments, a brief description of the electrodynamics of moving media particularly with respect to a model of a dipolar fluid will be first considered.

A description of the model of a dipolar fluid and the resulting equations developed by a force acting on the dipolar fluid is set forth in a book entitled *Electrodynamics of Moving Media* by Paul Penfield, Jr., and Hermann A. Haus which is published as Research Monograph Number 40 by the MIT Press, Cambridge, Mass. at pages 47 through 53. As stated in the description of the model of a dipolar fluid in the above-described Penfield and Haus reference, in a uniform field, the force density can be defined by the following formula:

$$f_k = \dot{P} \times B \quad (1)$$

wherein

f_k = Force Density (Newtons/Cubic Meter)

$\dot{P}$ = Polarization Current Density of Dipolar matter (in A/M^2); and

B = Magnetic Field Induction (Tesla)

From the formula identified as equation (1) above, the force density is a function of the polarization current of the dipolar material times the magnetic field intensity. Polarization is defined, for purposes hereof, as the average electric dipole moment per unit volume. The derivative thereof with respect to time yields current density.

Experiments have been conducted to verify that mechanical forces can be developed based upon the above-described formula and the results of such experiments were disclosed in an article entitled "Mechanical Forces of Electromagnetic Origin" by G. B. Walker and G. Walker of the Electrical Engineering Department, University of Alberta, Edmonton, Canada, which was published in a periodical entitled "Nature" at Volume 23, Sept. 30, 1976. The experiments disclosed that the above-identified formula results in a reactive force being generated.

Equation (1) above is a compact mathematical expression which represents the underlying microscopic physical forces taking place at the atomic level. This understanding is essential in order to appreciate and understand the teachings of the present invention.

Referring to FIG. **1**, a pair of electric dipoles **100** are shown consisting of oppositely charged ends, **102** and **104**, end **102** being the positively charged end and end **104** being the negatively charged end. The two dipole ends **104** and **106** are displaced a fixed distance "s" apart from each other and are free to rotate about an axis **106** which is the positively charged end **102**. The dipoles are shown pictorially to be an elongated shaft terminating in a sphere at each end thereof with the charges concentrated at each end thereof. In fact, in an actual ground state atom, the electrons exist as a cloud shifted from the nucleus.

As illustrated in FIG. **1**, the dipoles are situated in a crossed electric field and magnetic field referred to in the art as a Lorentz field. The electric field can be generated by a means for generating an alternating electric field having its electromotive lines of force extending in a first or selected direction. The alternating electric field varies at a selected frequency and the electric field is selected to have an electric field strength of a predetermined magnitude. In the preferred embodiment, the magnitude of the electric field is less than the known characteristic field ionization of particle or particles of matter having the dipole formed therein.

FIG. **1** includes a means for generating an alternating magnetic field having its magnetic lines of force extending in a second direction which is at a predetermined angle, which in the preferred embodiment, is at 90°, to the first or selected direction of the electromotive lines of force defining the electric field. The pole face of the magnet is shown as **122**. The magnetic lines of force intercept the electromotive lines of force at a predetermined location to define a spatial force field region. The frequency of oscillation of the alternating magnetic field is substantially equal to the selected frequency of the alternating electric field. Also, the oscillation of the alternating magnetic field magnitude is at a selected phase angle with the alternating electric field. As will be developed further herein, the magnetic field has a

flux density which when multiplied times the selected frequency produces a Tesla-Hertz level which is less than the selected field ionization limit of a particle placed into the field.

In FIG. **1**, the electric field shown by dashed lines **114**, is generated by a pair of electrodes **116** and **118** with electrode **116** being the positively charged electrode and with electrode **118** being negatively charged at an instant of time. The voltage applied to the electrode cyclically varies as a cosine function, Cos (wt). The magnitude of the electric field is chosen so as not to cause electrical breakdown of the dipole, that is to cause separation of the opposite ends of the dipole from each other. If the magnitude of the electric field is less than the electrical breakdown of the dipole, the electrons remain bound to each other at a fixed distance "s" apart. Likewise, a magnetic field B, shown by vectors **112**, is applied to the dipoles. Preferably, the magnetic field has a flux density which is as intense as is practically possible based upon the frequency of the alternating magnetic field and the Tesla-Hertz level thereof relative to the selected field ionization limits of the particle of matter subjected to the force field. The magnetic field applied to the dipoles varies as a sine function, Sin (wt).

Both electrode pair **116** and **118** and the magnetic field **112** are controlled to establish a predetermined spatial and time relationship at the selected frequency of the alternating electric field, the alternating magnetic field and the ultimate dipole rotation orientation.

When the electric field E is initially applied to dipoles **100**, the dipoles **100** will experience a torque that will twist them into an orientation such that they are parallel to the electric field lines **114** with the opposing charges facing each other at a given electrode. The dipole may rotate in either a clockwise or counterclockwise direction depending on its initial position. However, as will become apparent, the direction of rotation is immaterial to the translatory forces that are to be generated on the dipoles **100** as a whole. If an alternating electric field, E, is applied to the electrodes **114** and **116**, the dipoles **100** can be made to rotate or oscillate about its center mass, which is generally the positively charged end of the dipole. The frequency of rotation is in the megacycle range and the dipoles' rotation follows the frequency of the electric field. Thus, the dipole is driven into cyclic motion, which may be rotational or vibrational, by the electric field. When the alternating magnetic field is imposed on the dipoles, forces are exerted on each charge of the dipole given by the following Lorentz equation:

$$F=qv\times B \tag{2}$$

where

q=charge on each end of dipole (coulombs);

v=tangential velocity of each charge (m/s); and

B=magnetic field in teslas.

As shown in FIG. **2**, the force acts in a direction perpendicular to the plane of the electric and magnetic fields, which is along the X axis in FIG. **2**. For velocity components colinear with the magnetic field lines, which is along the Y axis in FIG. **2**, no force is produced in the X plane since the cross-product of the velocity and magnetic field is equal to 0. Only velocity components perpendicular to the magnetic field generates forces in the X and Z plane. The forces that are generated as the dipole is rotated through each quadrant in FIG. **2** can be summarized by analyzing equation (2) at each quadrant location and a chart thereof as set forth hereinbelow.

TABLE 1

		Forces on Negative Charge (Clockwise Rotation)				
Quadrant Location	Q	B(Y)	V(x)	V(z)	F(z)	F(x)
I	−e	0	+wR	0	0	0
II	−e	−MAX(Y)	0	+wR	0	+qVB
III	−e	0	−wR	0	0	0
IV	−e	+MAX(Y)	0	−wR	0	+qVB

As is apparent from the above chart, in respect to the negative end, at quadrant location I, the B field is 0 and the voltage in the z direction is 0 and the velocity in the x direction is equal to (+WR). Thus, applying the equation (2) to the above values, the force in the x direction and the z direction are both 0.

At quadrant location II, the B field is at a maximum negative designated as −MAX(Y), the velocity in the z direction is equal to +wR and the velocity in the x direction Vx is equal to 0. Applying the force equation, a force equal to a +qVB is produced causing the dipole to be forced to the right.

At quadrant location III, the same conditions exist as in quadrant I and the force is equal to 0, as both fields reverse direction.

At quadrant IV, the B is equal to a +MAX(Y), Vz is equal to −wR and Vx is equal to 0. Thus, the force in the x direction is also equal to a +qVB.

For the positive end of the dipole, the sign of charge is now positive, but its velocity is also reversed, since by Newton's third law, it moves opposite the direction of the negative end. Thus, the net force along the X-axis is the same.

The same analysis would apply to the second dipole, being noted that the second dipole is shown rotating in an opposite direction but the Z velocity components are the same for each charge. The dipole rotation can be commenced in either direction based upon the probability of the location of the electron at the time of the application of the electric field thereto.

The electric forces (E) for the negative charge on each dipole vary as a cosine function yielding a velocity which is its integral or sine function. Thus, the net force is vector sum of the forces on the negative and positive charges:

$$F = +q\,(V \sin wt)\,(B \sin Wt) + (-q)\,(V \sin wt + \pi)\,(B \sin wt) \tag{3}$$

$$= 2q\ w\ RB \sin^2 wt.$$

Since 2qR is the dipole movement (p=qs), the net force on each dipole is shown in equation (3):

$$F=p\ B\ w \sin^2 wt. \tag{4}$$

The average force is found by integrating equation (4) over a complete cycle and dividing by (2π):

$$F=\tfrac{1}{2}\ pBW. \tag{5}$$

For purposes of this invention, the term "particle" is intended to cover an atom of matter, a molecule of matter or a colloid of matter which can be defined as an

aggregate of molecules stuck together. As an example, consider the case where the particle is water. A water molecule H_2O has the permanent dipole movement equal to 1.85 Debyes (a Debye is equal to 3.3×10^{-30} Coul-meter) due to the assymetry of the hydrogen bonds with the respect to the oxygen atom. In addition, an induced dipole movement P_i can be created when an electric field is applied given by the following equation:

$$P_i=\epsilon_o\alpha E \tag{6}$$

where

ϵ_o is the permittivity constant; and

α is the polarizability (m^3).

Polarizability has the dimensions of volume, and a value that approximately corresponds to the actual volume of the atom or molecule. The volume of a molecule can be increased significantly (and hence its polarizability) by exciting the particles' outer electrons to high energy levels. The radius of a quantum orbit in a simple Bohr atom increases with the square of the principal quantum number (n). Hence, the polarizability increases as the volume by the following equation (40):

$$\alpha=4/3\ \pi\ n^6\ R_o^3 \tag{7}$$

In order to aid the explanation of the polarization of an atom, the subject shall be treated in a classical manner and should be based upon a reference to a simple Bohr atom (hydrogen) with a single proton at the core. The electron is assumed to have been excited to a higher energy state, and is in orbit about the nucleus as shown in FIG. **3**. An energy level diagram thereof is shown in FIG. **4** and will now be described in detail.

FIG. **3***a* is a graph showing the orbit traversed by an electron **128** of a hydrogen atom having a proton **130**. The atom is in a highly excited state. The electron (**128**) traverses a path shown by arrows **132** and the distance between the electron **128** and the proton **130** is shown by "r." The shortest distance between the electron **128** and the proton **130** is shown by "r_p," the lowest orbit point being the perihelion. The greatest distance between the electron **128** and the proton **130** is shown as "r_a" (the highest orbit point being the aphelion).

For large (n), the Rydberg electron moves in a nearly hydrogenic orbital around a core which consists of an atomic ion. This illustration shows a classical Bohr orbit. In reality, the electron is viewed as a cloud of charge. Hence, the charge in any region is equal to the volume of that region times the charge density. The average charge density is proportional to the time the electron spends in that region of its orbit. The faster the electron moves through a region, the less time it spends in that region and, therefore, the less average charge in that region. Classically, the charge density varies inversely as the speed of the electron. In FIG. **3***a*, as the electron moves further from the nucleus, the slower its speed, and hence a larger concentration of charge at a distance from the core. Hence, the Rydberg atom has an electric dipole moment, particularly when an external electric field is applied to the particle. In the simplest view, this moment is equal to the product of electron's charge times the distance from the ion core:

$$p=e\ n^2R_o \tag{8}$$

where R_o is the ground state radius of the electron. For n=20, in the case mentioned earlier, $p=1.6\times10^{-19}$ (400) $(10^{-10})=6.4\times10^{-27}$, coul-meters, more than 1939 Debyes, 1048 times larger than H_2O! The dipole moment-to-mass ratio for a simple excited hydrogen atom is thus nearly equal to unity (one). Hence for a magnetic field of $\frac{1}{2}$ Tesla, the acceleration corresponds to the value of the frequency, i.e., $10^6 m/s^2$ at one megacycle, etc. However, the induced electric field may be sufficient to ionize the atom as the atom or molecule is excited to higher and higher energy levels, it becomes more easily ionized. The ionization potential decreases inversely with the square of the principle quantum number:

$$U=U_i/n^2$$

The application of an external electric field E and magnetic field B distorts the path traversed by the electron **128** and pulls the electron to one side of the proton **130**. The effect of the external electric field E is to apply a moment onto the dipole in accordance with Equation (6).

FIG. **3***b* is a graph showing the charge density of the atom of hydrogen illustrated in FIG. **3***a* as a function of the distance of the electron **128** from the proton **130** in Bohr radii (R_o). As shown in FIG. **3***b*, when the electron is at distance "r_p" the charge density is high due to the close proximity of the electron **128** to proton **130**, even though the dwell time is short the charge density decreases as the distance "r" increases until the distance "r_a" is reached. At that point, the electron essentially reverses direction and the variance in speed results in a momentary increase in charge density.

As noted in Equation (8), the dipole moment p increases as the square of the dipoles energy level "n," wherein "n" is the quantum number of the energy level.

FIG. **4** is a graph of the effect of exciting hydrogen gas to various quantum levels "n" plotted as a function of electron volts (eV). The energy level of the hydrogen gas can be increased by means of a laser source or other energy source which is capable of raising the excitation level to a high quantum level. The Bohr radii increases as a square of the quantum number "n." For example, if n=2, the radius is four (4) times larger. The volume of the atom increases as a function of r^3, or N to the sixth (6th) power.

Thus from a theoretical aspect, one significant and important part of this invention is the increased operating efficiency and increased thrust that is obtained by exciting the atoms of the gaseous material to a high level of electronic excitation (sometimes referred to as a Rydberg atom). The relationship between the acceleration of dipolar particles in both a ground state and in an excited state and the effect thereof on the dipolar force field propulsion system can now be assessed. The ideal operational conditions of an inductive dipolar force field propulsion system can be developed as follows:

The particle acceleration has been derived earlier [equation (5)]:

$$\dot{X}=\frac{1}{2}\ \frac{Pe}{M_o}\ (BW) \tag{9}$$

The dipole moment (P_e) is that induced due to an applied electric field (E), to an excited atom:

$$P_e=\epsilon_o K_1 n^6 R_o^3 E \tag{10}$$

where ($n^6\ R_o^3$) is the polarizability in cubic meters, incorporating the recent evidence that the polarizability

scales as n^7 for excited atoms. Here R_o is the Rydberg electron orbit radius for the ground state (n=1 for light elements), and K_1 is a correction factor of the actual ground state polarizability versus the actual atomic volume. If the electric field is too high, field ionization of the atom will occur; this limiting field (E_f) is given by the Coulomb equation:

$$E_f = \frac{ZKe}{R^2} \tag{11}$$

where (R) is the electron orbit radius, equal to:

$$R = n^2 R_o \tag{12}$$

and (Z) is the atomic number, and K has the value 9×10^9.

For any simple atom, the number of protons equals the number of neutrons in the nucleus, and thus the atomic mass is approximately:

$$m_o = 2Z\,M_p \tag{13}$$

where (M_p) is the proton rest mass. The maximum dipole moment-to-mass ratio is thus (combining equations (10), (11), (12) and (13):

$$\Omega = \frac{P_e}{M_o} = \frac{\epsilon_o K K_1 n^3 R_o e}{2M_p} \tag{14}$$

Note that (r) is apparently independent of (Z). We can evaluate this result by letting:

$\epsilon_o = 8.85\times10^{-12}$

$K = 9\times10^9$

$K_1 = 1$

$R_o = 0.5\times10^{-10}$M

$M_p = 1.67\times10^{-27}$ kg

$e = 1.6\times10^{-19}$ Coul

The result is:

$$r = 2\times10^{-4}n^3 \tag{15}$$

Consider the following examples:

For:

n=17, r=1

n=36, r=10

n=79, r=100

In order to obtain high Rydberg states (n>10), the gas should be cooled to reduce the chances of collisional quenching:

$$\underset{\text{(molecular energy)}}{3/2\,KT} \quad < \quad \underset{\text{(ionization energy)}}{Ui/n^2}$$

where (U_i) is the ground state ionization potential, and here (k) is Boltzman's constant and (T) is the temperature in degrees Kelvin. High n's are possible in thruster applications where selected propellants are utilized. A cryogenic gas such as, for example, the boil-off of liquid helium at about 5° K. may be used, thus a possible maximum (n) value is:

$$n_{max} = \left(\frac{U_i}{\frac{3}{2}\,kT}\right)^{\frac{1}{4}} = 141$$

In an inductive dipolar accelerator, described later in reference to FIG. **36**, the acceleration is given by:

$$\ddot{X} = \frac{\epsilon_0 \alpha}{2M_o} R_c (BW)^2 \tag{16}$$

where R_c=the coil radius or field gap used in the magnet. We can calculate the limiting B-field frequency product before ionization is induced:

$$BwR_c < \frac{ZkI}{R^2} \tag{17}$$

$$\therefore Bw \cong \frac{Zk\ell^2}{R_c R^2} \Bigg\} \text{(Limiting Field-Frequency)}$$

Combining equations (16) and (17):

$$\ddot{X}_{max} = \frac{\epsilon_o K_1 K^2 Z e^2}{4M_p R_c n R_o}$$

Evaluating this with $k_1=1$, and assuming $R_c=1$ cm, we obtain:

$$\ddot{X}_{max} = \frac{10^{10}}{n}\ \text{M/sec}^2 \tag{18}$$

For n=100, the acceleration is $X=10^9 m/s^2$, comparable to conventional electric and plasma thrusters. This is achieved at a field-frequency product of:

$$B\nu = \ddot{X}/2\pi r = 0.8\ \text{MHz-T} \tag{19}$$

Thus, assuming we can have high Rydbergs, at a magnetic field-frequency product of less than 1 MHz-T, the particle acceleration is comparable to conventional thrusters. The lifetime (τ_e) of the excited Rydberg atom is greatly increased at large values of n, in fact it scales as:

$$\tau_e \sim n^3 \tag{20}$$

(neglecting collisions and field effects). Hence, the lifetime can be long enough to be accelerated over the channel distance before deactivation:

$$\tau_e > L/V_g \tag{21}$$

where (L) is channel length and (V_g) is gas velocity. The Lorentz forces exerted on the excited Rydberg electron by the external B-field becomes comparable to the Coulomb forces holding the electron captive to the nucleus:

$$qVXB \cong \frac{ZKe^2}{R^2} \tag{22}$$

This can be made into a squeezing force to be used to minimize the chances of ionization at the cyclotron

tion implies that the energy of molecular rotation is quantized, and the respective absorption frequency is given by:

$$f=J(J+1)h/2I \quad (33)$$

where (I) is the moment of inertia of the molecule. The moment of inertia is given by:

$$I=m_o n^4 r_o 2 \quad (34)$$

where r_o is the separation distance between the two nuclei of the diatomic molecule. Transitions between the quantized molecular rotational energy states of a polar molecule gives rise to the molecule's pure rotational spectrum. The selection rule governing allowed transitions is $J=+-1$. The rotational spectrum consists of equally spaced lines typically found in the far infrared and microwave regions of the electromagnetic spectrum for ground states. For excited states, the moment of inertia increases as n^4 and the rotation frequencies may be lowered to radio frequencies. Thus, it is clear that the rotation of water vapor molecules which are polar, to create thrust in the atmosphere in a high frequency Lorentz field, is quantized and selected frequencies are most effective for resonant absorption of energy.

It is also possible to have "superexcited molecules," that is, there is high probability of a molecule receiving energy in excess of its lowest ionization potential without immediate ejection an electron, as such, superexcited molecules form electrically neutral excited molecules possessing energy greater than the ionization potential. Such a superexcited molecule, may, like molecules excited to states below the ionization potential, undergo dissociation to form smaller fragments, one or both of which may be electronically excited.

An electronically excited molecule is thermodynamically unstable, and can lose energy rapidly by several competitive pathways. The actual lifetime of a superexcited molecule depends on its nature, on the complexity of the molecule, and the possible alternative degradation processes. The magnitude of such lifetimes are generally in the very wide range from 10^{10} to 10^{-3} second. One such process is molecular dissociation of the excited state leading to the formation of atoms or smaller molecules, which, in turn, may be excited. In contrast, the most likely processes leading to energy degradation without reaction are radiation conversion (fluorescence), or nonradiative conversion (internal conversion) to the ground state. The latter is generally less probable than internal conversion to the lowest excited state followed by fluorescence to the ground state. Internal conversion is a rapid process (10^{-10} sec), and may include intersystem crossing which involves a change of multiplicity, i.e., transition from a low lying singlet state to a lower lying triplet excited state. Triplet states are potentially very important in the present invention since light emission with a change of multiplicity (phosphoresence) is a slow process ($>10^{-4}$ sec), and the electronic energy is available for comparatively long times to provide longer periods of acceleration. Triplet states may also be formed by direct excitation by slow electrons and in the recombination reaction of a positive ion and electron.

It is clear that fluorescent energy emitted by one molecule could be absorbed by another. However, energy transfer can also occur from excited molecules by a nonradiative resonance process. This is formally equivalent to the emission of a photon by the excited molecule and its absorption by another molecule whose absorption spectrum overlaps the emission spectrum of the emissive molecule. This process is not restricted to situations involving collisions between molecules, but can occur when the distance separating the molecules is less than the wavelength of the emitted photon and can take place efficiently over distances of 50–100 A°.

In the case of collisions between neighboring particles, a pressure dependence of the excitation process involves the following major factors: (1) imprisonment of resonance radiation; and (2) collision transfer of excitation. Reabsorption of photons by atoms in the ground state effectively lengthens the life of the excited state, and spreads the excited state population over a larger volume. The longer effective lifetime of the upper state results in an increased probability for intervention of collisional processes, and for conversion through radiative transitions to lower levels other than the ground state. In collisional transfer, an excited atom is deexcited in a collision with a ground state atom with a transfer of excitation energy and possibly changes in the values of angular momentum and spin associated with the excitation energy. With the addition of gases of different species, "optical pumping" may occur in which the foreign atoms act as buffer atoms such that collisions between the excited atom and the buffer atom will not undo the excited state but because of the shapes of the electron orbits of the two particles, the buffer atoms prevent the magnetic interaction of their electrons. It is by this process that a population of excited or pumped atoms leak back to an unpumped, low ground state. The existence of such processes serves to diminish the excitation power required to accelerate a given amount of gas. The creation of a "population inversion" state is obtained. Thus, laser action may be used for practicing the present invention.

A discussion of an excited state of a single atom versus the ionization state energy will now be considered. The energy required to excite an atom to a given P.Q.N. is given by:

$$U_e = U_i\left(1-\frac{1}{n^2}\right) \quad (35)$$

Where U_i is the ground state ionization potential. The ratio of the maximum possible dipole moment-to-mass ratio (52) per unit of excitation energy is as follows:

$$\frac{\Omega}{Ue} = \frac{C_1 n^3}{(1-1/n^3)} \quad (36)$$

For large values of (n), this ratio increases as a function of n^3. Hence, it appears that the most effective use of the excitation energy occurs at the highest possible (n) value, and just below the threshold of ionization. The absorption frequency, however, becomes smaller as higher states of (n) are reached as shown as follows:

$$\nu = CR\left(\frac{1}{n_l^2}-\frac{1}{n_u^2}\right) \quad (37)$$

where:

n^u=upper Principal Quantum Number

c=velocity of light

n_l=lower

R=Rydberg Constant

At values of (n) greater than about 40, the electronic absorption frequency lies in the microwave region, compared to the ultraviolet region at near ground state values of (n).

In typical laboratory experiments with excited states, high values of (n) are achieved by using a gas laser and a tunable dye laser which provides some control over the frequency range. Thus, the process can be controlled from the ultraviolet to the microwave frequencies. Experiments in the laboratory have been performed with molecular beams of sodium in a high vacuum. A magnetic field is used to extract any ions that are present after excitation. The levels of excitation are then measured by applying a known field ionization voltage between a set of electrodes around the beam. The cutoff voltage will ionize all particles of a specific (n) and higher, providing an ionization current, whose magnitude determines the population of these excited states. Electron impact as well as laser excitation have been used. A discussion of the former, with reference to atmospheric oxygen, can be found in the *Journal of Chemical Physics*, page 3125 by R. Freund, Apr. 1, 1971.

MECHANISMS OF DIPOLAR COUPLING

There are at least five different basic methods of creating dipolar type interactions with an external Lorentz field. These various mechanisms are briefly reviewed as follows:

(a) Electronic dipole—at any instant of time, an electron in its orbit about the nucleus constitutes a dipole, and, as the electron orbits, the system can be viewed as a dipole rotating at the orbital frequency of the electron about the nucleus. This frequency is given by:

$$f=(\tfrac{1}{2}\pi)\,[ke^2/mn^6r_o^3]^{\frac{1}{2}} \qquad (38)$$

Hence, for excited states the frequency decreases inversely as the cube of the principle quantum number. For ground states, this frequency lies in the ultraviolet region, and for excited states, the frequencies involved lie well into the microwave region.

(b) Precessing Atomic Orbital Dipoles—The velocity of the electron reaches a low at the perhilion of its electrically stressed orbit which is the region of high space charge concentration. Hence, the flip-flopping of this orbit results in an oscillating dipole that establishes the polarization current density. To create this condition using atmospheric gases, the diatomic molecules must first be dissociated. The dipole moment is the major axis of the elliptical orbit from the more massive ion core to the electron at the perhilion, times the electronic charge.

(c) Precessing Molecular Orbital Dipoles—Here, the particle remains a molecule and the energy of dissociation is avoided. The molecule is excited, and the orbital perhilion is established by the alternating electric field. The dipole motion readily follows the applied electric field. This, together with method (b) represents the most common methods of dipolar coupling for atmospheric gases.

(d) Permanent Assymetric Dipolar Molecules—Some molecules, such as water (H_20), possess a permanent dipole moment (1.85 Debyes) due to the assymetry of the covalent chemical bonds between the constituent atoms. Other common dipoles of this type are NH_3. The rotation of these molecules is quantized, but clearly no energy of excitation is required to attain moderate dipole moments.

(e) Heteropolar Molecules—Some molecules which have ionic bonds, possess permanent electric dipole moments. For example, sodium chloride NaC1, has a dissociation energy of 4.24 eV, and an equilibrium separation distance of 2.36 A°. Since the molecule is held together by ionic binding, the end containing the Na nucleus represents a region of positive electric charge. The end containing the C1 nucleus represents a region of negative charge. Hence, it has a dipole moment of 9.0 Debyes, more than four times larger than the water molecule. Such molecules, while not existing in the atmosphere, could be used in more conventional thruster applications.

Before proceeding with a further discussion of the dipolar force field propulsion system, certain of the well known matter particles which may be useful as a source of neutral particles of matter having selected electric dipole moment or polarizability characteristics with known breakdown characteristics for practicing this invention are set forth hereinbelow. The below list are examples of possible ground state propellants for the dipolar force field propulsion system.

TABLE 2

PROPERTIES OF DIPOLAR SUBSTANCES IN GROUND STATE

Specie	Molecular Weight	Permanent Dipole Moment (D)*	Polarizability (A^3)	Ionization Potential (eV)	Dissassociation Energy (eV)	Boiling Point (°K.)
Helium (He)	4	—	2.5	24.48	—	4.95
Water (H_2O)	18	1.85	18.6	12.6	2.5	
Sodium (Na)	23	23.6		5.138	—	
Ammonia (NH_3)	17	1.47	27.8			239.8
Lithium Floride (LiF)	26	6.33				
Nitrogen (N_2)	28	—	22.1	15.576	9.75	77.35
Oxygen (O_2)	32	2 B.M.**		12.063	5.0	90.18
Hydrogen Cloride (HCl)	36.45	1.08				
Salt (NaCl)	58.45	9.00			4.24	
Xenon (Xe)	131.30	—	27.3	12.127	—	166.05

*D = Debye = 3.3×10^{-30} Coul-meter
**B.M. = Bohr Magnetron

FIG. 5 is a graph showing the polarizability and ionization potential versus the energy level of the atom. However, the field ionization limit of the particle cannot be exceeded, otherwise, ionization will occur, which is undesirable. The ionization potential decreases rapidly as the P.Q.N. increases. Also shown is the electronic absorption frequencies as the P.Q.N. is increased.

The thermal energy of ambient gas molecules is of the order 0.04 eV, hence P.Q.N. of up to 15 to 20 are possible without causing ionization of the excited atom. It is

evident that polarizabilities up to 10-24m^3 may be possible at ambient temperatures. Quantatively, the following condition must be satisfied:

$$E_f \cong BR_c w < \frac{Ke^2}{R^2} \quad (39)$$

where R is the coil radius.

The coulomb electric field experienced by the electron in its orbit equals the induced electric field at a distance R_c from the coil. In other words, the orbital radius of the Rydberg electron is restricted to the value indicated to prevent ionization of the atom. For the condition just mentioned, (n=20, B=½ Tesla and R=½ meter), the P.Q.N. is limited to 17; hence the Rydberg atom will not ionize for P.Q.N.'s equal to or less than this value. Combining equation (30) with (28) and (24) and solving for the maximum possible atmospheric acceleration "ẍ," for a given n. R_c and molecular weight, we obtain:

$$\ddot{x}_{atmos} = \frac{2.2 \times 10^7}{R_c} \text{ M/sec}^2 \quad (40)$$

where R_c is the radius from the center of the coil to the point of interest. This equation gives the approximate limit in particle acceleration that is possible without causing ionization to take place in the atmosphere. The equation further implies that for larger and larger diameter field coils, it is desirable to have lower excited states in order to avoid ionization.

FIG. **6** is a graph showing the possible particle acceleration attainable as a function of the product of the magnetic field and the applied frequency which must be less than the field ionization potential limit. The field ionization limit is not a specific boundary layer condition, but is a range where ionization occurs and is dependent on a number of variables including the strength of the magnetic field, frequency and properties of the dielectric substance. The graph of FIG. **6** is based upon the use of nitrogen (N2), the primary constituent of air for various principle quantum numbers. Also, shown is the acceleration of water vapor molecules which are assumed to remain in a ground state. From the graph in FIG. **6**, particle accelerations of 10^6 to 10^6 m/s^2 may be possible. These types of accelerations are typical of the gas accelerations found in rocket and jet engine thrust chambers. Hence, this invention has utility in propulsion applications.

LINEAR DIPOLE FIELD ACCELERATOR

Referring now to FIG. **7**, a simple LCR circuit is shown consisting of an electrode pair **140** and **142** having a capacitance C and which contains a polarizable gas **160** therebetween as a dielectric. The capacitor C defined by the electrode pairs **140** and **142** and the polarizable gas **160** as a dielectric is series connected to an inductance coil **146** having an inductance L. The inductance coil **146** provides a crossed magnetic field which crosses and intercepts the electric field extending between the electrodes **140** and **142**. The inductance coil **146** is shown in greater detail in FIG. **9**. The LCR circuit illustrated in FIG. **7** provides an electric and magnetic field which vary, in time, as a cosine and sine function, respectively. The circuit has a resistance R, shown by element **150**, which should be minimized to reduce joule heat losses. The circuit is supplied with electrical power from a voltage source E, shown as **152**, by closing a switch **154**. The gas molecules **160**, which are to be accelerated, are located between electrode **140** and **142** and are excited by a vacuum ultraviolet radiation source **170** having a reflector **172**. The radiation from the radiation source **170** is shown by arrow **174** which is directed into the gas molecules **160**. The gas molecules **160**, when in a ground state, normally have a relative dielectric constant (K_r) near unity. However, when the gas is excited, the dielectric constant, and hence the capacitance, increases significantly as given by the following equation:

$$P=(K_R-1)\epsilon_o E \quad (41)$$

where $P=\bar{\rho}N$, the polarization or average dipole moment per unit volume

For gases excited to PQN=10, the dielectric constant is near 10,000, at 10 KV/M field strength. Therefore, even with small electrodes, significant electrical energy can be stored in the excited gases. In the perferred embodiment, the electrodes **140** and **142** are sized to store the energy cycled between the coil **146** and capacitor C having the excited gas as a dielectric. The entire circuit is tuned for operation at substantially the resonant frequency. This configuration establishes the requisite spatial and time force field region to generate a dipolar propulsive effect on the gas.

Referring now to FIG. **8**, a linear accelerator **200** is shown using the construction and elements of the simple LCR circuit shown in FIGS. **7**, **8** and **9**. The linear accelerator **200** consists of a number of electroconductive plates **202** which act capacitively and are arranged to form two sides of a linear rectangular channel **206**. The other two sides of the linear rectangular channel **206** are the pole faces **212** and **214** of a series of U-shaped electromagnets which are arranged along the channel length. The electromagnets have energizing coils **216** situated externally to the linear rectangular channel **206**. The alternating current power source is applied to a conductor **220** across plate **202**, which plates are connected in series with the windings **216** of the coils **212**. The other side of the windings **216** of coil **212** is connected to conductor **222** which, in turn, is connected across the alternating current source. The windings **216** of coil **212** and the capacitive electrode **202** are electrically connected in series as shown in FIG. **10**. The connector **220** and **222** are responsive to an alternating current power source to provide a crossed electric and magnetic fields across the electrodes **202** and the windings **216** which vary as a cosine and sine function, respectively. Each stage of the elements which define the linear rectangular channel **206** are connected in parallel to each other to reduce the equivalent reactance to permit high frequency (HF) operation. The circuits are driven from an external high frequency power source which is applied via a control means **250** such that the frequency of the alternating current power supply is adjusted to operate at the resonant frequency of the circuit.

The gas molecules, which is to form the dielectric gas to be accelerated, is stored in a cryogenic Dewar of gas which maintains the dielectric gas at a extremely cold temperature. The cryogenic Dewar of gas is illustrated as **252** in FIG. **10**. The gas is stored in a pressurized vessel **254**. The dielectric gas passes from the pressurized container **254** through a regulator **256** to a control valve **258**. The control valve is operatively coupled to a "U" shaped cooling member **260** which passes along

each stage of the linear accelerator and which is located under each of the windings **216** of the coils **212** to provide cooling of the magnets **212** to increase the conductivity thereof. The "U" cooling core **260** has its other end terminating in a flowmeter **262**. The other side of the flowmeter **262** is adapted to feed the gas to a plenum **280** which, in turn, distributes the extremely cold dielectric gas into the linear rectangular channel **206**. The flow meter **262** is utilized to control the flow of the dielectric gas into the longitudinal rectangular channel **206**. Any suitable cold gas may be used, such as an inert gas which is chemically inert and, as such, avoids causing corrosion to the electrodes. Preferably, the gas pressure in the longitudinal rectangular channel **206** is as low as possible to reduce collisional quenching of the gas.

The dielectric gas located in the longitudinal rectangular chamber **206** is excited by an external excitation source such as for example a beam of vacuum ultraviolet radiation from a source such as a lasar **270**. The lasar **270** is bounded at one end of the longitudinal rectangular channel **206** and is positioned with respect thereto such that the lasar beam tranverses the entire inside length of the longitudinal rectangular channel **206** so that the dielectric gas contained therein is constantly exposed to this ultraviolet (UV) radiation. The dielectric gas is excited by the UV radiation and is strongly coupled to the alternating cross field from the electromagnets **212** and accellerated as described hereinbefore. The electric field utilized in this embodiment appears across the capacitors defined by the plates **202** having the dielectric gas therebetween. The magnitude of the electric field utilized in this embodiment is determined by the voltage that appears across the capacitors defined by the plates **202** along with the dielectric gas stored therebetween.

As stated hereinabove, the dielectric gas is preferably supplied from a Dewar 252 which preserves the fluid as a cryogenic fluid (such as helium at 4.4 degree K). The dielectric gas supplied is preferably as cold as possible to reduce the collisional thermoquenching of the excited states which is controlled by the following formula:

$$3/2kt = ui/n^2 \tag{42}$$

With a cryogenic dielectric gas, the P.Q.N.s over 100 might be possible. Thus, such a dielectric gas may have a very large electric dipole moment in high particle accelerations at low field frequency products. The possible P.Q.N. is determined by the following equation:

$$P.Q.N. = \left[\frac{2U_i}{3kT}\right]^{\frac{1}{2}} \tag{43}$$

The electric field utilized inthis embodiment is that across the capacitors ("Q" times the supply voltage V_s) as it alternates its stored energy with the magnet coils according to:

$$\tfrac{1}{2}cu^2 = \tfrac{1}{2}Li^2$$

where: C is the capacitance
V is the voltage across electrodes
L is the coil inductance
i is the coil current
Hence,

$$V = [L/C]^{\frac{1}{2}}\, i \text{ and } E_e = \frac{V}{d} \tag{44}$$

where d = electrode gap

The induced electric field (E_i) due to the time varying magnetic field which has a direction at right angles to the magnetic field is not utilized. This capacitive electric field is more useful at lower frequencies when:

$$E_e >> E_i \tag{45}$$

Whereas E_i is useful at higher frequencies and magnetic fields as described in other embodiments later.

FIG. **9** illustrates one embodiment of a linear dipole field accelerator which can be used for practice in the invention. The accelerator includes electrodes **312** and **314** which are adapted to establish electromotive lines of force thereacross to establish electric field as illustrated by the arrows **318**. Electrode **312** is adapted to be connected via conductor **320** to an alternating electric field source. The other electrode **314** is connected via conductor **330** to windings **332** of a coil **334**. The other end of the windings **332** of coil **334** terminates in a conductor **340** which is adapted to be connected across the other side of the alternating electric field source. A highly permeable magnetic conductive member, **360**, (such as ferrite) generates the necessary magnetic lines of force which are shown in FIG. **9** by arrows **362**. The magnetic lines of force extend in a direction which is at a predetermined angle to selected or first direction of the electromotive lines of force and the magnetic lines of force **362** cross and intercept the electromotive lines of force **318** at a predetermined location to define a spatial force field region which is located between the electrodes **212** and **214**. The alternating electric source which is applied between conductors **320** and **340** generate both electromotive and magnetic lines of force as a function of the magnitude of the alternating source which varies as a function of a selected frequency. Thus, since the electroplates **312** and **314** are connected in series with the coil **334**, the rate of frequency change of the alternating source will determine the frequency of the electric field applied across the electrodes **312** and **314** and the frequency of the alternating magnetic field developed by windings **332** and applied via the magnetic coupler **360** across the spatial force field region.

FIG. **10** is the schematic diagram which shows a schematic for a multistage linear dipolar field accelerator having five stages shown by stages **364** through **372**, inclusive. The stages are all connected in parallel across a pair of conductors **374** and **376** which energize from a source **380**. Stage **372** illustrates a capacitor **386** which is formed of electrode plates in a manner similar to that described with respect to FIG. **7** wherein the polarizable gas molecules are located between the plates of the capacitors and wherein the gas molecules has a predetermined dielectric characteristic. The inductor, shown by inductor **388**, is formed of high-flux density magnetic coil.

FIG. **11** illustrates the potential specific impulses that appear to be possible, using the principles of this invention, as the operating parameter of the device. The operating parameters are the product of the channel length and the frequency and magnetic field. The graph of FIG. **11** shows the Isp for various dipole moment-to-mass ratios, such as water, and excited gases. The later

can have ratios equal to or greater than unity, if the gas is properly cooled to minimize thermal quenching.

ELECTRICAL POWER REQUIREMENTS

The generation of thrust utilizing the principles disclosed in this Application requires the absorbtion of power by the dipoles in the gas. Generally, this energy absorption can be grouped into five different categories:

(1) Excitation Energy—energy in the form of a quanta of photon (hv) or electron impact energy is absorbed to create an excited state having a high polarizability or induced dipole moment.

(2) Orientational Energy—thermal molecular collisions in the gas tend to disorient the dipoles in the external applied electric field; consequently a restoring torque equal to pXE must be applied.

(3) Polarizability Energy—once the atom is excited, the electronic cloud must be stressed or distorted to create an induced dipole, with energy given by $\frac{1}{2}\alpha E^2$.

(4) Rotational Energy—finally, the dipole must be rotated by an alternating electric field, and since it has a finite moment of inertia, it has a rotational energy $\frac{1}{2}$ I W^2 which must be maintained regardless of molecular collisions.

(5) Translational Energy—the kinetic energy of the particles ($\frac{1}{2}$ mV^2).

In general, most of these energies are very small compared to the excitation energy required, which energy cannot exceed the ionization potential of the gas, around 14–15 ev for atmospheric gases. In addition to these energies, which are absorbed by the dipoles, there are various losses that the system will incur:

(1) Radiation Losses: Once an excited state has been accelerated and is quenched or deactivated, it will flourese or emit a photon of radiation which may be aborbed by another neighboring atom or lost to the system. If the emitted radiation excites another atom, then this improves efficiency as the energy of excitation is reused. Finally, the coil itself is a RF antenna that broadcasts radio frequency energy which can be reduced by correct design or shielding.

(2) Thermal Losses: The coil has a resistance which generates a joule heating loss (I^2R) which must be minimized or reduced by cooling to prevent overheating the coil. The use of cryogenic cooling or superconductivity is exploited in this respect.

Further, dielectric losses in dielectric gas are reduced. A circuit diagram of the power source and electrically coupled load was sown in FIGS. **7** and **10**. In order to achieve sufficient thrust density at lower frequencies, high magnetic fields in the vicinity of 0.1 to 1 Teslas are desired. The stored magnetic field energy in the working volume times the cycle frequency represents the circulating electrical power. The actual power discipation is the circulating power divided by the circuit "Q", or figure of merit which is the ratio of inductive reactance to the resistance. The ratio of the body force to the body power discipation thus simplifies to:

$$F_b/P_{dis}=K_1\lambda_c\omega^2/R \tag{46}$$

Thus, for a given condition of excited gas or electric susceptability, the ratio of the frequency to resistance (Q) should be optimized. The coils shown in FIG. **10** thus consist of elements of large cross-sectional area with minimal length and are cooled to very low temperatures to minimize the resistivity. For example, in a rocket driven MHD power generator, the liquid hydrogen (−400° F.) for the fuel can be circulated through the coil before combustion takes place.

The present invention has utility as a new and innovative propulsion system in which the thrust-to-power-ratio is potentially very high compared to conventional systems. The thrust-to-power ratio (γ) is given by:

$$\gamma = \frac{\dot{m}V_g}{U_e\dot{N}_e + \frac{1}{2}\dot{m}V_g^2} \tag{47}$$

where:

$\dot{m}$ is the total mass flow rate (kg/s)

U_e is the excitation (photon) energy absorbed

$\dot{N}_e$ is the number flow rate of excited particles

V_g is the net change in velocity of the gas

If (β) equals the population fraction of excited states in the total gas flow, this equation becomes:

$$\gamma = \frac{2v_g}{\frac{2U_e\beta}{M_o} + V_2} \tag{48}$$

Where M_o is the mass of the atom or molecule. Differenting this equation and setting equal to zero, we find the optimum velocity for maximum (γ):

$$V_{optimum} = \left[\frac{2\ U_e\beta}{m_o}\right]^{\frac{1}{2}} \tag{49}$$

As an illustrative example, assume an excitation photon energy of 10 ev and a population fraction of 1% or 0.01 using diatomic nitrogen with a mass $m_o = 28 \cdot 1.67 \times 10^{-27}$Kg, the velocity is 840 m/s and the power/thrust ratio is about 800 watts/newton. This compares to the performance of the SSME rocket engine on the space shuttle which requires 4540 watts/-newton of thrust. Even better performance may be possible depending upon the number of rebounding collisions and collision cross-section of the excited atoms, which are generally much larger than ground state atoms.

FIG. **12** is graph showing the power/thrust ratio for atomic hydrogen gas assuming no photon recycling the ratio decreases inversly with the square root of the molecular weight, thus Xenon gas would have a power thrust ratio more than 10 times smaller than hydrogen. Moreover, the ionization limit is moved further up so that higher induced electric fields are possible without field ionization. In fact, the field ionization limit (E_i) increases as follows:

$$E_i = \frac{ZKe}{R^2} \tag{50}$$

It increases with atomic number for an atom of given radius (R). As illustrated in connection with FIG. 7, no effort was made to capture "lost radiation." It was simply assumed that the gas completely absorbed the UV radiation as it traversed the length of the acceleration channel **306**.

As shown in FIG. **13**, the input gas **400** located between plates **402** absorbs the photons from an excitation source **406**. The gas **400** is excited for a lifetime τ_e and then is de-excited. Meanwhile, the gas has traveled a length ($V_{g\tau e}$), where V_g is the gas velocity. The de-exci-

tation involves the emission of a photon, with a frequency generally less than the original frequency, but still greater than that required for the first transition state above ground and thus, can be usefully "recaptured." Thus, FIG. **13** shows the emitted photon **412** being reflected (arrow **414**) and returned upstream to the source gas where reaborption takes place. In practice, the input radiation may be introduced at right angles to the gas flow, and bounce repeatedly off the walls of the channel, which are approximately made into reflecting surfaces.

In the embodiment illustrated in FIGS. **14** and **15**, the feature of reflecting trapped radiation in a optical cavity is utilized. In this embodiment, a torroidal coil is used to establish the alternating magnetic field between a cylindrical capacitive electrode arrangement. The torroid coil has the advantage of having no external field (for the ideal case) and, consequently radiation losses are minimal.

Referring to FIGS. **14** and **15** therein is shown this particular embodiment consisting of flat rectangular plate conducting elements **450** arranged around a pair of cylindrical electrodes **452** and **454**. The plate conducting elements **450** are insulated from the cylindrical electrodes **452** and are held to the core conductor by a collet arrangement with spindle chuck assembly **458** which locks them into position. A source of UV radiation **470** enters through holes **472** such as from an exciter laser source **474**. The UV beam is tilted slightly off a radius vector to allow the beam **470** to be reflected off the inner reflective surfaces of the cylindrical electrodes which also act as an optical cavity to trap the radiation. The air or dielectric gas, shown by arrow **420**, enters from the left through the conducting elements **450** and is immediately excited by the radiation and electromagnetically accelerated. As mentioned earlier, an alternate method of excitation involves electric discharges which should also be considered in this application. In this embodiment, the plate conducting element **450** are connected in series with the cylindrical electrodes **452** which define the capacitors.

METHODS OF EXCITATION

As mentioned previously, there are two basic methods of excitation involing (1) electron impact and (2) radiative or photon interaction. Each approach has its advantages and disadvantages and which one or both should be utilized depends upon the application.

Methods employing electron impact are:

Electron Beam Excitation—in this a cathode is heated in an evacuated chamber and when a voltage is applied, electrons are emitted which can be focused and directed into the gas. The beam tends to be rapidly attentuated in the atomosphere and diverges with distance due to mutual repulsion between the electrons. This technique might be used directly in propulsion applications of small dimensions, comparable to the attentuation path length.

High Voltage AC or DC Electric Discharge—this technique is perhaps the easiest to implement, can be lightweight and may provide good efficiency. Using the AC approach, the voltage may be readily stepped up to high voltages, e.g., by using a Tesla coil. The breakdown voltage causes ionization to take place, and the ions and electrons, in turn are accelerated by the field to impact ground state atoms to cause excitation. The DC approach is more complex insomuch as HV rectifiers are required, and it's not clear what is gained by doing it this way.

Radio Frequency or Microwave Discharge—in this technique, a high power microwave is applied to the gas, which, by heating the gas leads to thermal ionization and excitation. Once some ions are generated, they are further accelerated by the fields to cause more excitation and ionization. This method may not be the most efficient since thermalization and ionization may dominate the process with only incidental excitation to take place. However, if it can be made efficient, it promises to be operative over larger volumes. If done at lower megahertz frequencies, the field coil of the propulsion system itself may be used to achieve self-excitation.

Methods employing photon interactions are:

Flashtube or Flashlamp Excitation—in this technique a Xenon flashlamp is fired with a high voltage pulse which emits a spectrum of light of varied frequencies. The efficiency is low, and, moreover, there exist many frequencies not useful, i.e., that do not conform to an energy transition in the atom or molecule to be excited. Even so, the radiation can be directed, reflected in an optical cavity, and can penetrate the gas over large distances.

Laser Beam Excitation—This technique offers the advantage of a single monochromatic beam of intense, coherent electromagnetic radiation. A wide variety of types of lasers exist, e.g., water vapor lasers, nitrogen (pulsed) are rare gas excimer lasers than emit in the ultraviolet range, with photon energies that overlap the transitions in the atoms to be excited (about 10 eV), or around 1300 A wavelength. The required resonance transition levels may be 1300 A wavelength. The required resonance transition levels may be easily excited by a low pressure electrodeless discharge sustained in a microwave generator, and the resultant photons transmitted into the reaction chamber or channel through lithium floride sapphire, or calcium flouride windows. The exciting wavelengths provided by such sources include xenon (1295 A at 9.6 eV); argon (1048 A at 11.8 eV and 1067 A at 11.6 eV). When the photon energy is less than the ionization potential, the invention can function in the absence of ionization. Above the ionization potential, superexcited molecules may occur, with the added possibility of ionization. The efficiency of these lasers is generally only a few percent, but efficiencies of up to 10% for chemical lasers has been reported.

Synchrotron Radiation Sources—These utilize the acceleration of relativistic electron beams to produce radiation. The possibility of FEL's, or Free Electron Lasers may mean electron beams interacting with "wigler" magnetic fields to generate coherent radiation, may provide up to 50% efficiency.

FIG. **16** illustrates the mechanical efficiency of energy conversion into vehicle kinetic energy by reacting against gas of large mass via a force field extending over space.

FIG. **17** illustrates the range of required force field (R_e) plotted as a function of decreasing medium density. As illustrated in FIG. **17**, the medium density decreases, that is the density of the atmosphere from sea level to interstellar space. Thus, the range of the force field (R_e) increases inversely to the medium density. A family of curves are plotted for various mass ratios (M.R.).

FIG. **18** is another embodiment showing the construction of a wing structure which functions as a capacitor. The wing structure includes an exterior metal surface **500** having a plurality of cell members joined by

tional or electronic), of either molecule, the collision will be perfectly elastic. The graph shows the reference line (horizonal) translated back to the top of the graph after each collision to keep the motion depicted within the boundaries of the graph. During the collision process, the excited molecule may gradually decay with the emission of a photon. As a consequence, the dipole moment may decrease, with a resultant diminishment in the momentum imparted by the force field. However, the radiation emitted may be absorbed by another adjacent excited or ground state molecule, so that the photon energy is repeatedly utilized until the gas eventually thermalizes (by which time the gas has already been fully accelerated).

The attainment of high thrust for the least amount of power requires few as possible excited states with large collision cross sections transferring their momentum to the greatest number of ground state atoms. Thus, the graph of FIG. **25** shows the momentum or impulse exchanged versus the number of collisions experienced by an excited atom before it is quenched. The rebounded excited atom is turned each time by the force field and collides with additional ground states. If the dissipation of energy is minimal, the excited state can undergo many collisions in this way before it is extinguished by quenching or radiative decay (deactivation). For example, the sea level collision frequency is 10^9 Hz in air; if the lifetime is 10 microseconds, the total number of collisions possible is $10^9 \times 1.0 \times 10^{-5} = 10^4$ collisions. Accordingly, the momentum induced in the excited Rydberg particle is transferred to thousands of ground state atoms. In this arrangement a very low B field is possible while securing high performance. This is further realized when one considers the large collision cross section of an excited particle relative to a ground state atom; it can be millions of times larger since it increases with the fourth power of the P.Q.N., (n^4). The effect of the larger collision cross section is to increase the collision frequency, which is directly proportional to the cross section.

The propulsion efficiency (thrust power divided by rate of propellant energy release) shown in the graph of FIG. **26** is for three different classes of propulsion systems: rockets, conventional air breathing ramjets or jet engines and a force field propelled system as disclosed herein. The propulsion efficiency equations for the rocket and airbreather respectively are:

$$n_{rocket} = \frac{2\nu}{1+\nu^2} \tag{51}$$

$$n_{air\ breathen} = \frac{1}{\frac{\beta}{2\nu}+1} \tag{52}$$

where

ν=ratio of Vehicle Velocity to exhaust and

β=ratio of delta velocity of air to exhaust of a rocket.

The present force field propulsion system is an air breather in which very low delta velocities are possible due to the interaction with a very large volume or mass of air with dimensions comparable to the size of the vehicle itself. An external force field arrangement could be used in the arrangement. As illustrated in FIG. **24**, rockets gradually reach peak propulsion efficiency as their vehicle velocity approaches their exhaust velocity. Thereafter, the efficiency thereof gradually tapers off. In a ramjet or jet engine, the efficiency gradually increases in a slow and steady fashion. However, when the spacecraft reaches high altitude where the atmosphere density becomes too rarified, the jet engine must be shut down. This occurs at about 100,000 feet. In a force field, air breathing system, operating at low delta velocities over large volumes, the efficiency more rapidly increases at lower vehicle velocities and maintains nearly 90%+ efficiency as velocity increases. Such engines can continue operation at nearly twice the altitude of conventional air breathing engines, with electrical power being supplied by some internal primary energy source such as a nuclear reactor.

FIG. **27** illustrates the possible body force plotted as a function of magnetic field frequency in Tesla-Hertz for a fully excited nitrogen gas at the quantum level of $n = 10$. he plot is for different altitudes commencing at sea level, 50 kilometers and 100 kilometers. When the magnetic field frequency approaches approximately 10^8, field ionization limit is reached which is illustrated by dashed line **680**. The field ionization limit is that point where the gas commences to ionize which reduces the efficiency of the dipolar force field propulsion system.

FIG. **28** is a plot of the body force for various levels or fractions of excitation plotted as a function of the magnetic field frequency in Tesla-Hertz for gas excited at the quantum level of $n=10$. When the product of the magnetic field times the frequency approaches 10^8 and the population fraction of excited states approaches 100%, the body force is extremely high. A field ionization limit occurs at about 10^8 Tesla Hertz as is illustrated by dashed line **682** in FIG. **28**.

FIGS. **29, 30, 31** and **32** show the construction details of a spacecraft generally referred to as a "X-wing" aerospace vehicle which is adapted to utilize the teachings of the present invention.

The spacecraft includes a lower set of wings **700** and an upper set of wings **702**. If desired, the angle between the upper and lower wings can be variable for efficiency optimization purposes. The aircraft utilizes a verticle tail **204** and horizontal stabilizing fins **706**. A source of electromagnetic radiation, such as an elongated flash tube **708** is located on the lower wing **700** and positioned to direct the electromagnetic radiation generated thereby toward the undersurface of the upper wing **702**. The upper wing **702** includes prismal reflecting member **716** which are adapted to reflect the ultraviolet radiation designated by arrow **714** between the upper and lower reflective surfaces of the wing **700** and **702**. The final radiation is return reflected by reflector **718** located at the extremity of the upper wing. At the terminus of each wing is located a pressurized liquid hydrogen storage tank **720**. The front plan view of FIG. **29** shows that the aerospace vehicle includes air intakes **706**, has a fuselage **722**, landing wheels **726** and, if desired, auxiliary airbreathing jet engines **724**.

The details of the construction of the wings is illustrated in greater detail in FIGS. **30, 31** and **32**. The inductive coils are formed by strut numbers **730** which are adapted to be a plurality of spaced aligned members and which are adapted to carry a current therein as illustrated by the current flow arrow. The strut members **730** are covered by a conductive surface **734** which function as the conductor plates for confining the dielectric gas therebetween. In the preferred embodiment, the main power plant for generating the alternating current power may be a rotating nuclear bed reactor

which is similar to that illustrated in connection with FIG. **21**. The blades of the turbine are illustrated as **740**, the high frequency generator illustrated at **744** which is coupled to the rotating nuclear bed reactor by the clutch **742**. The strut number **746** of wing **702** function as part of the secondary winding of the transformer type coupling member which is operatively coupled to the high frequency generator **744**.

FIG. **31** illustrates in greater detail the construction of the upper and lower wings and the means for generating the electromagnetic field and the electromotive lines of force to establish the E field. The excitation source **708** generates the electromagnetic radiation **714** which is reflected from the optical surfaces of the wing **702** which functions to excite the atoms of nitrogen gas in the atmosphere to a higher quantum level. The gases are confined between the upper wing **702** and the lower wing **700** which establishes the E field shown by lines **752** which pass between the wings and from the pointed ends of members **716** and the B field which emanates from the fuselage, as line **754**. Thus, the area between the wing **700** and **702** function as a spatial force field region which has the excited nitrogen gas particles located therebetween and which, in the presence of the crossed magnetic field and electric field, cause the dipoles thereof to rotate and cause the reactive thrust.

The details of the wing construction disclose that the upper surface of wing **700** is conductive while the lower surface **756** is an insulator. Internal struts **730** are insulated from the upper surface of wing **700** by insulator spacers **750**. Also, each of the struts **730** contain passageways **758** which is adapted to permit hydrogen liquid **760** to pass therebetween. The hydrogen gas acts as a coolant in addition to being used as a fuel and can be utilized to cool the superconducting magnets which generate the magnetic field indicated by arrows **754**.

FIG. **32** illustrates, by means of a cross section, the relationship between the upper wing **702** and the lower wing **700** and the specific construction of the various wing struts. The upper wing **702** is insulated from a center support **762** by an insulator **764**.

In a similar manner, the lower wing **700** has the center strut **720** insulated from the conductive upper surface **774** by means of insulators **750**. Wing struts **730** have the lower outer surface which is formed of insulating materials **756** affixed thereto. The airflow between the wings is illustrated by arrows **778**. The direction of the B field is illustrated by vectors **754** which are extending outward from the fuselage toward the end of the wings. The electromotive lines of force of the electric field as shown by lines **752** and extend between the lower wing **700** and the upper wing **702**.

FIG. **33** is a schematic representation of the inductance coils and electrodes forming the same **786** which are located in each of the wings. The inductors are driven from a high frequency alternating current source through a transformer coupler illustrated as **788**.

The power source which is adapted for use in the "X-wing" aircraft is illustrated in FIG. **34**. In operation, a power source, such as a turbine **790**, drives a high frequency generator at the selected frequency. The high frequency output is coupled through a transformer coupler **794** to the wing and to the inductors **796** which are connected in series with the capacitors **800** formed between the upper and lower wings.

The embodiment of the invention shown in FIGS. **35** and **36** utilizes the inductive electric field due to the motional magnetic field as given by Faraday's Law:

$$\int E \cdot dl = -(d0/dt) \tag{53}$$

For a solenoidal coil, the Azimutha L electric field produced is given by the following equation:

$$E = -\frac{1}{2} R_c \frac{dB}{dt} \tag{54}$$

or

$$E = \frac{1}{2} R_c W B_o \cos wt$$

Combining with equations (1), (6) and (54), we obtain:

$$F_b = ; \tfrac{1}{8} t_o \lambda_e R_c B_o^2 w^2 \sin w^2 t \} \lambda_e = N\alpha, \tag{55}$$

the electric susceptability

which is the body force produced in a dielectric gas subjected to an inductive high frequency magnetic field. The force increases with the square of the magnetic field and frequency. An upper limit is reached when the induced electric field becomes so intense that electrical breakdown and ionization of the gas takes place. The invention is preferably operated at such a frequency and magnetic field condition so as to avoid ionization and the problems which would thereby ensue. It should be pointed out that in the presence of a transverse magnetic field, the breakdown voltage of a gas is increased significantly. FIG. **21** is a graph of the potential body force established in the atmosphere for various altitudes for an assumed excited state gas having a P.Q.N. of 10. The upper limit where ionzation will approximately start to take place is also shown in this Figure.

For sea level, the field ionization limit is reached where the product of the magnetic field times the frequency reaches 10^7–10^8 volts per meter. At higher altitudes, this number decreases as the ambient conductivity increases. Even so, body forces of 10^3–10^4 NT/m^3 are possible at megacycle frequency at sea level. This has been discussed in detail with respect to FIGS. **27** and **28** hereinbefore.

As shown in FIG. **35** and **36**, the magnetic field is generated inside of a conical shaped spiral coil **810** consisting of a number of turns each parallel connected to minimize the inductance to permit resonant operation in a series tuned circuit at megacycle frequencies. The coil is preferably made of lightweight material such as aluminum alloy and housed in a structure **812** designed to handle the mechanical stress of the magnetic field pressures. The coil is cryogenically cooled via input flanges **820**, and hollow conductors, with an exit plenum **822**. If the coolant is water (which is a dipole), it may be injected as a fine spray via conduit **224** into the acceleration cavity **826** to enhance the thrust and reduce the levels of excitation required. The water vapor may also be the combustion products of a liquid hydrogen and oxygen rocket driven MHD generator.

The dipolar propulsion unit has an entrance or intake manifold or shroud canapy **830** through which the working fluid such as air enters and is directed into the Lorentz propulsion chamber cavity. The coil elements **810** consist of flat strips through which air is free to pass and are held in rigid position by the insulator attenuator fins **814** which also act to attentuate the exterior unwanted upstream electric field. A source of ultraviolet excitation radiation such as an excimer laser **832** is provided which directs its beam into an optical cavity **834**

vehicle **970** as shown in FIG. **42***a*, the thrust is vertical through the center of gravity of the vehicle. However, in FIG. **42***b*, if the field of radiation is shifted to one side, an increase or asymetry of excited states on that side of the vehicle exists resulting in increased thrust, which tilts the vehicle producing a horizonal thrust component moving the vehicle to the right. Moreover, the reflector **963** can be rotated through 360° in a plane parallel to the vehicle structure. Horizonal thrust component can be directed accordingly, as shown in FIG. **42***c*, where the reflector **962** has been rotated through 180° .

The construction of the directional control reflector **962** and ultraviolet radiation source **960** are more clearly understood by referring to FIG. **46** and **47**. Two flashtubes rotatably mounted about an axis **1000** below a platform **1002** supported by bearings **1004**. A gear wheel **1006** fixed to the vehicle structure. The flashtubes **960**, surrounded by reflectors **962** are adjustably mounted for rotation via a linear gear rack actuator **1012** acting upper semi-gear wheel **1014**. The power to the flashtubes is supplied via a pair of commutator rings **1016**, and connecting arm **1018**. The reflector **962** is rotatably mounted to the axis of the flashtube via spoke structure **1020**. The component effect is that the radiation field from the curved reflector **962** can be varied through 90 degrees of rotation about a horizonal axis from a horizonal plane to a verticle plane, as well as through 360 degrees about a vertical axis.

The vehicle VTOL dipolar propulsion system shown in FIG. **43** consists of a number of magnets arranged with their axis radially directed, with each alternate magnet of opposite polarity. The top field above the centerline of the magnets is shunted into the vehicle structure, without however effecting the external field below used to accelerate the ambient gas. This top field can now be used to bend a relativistic beam of electrons to produce ultraviolet (1000 A^o) synchrotron radiation in the direction target to the beam, and, via an appropriate window and optical reflectors, direct the UV radiation into the gas for excitation of said gas.

The method of generating an alternating magnetic field is shown using D.C. superconductive magnets **1020** or permanent magnets. Use of the D.C. superconductive magnets with rotating ferrite shunts eliminates the A.C. current losses in the superconductive magnet arising therefrom due to resistence thereof, if the superconductive magents were operated in an A.C. mode to generate the same alternating magnetic field. The magent coils are arranged in a circle with alternate magnets in reversed field direction. A slotted ferrite disc **1040** rotating at high speed shunts the field of all magnets in one direction as shown in FIG. **44** leaving the unshunted field of the others expelled into the surrounding dielectric gas. The device is more clearly illustrated in FIG. **45** which graphically illustrates the magnitude and direction of the external field as the ferrite rotor **1040** is rotated by motor **1042** through several different angular positions. In **46***a*, the outward (north) positive fields of magnets **1030** are shunted through the ferrite leaving the inward (south) negative field unshunted and exposed to interact with the dielectric gas. As the ferrite rotor moves 22.5° to the position shown in FIG. **42B**, a neutral position is reached where the external field is approximately zero, as averaged, over the 45° of rotation. When the rotor **1040** reaches position shown as **42***c*, the ferrite shunts the onward (south) negative field, leaving the outward positive field exposed to the gas. Thus, through 90° of rotation the field has gone through a complete cycle of outward and then inward reversed field. The frequency of the alternating field is given by

$$f_r = N_r \text{ (R.P.S.)} \tag{56}$$

where N_r is the number of magnet pairs of opposite polarity, and (R.P.S.) the frequency of rotation in revolutions per second (R.P.S.). The speed of rotation has been found by Beams to be limited to the rim velocity reaching the speed of sound of the material; where the centrifugal forces induce stresses sufficient to tear the rotor apart. Preferably, the ferrite rotor is reenforced with high strength material such as glass filaments. For example, a 1 meter diameter ferrite rotor spinning at 500 R.P.S. with 100 coil pairs mounted on a nonrotating frame could generate an intense field alternating at 50 kilocycles. For a fully excited gas (air at sea level), the thrust generated is sufficient to lift the vehicle even using rare earth magnets. The 500 R.P.S. or 30,000 R.P.M. could be generated by a gas turbine engine. Positive torque is required to break the magnetic field, but negative torque is obtained as the ferrite is attracted to the next coil. Hence, the average torque due to magnetic attraction is zero. The power is absorbed to reverse the field through the ferrite which has small losses since it is an insulator. Some heating is expected so air circulation is desirable to keep the rotors cool and prevent the superconductive magnets from heating up and going resistive.

FIGS. **47** and **48** illustrate a VTOL version of this method of field generation. The ferrite rotor rotates in a horizontal plane beneath the magnet coils arranged in a circle near the rim. A top row of ferrite plates fixed over the coils is used to shunt the field over the top of the vehicle which could produce an adverse downward force. The air gap between these plates and the coils is adjusted for this purpose. The radiation field used to excite the gas is derived from a free electron laser (FEL) **1050** using the same coils as the propulsion magnets **1052**. Electron guns are arranged near the rim of the top edge of the superconductive magnets **1052** and direct their electron beams **1054** in a circular path. The fields bend and accelerate the beam, **1054**. The acceleration produces synchrotron radiation in the far ultraviolet region which is directed to reflector **1060** which reflect the radiation **1062** downwards beneath the vehicle to excite the air. The excited air then interacts with the azimuthal electric fields produced by the alternated fields, is repelled downward, setting up a flow pattern around the vehicle as shown which generates the vertical thrust.

FIG. **48** illustrates pictorially the physical arrangement between the magnets **1052**, the shading magnets **1070** and the radiation **1062** traversing the magnets **1052** onto the reflector **1060**.

FIG. **49** is a pictorial representation of an aerospace vehicle using the dipolar force field propulsion system in combination with a rotating shunt plate **1092** and superconducting magnets **1090**. An appropriate energy source **100** is used for the aerospace vehicle. The radiation for exciting the particles **1104** is directed by reflectors **1102** to excite the gaseous atoms in the atmosphere under the spaceship. The electrical energy developed by the generator **1100** is rotatably coupled to the magnets through an electromagnetic coupling means **1108**.

HIGH ALTITUDE OPERATION

At high altitudes, the artificial excitation source can be deactivated and the natural ultraviolet radiation from the sun used to excite the air. Such phenomena is known in geophysics as "airglow," dayglow, nightglow and "aura borealis."

In addition to carrying power on board the vehicle for the purpose of exciting the gas around the vehicle, the gas may, to some extent, be excited from external sources such as a ground station or geosychronous power satellite. This has the distinct advantage of reducing weight. However, the frequencies are restricted to those which will propagate through the atmosphere with little attentuation, such as the visible and down to the microwave region; ultraviolet being highly absorbed. Thus the vehicle carries its own ultraviolet radiation source, such as from a syncrotron radiation source which can be varied to provide any desired distribution of wavelengths, e.g. by changing the energy of an electron beam. The absorbing frequency of the excited gas is given by the following equation for simple hydrogenic atoms:

$$\nu = CR_R\left(\frac{1}{n_l^2} - \frac{1}{n_u^2}\right) \tag{57}$$

where (n1) is the P.Q.N. of the lower state of interest and (n_u) is the upper state of interest. For excited states with n=40, and higher, the gas will absorb microwaves and increase the polarization, especially at higher altitudes where gas temperature and pressure is reduced. Thus, a ground station microwave source could enhance the polarization around a high flying electromagnetic aerospace vehicle.

In addition to absorption by electronic states, which enhances polarization for thrust augmentation purposes, other vibrational or rotational states may be created to absorb wavelengths of a specific nature to avoid reflection and consequent detection. This could be done automatically, by sensing the offending frequency, and adjusting the energy of the electron beam to control the spectral distribution of the synchroton radiation so as to excite the gases around the vehicle and absorb completely the offending frequency. If the frequency changes, the electron beam is likewise changed to again permit absorption of the offending frequency.

It is envisioned that the spacecraft illustrated in FIG. **49** could be operated in a vacuum, such as in interstellar space. It has been found by recent experiments that a momentum reaction force can be generated by the field itself due to the EXB vectors. This phenomenon is described in an article by G.M. Graham and D.G. Lahoz entitled "Observation of Static Electromagnetic Angular Momentum in Vacuum," *Nature,* Volume 285, May 15, 1980.

In FIG. **50**, a method of cyclically pumping an LCR tank circuit by magnetohydrodynamics so as to sustain the oscillations against the transfer of energy into the primary propulsion tank circuit is shown. The device consists of a rocket engine (**1160**) injected with fuel, oxygen and seed material to produce an electrically conducting plasma which passes through channel at velocity Vg with electrodes **1162** and field coils **1164** and ferrite core **1166** to increase magnetic permeability in the channel. The coils **1164** generate a varying current in series with the coils perpendicular to the plane of the paper, according to the equation:

$$\left.\begin{aligned} i = \frac{E}{R} = \frac{V_g}{R} B_\delta \sin \omega t \\ R = \text{resistance} \end{aligned}\right\} \tag{58}$$

The current charges up the capacitor element C_z which discharges its current back into the coils at the resonant frequency that matches the primary circuit to the left.

The teachings of the invention have wide application. In its most generic application, the teachings can be utilized as a means for controllably accelerating a particle of matter having a selected dipole characteristic. Also, the invention teaches a method for controllably accelerating such a particle of matter.

The dipole force field propulsion system has utility for propelling an aerospace vehicle in the earth's atmosphere or in interstellar space. The propellant in the form of a cryogenic gas can be carried aboard the aerospace vehicle or the propellants can be external to but contiguous to the aerospace craft such as air or particles of matter or plasma in interstellar space. The energy sources likewise can be carried aboard the aerospace vehicle or can be external such as solar, microwave or laser excitation source.

What is claimed is:

1. A dipolar force field propulsion system comprising

means for generating an alternating electric field having its electromotive lines of force extending in a first direction and which vary at a selected frequency, said electric field having an electric field strength of a predetermined magnitude;

means for generating an alternating magnetic field having its magnetic lines of force which extend in a second direction which is at a predetermined angle to said first direction and which crosses and intercepts said electromotive lines of force at a predetermined location to define a spatial force field region and wherein the frequency of oscillation of the alternating magnetic field is substantially equal to the said selected frequency and is at a selected phase angle relating to said alternating electric field, said magnetic field having a flux density which when multiplied times the selected frequency is less than a known characteristic field ionization potential limit;

a source of neutral particles of matter having a selected electric dipole characteristic and having a known characteristic field ionization potential limit which is greater than said magnitude of the electric field strength, said dipoles of said particles of matter being capable of being driven into cyclic motion at said selected frequency by said electric field to produce a reactive thrust;

means for vaporizing said particles of the matter into a gaseous state at a selected temperature below the thermal ionization level thereof and for transporting said vaporized matter in said gaseous state into said spatial force field region defined by said crossed electromotive lines of force and magnetic lines of force which coact with and drive said dipoles into cyclic motion at said selected frequency to produce the reactive thrust which is substantially normal to said first direction of said electromotive lines of force and to the second direction of said magnetic lines of force; and

control means operatively coupled to said means for generating an alternating electric field and to said means for generating an alternating magnetic field and which is responsive to the dielectric properties of the vaporized matter located in the spatial force field region for establishing a predetermined spatial and time relationship between the electric field, magnetic field and dipole cyclic motion for a selected frequency.

2. Means for generating a reactive thrust force adapted to propel an aerospace vehicle comprising

means for generating an alternating electric field which varies at a selected frequency and extends in a first direction, said electrical field having an electric field strength of a predetermined magnitude;

means for generating an alternating magnetic field at substantially said selected frequency which extends in a second direction which is positioned at a predetermined angle to said first direction and which crosses and intercepts said electric field at a predetermined location to define a force field region, said magnetic field having a flux density which when multiplied times said selected frequency is less than selected characteristic field ionization potential limit;

means for vaporizing neutral particles of matter into a gaseous state at a selected temperature which is below the thermal ionization level of said particle, said particle having a selected electrical dipole characteristic, a breakdown characteristic which is greater than the magnitude of the electric field strength and a selected characteristic field ionization potential limit, said dipoles of said matter being capable of being driven into cyclic motion at a selected frequency by said electric field;

means operatively coupled to said vaporizing means for transporting said particles of the material into said force field region wherein said crossing electric field and magnetic field coact with and cause said dipoles of matter to be driven into cyclic motion at substantially said selected frequency produce a reactive thrust force in a direction which is substantially perpendicular to said first direction and said second direction; and

control means operatively coupled to said electric field generating means and said magnetic field generating means and responsive to the dielectric properties of the vaporized particles of matter located in said force field region for establishing a predetermined spatial and time relationship between the alternating electric field, the magnetic field and frequency of the cyclic motion of said dipoles said control means establishing said selected frequency at substantially the resonant frequency of a capacitance and inductance circuit formed by the electric field generating means, said magnetic field generating means and the vaporized particles of matter in the force field region.

3. The propulsion system of claim 1 wherein the predetermined angle between the first direction of the electric field and the second direction of the magnetic field is selected to be 90° .

4. The propulsion system of claim 1 further comprising

means for raising the electronic excitation level of said particles of neutral matter in the vaporized gaseous state to a higher quantum level thereby increasing the magnitude of the selected electric dipole moment characteristic.

5. The propulsion system of claim 4 wherein said electronic excitation level raising means is a laser.

6. The propulsion system of claim 5 wherein said laser raises the quantum level of the particles of material to a quantum level between n=1 and n=20 by controlling the wavelength of the laser in step wise fashion to establish the dipole moment at a selected energy level which varies between the lowest energy level of the material at a quantum level of n=1 and a higher energy level which is below the thermal ionization level of the material at a quantum level of n=20.

7. The propulsion system of claim 4 wherein said electronic excitation level raising means is ultraviolet radiation.

8. The propulsion system of claim 5 wherein said laser originates from an external location.

9. The propulsion system of claim 1 wherein said magnetic field generating means are permanent magnets.

10. The propulsion system of claim 1 wherein said magnetic field generating means is a plurality of spaced, radially aligned superconducting magnets with the poles thereof alternately positioned relative to each adjacent magnet and a rotatable, ferrite magnetic material rotor which cyclically is transported past each of the radially aligned superconducting magnets to generate an alternating magnetic field.

11. The propulsion system of claim 1 wherein said magnetic field generating means is a coil.

12. A propulsion system comprising

a plurality of U-shaped superconducting pole pieces positioned in spaced alignment to define a substantially rectangular elongated channel;

a plurality of coils positioned one each around the center of one pole piece;

a plurality of pairs of spaced, substantially planar conducting electrodes positioned with each spaced pair extending between the ends of the U-shaped pole pieces wherein one of the planar electrodes is located adjacent the coil and the other planar electrode is spaced therefrom a distance substantially equal to the length of the U-shaped pole pieces defining a spatial region defined on two boundaries by the pair of planar electrodes and on two boundaries by the U-shaped end of the pole pieces, each of the spatial regions of each pole piece and planar electrode pair being in alignment enclosing said substantially elongated channel;

means for electrically connecting one of the planar electrodes of the planar electrode pair in series with the coil associated with its respective pole piece and for electrically connecting each series connected planar electrode pair and coil in parallel with the other series connected planar electrode pairs and being adapted to be connected to an alternating electrical power source;

a radiation source positioned at one end of the substantially rectangular elongated channel for directing radiation through each spatial region defined by each planar electrode pair and pole piece ends;

a plenum positioned at said one end adjacent said radiation source adapted to transport a vaporized propellent gas having neutral particles of matter having a selected dipole characteristic at a controlled rate through said substantially rectangular elongated channel; and

a cryogenic source of propellant gas comprising neutral particles of matter wherein the particles of matter have a selected electric dipole characteristic and a known characteristic field ionization potential limit, said cryogenic source being operatively coupled to said plenum through a means for vaporizing said propellant gas to a level less than the ionization level thereof and applying a continuous stream of vaporized propellant gas to said plenum, said electrical connecting means being responsive to a said alternating electrical power source to produce an alternating electric field across each planar electrode pair and an alternating magnetic field between each pole piece and which was the alternating electric field establishing a plurality of aligned spatial force field region into which the vaporized gas is transported by said plenum into said substantially rectangular elongated channel through each spatial force field region of each planar electrode pair and coil, whereupon the particles of matter of the propellant gas are raised to an electronic excitation level by said radiation source and the crossing electric field and magnetic field which cause the dipoles of the particles of matter to be driven into cyclic motion to produce a reactive thrust.

13. The propulsion system of claim **12** wherein said radiation source is a laser.

14. The propulsion system of claim **12** wherein said means for vaporizing the propellant gas includes cooling means located adjacent each coil and pole piece center which is adapted to absorb heat from said coils which vaporizes said propellant gas passing therethrough.

15. The propulsion system of claim **14** further comprising

a flow meter positioned between said plenum and said vaporizing means to control the flow rate of the vaporized propellant gas into the plenum.

16. The propulsion system of claim **3** wherein said means for generating an alternating electric field is formed of a pair of spaced parallel plates which define a capacitor having a space between the parallel capacitive plates and wherein said means for generating an alternating magnetic field includes a plurality of spaced coils which are spaced relative to each other, said coils and said capacitor being electrically connected in series, resulting in the electric field being phase displaced from the magnetic field by 90°, said magnetic means being adapted to direct and concentrate the lines of magnetic force between the capacitive plates to establish an electric field which is located at substantially **90°** relative to the magnetic field.

17. The propulsion system of claim **16** wherein said means for generating the alternating magnetic field includes a ferrite coil for further concentrating said magnetic lines of flux.

18. The means for generating a reactive thrust force of claim **2** wherein said means for generating an alternating current electric field is a pair of spaced parallel electrodes which are adapted to distribute charges on a controlled surface and to distribute the charges uniformly on the surface thereof to produce an electric field which extends in said first direction and which is adapted to intercept the magnetic field generated by said means for generating throughout the spatial region in the vicinity of the electrode an alternating magnetic field at substantially right angles to form a crossed dipole magnetic throughout said spatial region field which is substantially at a right angle to the electric dipole field.

19. The dipolar force field propulsion system of claim **1** further comprising

means including an excitation source of radiation positioned at a selected location on the system for producing a field of radiation; and

means including means defining a reflecting surface postion adjacent radiation field producing means for selectively positioning said reflective surface at a controlled angle relative to said excitation source to produce a thrust component of force in a selected direction causing said system to move in a direction opposite to said selected direction of a thrust component of force.

20. The propulsion system of claim **4** further comprising

a source of second neutral particles of matter which is of different species than the source of neutral particles of matter and wherein the second neutral particles of matter have a selected electron dipole characteristics, said second neutral particles of matter being capable of interacting with said neutral particles of matter which have been raised to an electronic excitation level enabling the atoms of said second neutral particles of matter to act as buffer atoms with said neutral particles of matter to permit optical pumping of the neutral particles of matter at raised electronic excitation levels.

21. The propulsion system of claim **20** further comprising

a laser adapted to optically pump said neutral particles of matter.

* * * * *

Appendix C. U.S. PATENT # 5,197,279

US005197279A

United States Patent [19]

Taylor

[11] Patent Number: 5,197,279

[45] Date of Patent: Mar. 30, 1993

[54] **ELECTROMAGNETIC ENERGY PROPULSION ENGINE**

[76] Inventor: **James R. Taylor**, 1907 May Cir., Fultondale, Ala. 35068

[21] Appl. No.: **847,684**

[22] Filed: **Mar. 6, 1992**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 459,441, Jan. 2, 1990, abandoned.

[51] **Int. Cl.**[5] **F03H 5/00**

[52] **U.S. Cl.** **60/203.1**; 60/200.1

[58] **Field of Search** 60/200.1, 201, 202, 60/203.1

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Primary Examiner—Louis J. Casaregola

Attorney, Agent, or Firm—Jacobson, Price, Holman & Stern

[57] **ABSTRACT**

An electromagnetic energy propulsion engine system including a hollow housing having a front part (**50**) and a rear end part (**4**) of material transparent to the passage of electromagnetic fields, electromagnetic field generating solenoidal windings (**23**), (**25**), having central axes parallel with the central axis of the engine and axially spaced from each other to provide a forward field generating winding (**25**) and a rear field generating winding (**23**), a power source (**44**), a control computer (**42**), and a power pulse generator (**40**) connected between the electromagnetic field generating windings and the power source and control computer. The forward field generating winding generates a rearwardly directed magnetic field toward the rear wall parallel to the central axis, and the rear field generating winding produces a forwardly directed magnetic field opposing the rearwardly directed magnetic field of the forward field generating winding so that the rearwardly directed magnetic field repels forwardly directed pulses of the rear magnetic generating winding. As the electrical current conduction in the rear field generating winding suddenly reduces, the continuing rearwardly directed magnetic field force transmits pulsating magnetic field energy produced by the rear field generating winding through the rear of the housing. The reaction to the rearwardly transmitted field energy produces a thrust propelling the engine and a vehicle in which it is mounted.

26 Claims, 20 Drawing Sheets

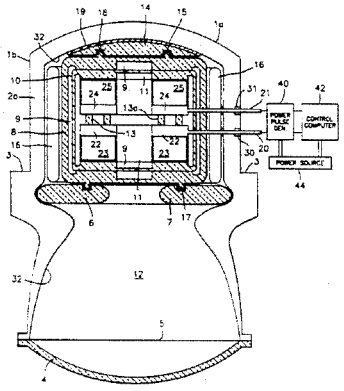
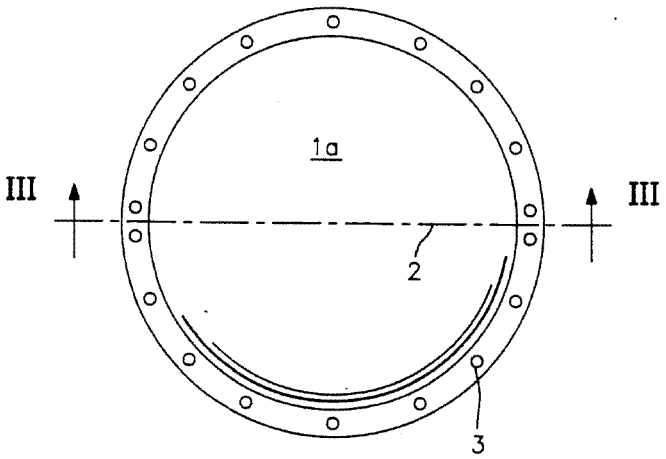


FIG. 1



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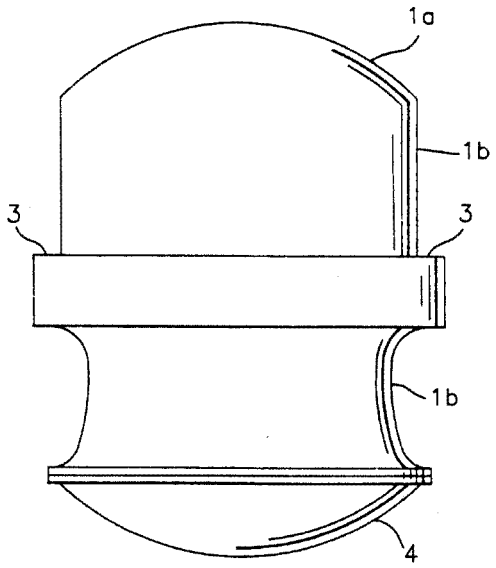

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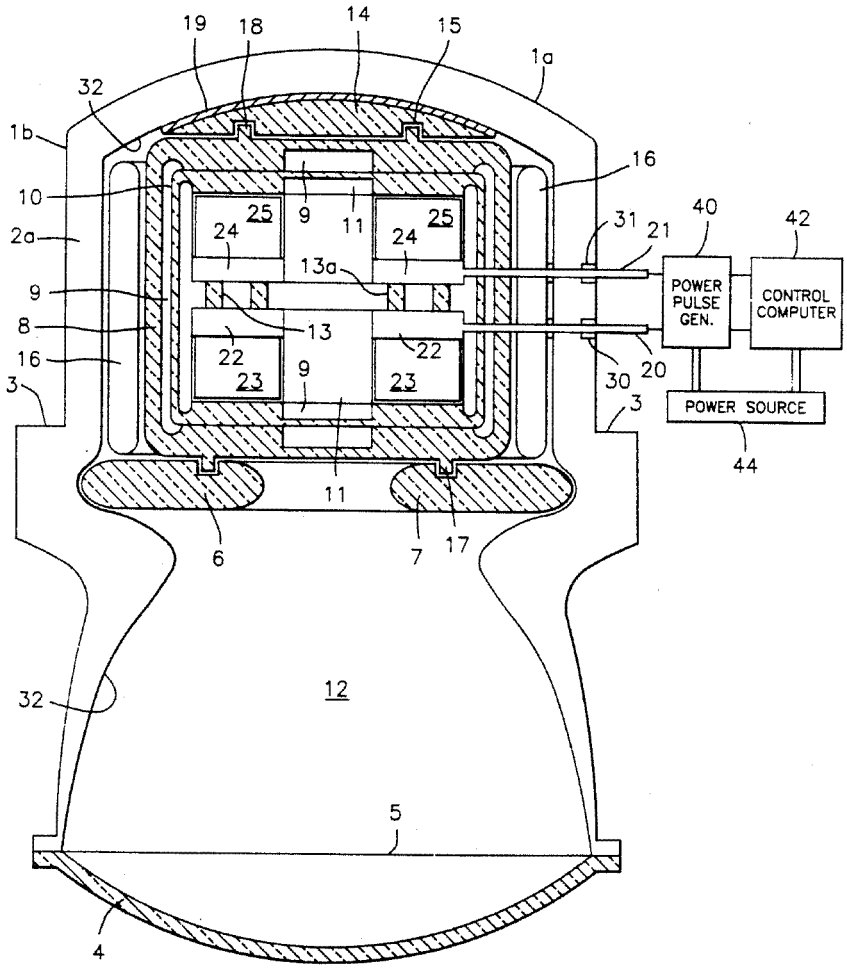
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13a
POWER PULSE GEN.
CONTROL COMPUTER
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POWER SOURCE
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FIG. 4

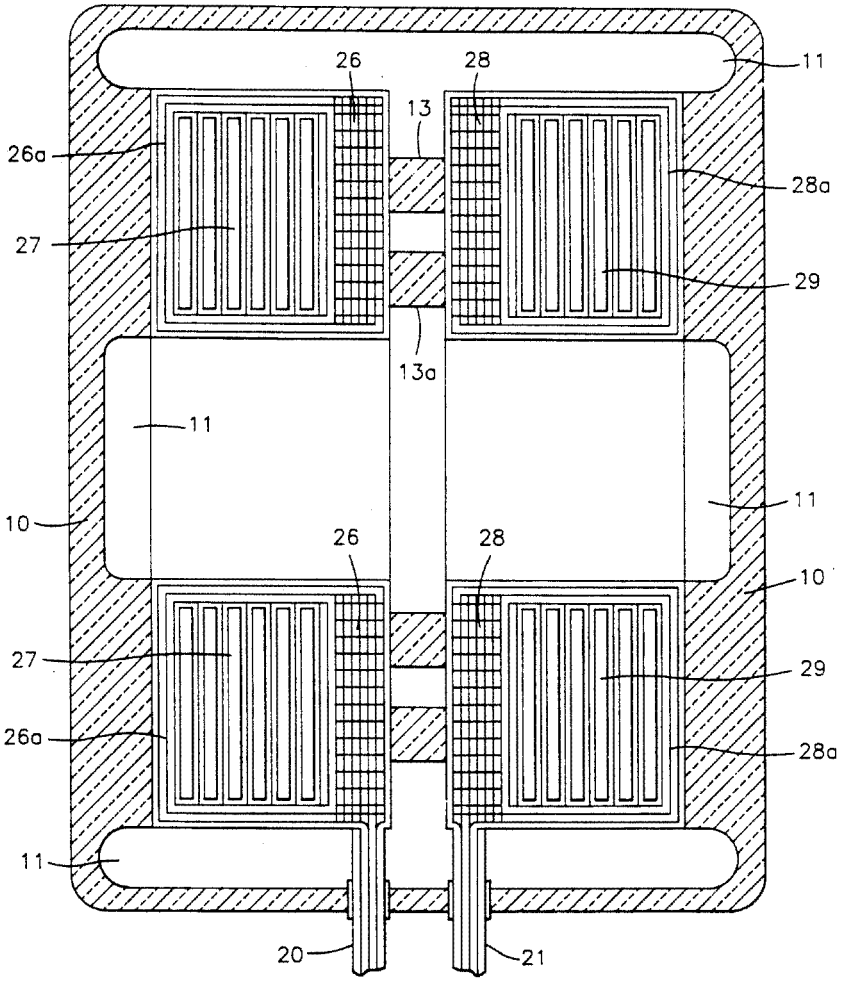

FIG. 5

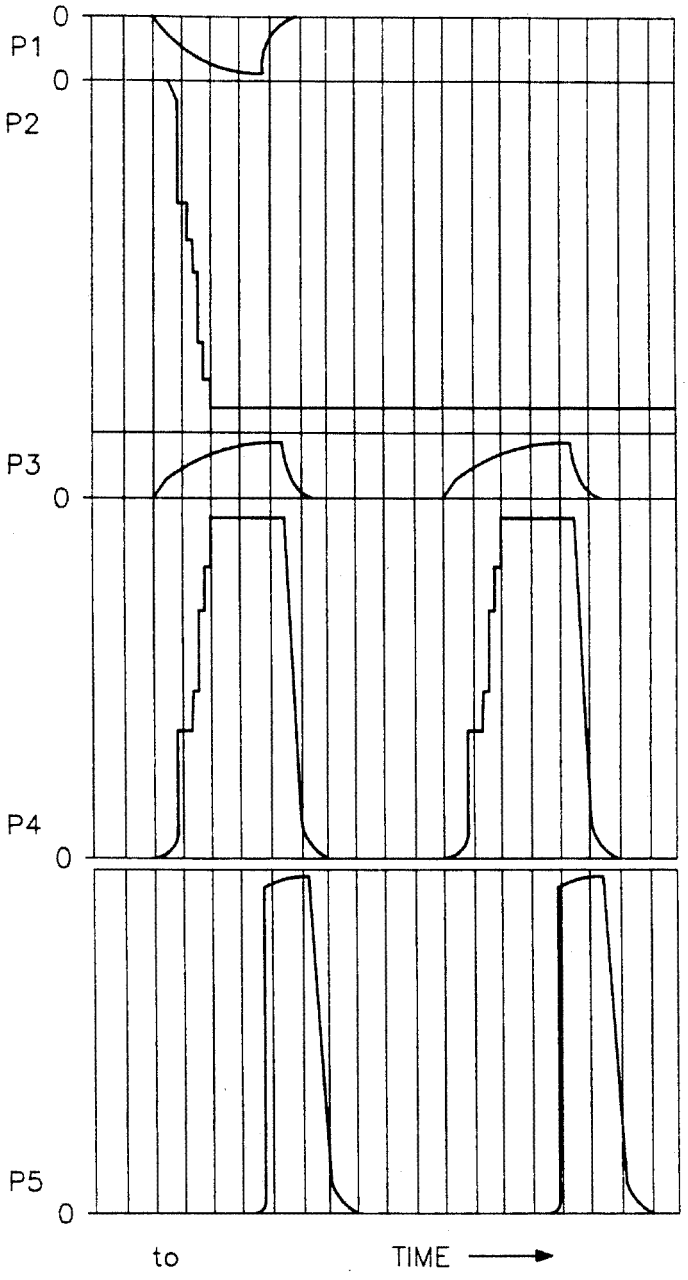

FIG. 6

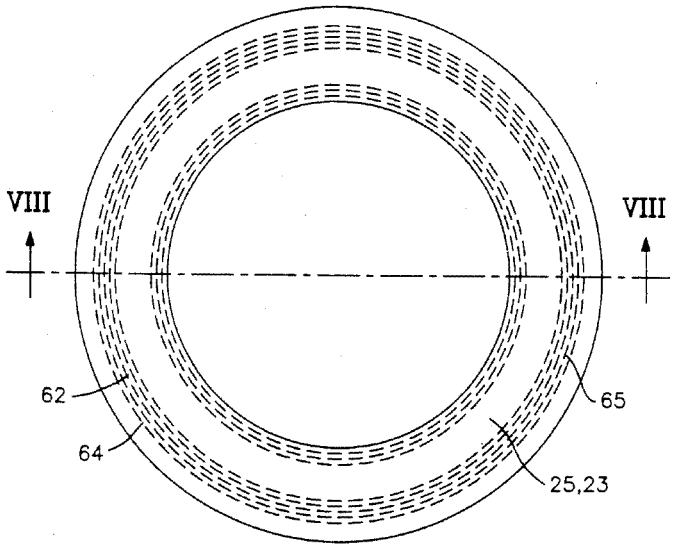
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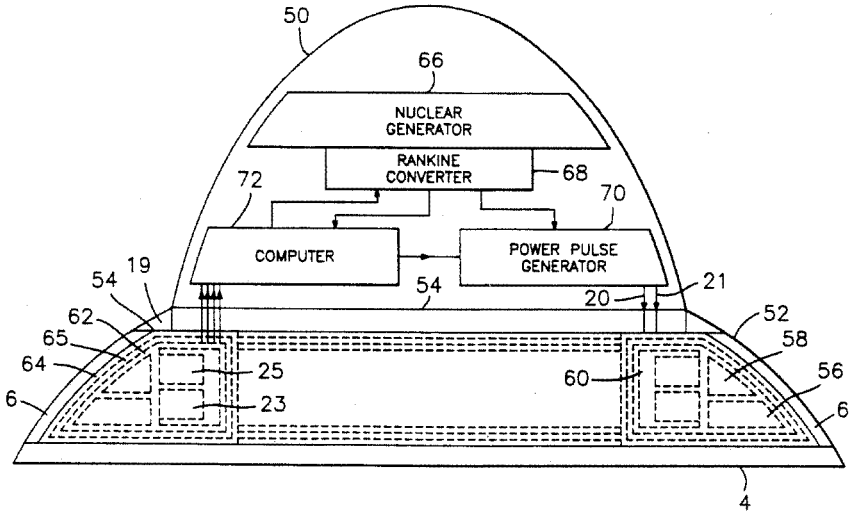
FIG. 7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NUCLEAR GENERATOR
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FIG. 7a

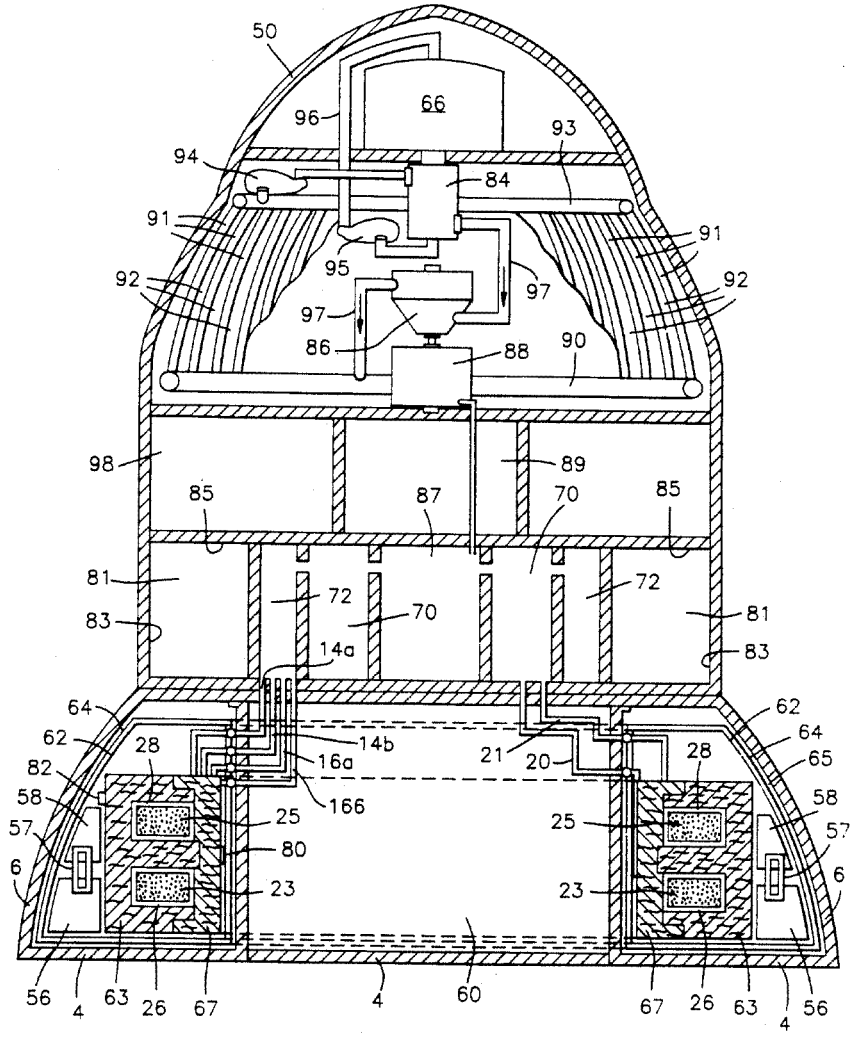
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FIG. 8

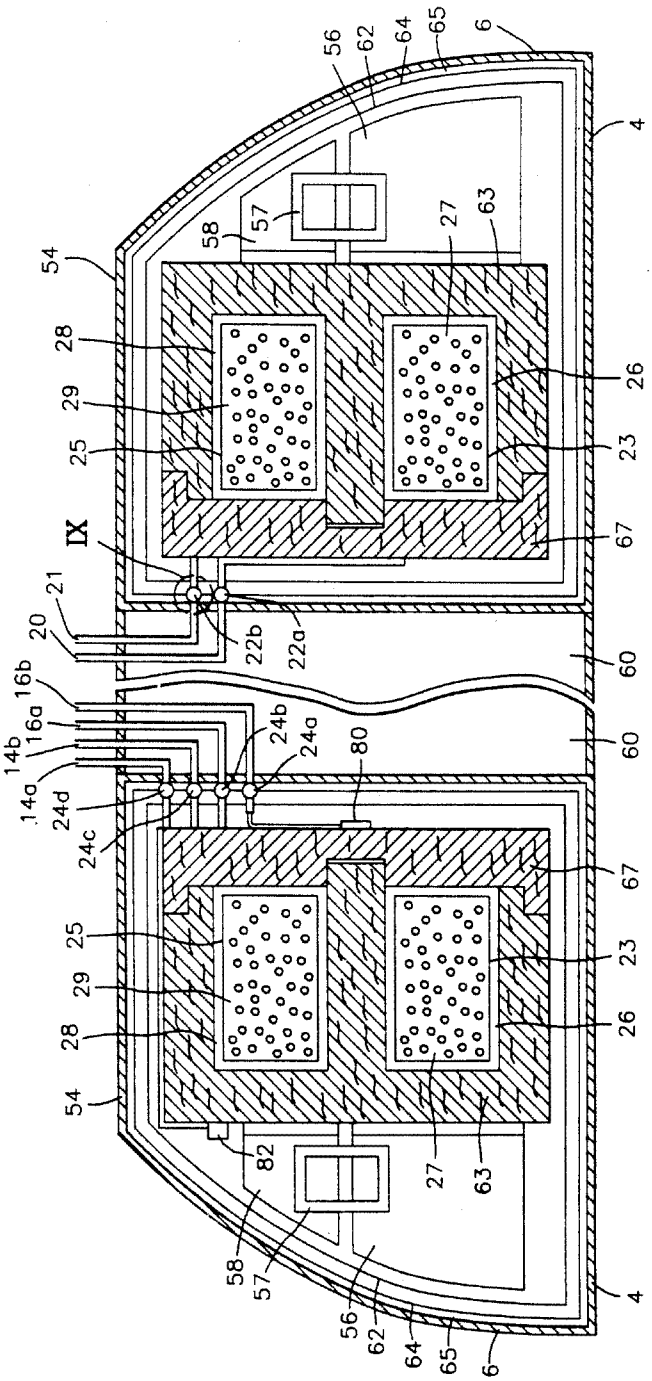
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FIG. 8a

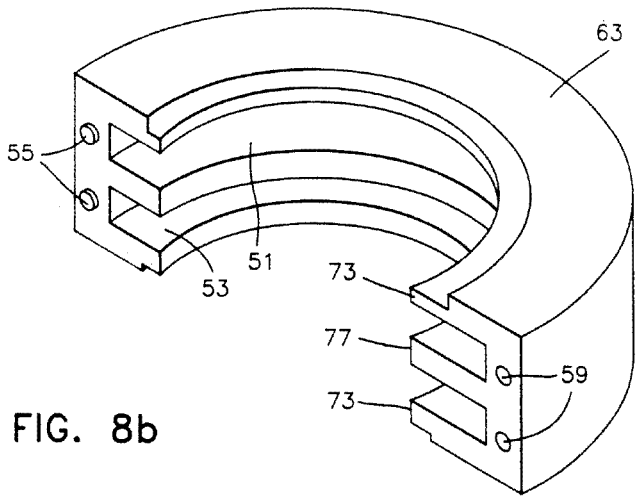


FIG. 8b

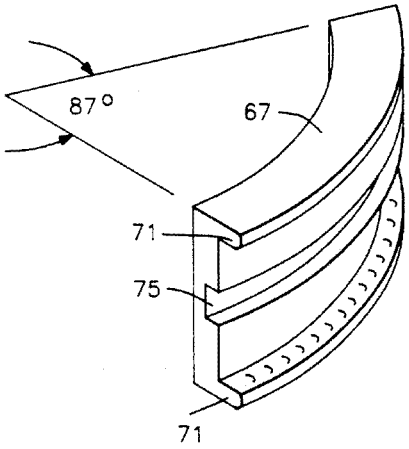
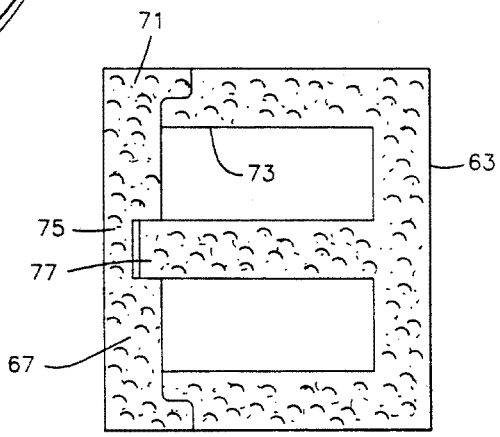


FIG. 8c



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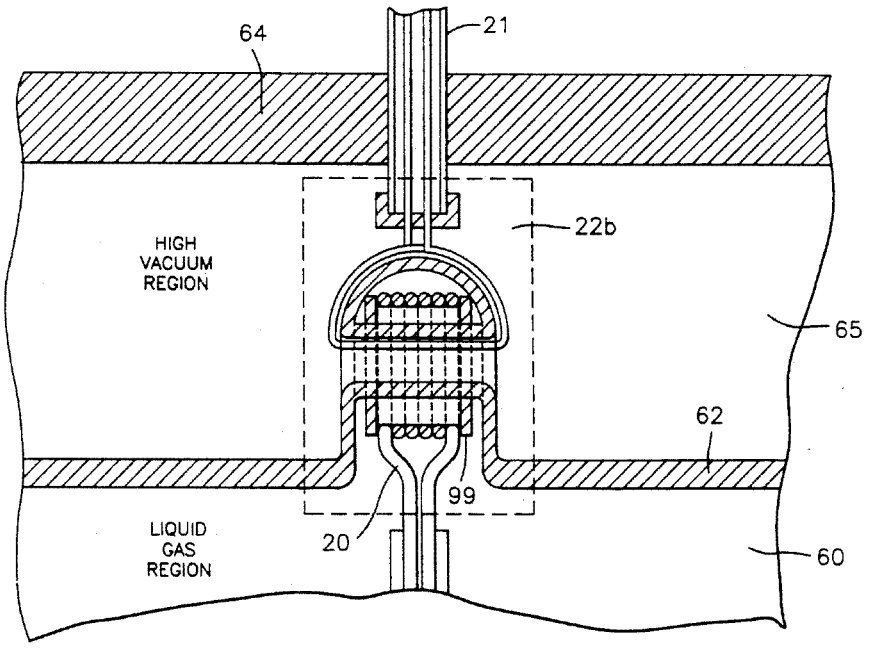
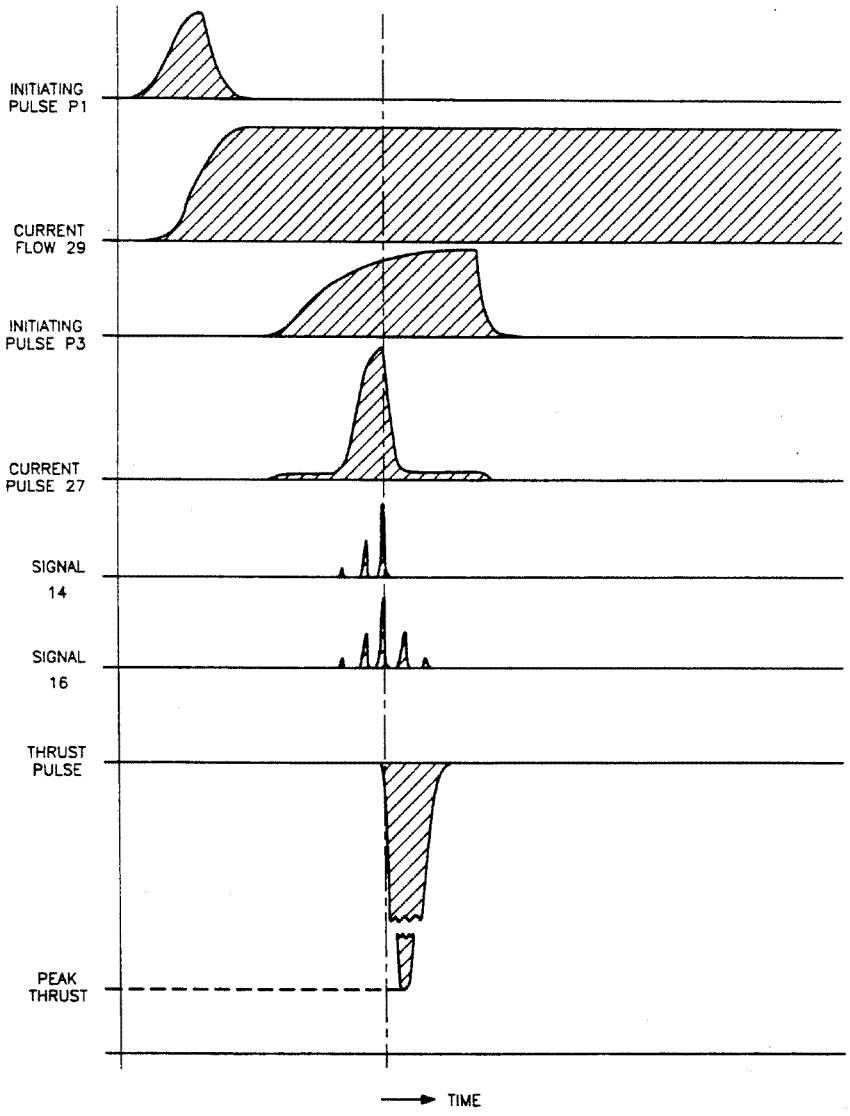


FIG. 10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THRUST PULSE
PEAK THRUST
TIME

FIG. 11

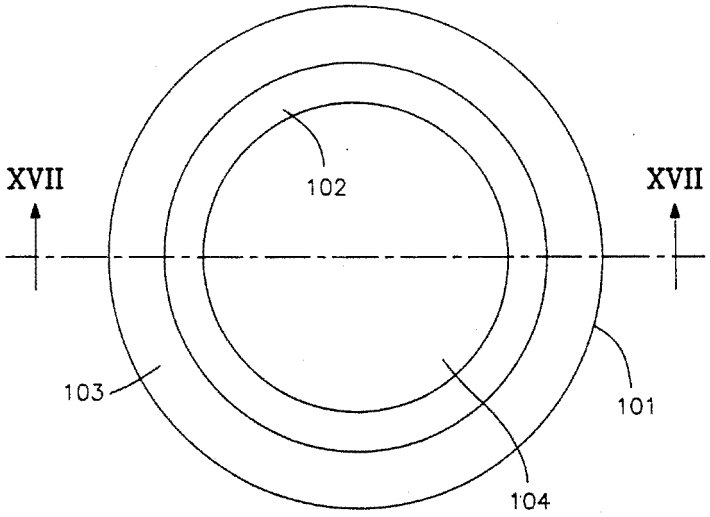
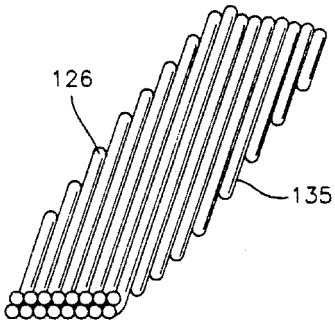


FIG. 12



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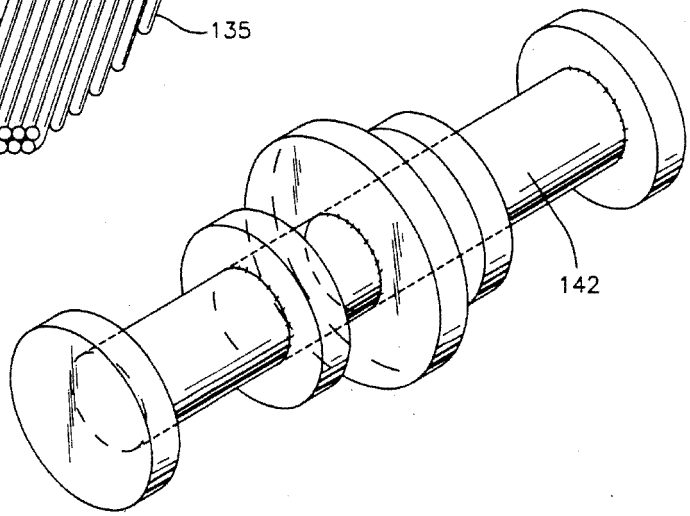

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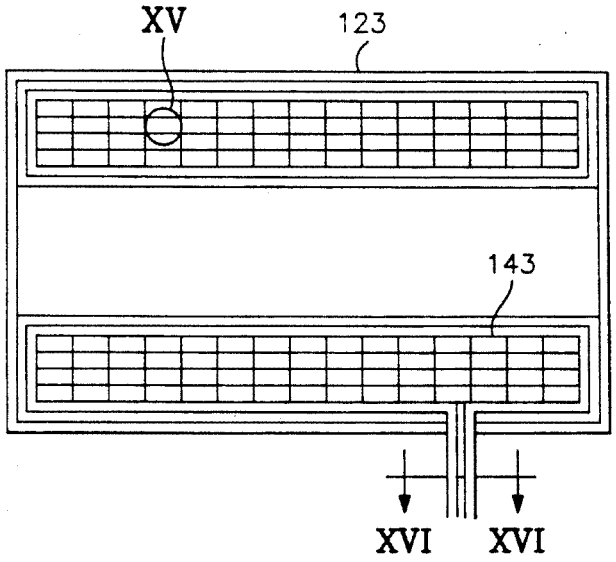

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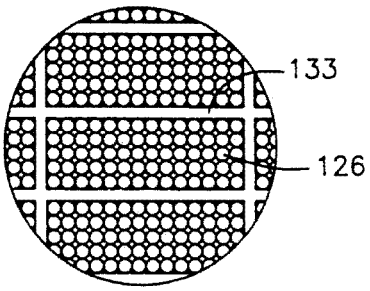
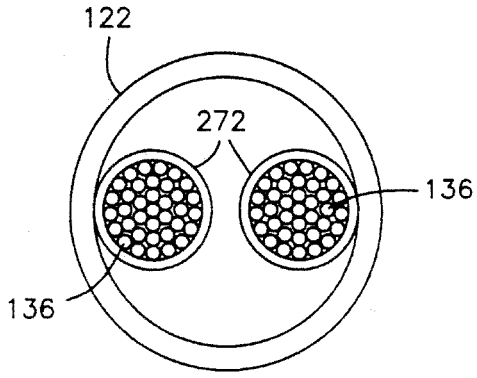


FIG. 16



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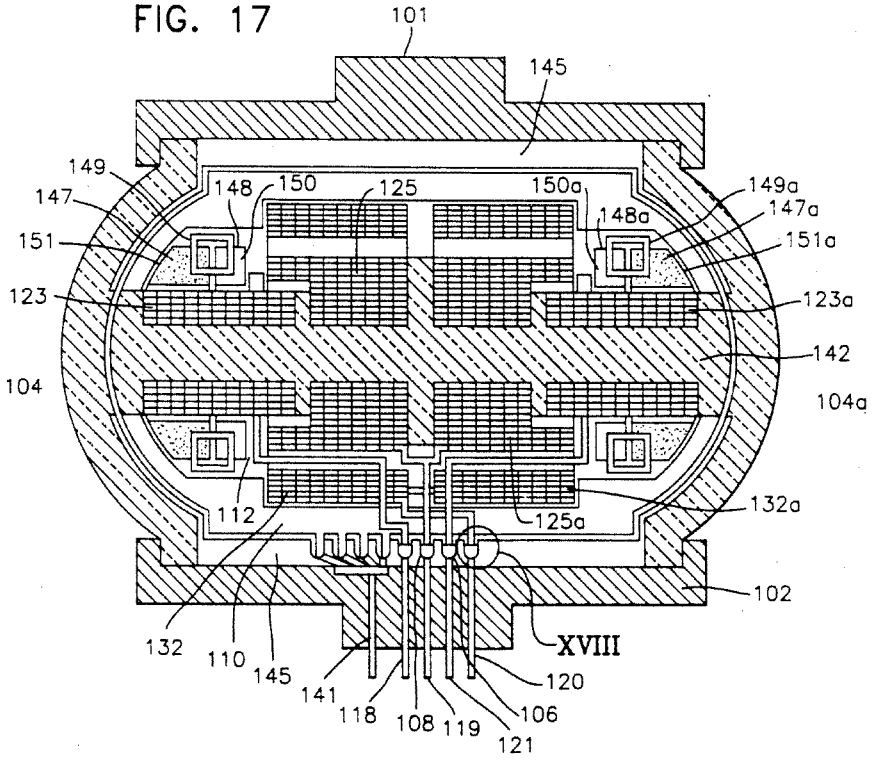
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FIG. 18

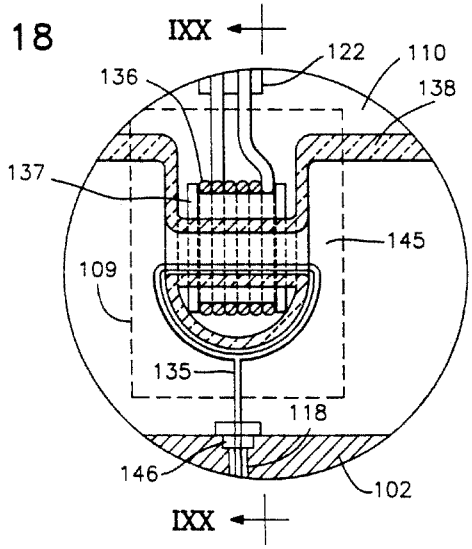
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FIG. 19

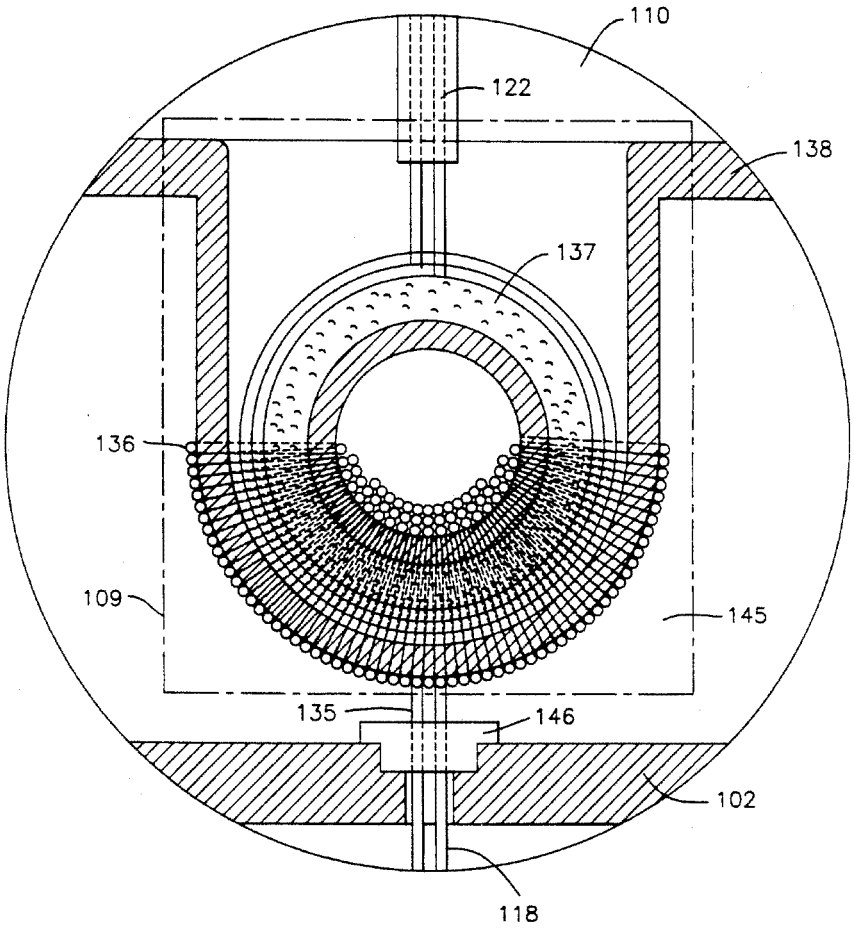
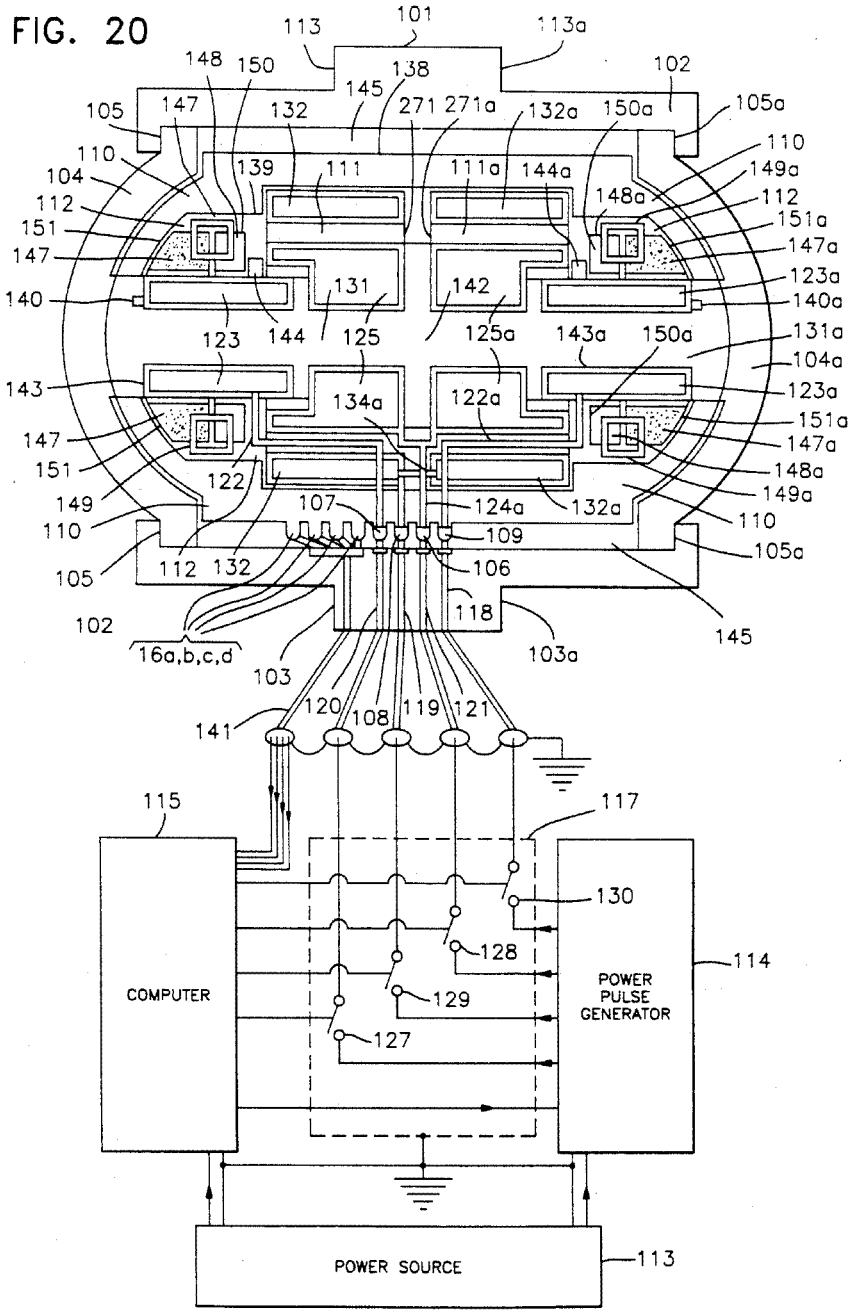


FIG. 20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GENERATOR
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POWER SOURCE
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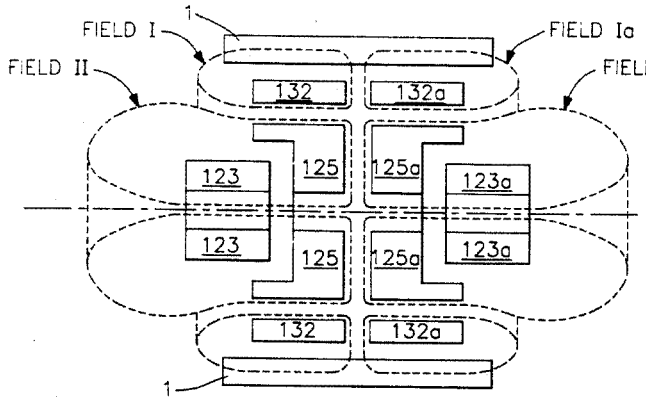

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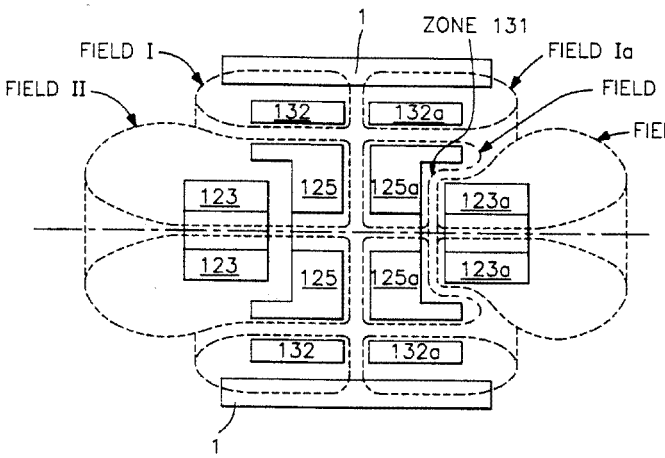

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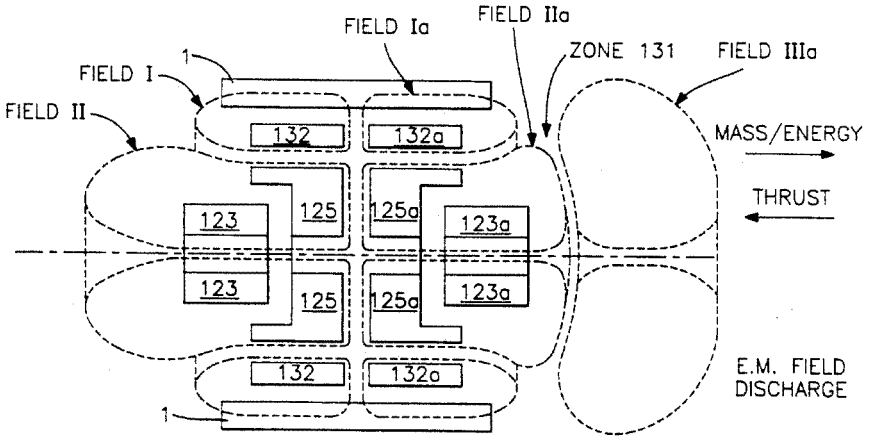
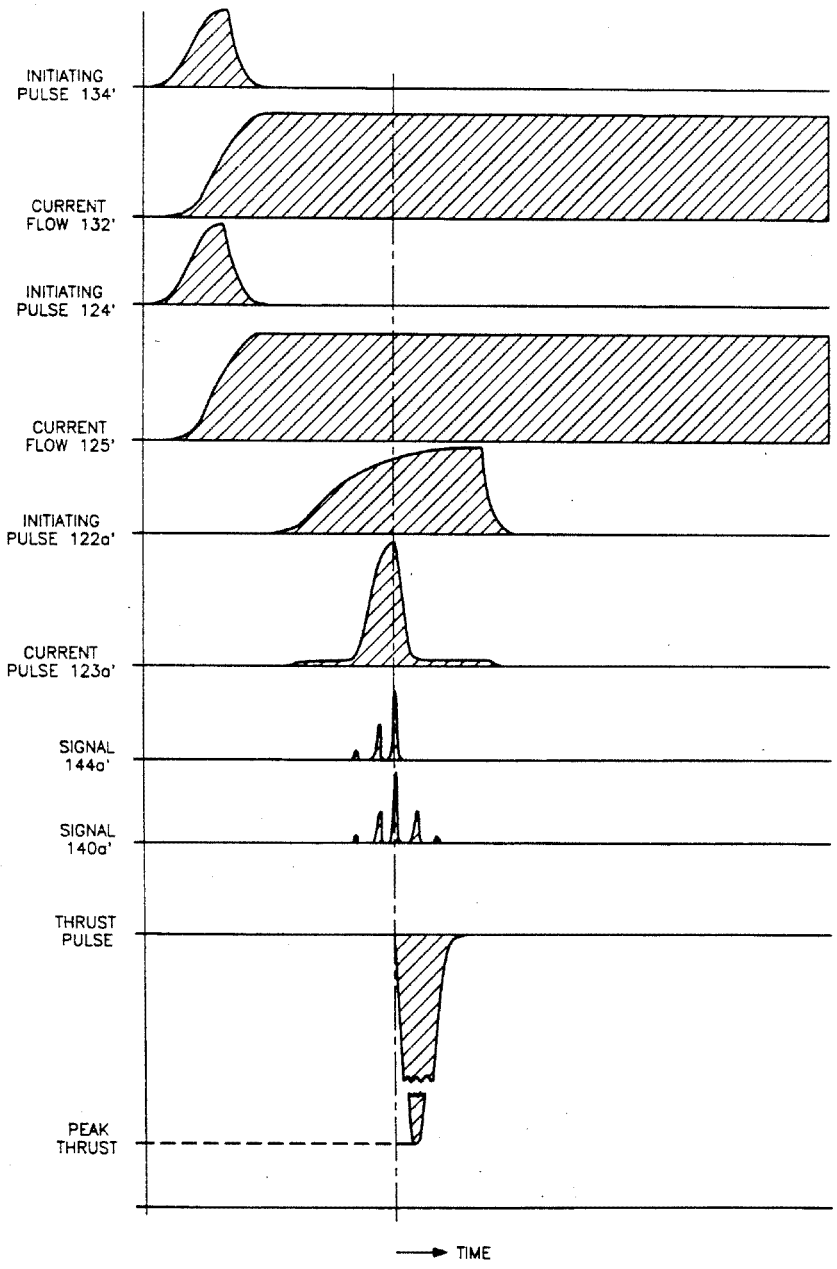


FIG. 21c

FIG. 22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INITIATING PULSE 124'
CURRENT FLOW 125'
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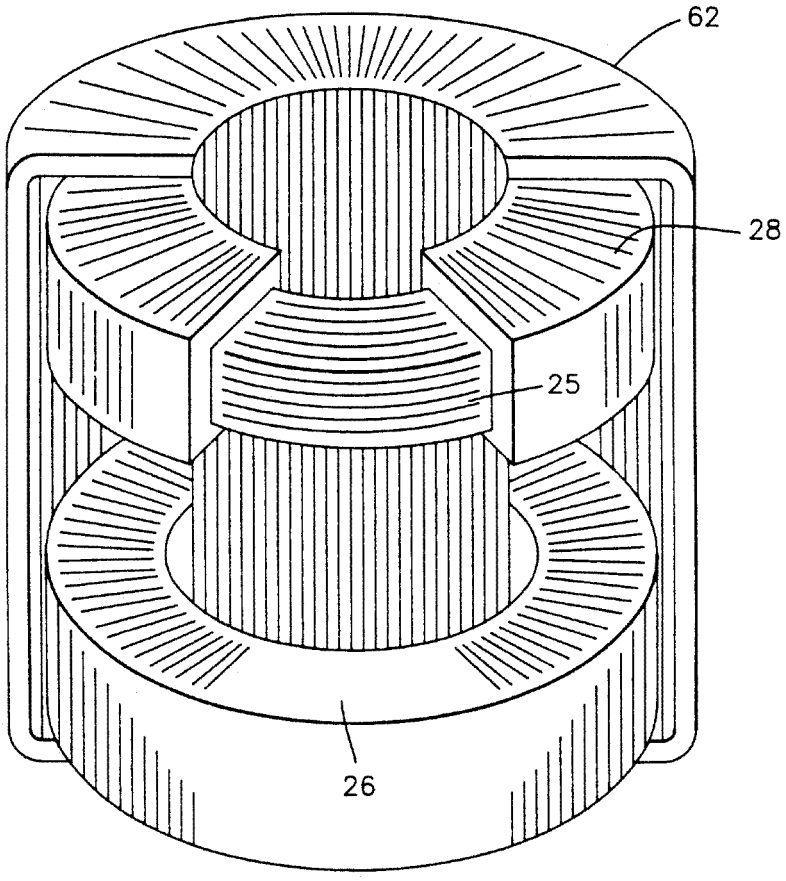
CURRENT PULSE 123a'
SIGNAL 144a'
SIGNAL 140a'
THRUST PULSE
PEAK THRUST
TIME

FIG. 23



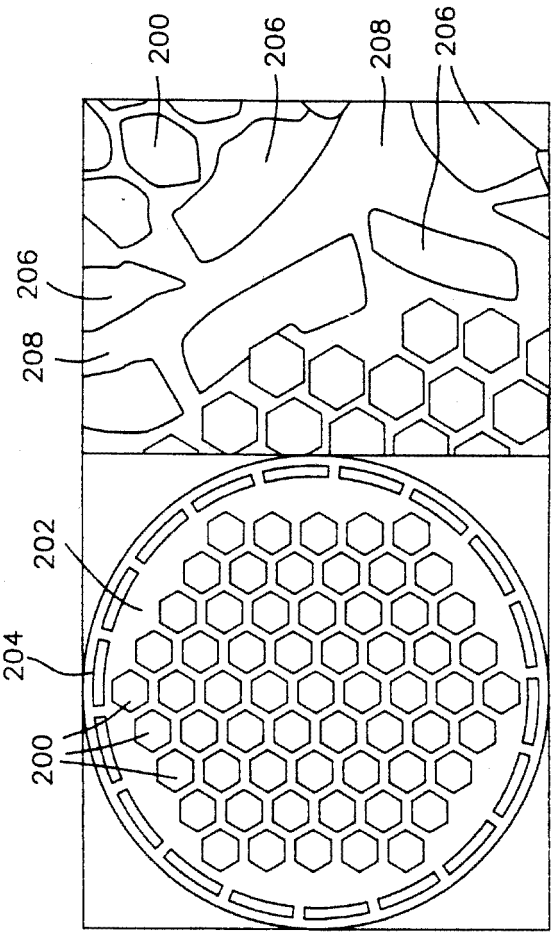
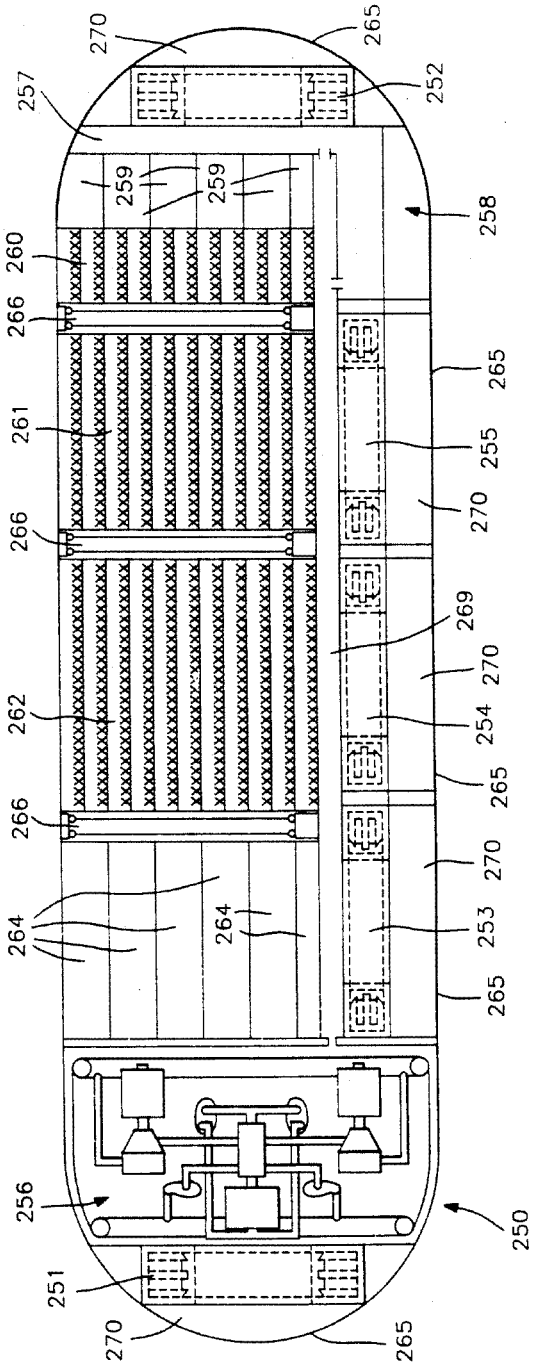


FIG. 24

FIG. 25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ELECTROMAGNETIC ENERGY PROPULSION ENGINE

This application is a continuation-in-part of U.S. patent application Ser. No. 07/459,441, filed Jan. 2, 1990 (abandoned) in the name of James Robert Taylor.

BACKGROUND OF THE INVENTION

The present invention relates to apparatuses and methods for the production of electromagnetic fields and for interrupting and controlling such fields, and to the production of such fields for propelling an object.

It is known to use electromagnetic fields for the purpose of propelling an object as shown in Japanese patent document JP-A-58 32976 and French patent documents FR-A-1,586,195 and FR-A-2,036,646. However these teach only making use of conventional methods of electromagnetic radiation such as those normally used in radio transmissions. In addition, the Japanese patent document concerns the impingement upon and the reflection from solid surfaces of conventional electromagnetic photon radiation as a means of gaining propelling force on an object.

These prior art patent documents are incorporated herein by reference and all show the use of well known electromagnetic radiation principles of radio, radar, and television in which the only electromagnetic energy that is emitted is in the form of large numbers of photons that radiate outwardly from their source electrons as individually propagating energy packets. Although the Japanese patent document describes the production of strong magnetic fields, there is no teaching of how such magnetic fields are propelled away from the vehicle in which they are generated, and therefore there is no propelling force generated from the vehicle. The only electromagnetic energy that propagates away from the vehicle exists in the form of photons which irradiate into space by spraying from a wave guide against the concave surface of a parabolic member from which they are reflected to pass through pulsing high-frequency magnetic fields. Alternatively, photons are generated when free electrons in conductors are caused to be either accelerated or decelerated in the process of producing strong magnetic field pulses.

Both of the French patent documents show generation of strong magnetic fields, but do not demonstrate any method or means by which such fields are separated from their generators or propagated through space. There is therefore no propelling force produced by the electromagnetic fields. The only electromagnetic energy that departs from the vicinity from either of the French devices exists in the form of photons that are radiated into space, the photons being generated in the acceleration or deceleration of free electrons used to produce the electromagnetic field pulses of the inventions.

The theory and use of electromagnetic energy is also shown in the following publications: *Static and Dynamic Electricity*, by W. R. Smythe, McGraw-Hill Book Company, Inc., New York, New York, 1950, pages 447 and 448; *Megagauss Fields*, by J. G. Linhart, *Physics Today*, February 1966, pages 37–42; *Introduction to Modern Physics*, by Richtmyer and Kennard, 4th Edition, McGraw-Hill Book Company, Inc., New York, New York, 1947, pages 58–61 and 146–149; *Principles of Electricity and Electromagnetism*, by G. P. Harnwell, 2nd Edition, McGraw-Hill Book Company, Inc., New York, New York, 1949, pages 572–579; *Electromagnetic Fields, Energy and Forces*, by Fano, Cheu and Adler John Wiley and Sons, Inc., New York, New York, pages 421–425; *The Feynman Lectures on Physics*, by Feynman, Leighton & Sands, Addison-Wesley Publishing Co, New York, N.Y., pages 17-5 to 17-6, 27-9 to 27-11, 34-10 to 34-11. The theory of magnetic relaxation cooling is described in the *McGraw-Hill Encyclopedia of Science and Technology*, McGraw-Hill Book Co. Inc., New York, New York, 1977 Volume 8, pages 44–45. These publications are also incorporated herein by reference.

BRIEF SUMMARY OF THE INVENTION

It is an object of the invention to provide an engine for producing electromagnetic energy which is used to propel a vehicle.

It is a further object of the invention to provide an engine for imparting momentum to a vehicle by generating and transmitting in predetermined directions massive quantities of electromagnetic field energy in successive pulses.

It is a still further object of the invention to provide an engine for imparting momentum to a vehicle by transmission of electromagnetic field energy in accordance with the slingshot principle wherein powerful repelling forces are first produced between opposing electromagnetic fields, produced by a forward generator generating a field in a rearward direction and a rear generator generating a field in a forward direction, the rearwardly directed field acting on and transmitting away from the vehicle the forwardly directed electromagnetic field when the rear field generator superconducting current suddenly ceases flowing, resulting in a reaction upon the engine and its associated vehicle due to the tra.ismission of electromagnetic field pulse energy of several kilograms mass at high velocity to provide thrust to the vehicle.

These objects are accomplished by the invention wherein electromagnetic field generators are mounted and affixed within a succession of chambers, the chambers being mounted in a more or less cylindrical enclosure of varying diameter circular cross section, a front generator being affixed toward the front end of the enclosure while the rear magnetic generator is affixed with the front magnetic generator on a common winding form of magnetically transparent material having good mechanical strength, the two generators being more or less cylindrical and circular in configuration and having a common axis that is more or less coincident with that of the enclosure. The enclosure makes use of magnetic shield materials on its forward walls that shield the regions adjacent the front wall, thereby minimizing the passage through those members of magnetic fields. The rear wall of the enclosure about the engine is constructed of materials that are highly transparent to the passage of magnetic field lines of force. The structure is constructed and assembled so that it may be pressurized and adapted for the input of control signals, the containment of liquid gases at low temperatures and the containment of magnetic refrigeration devices.

Although the above referred to prior art apparatuses make use of interrupted or pulsed electromagnetic fields, each depends on the radiation of electromagnetic field pulses of high frequency alternating currents similar to those that have been transmitted by backward-looking radars of conventional aircraft for several dec-

ades. The operation of the engine of the instant invention makes use of time dependent direct current flows to produce the pulses of massive electromagnetic field energy and transmit them into the adjacent space, as distinguished from the frequency dependent current flows of the above prior art.

The principles and materials of superconductivity are utilized in the engine of this invention both to generate the massive pulses of electromagnetic field energy that are transmitted to produce the thrust, and to turn off one of the two opposing electromagnetic field generators so that the other active forward position field generator will transmit in a rearward direction the massive quantity of energy generated in each pulse by the rear field generator, the critical magnetic field intensity for which is exceeded at the peak of each pulse.

The vehicles which ar propelled by the engine of the invention may be air foil configured composite housings made of different parts that are assembled together as depicted in some of the drawings. The housings contain means for generating several megawatts of electrical power, means for processing, distributing and controlling the electrical power, means for generating high power direct current initiating pulses of electrical energy for operating the propulsion engine, computer means for controlling the operation, thrust and flight of the vehicles, means for providing propulsion for the vehicles, means for utilizing liquid helium, and means for accommodating a crew and passengers in the vehicles.

Associated and integral with the propulsion engine assembly is a magnetic refrigeration system used for removing thermal energy generated in the electrical conductors during the course of operation of the engine. Also provided external to the engine are a high energy electrical power source. a power pulse generator and an electronic control system computer that provides programmed control pulses of electric current to torodial control windings that are wound about the solenoid windings of each of the field generators. In the operation of the engine, intense magnetic fields in the form of magnetic field energy are first generated by the rear engine and then caused to be transmitted from the rear of the propulsion engine by the repelling force of the forward field generator, thereby providing pulses of forward thrust to the propulsion engine assembly.

In accordance with the present invention methods, materials and apparatuses are provided for the purpose of producing propulsion of vehicles under a range of conditions and in several environments. The invention is intended to provide propulsion for vehicles that fly in the earth's atmosphere as well as in outer space, and also to provide propulsion for vehicles that move in other environments. An engine in accordance with the invention uses highly intensive electromagnetic fields produced by superconducted electric and magnetic currents flowing in its coils.

A further embodiment of the invention provides an engine constructed of a high strength cylindrical housing of ferromagnetic materials, its two ends being enclosed by circular windows constructed of a material, such as high alumina ceramic, that are transparent to the passage of electromagnetic fields. A winding core of similar high alumina ceramic material is provided integral with the two end windows. Four solenoidal field generator windings are mounted concentric with and along a ceramic core, including two continuously operating main field generator solenoidal windings mounted in the center and one pulsed field generator solenoidal winding mounted adjacent to and toward each end of the ceramic core, respectively, relative to the centrally mounted main field generator winding. Concentric with and surrounding each of the centrally mounted main field generator solenoidal windings are mounted field generator solenoidal windings that are parallel with and inside the ferromagnetic housing. Each of the solenoidal windings of the six field generators is provided with an additional coil wound toroidally about it for use in initiating and otherwise influencing the electric and magnetic current flow in the six solenoidal windings. The six solenoidal and six toroidal windings are all constructed of specially designed and fabricated superconducting materials.

Associated with the engine and mounted external to the engine are a number of auxiliary items of equipment, including a primary power source, a power transducer, a power pulse generator, a control computer, and a switching panel, all with appropriate connecting cables to transport the electrical energies.

Primary electrical energy for operation of the engine and its associated equipment comes from an external primary power supply that provides electrical energy to the vehicle upon which the engine is mounted. The primary power supply is chosen to supply the amount of energy needed to operate the flying vehicle and its life support systems, if any, as well as to supply electrical power to the engine. Typically, in a space flight application such a primary electrical energy source could make use of a nuclear reactor capable of supplying heat energy in the kilowatt to megawatt range, the heat energy being converted by use of a Rankine cycle system. Preferably, a fissioning nuclear reactor of the heterogeneous type using low temperature moderators would be used as the primary energy source.

The purpose of the propulsion engine of this invention is to provide solutions to a number of problems with existing engines of other types that provide propulsion to vehicles, such as noise, overflights, large take-off runway lengths, and limited velocities in flight, as well as distance restrictions to flight. The propulsion engine of the invention transmits magnetic fields in pulses from the rearward end of the engine, thereby providing for flight velocities that are appreciable compared to the velocity of light. As such, the purpose of the propulsion engine of this invention is to propel vehicles in space, through the atmosphere of planets, and other media, and by doing so to assist in solving several problems that result from existing propulsion systems.

Via its mountings the propulsion engine of the invention can transfer thrust to a wide variety of vehicle configurations, thereby providing propulsion for the vehicles in their respective modes of travel. Major benefits that will be gained by the use of the propulsion engine of the invention on flying vehicles are the reduction of noise, the cessation of use of fossil fuels with their consequent emission of carbon dioxide into the atmosphere, the reduction in area required for landing and take off, removal of fear from people living in the flight paths of conventional aircraft and shortening of time required for long distance travel by enabling the flying vehicles to combine short vertical flights in the atmosphere with longer distance high velocity tangential flights through space above the atmosphere. By converting energy from its primary power source, the engine of this invention will make it unnecessary to transport large volumes and masses of fuel since the fuel

used will be the electromagnetic energy contained in the pulses of magnetic fields.

The invention, provides a propulsion engine that produces its own fuel in the form of pulses of magnetic energy fields that exist as independent regions of intense curvature in that part of the space-time continuum existing inside the engine housing prior to their transmission to gain thrust.

The present invention works by imparting momentum to pulses of intense electromagnetic field energy using the slingshot principal to separate the fields of energy that are principally not composed of photons from their generator and to eject into adjacent space the pulses of electromagnetic energy in the form of a succession of independent fields, the reactions upon the engine from imparting momentum to the pulses of electromagnetic field energy thereby achieving propulsion of the engine and any vehicle attached thereto.

The slingshot action is achieved by producing a increasingly strong repelling force built up between the opposing electromagnetic fields of two solenoid wound electromagnetic field generators, the electric and magnetic currents generating one of the two fields being caused by design to cease flowing at the predetermined peak of the build up of opposing forces. At the same time as the magnetic and electric current flows cease in one of the two opposing electromagnetic field generators, a pulse of potential having the polarity needed to inhibit reversed electric and magnetic current flow in the now ceased electromagnetic field generator is applied to that field generator in which current flows have ceased. In this manner the continuing and opposing electromagnetic field force is aided in repelling an ejecting or transmitting the pulse of the intense electromagnetic field energy of the ceased field generator away from its generating coil and into the adjacent space outside the engine assembly.

Although the use of interrupted or pulsed electromagnetic fields is shown in the above prior art, only the present invention uses the slingshot method for imparting momentum to electromagnetic fields that are largely composed of non-photonic electromagnetic energy. The use of pulses of electromagnetic energy composed of large numbers of individual photons in the form of conventional radiation from accelerated free charges, as in the three patent documents noted above, has been shown to convey only minuscule amounts of momentum to the photons, and hence thrust to the devices that project the photons into space. These teachings, therefore, do not represent effective methods for achieving significant amounts of vehicle propulsion. French patent FR-A-1,586,195 concerns the use of superconductivity to enhance the level of flow of free electrons for the purpose of producing electromagnetic fields from greater quantities of photons; however the use of superconductivity to increase the amounts of currents that will flow in a conductor in order to produce more intense electromagnetic fields has been practiced for many decades. French patent FR-A-2,036,646 makes use of Ferroxcube material to reduce the reluctance of magnetic paths for the purpose of increasing magnitudes of current flows thereby increasing the quantities of photons that are produced; however the use of Ferroxcube material for such purposes has been in use for enhancing current flows for several decades.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described in greater detail with reference to the accompanying drawings wherein:

FIG. **1** is an end view of the engine enclosure showing its circular cylindrical configuration;

FIG. **2** is a side elevational view of the engine assembly in its enclosure;

FIG. **3** is a cross-sectional view taken along line III—III of FIG. **1**, showing the propulsion engine assembly consisting of two magnetic field generators mounted inside th engine enclosure with a magnetic refrigeration system operated from the pulses of magnetic field energy generated by the two field generators;

FIG. **4** is an enlarged cross-sectional view of the two magnetic field generators mounted inside their liquid gas vessel and minus the shroud, the anvils of the liquid gas vessel being shown pressing against the outer ends of the cylindrical field generators to restrain them from outward movement, each field generator consisting of contiguous, but independent electromagnetic field generating coils, the independent coils comprising those that are constructed of multiple turns of a conventional electric current conductor material such as copper and those members that are comprised of multiple independent circular loops of superconducting materials such as Type II superconductors;

FIG. **5** is a graph showing the sequence of pulses used to initiate and terminate the superconducting states of the superconductors in those variations of the rear and front mounted field generators depicted in the invention. Also shown are the respective electric current pulses generated by the front mounted and by the rear mounted field generators and the pulse of thrust generated once each cycle of operation of the propulsion engine;

FIG. **6** is a view similar to FIG. **1** of another embodiment of the invention;

FIG. **7** is a side elevational view of FIG. **6**;

FIG. **7***a* is a schematic cross-sectional view of an embodiment similar to FIG. **7** showing components in greater detail;

FIG. **8** is an enlarged partial cross-sectional view taken along line VIII—VIII of FIG. **6**;

FIG. **8***a* is a perspective view of a semi-circular segment of the outer support member for the electromagnetic coils;

FIG. **8***b* is a perspective view of one of the four segments of the inner support members which cooperate with the outer support member of FIG. **8***a*;

FIG. **8***c* is a cross-sectional view of the support members of FIGS. **8***a* and **8***b* when assembled;

FIG. **9** is an enlarged cross-sectional view of the encircled part IX in FIG. **8** of the power pulse input transformers and the method of power input without breaching the thermal integrity of the liquid gas chamber;

FIG. **10** is a graph showing the sequence of pulses used to initiate the superconducting states of the superconductors in those variations of the field generator of the embodiment of FIGS. **6–9**. After initiation, the front field generator will normally continue in steady state conduction throughout the time of use of the engine. Also shown is the continuing pulse current flow of the pulse generator's initiating pulse during the time that the magnetic field energy of that generator is being transmitted from the engine and the pulse of thrust

generated once each cycle of operation of the propulsion engine;

FIG. **11** is an end view similar to FIG. **1** of a further embodiment of the invention;

FIG. **12** is a perspective view of a part of an assembly of filaments of the pulse operated superconducting winding showing the manner of assembling the filaments;

FIG. **13** is a perspective view of a high-alumina ceramic winding core or shaft upon which the windings of the electromagnetic field generators are assembled;

FIG. **14** is a cross-sectional view of one of the pulse electromagnetic field generator windings used in the field generators and showing the manner of achieving the maximum filling factor of winding filaments consistent with adequate cooling from liquid helium and the attainment of adequate mechanical strength, the rolled transposed filaments of FIG. **12** being combined with others similarly produced which are then sheathed in a copper alloy and rolled into a complete winding subassembly for final winding of the field generator coil. The torodial initiator winding is shown at **143**;

FIG. **15** is a cross-sectional view of the part encircled at XV in FIG. **14**;

FIG. **16** is a cross-sectional view taken along line XVI—XVI in FIG. **14**;

FIG. **17** is a cross-sectional view taken along line XVII—XVII in FIG. **11** showing different parts of the engine in their relative positions;

FIG. **18** is a cross-sectional view similar to FIG. **9** of the part shown encircled at XVIII in FIG. **17**;

FIG. **19** is a cross-sectional view of the coil and associated components taken along line XIX—XIX in FIG. **18**;

FIG. **20** is a schematic cross-sectional view similar to FIG. **17** and further showing the location of the components of the engine and manner of connection via transformers to the external equipment that supply controlled electronic power initiation and control pulses to the engine;

FIGS. **21***a*, **21***b* and **21***c* are diagrammatic views of the electromagnetic fields generated by the engine of the invention in three stages during a single cycle of operation, all views showing the constraining effect on the electromagnetic fields of the main field generators by the magnetic fields of the other generators;

FIG. **22** is a diagram similar to FIG. **10** for the embodiment of FIGS. **11**–**21***a*, *b* and *c*.

FIG. **23** is a perspective schematic view of the field generator windings within the liquid gas vessel;

FIG. **24** is a cross-sectional view of the three-component composite used for the superconductors; and

FIG. **25** is a schematic cross-sectional view of a further embodiment of the invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

A number of the features of the invention may be varied and still obtain the pulses of thrust due to the transmission from the engine enclosure of pulses of magnetic field energy through the rear of the engine. Embodiments of the invention for achieving the controlled pulses of forward thrust from rapid transmission from the engine enclosure of pulses of magnetic field energy through the rear of the engine will now be described.

Referring to the form of the invention shown in FIGS. **1** through **4** and to FIG. **5** for the electric current pulses and forward thrust pulses, a housing constructed of front walls **1***a*, side walls **1***b*, and rear wall **4** is shown, the front walls **1***a* and cylindrical side walls **1***b* being constructed of two halves that are joined during assembly along line **2**, the rear wall **4** being one piece of material and being joined to the assembled side walls **1***b* along line **5** by suitable means such as screw-threaded fasteners (not shown). In the form shown the front walls **1***a* and side walls **1***b* are constructed of layered materials, the inside layer **32** consisting of material that is capable of guiding magnetic field lines of force along its surfaces, the outer layer consisting of magnetic shield material capable of minimizing the transmission through it of magnetic fields and having high mechanical strength and low magnetic reluctance, such as a suitable steel, for example. The rear wall **4** is constructed of an electrically nonconducting material, such as high alumina porcelain that is capable of permitting the transmission of magnetic fields through it to the outside of the engine housing. Threaded bolt holes **3** are provided for joining the propulsion engine assembly onto a vehicle to which the engine transmits pulses of thrust during its operation.

The combined structure of the high alumina porcelain engine support ring **6**, the high alumina porcelain liquid gas shroud **8**, the high alumina porcelain low temperature liquid gas vessel **10**, the high alumina porcelain thrust impact anvil **14**, the impact pad **19** and the engine housing walls **1***a* and **1***b* is such that when assembled they serve together to resist and contain the repulsive force generated by the opposing magnetic fields of the two magnetic field generators during the operation of the engine. Ceramic spacer rings **13** and **13***a* serve to determine the distance between the rear field generator containing coils **22** and **23** and the front field generator containing coils **24** and **25**.

The liquid gas shroud has front and rear indexing rings, rear index ring **17** being caused at assembly to protrude into index cavity **7** of support ring **6** when front index ring **18** protrudes into and indexes with location cavity **15** in impact anvil **14**. Magnetic refrigeration chamber **16** is essentially cylindrical and is positioned in the region between the outer periphery of the liquid gas shroud **8** and the inner surface **32** of the engine side walls **1***b*.

The liquid gas in chamber **11** of the liquid gas vessel **10** cools the superconducting electrical current coils **23** and **25** having superconducting members **27** and **29**, respectively, of the front magnetic field generator and the rear magnetic field generator to the same superconducting temperature. The liquid gas vessel **10** is enclosed within liquid gas shroud **8**, containing liquid gas at a somewhat higher temperature in shroud chamber **9** than the temperature of the liquid gas contained in chamber **11** of vessel **10**.

Conventional windings **26***a* and **28***a* are wound toroidally around superconducting members **27** and **29**, respectively, and have the purpose of initiating current flow in the superconductors. Conventional windings **26** and **28** are wound so as to aid in terminating electric current flow in the superconductors **27** and **29**, respectively. Windings **26** and **28** may be operated in conjunction with or independent of windings **26***a* and **28***a*.

The superconducting materials that comprise the front superconducting field generator members **29** are either specially formulated in manufacture or are specially selected so that they have a critical magnetic field intensity at which they will drop out of superconduc-

tion that is marginally higher in intensity than the critical magnetic field intensity that is required to cause the superconducting members **27** of the rear magnetic field generator coil **23** to drop out of superconduction, the temperature of the two superconducting field generator coils **23** and **25** being the same and the magnitudes of the electric currents flowing in them during superconduction being such as to give the high repelling forces required to yield usable levels of thrust when the field intensity internal to the engine housing is rapidly reduced by being ejected or transmitted from the rear of the housing. During normal use region **12** inside the engine housing is filled and pressurized with a spark quenching gas, such as sulfur hexafluoride.

In the operation of the engine the associated electronic equipment shown generally in FIG. **3** as a power pulse generator **40**, control computer **42** and power source **44**, for example, supplies drive pulses Pl via the rear generator control cables **21** to conductors **28***a* of coil **24**. The rising electric current flowing in toroidal windings **28***a* of coil **24** cause superconducting electric current to begin flowing in superconducting coil **25**, the electric currents in windings **28***a* being caused to flow in a direction such that its magnetic field is directed toward the rear of the engine. Once established, the superconducting electric currents continue to flow in solenoid winding **29** throughout the period of use of the engine. In a similar manner, initiating current pulses via cable **20** causes electric current to flow in toroidal coil **26***a*, thereby inducing superconducting electric current flow in solenoid wound coil **27**, the direction of the magnetic field thereof opposing the magnetic field of coil **29**.

The rising magnetic field intensity generated by superconducting coil **23** reaches a magnitude at which its effect exceeds the critical magnetic field value at which the superconduction of coil **23** will cease and the electric current flowing in coil **23** will rapidly fall. During the time period immediately following the fall of superconductor current in the elements of coil **23**, the initiated pulse applied to toroidal winding **26***a* continues to rise, applying a potential across the no longer superconducting elements of coil **23** to prevent their reverse conduction from producing a tendency of that coil's magnetic field to collapse as it is being transmitted from the rear of the engine. The magnetic field intensity of superconducting coil **25**, being in opposition to the no longer supported field of coil **23**, is directed parallel to the axis of the engine housing toward the rear and proceeds to transmit the magnetic field energy of coil **23** from the rear of the engine, at the same time suddenly extending itself rearward in the no-longer resisted rearward direction. The design and operation of coil **25** is such that, immediately following the transmission of the magnetic field energy of the field previously generated by magnetic coil **23**, the electric current flowing in superconductors **29** produces a stable level of magnetic field intensity that no longer induces current flow in coil **23**, thereby permitting that solenoid to return to its earlier state of readiness for the next initiating pulse from the electronic control system. All electrical currents flowing in the circuits of the electromagnetic energy propulsion engine are of a direct current kind, the only frequency involved being the time rate of production of direct current pulses of superconducting and conventional current flow used to produce the pulses of transmitted electromagnetic energy. It is the transmission of a succession of electromagnetic field energy pulses from the rear of the engine that yields the forward thrust on the engine and its vehicle. Electrical signals of various frequencies are required in certain parts of the associated equipment for the generation of power pulses for initiation and for use in telemetry sensing.

There is no secondary superconduction started in coil **23** superconductors **27** during the transmission part of the cycle, due to the fact that the magnetic field intensity produced by coils **24** and **25** in the region surrounding coil **23** exceeds its critical magnetic field intensity. The flow of electric current in the conventional conductor coils **22** and **24** and the fluxoids produced in the superconductors **27** and **29** of coils **23** and **25** act together to produce a small quantity of thermal energy during each cycle of operation of the engine. The thermal energy is removed by the magnetic refrigeration system **16** that operates from the magnetic pulse energy of the engine coils **22**, **23**, **24**, and **25** in the usual manner.

When the first thrust cycle is completed, the next cycle is begun by the application of control pulse P3 to the conductors **26***a* of coil **22**. The minimum repetition rate of the pulses of thrust generated by the engine is determined by the rate at which electronic control pulse P3 is supplied, the maximum repetition rate being determined by the design and construction of the engine assembly which determines its recovery time.

Referring to the embodiment of the invention shown in FIGS. **6** to **9** and to FIG. **10** showing the electric current pulses and forward thrust pulses, wherein like numbers are used for the same or similar parts, a housing enclosure is constructed of front wall portion **50**, side wall portion **52** and rear wall **4**. The engine occupies the space inside wall portion **52** and an intermediate wall **54** between wall portions **52** and **50**. The auxiliary equipment, later described, occupies the space inside the front wall portion **50**. In the form shown wall portions **52** and **54** are made of magnetic shield material capable of minimizing the transmission therethrough of magnetic fields Rear wall **4** is constructed of an electrically non-conducting material, such as high alumina porcelain, that is capable of permitting the transmission of magnetic fields through it to the outside of the engine housing. These wall portions are joined together by some means, such as suitable fasteners (not shown), or welding, to form the enclosure housing. The combined structure of the high alumina porcelain engine housing rear wall **4** and the shield side wall portion **52** and wall **54** serve together to provide a sealed compartment that is normally pressurized with a spark quenching material, such as sulfur hexafluoride gas.

Magnetic refrigeration equipment **56**, **58** and **60** is positioned inside the liquid gas chamber in vessel **62** within side wall portion **52** and circumscribes the engine's magnetic field generator coils.

The liquid gas in vessel **62** cools the solenoid superconducting electrical current coils **23** and **25** having superconductor members **27** and **29**, respectively, as well as their torodial windings **26** and **28** of the front and rear magnetic field generators, respectively, to the same superconducting temperature below 4.2° K. Liquid gas vessel **62** is enclosed within liquid gas shroud **64** containing liquid gas at a somewhat higher temperature than the temperature of the liquid gas that is contained in vessel **62**, but still below 4.2° K. Shroud **64** is enclosed within high vacuum chamber **65**.

Superconducting windings **26** and **28** are wound torodially around superconducting members **27**, **29**.

respectively, as shown in FIGS. **8** and **23** and have the purpose of initiating current flow in the superconductors **27**, **29** of coils **23**, **25**. Superconducting windings **26**, **28** are wound so as to aid electric current flow in the superconductor members **27**, **29**, respectively.

The superconducting materials incorporated into front superconducting field generator members **29** are specially formulated and produced so that they have a much higher critical magnetic field at which they will drop out of superconduction than the corresponding but lower critical magnetic field intensity superconducting materials incorporated into the rear superconducting field generator members **27**, the temperatures of the two superconducting field generator coils **23** and **25** being the same and the magnitudes of the current flowing in these coils producing opposing magnetic fields of similar intensities.

To provide superconducting windings, superconducting elements **27**, **29** are fabricated metallurgically from suitable alloys of material, such as niobium-titanium, so that each alloy will possess the required operating characteristics for the several different superconducting wires used. There is a minimum of five different alloys required, one for each of the materials for the coils **26** and **28** and the superconductors **27** and **29** and for element **57**. Toroidal coil **28** must have a critical magnetic field intensity that will be exceeded when superconduction is achieved in superconductors **29**. The critical magnetic field intensity and the critical current level of elements **29** must not be exceeded for any of the operating conditions of the engine. The critical magnetic field intensity of elements **27** must be exceeded at that level which will produce the desired mass of magnetic energy in its field for use in producing propulsion. The critical magnetic field intensity of coil **26** must be exceeded at the time when the repelling magnetic field of coil **25** has transmitted the field of coil **23** through the rear wall **4** of the engine. Superconduction flow of electrical current in element **57** must begin as paramagnetic salt molecules of element **56** return to their random state with the cessation of current flow in superconductors **27**, thereby opening the thermal gate for heat flow from the paramagnetic salt molecules of element **56** to the liquid helium in element **58** that is physically part of the liquid helium in vessel **62** and providing magnetic refrigeration for the engine.

Coils **23**, **25**, **26** and **28** are supported within the housing by support members **63**, **67** made of suitably strong material, such as high alumina ceramic, which will not inhibit the flow of magnetic field energy. These support members are shown in detail in FIGS. **8***a*, **8***b* and **8***c*. Forward coil assemblies **25**, **28** and rear coil assemblies **23**, **26** are mounted in circumferential slots **51**, **52**, respectively, of outer support member **63**. Support member **63** is formed of two identical semi-circular components, each having locating plugs **55** and locating holes **59** which interfit when the semi-circular parts are assembled together to form a complete outer support member **63**. The inner support member is comprised of four identical segments **67**, each having outer circular shape flanges **71**, which cooperatively engage with flanges **73** of members **63**, and curved slot **75** cooperatively engaging with the radially inner curved edge portion **77** of outer member **63** when the support members are assembled. The four segments **67** have side edges lying in planes which intersect substantially at the central axis of the support members and form included angles of approximately 87°. These support members are designed and constructed to maintain the electromagnetic field coils **23**, **25** in position against the strong repelling force of the magnetic fields generated thereby. The four identical inner support members **67** brace the coils on their radially inner sides and retain them in the slots **51**, **53** of the outer members **63**.

Region **60** inside the engine enclosure housing is pressurized with a spark quenching gas, such as sulfur hexafluoride, to minimize the long term damaging effect of ionization and corona on the engine members.

In this embodiment, the power source, such as a nuclear generator **66**, and a Rankine converter **68** are operatively connected together in a well known manner, such as shown in FIG. **7***a* described below. A power pulse generator **70** and computer **72** are connected together and also connected with the generator **66** and converter **68**. These components are supported in some suitable manner, such as by a framework on which they are mounted, disposed within the cone shaped front portion **50**.

The power pulse generator used to drive the several superconducting windings into superconduction can be a single generator with multiple outputs, or separate pulse generators all controlled by the computer. It will have low output impedance to match the low impedance of the superconducting windings and will deliver high current low voltage pulses to initiate the superconduction in the several windings.

A more detailed embodiment is shown in FIG. **7***a* wherein the electromagnetic engine in the rear part within shield walls **6** and **54** and rear wall **4** is the same, or substantially the same as that shown in FIG. **8**. Associated equipment used in this embodiment includes a nuclear powered primary energy source which may be a nuclear reactor **66**, for example, and a Rankine cycle energy converter **68**. The converter **68** is comprised of a boiler **84**, a turbine **86**, an electric generator **88** connected to and driven by the turbine by a shaft, as is well known, and a condenser-radiator having a vapor manifold **90**, tubes **91**, radiating fins **92**, liquid manifold **93** connected to tubes **91**, suitable pumps **94**, **95** and interconnecting pipes **96** for conducting primary fluid through the heat source **66** and boiler **84** and pipes **97** for conducting secondary fluid through a boiler **84**, turbine **86**, manifolds **90**, **93**, and tubes **91**. FIG. **7***a* shows a framework forming compartments for storage, living quarters, and other component chambers for computers, power pulse generators and electrical control, for example.

An operational control computer **72** with manual override, and a power pulse generator **70** used to drive the magnetic field generators of the engine may be housed where shown. Cylindrical space **81** may be used as crew and passenger quarters in which wall **83** would be the floor when the vehicle is in flight and rotating about its central axis to give stability of orientation and for the generation of artificial gravity in space flights. Flight control instruments are suitably located in the crew area, such as at **85**, and electrical power supply **87** operating from generator **88**, as well known, supplies electrical energy throughout the vehicle. Compartment **89** is used to store spare tanks of helium and oxygen as well as a helium liquification plant. The adjacent compartment **98** is used for cargo.

FIGS. **7***a* and **8** show signal transformers **24***a*, **24***b*, **24***c*, **24***d*, with their respective cables **16***b*, **16***a*. **14***b* and **14***a* connecting the signal transformers to computer **72**.

These transformers are constructed similarly to transformers 22*a*. 22*b* shown in greater detail in FIG. 9.

In the operation of the engine, the associated equipment shown in FIGS. 7 and 7*a* and 8 is operated to supply drive pulses P1 via generator control cable 21 to drive pulse transformer 22*b* having core 99 (FIG. 9) and hence to toroidal superconductor windings 28 of field generator 25. The rising electric currents flowing in toroidal windings 28 cause superconducting electrical currents to begin flowing in the superconducting winding of coil 25. The electric currents in superconducting winding 29 are caused to flow in a direction so that the magnetic field produced is directed toward the rear of the engine. The superconducting currents flowing in winding 29 that are established at the start of the use of the engine continue to flow in the winding throughout the period of use of the engine.

In a similar manner, and at a rate determined by the level of propulsion thrust desired, and as allowed by engine feedback signals from transducers 80 and 82 to computer 72, initiating current pulses P3 are applied by generator 70 via cable 20 to transformer 22*a* having core 99 and hence to coil 26 to cause superconducting current to flow in toroidal coil 26, thereby inducing superconducting current to flow in solenoid windings 27 of coil 23 in a direction so that the magnetic field produced opposes the magnetic field of the front magnetic field generator winding 29. The rising magnetic field intensity generated by superconducting winding 27 reaches the magnitude at which its effect exceeds the critical magnetic field intensity value at which the superconduction of windings 27 will cease and the electrical current flowing therein will rapidly fall. During the time period immediately following the fall of superconduction current in winding 27, the initiation pulse current applied to torodial winding 26 continues to rise, applying an induced potential across the no longer superconducting elements 27 to prevent their reverse conduction from a tendency of the magnetic field of coil 27 to collapse as it is being transmitted from the rear of the engine.

Each transducer 80, (FIG. 8) may be a magnetically compressed strain gauge that has its four internal resistive elements connected in a balance bridge arrangement to give it greater sensitivity. As the field generator 27 generates pulses of magnetic field energy in opposition to the normally existing powerful magnetic field of front mounted generator 29 the usually unbalanced bridge comes more into balance, a state that is reflected in the changes of resistance of its members, indicating to the computer the state of opposing force in the engine. The location of transducer 80 between the two field generators is important and the computer samples and senses the strain gauge resistance changes. Transducer 82 indicates temperature.

The magnetic field intensity of superconducting coil 25, being in opposition to the no longer supported field of coil 23 is directed parallel to the engine axis and toward the rear of the engine and proceeds to transmit the magnetic field energy of coil 23 from the rear of the engine, at the same time resuming its rearward extension in the no longer resisted rearward direction. The design and operation of windings 28 and 29 are such that immediately following the transmission of the magnetic field energy of the field previously generated by magnetic coil 23, the electric current flowing in the superconducting members 29 of coil 25 produce a stable level of magnetic field intensity that no longer induces current flow into adjacent coils, thereby permitting solenoid coil winding 27 to return to its state of readiness for the next initiating pulse from the control system.

All electrical currents flowing in the circuit of the electromagnetic energy propulsion engine superconductors are direct current, as opposed to alternating currents of radio or high frequency transmissions The direct current pulses of superconducted current are used to produce and transmit the field energy pulses. It is the transmission of a succession of electromagnetic field energy pulses from the rear of the engine that produces the reaction of the engine and the consequent forward thrust on the engine and the vehicle in which it is mounted. Electrical signals of various direct current or alternating current are used in certain signaling and control activities within the engine and its associated equipment. However, these do not constitute the resultant propulsion action of the engine.

There is no secondary superconduction started in coil 23 superconductors 27 during the transmission part of the cycle, due to the fact that the magnetic field intensity produced by coil 29 in the region surrounding winding 27 exceeds its critical magnetic field intensity. The flow of electric current in the copper or copper-nickel sheath into which the superconductor elements are extruded acts to produce a small quantity of thermal energy during each cycle of operation of the engine, which is removed by the magnetic refrigeration system located inside the cold chamber 62 that operates from the magnetic pulse energy of the engine coils in the manner described above regarding the first embodiment.

When the first thrust cycle is completed, the next cycle is begun by the application of control pulse P3 to the conductors of coil 26. The minimum repetition rate of the pulses of thrust generated by the engine is determined by the rate at which electronic control pulses P3 are supplied, the maximum repetition rate being determined by the design and construction of the engine assembly which determines the recovery time.

The assembly comprised of front walls, rear walls and rear window 4 is preferably shaped as an airfoil that may act as a flying vehicle inside of which are enclosed the electromagnetic energy propulsion engine and the auxiliary equipment. The entire vehicle depicted in FIGS. 7 and 7*a* will normally be made to rotate about its central front to rear axis, or geometric center line, at about 11 revolutions per minute, or a suitable rate that will provide orientation stability while inside the earths gravity field and provide a centrifugal force for the crew and passengers that is approximately equal to the earths gravitational pull.

An exemplary geometry of the embodiment of FIGS. 6-10 will now be described with dimensions. It is desirable to obtain in the engine a large value of inductance as that will give the respective winding a higher "Q" or quality factor and hence a higher impulse thrust per pulse. The quality factor or "Q" of a winding is equal to the ratio of the current that is flowing in the inductance to that flowing in the resistance of the winding when the winding is at resonance. Though the solenoid windings of the magnetic field generators are not operated in a resonance mode as direct current is used the ratio of inductance to resistance of the winding is important in obtaining rapid changes in operating conditions and hence an increased thrust.

FIGS. 7, 7*a* and 8 show the geometry chosen for the working embodiment described here. It consists of the two field generators wound as solenoids of approximately square cross section of windings, with the mean winding diameters being chosen as 305 centimeters, each winding having a 50 cm. × 50 cm cross section and a winding length of 50 cm. with 100 cm. spacing between windings. Each solenoid has a toroidal winding wound around its outside for the purpose of inducing in it superconducting current flows.

In practice, the engine may be envisaged as occupying a chamber region that comprises, in this example, a circular hollow ring having an outer diameter of approximately 366 cm. with the engine's solenoid windings having a mean diameter of 305 centimeters. Larger diameters up to 1830 cm. may be used The chamber is a compounded structure comprising three separate chambers positioned with an inner cold chamber held below 4.2° K., inside a shroud held below or only slightly above 4.2° K., and that in turn being inside a third chamber, the space between it and the shroud being evacuated to high vacuum for insulation purposes. The magnetic field generators and magnetic refrigeration system are mounted, with the high alumina ceramic winding form, inside the inner cold chamber.

The enclosure for this engine may take a variety of configurations and sizes, the air foil shown in FIG. 7*a* being one such configuration. Other suitable enclosures may include elongated fuselage type volumes with the engine and a nuclear power source being positioned at one end and the passenger compartment being at the other end.

The operating situation assumed for the engine is one where the vehicle that contains the engine is initially at rest. When the vehicle is moving the velocity affects the magnitude of the final thrust only to the extent that the vehicle velocity becomes appreciable part of the velocity with which the field energy is transmitted from the engine. In this initial operating condition the superconducting current has been induced into the solenoid conductors of the forward located driving magnetic field generator **25**, and the pulse of current in the pulsed magnetic field generator **23** may be considered to be approaching that value that will yield the critical magnetic field intensity for the generator **23**.

The engine has a primary power source in the form of, typically, a heterogeneous fissioning nuclear thermal energy generator equipped with a Rankine cycle convertor system, that supplies electrical energy to the entire vehicle. Operating from that source, a computer controlled power pulse generator drives the engine.

The driving magnetic field generator solenoid coil **25** first has superconducting current caused to flow through its conductors **29** with its magnetic field being directed along its axis toward the pulsed magnetic field generator **23**, and the rear of the vehicle. Then the computer causes the power pulse generator to supply pulse current via the respective toroidal winding to the super conductors of the solenoid winding of the pulsed magnetic field generator **23**. The magnetic field generated by the rear pulsed field generator opposes the field of the driving field generator and builds until it reaches a peak, determined by the designed critical magnetic field strength or intensity, B_{c2} of the rear generator that causes the superconducting current flow in the pulsed field generator to suddenly cease and drop toward zero. It is at this point in the cycle, and over the next several microseconds, after the cessation of current flow in the pulsed field generator solenoid Winding that the peak magnetic field energy is repelled away and transmitted from the engine by the rearward directed field of the forward field generator

Characteristics of each of the front and rear field generators that are predetermined by design and manufacture are used in the calculations. They include the number of turns of superconducting elements in the pulsed solenoid **23**, the use of niobium-tin for the front superconducting elements of the front field generator solenoid winding and the use of niobium-titanium alloy for the superconducting elements of the pulsed field generator's solenoid winding, the front field generator's solenoid winding being produced with a critical magnetic field intensity of 18 to 18.5 Teslas while the rear pulsed field generator's solenoid winding is produced with a critical magnetic field intensity of 10 Teslas.

There are wound on the pulsed field generator's solenoid winding 8,640 turns of Cuprous-Nickel sheathed wire, each wire containing 14,701 superconducting elements, giving a total number (n) of 1.27×10^8 superconducting turns. Calculations will be carried out in CGS units, with conversions being made to other units as appropriate.

For the purpose of the calculations we shall assume that the engine's superconducting elements are being maintained at 4.2° K. and that the critical magnetic field intensity of those elements was established using that temperature. For the operation of the engine, the front magnetic field generator solenoid winding has a constant superconducting current flowing that produces a constant rearward directed magnetic field of some 9.5 to 9.8 Teslas intensity.

From page 3 of the book, *Superconducting Magnets*, by Martin Wilson, published by Oxford University Press, second edition, 1989, we see from FIG. **1.2** that for a critical field intensity of 10 Teslas for the pulsed field generator using niobium-titanium superconductor elements the required electric current flow is 2.5×10^8 amperes per square meter. For these calculations we assume the cross section of the pulsed field generator's solenoid winding is 50 centimeters × 50 centimeters giving one quarter of a square meter. The required current flow would therefore be 6.25×10^7 amperes. The current flow per superconductor element is obtained by dividing 6.25×10^7 amperes by 1.27×10^8 superconductor turns, giving 0.492 amperes per turn. Though that current appears small one must take into consideration the extremely small cross section of each superconductor element, for which 0.492 amperes amounts to a high level of current density. Minor current flows will take place in the cuprous-nickel sheathing.

We may calculate the mass of the electromagnetic field energy that will be produced by the pulse of current flow in the rear pulsed magnetic field generator, and that will be available for transmission from the engine in producing the thrust, as follows;

$$\tfrac{1}{2} L I^2 = m c^2$$

Where:

m = the mass of the energy

$I = 6.25 \times 10^7$ amperes

$c = 3 \times 10^{10}$ cm/sec

L = solenoid inductance in Henries

$L = (4\pi \times n^2 \times A)/(1 \times 10^9)$

$$L = \frac{(4\pi \times (1.27 \times 10^8)^2 \times 50 \times 50)}{(50 \times 10^9)}$$

$L = 1.01 \times 10^{10}$ Henries

Transposing for the mass, m we have;

$m = (LI^2)/(2c^2)$

$m = ((1.01 \times 10^{10})\ (6.25 \times 10^7)^2)/2 \times (3 \times 10^{10})^2)$ grams

$m = 2.19 \times 10^4$ grams

$m = 21.9$ kilograms

We will need the value of the magnetic field in Oersteds in order to find the velocity with which the field energy is transmitted away from the engine. We may find the field, H as follows;

$$H = (4\pi \times n \times I \times \text{Cos } \Theta)/(10 \times l)$$

Where:

$n = 1.27 \times 10^8$ turns

$I = 0.492$ amperes

$\text{Cos } \Theta = 0.953$

$l = 50$ cm. Winding length

$H = (4\pi \times 1.27 \times 10^8 \times 0.984 \times 0.953)/(10 \times 50)$

$H = 2.99 \times 10^6$ Oersteds

We will also need to know the field strength in volts per meter to calculate the velocity with which the energy is transmitted from the engine. The voltage per meter E is given by;

$$E = (BM/\mu s) = (T \times 120\ \pi)/(4\pi \times 10^{-7}) \text{ volts/meter}$$

$E = (10 \times 120\ N_0)/(4N \times 10^{-7})$ volts/meter

$E = 3 \times 10^9$ volts/meter 3×10^7 volts/centimeter

The velocity with which the massive field of electromagnetic energy is transmitted away from the engine is, assuming permitivity and permeability are unity

$$V = (2c \times E \times H)/(E^2 + H^2) \text{ centimeters per second}$$

$V = (2 \times 3 \times 10^{10} \times 3 \times 10^7 \times 1.5 \times 10^6)/(3 \times 10^7)^2 + (1.5 \times 10^6)^2)$

$V = 2.39 \times 10^9$ centimeters per second

$V = 29{,}900$ kilometers per second

$V = 1.08 \times 10^6$ kilometers per hour

We are concerned with two values of thrust, the peak thrust produced each pulse, and the average thrust over time. The peak thrust is designated by P while the average thrust is designated by P_a. They are calculated as follows;

$$P = m \times V$$

Where

$m = 21.9$ kilograms mass

$V = 2.99 \times 10^7$ meters/second

$P = 21.9 \times 2.99 \times 10^7$

$P = 6.55 \times 10^8$ kilograms peak force per pulse

$P = 1.4 \times 10^9$ pounds peak force per pulse (using 2.2 lb. = 1 kg.)

If we assume a repetition rate of 0.001, i.e., one pulse of thrust is produced each millisecond, and if we assume that energy loss is negligible, we obtain an average thrust

$$P_a = 1.44 \times 10^6 \text{ pounds force average}$$

It is important to know the peak force of repulsion that is produced between the driving and pulsed magnetic field generators during each cycle of pulse of operation of the engine. That figure may be obtained as follows

$$F = (2I_1 \times I_2/100 \times d)$$

Where:

$I_1 = 6.25 \times 10^7$ amperes

$I_2 = (5.2 \times 10^9)/4)$

$I_2 = 1.3 \times 10^9$ amperes (driving currents)

d = mean distance between coils

$d = 100$ centimeters

$F = (2 \times 6.25 \times 10^7 \times 1.3 \times 10^9/1100)^2$

$F = 1.657 \times 10^9$ grams force

$F = 1.657 \times 10^6$ kilograms force

$F = 3.65 \times 10^6$ pounds force

$F = 1.6 \times 10^{12}$ dynes force

The above force must be mechanically constrained during the operation of the engine or it will damage the engine's structure. Materials such as high alumina ceramic with 50,000 pounds per square inch tensile strength are adequate for the purpose.

The above average thrust of 1.44×10^6 pounds force may be compared with the thrust that is achieved in some of the more modern fighter aircraft engines as follows;

Gruman F-14 P&W TF-30-P-414A = 20,900 pounds thrust

MIG-29 Isotov RD-33 Engine = 18,300 pounds thrust

Sukhoi Su-27 Lyulka AL-31 = 27,500 pounds thrust

F-16 Falcon P&W F100-PW-200 = 25,000 pounds thrust

With the maximum velocity calculated of 29,900 kilometers per second, the non-air breathing engine of this disclosure will make it possible for a space shuttle to operate without rocket assist and escape from the gravitational pull of the earth and also from any other planet in the solar system.

Referring to the embodiment of the invention shown in FIGS. **11** through **22**, a cylindrical housing **102** is constructed of two equal semi-cylindrical halves, each half being constructed of high strength magnetic field shielding material, mounting protrusion **101** with mounting faces **103** and **103***a* surrounding the center of its periphery. The housing **102** is joined to magnetic field windows **104** and **104***a* along lines **105** and **105***a*, respectively, by ultra high strength methods so as to aid in resisting the extreme forces generated by electromagnetic repelling forces in zone **131** or **131***a* of FIG. **20** when the electromagnetic field of either generator **123** or **123***a* interacts in a repelling manner with the respective electromagnetic field of generator **125** or **125***a* during operation of the engine Generators **125**, **125***a*, **123** and **123***a* are assembled on a common shaft **142** of high alumina ceramic material that is transparent to electromagnetic forces and of such dimensions and configuration to serve as a major contributor to the containment of the repelling forces generated. With the exception of the ferromagnetic cylindrical housing and the pressed iron cores of transformers **106**, **107**, **108** and **109**, all efforts are made to exclude ferromagnetic materials from the interior construction of the engine.

FIG. **12** shows the manner of assembling filaments of the pulse operated superconducting windings **126** in the form of hollow tubular cables **135** of fully transposed

windings for the purpose of pulse use and minimizing losses through self inductance, the tubular cable being then oxidized and flattened by rolling to yield the maximum filling factor for the purpose of getting the maximum number of windings in the minimum volume of space and thereby reducing the total engine mass.

FIG. **13** shows the high alumina ceramic winding core **142** upon which the windings of electromagnetic field generators **125**, **125***a*, **123**, and **123***a* are assembled. The two pulsed electromagnetic field generator windings **123** and **123***a* with toroidal windings **143** and **143***a*, one of which is shown in FIG. **14**, are assembled on the same axis with and adjacent to the ends of the two centrally located main electromagnetic field generators, **125** and **125***a* with their toroidal windings **271** and **271***a*. The high alumina ceramic winding core **142** absorbs a major portion of the several million pounds of stress that is produced by the repelling forces generated between the two main field generators and between each main field generator and the adjacent end mounted pulse operated field generator.

FIG. **15** shows in cross section details of the pulsed electromagnetic field generator windings used in field generators **123** or **123***a* and depicts the method of achieving the maximum filling factor of winding filaments **126** consistent with adequate cooling from liquid helium and the attainment of adequate mechanical strength, the rolled transposed filaments of FIG. **12** being combined with others similarly produced which are then sheathed in a copper alloy and rolled into a complete winding sub-assembly **133** for final winding of the field generator coil. Leads **122**, or **122***a*, are shown in FIG. **16** with conductors **136** insulated by sleeves **272**.

FIG. **20** shows a schematic cross section of the engine assembly depicting the location and numbering of the components of the engine, as well as its manner of connection via transformers to the external equipments that supply controlled electronic power initiation and control pulses to the engine. Also shown are the primary power source **113**, with converter, for the engine and its vehicle, the computer **115** that controls the sequence of functions of the engine, the power pulse generator **114** that supplies power to the engine, and the sensor signal paths that feed data to the computer during the engine's operation. The transformers **106**, **107**, **108**, and **109** carry pulse energy into the assembly and transformers **116***a*, **116***b*, **116***c*, and **116***d* carry signals out of the assembly, both types of transformers bridging the liquid helium chamber walls **138** without providing thermal energy paths into or out of the engine enclosure.

FIG. **17** shows a cross section of the engine to emphasize the different parts in their respective and relative positions. This view is to be compared to FIG. **20** for the numbering of other relevant parts of the engine, this view not being completely numbered so as to minimize confusion of part identification. Shown in ballooned view FIG. **18** of part of FIG. **17** (similar to FIG. **9**) is a current transformer **109** typical of current transformers **106**, **107**, and **108**, all used for feeding electrical power pulses into the engine without breaching the thermal integrity of the vessels holding liquid helium to cool the engine. Parts designated with a combination of a number and the suffix letter a are the exact counterparts at one end of the engine structure to similar parts at the opposite end of the engine assembly.

FIGS. **21***a-c* show diagrammatically the electromagnetic fields generated by the engine at three stages during a single cycle of its functioning, all figures showing the constraining effect on the electromagnetic fields II and IIa of the main field generators **125** and **125***a* by the magnetic fields I and Ia of field generators **132** and **132***a*. FIG. **21***a* shows the engine in a standby state of readiness when no thrust is being produced. FIG. **21***b* is a diagram of the engine's field generators during the compression phase of its operational cycle when the pulsed electromagnetic field generator **123***a* is near the peak of its field IIIa magnetic energy intensity and immediately prior to reaching its critical magnetic field level for the superconductor solenoidal coil **123***a*, at which point its superconducted electrical and magnetic currents drop suddenly toward zero, thereby, as shown in FIG. **21***c*, releasing its field for ejection from the engine by the repelling force of the electromagnetic field IIa of the main electromagnetic field generator **125***a*, at which time a pulse of potential of the appropriate polarity and magnitude is being applied to the solenoidal winding of electromagnetic field generator **123***a* to prevent reverse current heating of the generator **123***a* winding due to any tendency of field IIIa to collapse as it is being ejected.

FIG. **22** graphically shows the sequence of principal electrical current flows involved in the engine's operation during startup and during one cycle of its operation, plus the pulse of mechanical thrust that is generated when the extremely large quantity of electromagnetic energy transported by electromagnetic field IIIa is ejected from the engine by the slingshot effect of the repelling electromagnetic field IIa, the ejection being initiated by the collapse of electric and magnetic current flow in field generator **123***a* (similar for **123**).

A number of the details and aspects of the invention may be varied from those shown in the figures supplied with the specification and still obtain some degree of thrust from the slingshot ejection of electromagnetic field energies. All such working variations are embodied in the concepts of the invention along with the means and methods for effecting such variations.

The engine is prepared for use by readying the thermal environment which requires the supply and installation of liquid helium into the inner vessel volume **112** and into the shroud volume **110** that are enclosed respectively, by vessel walls **138** and **139**, and cooling the contents of those chambers to near zero degrees Kelvin. In addition, enclosing space **145** is evacuated and then sealed. Residual gas atoms remaining in the evacuated space **145** are freeze evacuated by the action of the low temperatures and surface preparation causing their deposition on the inner walls of the vacuum chamber. During periods of non-use of the engine, paramagnetic salts **147** and **147***a* in magnetic cooling vessels **151** and **151***a*, respectively, lie dormant awaiting activation by polarizing magnetic fields. Thermal reservoirs **150** and **150***a* are filled with liquid helium **148** and **148***a*, respectively, when the vessel **112** is filled with liquid helium. Superconducting thermal transport switches **149** and **149***a* lie dormant during periods when the engine is not readied for use, being active only when the pulsed electromagnetic field generators **123** or **123***a* are used.

Thermal transport switches **57**, **149** and **149***a* are comprised of a loop of superconducting elements that pass through and are connected to a paramagnetic salt volume contained in components **156**, **151**, or **151***a*. The loop then passes across to a liquid helium heat sink located at **58**, **150** or **150***a* where the superconducting elements pass through and are connected to the liquid

helium. The three magnetic refrigeration systems depicted in the drawings are identified as **56**, **57** and **58**, and components **149**, **150** and **151**, and **149***a*, **150***a*, and **151***a*. Each group Comprises a refrigeration system that makes use of the spin-lattice relaxation mode of cooling. The spin-lattice relaxation takes place in the paramagnetic salt each time there is a reduction in the magnetic field strength to which the salt is subjected. The relaxation cools the salt and by the superconduction in the switch loop transfers heat energy to the liquid helium reservoir at successively lower temperatures. When the superconduction in the switch loop ceases as critical field strength is reached for the loop, the superconductor presents a high thermal resistance to the flow of thermal energy and the heat is isolated in the reservoir, allowing the spin-lattice relaxation to take place.

Operation of the embodiment of this invention shown in FIGS. **11–22** is as follows. The main power supply **113** is turned on, making available energy to the computer **115**, power pulse generator **114**, and switch panel **117**. Computer **115** first interrogates the engine signal transducers **140**, **140***a*, **144** and **144***a* by sending interrogation signals via leads **141** and transducer signal transformers, **116***a*, **116***b*, **116***c*, and **116***d* to ascertain the state of the engine. Transducer signal transformers **24***a*, **24***b*, **24***c*, **24***d*, **116***a*, **116***b*, **116***c*, and **116***d* are used to minimize the entry of thermal energy into the liquid helium chambers from outside the engine. Though transformer characteristics will change, they are all similar to FIGS. **9**, **18** and **19**. Other signals from external transducers may also be used but are not shown. When it has been determined that the engine is in a state of readiness for initiation, the computer **115**, acting automatically or under the control of a human operator, closes switches **128** and **129** on switch panel **117** and then causes the power pulse generator **114** to supply initiating pulses **134'** and **124'** (See FIG. **22**) to the current transformers **116** and **118** via input leads **121** and **119**, respectively. Initiation pulses **124***a'* and **134***a'* induce superconducted electrical and magnetic current flows in leads **124** and **134**, respectively, and thereby in the toroidal windings of field generators **125**, **125***a*, **132** and **132***a*. The superconduction currents flowing in the toroidal windings of field generators **125**, **125***a*, **132** and **132***a* cause superconduction currents to flow in the solenoidal windings of field generators **125**, **125***a*, **132** and **132***a*, establishing continuous and steady electric and magnetic current flows such as current flows **132'** and **125'** shown in FIG. **22** and thereby setting up the opposing electromagnetic fields I and II, and Ia and IIa, as depicted in FIGS. **21***a*, *b*, and *c*. The electromagnetic fields of generators **125**, **125***a*, **132** and **132***a* remain in operation throughout the period of use of the engine. When the superconducting currents generating fields I, Ia, II and IIa are flowing uniformly the computer **115** causes switches **128** and **129** to open. The computer **115** then closes switches **127** and **130** and causes the power pulse generator **114** to send neutralizing pulses along leads **120** and **118**, respectively, and via current transformers **107** and **109**, respectively, through leads **136** in ducts **122** and **122***a*, respectively to eliminate current flows in field generators **123** and **123***a*, respectively. The purpose of the neutralizing pulses is to stop any current flow that may have been induced by establishing the electromagnetic fields of generators **125**, **125***a*, **132** or **132***a*.

The computer **115** then either receives a command signal from an operator or acts autonomously from such external sources as anti-collision signal producers, etc. to make the decision as to the direction and time to produce thrust by the engine. For purposes of this explanation it is assumed that the decision is made to produce thrust from right to left in FIGS. **17** and **20** or FIG. **21***a*, *b*, *c*, and on the engine assembly. Switch **127** remains in the open position and electromagnetic field generator **123** remains dormant during this period of operation of the engine. The computer **115** next causes switch **130** on switch panel **117** to close and then causes power pulse generator **114** to send initiating pulse **122***a'* (see FIG. **22**) of electrical and magnetic currents around wires **135** on the primary of current transformer assembly **109** shown more clearly in FIGS. **18** and **19** (current transformer assemblies **106**, **107**, and **108** being dormant during this period). Wires **135**, being wound toroidally about pressed iron core **137** and on which are wound superconduction turns **136**, cause the pulse of power current to induce superconduction current flow inside the engine cold region without any lead-in wires breaching the controlled thermal environment. The initiating current pulse **122***a'* as shown in FIG. **22** is fed along superconducting wires **136** inside sheath **122** (FIG. **16**) to circulate around the toroidally wound initiating winding of magnetic field generator **123***a*, thereby inducing a current pulse **123***a'* (FIG. **22**) of superconduction current into the filaments **126** in their sheaths **133** of the generator **123***a* winding (FIGS. **14**, **15**, and **16**).

The electromagnetic field IIIa of generator **123***a* is produced with a polarity so that it will repel the already existing field IIa of adjacent field generator **125***a*, causing the latter field to be compressed inward along the axis and shaft **142** of the engine, much as the compression stroke of a piston in an internal combustion engine. The stress of the repelling force, having a magnitude of some millions of pounds, is countered by a tensile stress that is established in the shaft **142** of the engine, and a similar tensile stress that is produced in the engine housing via the end windows, **104** and **104***a* of high alumina ceramic material and their mountings **105** and **105***a* to the engine housing. The superconduction currents of current pulse **123***a'* flowing in generator **123***a* cause its field intensity to exceed the predetermined critical magnetic field intensity of the turns of superconducting filaments **126** for that solenoidal winding, at which point in time the superconduction currents flowing in generator **123***a* coil cease flowing and the dynamic, high compressed electromagnetic field IIa of generator **125***a* is freed to eject, or transmit, the no longer supported electromagnetic field IIa of generator **123***a* from the vicinity of the engine assembly, the ejection being outward along the engine axis and through the end window **104***a* into outside space. Though the critical magnetic field intensity for the field generator **123***a* coil filaments **126** has been exceeded, the outside computer driven power pulse generator continues to supply pulse energy to the uncritical toroidal initiator coil windings **143** and thereby prevents reverse currents from the previously generated electromagnetic field of generator **123***a* from heating its windings. The extremely high energy electromagnetic field IIIa of field generator **123***a* will continue to exist in its uncollapsed state for some microseconds following the cessation of the superconduction current flow that generated it, providing an interval of time that is adequate for that field to be ejected. The momentum imparted to the ejected field of electromagnetic energy reacts on the engine structure to produce a pulse of thrust in the opposite direction.

Following the ejection of the electromagnetic field energy with its momentum, and after each pulse of thrust, the windings of field generator **123***a* ar made ready for the next cycle of operation. With no superconduction current flow in field generator **123***a* between pulses, and the electromagnetic field IIa of field generator **125***a* in its normal unrepelled state, the engine system is ready for the start of the next cycle of operation. The repetition rate of the engine, and hence the average total thrust produced, is a function of the computer triggering rate as well as the design and recovery times of the engine assembly and its external support equipment.

Each of the pulsed field generators **123** and **123***a* is wound with a sufficient number of turns of superconducting filaments of niobium-titanium alloy superconductor wire that is specially alloyed to reach its critical magnetic field intensity when the required energy content has been produced in the electromagnetic field of that field generator. Typically, field intensities commensurate with the current flows in the pulsed field generator coils of several million amperes are involved. The main field generators **125** and **125***a* are wound with sufficient numbers of turns of niobium-tin filament, each of which is alloyed so that it will not reach its critical magnetic field intensity during the operation of the engine, such that they will produce electromagnetic fields having repelling forces equivalent to or above that produced by the pulsed field generators **123** or **123***a*. The field generators **132** and **132***a* are wound with niobium-titanium superconductor filaments that will not reach their critical magnetic field intensity in their normal conditions of use, and yet will produce a magnetic field of sufficient strength to repel and contain the electromagnetic fields of generators **125** and **125***a* and cause those fields to be extended farther outward along the engine axis and possess additional dynamism. The superconducting windings of the toroidal initiating coils of the field generators are specifically designed and alloyed to operate in pulsing modes satisfactory to the needs of the engine.

The methods for and means of mounting and affixing components in position, and the choice of impregnating resins, sheathing materials, winding and annealing techniques, superconductor filament oxidation, direction of winding, and location of magnetic refrigeration components are all directed toward achieving optimum pulsed operation and yet presenting the minimum impedance to the passage of fields II, IIa, III and IIIa of FIGS. **21***a*, **21***b*, **21***c* as fields II or IIa eject fields III or IIIa, respectively.

Magnetic field interaction zones **111**, **111***a*, **131** and **131***a* are shown in FIG. **20** at the regions where the magnetic fields of field generators **132** and **125**, **132***a* and **125***a*, **125** and **123**, and **125***a* and **123***a*, respectively, reach the greatest levels of magnetic repelling force during the operation of the engine. Zones **131** and **131***a* move inward along the engine axis with the build up of electromagnetic repelling force by field generators **123** and **123***a*, respectively ,and later move outward with the ejection of field III or IIIa.

Inner liquid helium chamber **112** is separated from outer liquid helium chamber **110** by partition **139**, while outer high vacuum chamber **145** is separated from the outer liquid helium chamber **110** by partition **138**, walls **139** and **138** being connected at suitable places and by suitable means throughout their structures and being composed of such materials as high strength high alumina ceramics or other suitable materials so that they ar transparent to the passage of electromagnetic fields.

FIG. **24** is a cross-sectional view of the three-component composite of cupro-nickel sheathing and niobium-titanium superconductor elements used in the windings of the pulsed magnetic field generators of the engines of this invention. The left side of FIG. **24** shows NbTi filaments **200** in a copper-cupro-nickel matrix **202** and enclosed within a sheath **204**. The enlarged view at the right of FIG. **24** shows the cupro-nickel barriers surrounding each filament and also subdividing the matrix, the copper being shown at **206** and the nickel being shown at **208**.

FIG. **25** shows a further embodiment of the invention comprising a multi-engine large capacity vehicle generally shown at **250** constructed to use the engine of the invention. Forward thrusting engine **251**, reversed thrusting engine **252**, and side or upward thrusting engines **253**, **254** and **255** provide propulsion for the vehicle. Primary power is provided for the vehicle and its engines by nuclear power plant **256** comprising components similar to those shown in FIG. **7***a*. Vehicle controls are located in control room **256**. A vehicle atmosphere control facility and work shop **258** and elevators **266** service the vehicle. Power and access channel **269** distributes these services throughout the vehicle. Crew quarters **259**, passenger rooms **260**, **261** and **262**, and cargo decks **264** are also provided. Windows in the air foil that are transparent to magnetic fields, such as windows or rear wall portions **4** described above, are shown at **265**. Regions in each engine compartment that are pressurized with spark quenching gas are shown at **270**.

It is to be understood that the foregoing description and accompanying drawings set forth preferred embodiments of the invention at the present time. Various modifications, additions and alternative designs will, of course, become apparent to those skilled in the art in light of the foregoing teachings without departing from the spirit and scope of the disclosed invention. Therefore, it should be appreciated that the invention is not limited to the disclosed embodiments but may be practiced within the full scope of the appended claims.

I claim:

1. An electromagnetic propulsion engine comprising:

a hollow housing having a central axis, a forward wall, a side wall portion, and a magnetically transparent rear wall;

a forward electromagnetic field generating means within said housing for generating a rearwardly directed magnetic field toward said rear wall and parallel to said central axis;

a rearward electromagnetic field generating means between said forward generating means and said rear wall for producing a forwardly directed magnetic field parallel to said central axis and opposing said rearwardly directed magnetic field, said rearwardly directed magnetic field repelling forwardly directed pulses of said forwardly directed magnetic field generated by said rearward magnetic field generating means;

means for providing controlled pulses of electric power having predetermined durations to said field generating means, so that sudden reduction of electrical current conduction in said rearward field generating means during continuing rearward directed magnetic field force of said forward magnetic field generating means causes a pulse of mag-

netic field energy of said rearward magnetic field generating means to be transmitted from the rear of the propulsion engine as said magnetic field of said forward field generating means is projected with a sudden action through said magnetically transparent rear wall, producing a rapid reduction of magnetic field intensity inside said housing and a corresponding combined forward thrust to said housing.

2. An electromagnetic propulsion engine as claimed in claim 1 wherein said housing comprises:

means for providing magnetic barriers for reflecting and guiding magnetic fields along inner walls of said forward wall and side wall portion; and

means for shielding objects and individuals outside of and in proximity to said forward wall and side wall portion and providing capacity for maximum transmission of magnetic energy through said rear wall as pulses of magnetic field energy having a major component of transmission direction along said central axis of said housing.

3. An electromagnetic propulsion engine as claimed in claim 1 and further comprising:

engine structural members in said housing for supporting said field generating means and constructed of materials having minimum impedance to the passage of magnetic field energies inside said housing and mechanical rigidity, strength and high temperature stability; and

means for minimizing the presence of internal ionized atmospheres in said housing.

4. An electromagnetic propulsion engine as claimed in claim 1 wherein:

said forward and rearward electromagnetic field generators comprise superconducting elements; and

said means for providing controlled pulses of electric power comprises means for initiating and terminating superconduction of electric current in said superconducting elements of said rearward field generating means while maintaining superconduction of electric current in said superconducting elements of said forward field generating means, and maintaining an electrical potential opposing reverse current flow in said rearward magnetic field generating means when the magnetic field energy of said rearward field generating means is being transmitted from said rear of the engine.

5. An electromagnetic propulsion engine as claimed in claim 1 wherein:

said forward and rearward electromagnetic field generating means comprise superconducting elements; and further comprising

means for providing commutation of said electromagnetic field energy generated by said rearward field generating means comprising said superconducting elements in said forward magnetic field generating means having the ability to withstand more intense magnetic fields before ceasing superconduction than said superconducting elements of said rearward magnetic field generating means.

6. An electromagnetic propulsion engine as claimed in claim 1 wherein:

said forward and rearward electromagnetic field generating means comprise superconductors; and

said superconductors of said forward electromagnetic field generating means continue conducting electric current at superconduction levels while said superconductors of said rearward electromagnetic field generating means are commutated between time periods of high superconduction current flow and periods of no current flow or low non-superconduction current flow.

7. An electromagnetic propulsion engine as claimed in claim 1 and wherein said means for providing controlled pulses of electric power comprises:

power source means;

control computer means connected to said power source means; and

power pulse generator means connected to said forward and rearward electromagnetic field generating means, said control computer means and said power source means for ensuring that said forward electromagnetic field generating means produces a rearward directed magnetic field force and said rearward electromagnetic field generating means produces a forward directed magnetic field force opposing said rearward directed field force,-the direction of said field forces being measured along or parallel to said central axis of said housing.

8. An electromagnetic propulsion engine a claimed in claim 1 wherein:

said field generating means comprises respective superconducting means designed and fabricated of superconduction materials; and

said means for providing controlled pulses of electric power comprises electronic control means for generating a succession of pulses of thrust at independently determined frequencies and with independently determined times and magnitudes of superconductor current flow, thereby controlling the time averaged magnitude of the total thrust obtainable from the engine.

9. An electromagnetic propulsion engine as claimed in claim 1 wherein:

said forward and rearward electromagnetic field generating means comprise separate coils of superconducting elements;

means are provided for maintaining said superconducting elements at substantially the same temperature during operation; and

said superconducting elements used to generate said rearward directed magnetic field force have a higher critical magnetic field at which they will cease superconduction than said superconducting elements that generate said forward directed magnetic field.

10. An electromagnetic propulsion engine as claimed in claim 9 wherein:

said temperature maintaining means comprises magnetic refrigeration means comprising a first chamber containing a magnetically active salt and a second chamber containing a liquid gas, and a superconducting switch connecting said chambers in said housing for using a portion of said pulsed magnetic field energies of said magnetic field generators for cooling said liquid gas and removing thermal energies produced in the operation of said pulsed magnetic field generating means.

11. An electromagnetic propulsion engine as claimed in claim 1 wherein:

said housing comprises internal conformations inside of said side wall portion proximate the rear of said housing for enhancing the guidance and transmission of the magnetic field energies generated inside said housing to assist the movement and emission of magnetic field energies along the inside of said housing and through said rear wall.

12. A propulsion engine as claimed in claim 7 and further comprising:
a liquid gas cooling chamber shroud in said housing and surrounding said field generating means;
a high vacuum thermal isolation vessel in said housing and surrounding said liquid gas cooling shroud; and
thermal isolating transformer means in said liquid gas cooling chamber shroud for transmitting electric power from said means for providing controlled pulses of electric power to said electromagnetic field generating means.

13. A vehicle for using the electromagnetic propulsion engine claimed in claim 1, comprising:
a vehicle body incorporating said housing;
means for causing said vehicle body to rotate about said central axis for imparting greater vertical stability to the orientation of said vehicle when flying in a gravitation field of an astronomical body; and
means for controlling the rate of rotation of said vehicle body about said central axis so that a centrifugal force is applied to individuals inside said vehicle, said centrifugal force having a similar magnitude to gravitational attraction force of a planet on which said individuals normally live.

14. An electromagnetic energy propulsion engine system comprising:
a cylindrical housing of ferromagnetic material;
end windows in ends of said housing made of material that is transparent to the passage of electromagnetic fields;
an engine axis substantially centrally disposed parallel to the central axis of said cylindrical housing;
four superconducting electromagnetic field generating solenoid windings mounted end to end on a shaft and supported inside said housing comprising two center field generating windings and two outer field generating windings;
a superconducting initiating and controlled toroidal winding for each of said four field generating solenoidal windings;
fifth and sixth electromagnetic field generating windings circumscribing and surrounding in coaxial relationship said center field generating windings so that the electromagnetic field generated by each of said fifth and sixth field generating windings repels the field of the respective center field generating winding radially inwardly thereof for adding dynamism and axial extension to the field of said respective center field generating winding;
said center field generating windings being designed to carry superconducting electrical and magnetic currents continuously during operation of said engine;
said outer two field generating windings being designed and constructed to operate in a repetitive pulsing mode and alternatively to produce thrust in either direction selectively parallel to said central axis;
liquid gas chamber means within said housing and surrounding said electromagnetic field generating windings;
vacuum chamber means surrounding said liquid gas chamber means in said housing;
an external electrical power source;
an external control computer operatively connected to said power source;
a power pulse generator means operatively connected to said power source; and
switching means operated by said computer means for connecting electric power from said power source through said power pulse generator means and through said housing to said respective electromagnetic field generating windings for producing superconduction current generated electromagnetic repelling force to transmit highly intensive electromagnetic fields of energy selectively through either of said end windows by a slingshot effect so that a reaction to momentum imparted to said fields of energy produce pulses of thrust on the engine.

15. A propulsion engine system as claimed in claim 14 and further comprising:
means for applying a pulse of potential of polarity to said pulsed field generator windings for momentarily inhibiting from collapsing and heating the respective generator windings producing energy in a momentarily unsupported electromagnetic field that is being repelled by a respective field.

16. A propulsion engine system as claimed in claim 14 wherein:
said means for producing thrust comprises means for producing said thrust in either direction parallel to said axis.

17. A propulsion engine system as claimed in claim 14 wherein:
said pulsed electromagnetic field generator is constructed to cease conducting superconduction currents at a predetermined electromagnetic field intensity to which it is subjected exceeding the critical magnetic field intensity for the superconductor winding thereof.

18. A propulsion engine system as claimed in claim 14 wherein:
said pulsed electromagnetic field generator comprises superconducting elements; and
means are provided for initiating and terminating on command the superconduction of electric and magnetic currents in said pulse operated superconducting elements.

19. A propulsion engine system as claimed in claim 14 wherein:
means are provided for producing a strong electromagnetic repelling force between two electromagnetic fields, one of said fifth and sixth field generating windings producing said repelling force ceasing to conduct electric and magnetic currents at a point in time when continuing field energy of a respective center field generating winding sweeping through the pulsed field generating winding as the opposing field energy is being transmitted produces a pulse of potential across the winding of the pulsed field generating winding that opposes the induction of any reverse flow of currents in the pulsed field generating winding by tendency of the field that is being transmitted to collapse.

20. A propulsion engine system as claimed in claim 14 wherein said computer means comprises:
a control computer;
sensor inputs to said computer; and
manual override inputs to said computer, so that time averaged thrust from a plurality of pulses of said thrust is determined by said control computer in response to a combination of programmed controlled information and said sensor inputs.

21. A propulsion engine system as claimed in claim 14 and further comprising:

magnetic refrigeration means mounted inside said housing for utilizing part of the energy from said electromagnetic field pulses for assisting in maintaining a liquid gas state of said coolant of the engine.

22. A propulsion engine system as claimed in claim 14 and further comprising:

spaces inside said engine housing and outside said liquid gas chamber means and said high vacuum chamber means; and

spark quenching gas of pressurized sulfur hexafluoride filling said spaces.

23. A propulsion engine system as claimed in claim 14 and further comprising:

a plurality of power and signal energy input and output transformers having one winding mounted outside said liquid gas chamber means and a second winding mounted inside said liquid gas chamber means for maintaining a minimum of thermal energy transfer into cold regions of the engine within said liquid gas chamber means, and for providing for superconduction on said inside transformer windings constructed of superconducting materials.

24. A propulsion engine system as claimed in claim 14 and further comprising:

sensing devices mounted on said engine inside said housing for indicating temperature and the levels of force generated between propelling electromagnetic force-generating members and members providing said field energy; and

means for connecting said sensing devices to said computer means.

25. A propulsion engine system as claimed in claim 24 wherein:

said force sensing devices comprise crystal strain gauges.

26. A propulsion engine system as claimed in claim 14, and further comprising:

pulse operated superconducting electrical coils mounted on said housing about peripheries of said end windows for producing radially inwardly directed electromagnetic force fields for altering the direction of thrust by acting o the propulsion producing electromagnetic fields transmitted through said end windows to provide directional control of a vehicle on which said engine is mounted.

* * * * *

Appendix D. U.S. PATENT # 5,269,482

US005269482A

United States Patent [19]

Shearing

[11] Patent Number: 5,269,482

[45] Date of Patent: Dec. 14, 1993

[54] **PROTECTIVE ENCLOSURE APPARATUS FOR MAGNETIC PROPULSION SPACE VEHICLE**

[76] Inventor: **Ernest J. Shearing**, 297 W. Grand Ave., Porterville, Calif. 93257

[21] Appl. No.: **767,794**

[22] Filed: **Sep. 30, 1991**

[51] **Int. Cl.**[5] **B64G 1/46**

[52] **U.S. Cl.** ..... **244/163**; 244/158 R

[58] **Field of Search** ..... 244/163, 158 R, 172, 244/166

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Primary Examiner—Joseph F. Peters, Jr.
Assistant Examiner—Anne E. Bidwell
Attorney, Agent, or Firm—Fulwider Patton Lee & Utecht

[57] **ABSTRACT**

The protective enclosure for a space vehicle with a magnetic propulsion system includes an insulated Dewar vessel formed of walls of superconducting material surrounded and suspended by superconducting magnets. The superconducting walls shield the interior of the enclosure from external magnetic and electric fields, and the superconducting walls and corresponding magnetics act to cushion passengers or equipment within the enclosure from acceleration or gravitational forces. One or more accelerometers are preferably provided for sensing acceleration or gravity in each of the three orthogonal axes of the enclosure, and a control unit is also preferably provided for controlling the superconducting magnets of the enclosure responsive to output signals from the accelerometers.

15 Claims, 6 Drawing Sheets

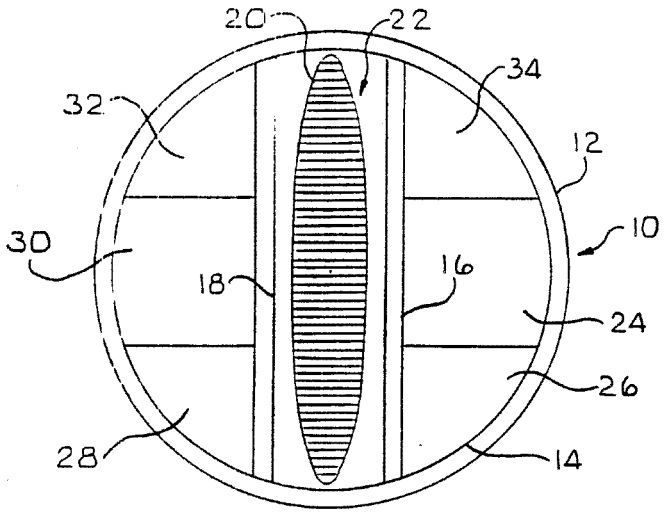
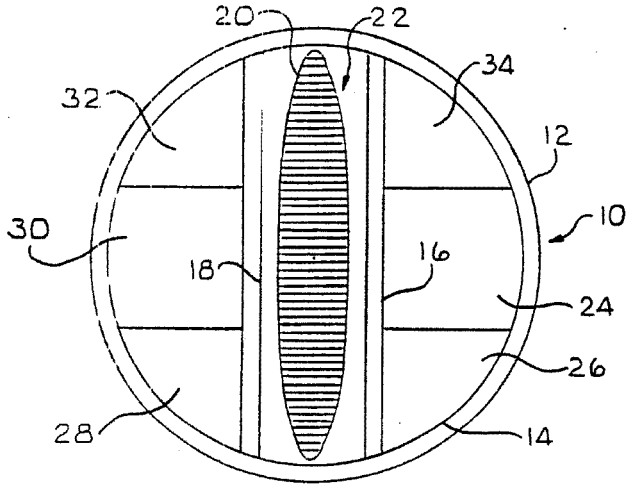


FIG. 1



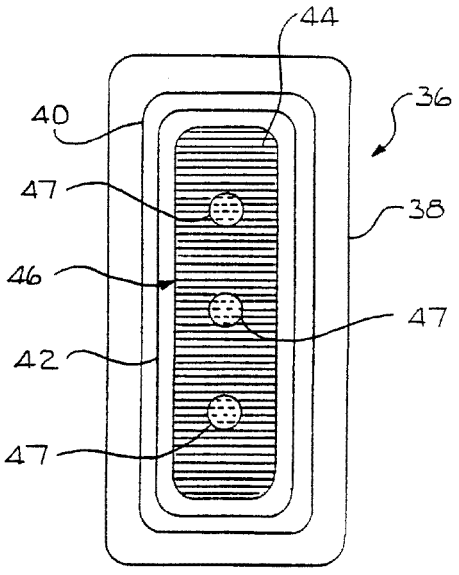


FIG. 2

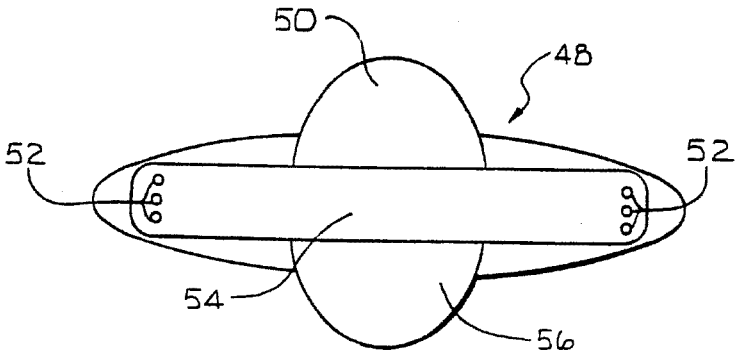


FIG. 3

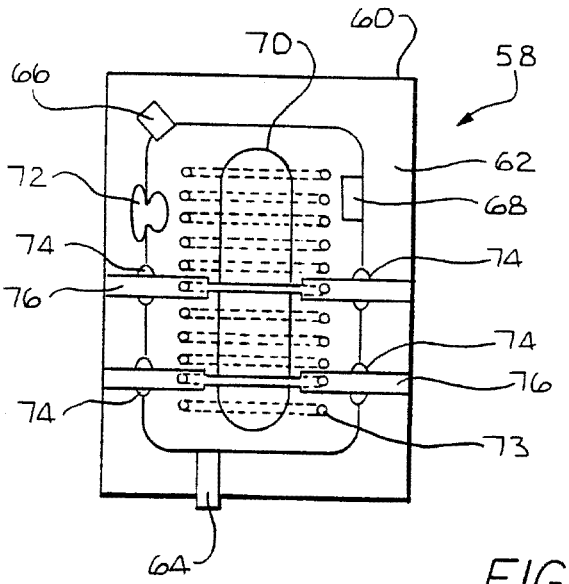


FIG. 4

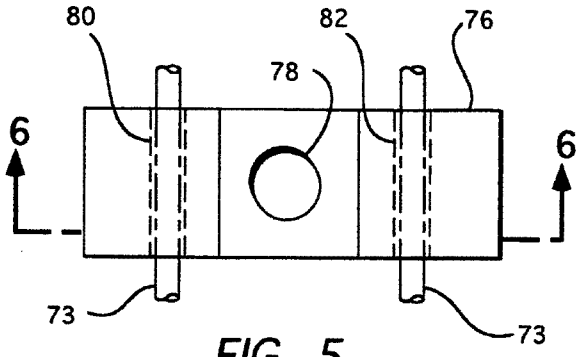
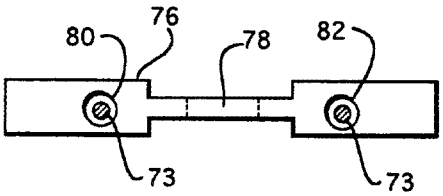


FIG. 5

FIG. 6



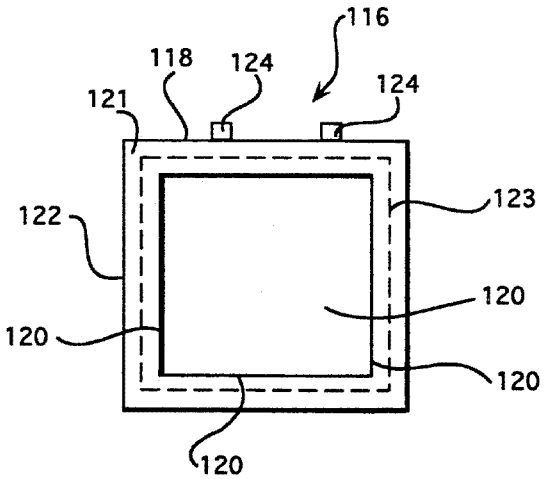
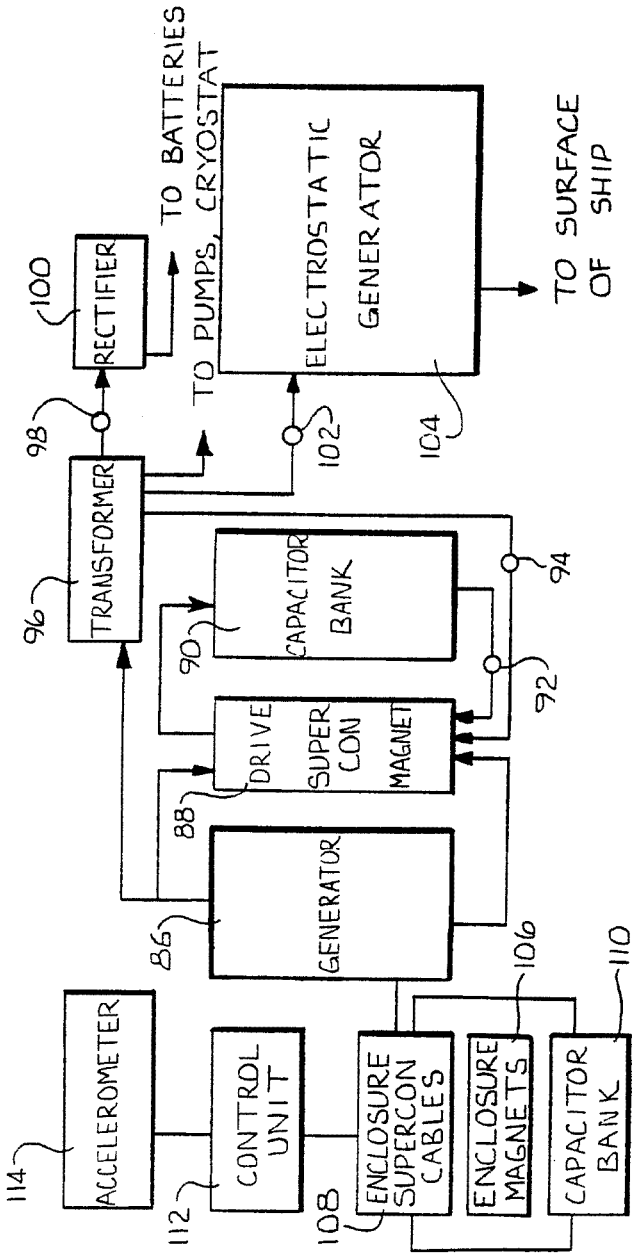


FIG. 8


TO BATTERIES
TO PUMPS, CRYOSTAT
TO SURFACE OF SHIP
ELECTROSTATIC GENERATOR
RECTIFIER
TRANSFORMER
CAPACITOR BANK
DRIVE
SUPER CON MAGNET
GENERATOR
ACCELEROMETER
CONTROL UNIT
ENCLOSURE SUPERCON CABLES
ENCLOSURE MAGNETS
CAPACITOR BANK
100
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110

FIG. 7

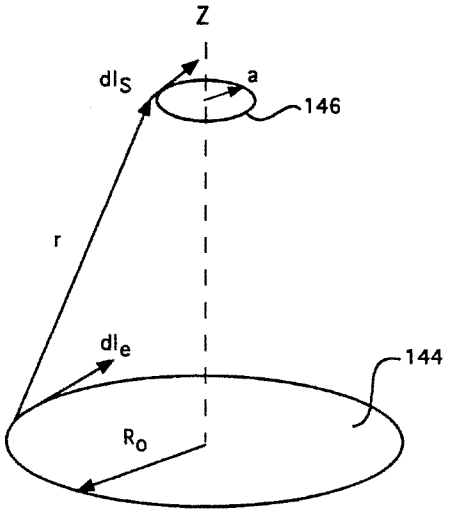

FIG. 13

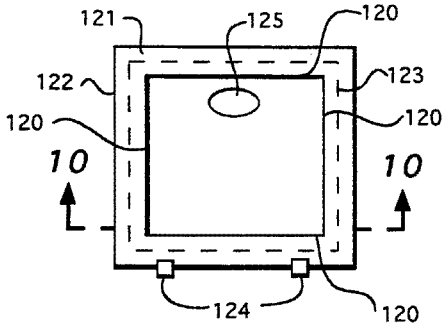

FIG. 9

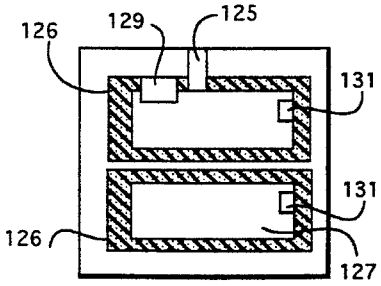

FIG. 10

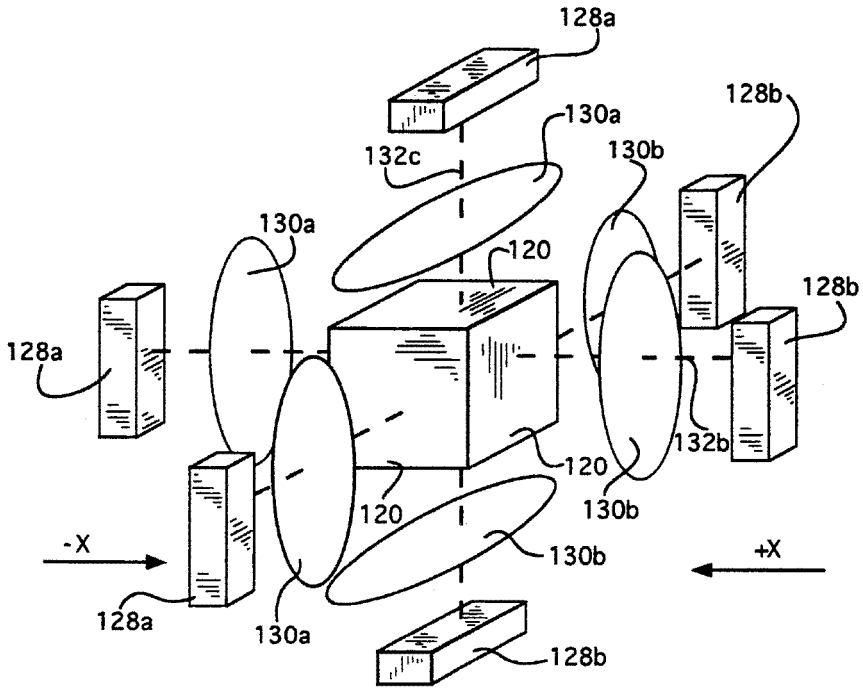
128a
128b
130a
132c
130b
130a
120
128b
128a
132b
120
130b
120
-X
+X
130b
128a
130a
128b

FIG. 11

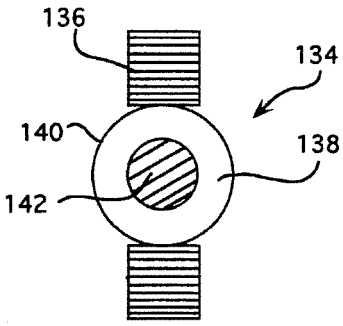
136
134
140
138
142

FIG. 12

PROTECTIVE ENCLOSURE APPARATUS FOR MAGNETIC PROPULSION SPACE VEHICLE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to space vehicles, and more particularly relates to a superconductor enclosure for a space vehicle having a magnetic propulsion system.

2. Description of Related Art

Proposals have been made for space vehicles with magnetic propulsion systems, such as for maintaining a spacecraft in orbit, or for launching a space vehicle from the surface of the earth. Such space vehicles would utilize coils or wires attached to the vehicle carrying a current to induce a magnetic field to interact with the earth's own magnetic field, to thereby propel the vehicle. One such proposal involves the use of superconductive material maintained in a temperature region at which superconductivity occurs. Thus, once current flow is established in the coil or loop, current will continue to flow in the superconducting material without requiring additional energy. A cryogenic cooling system may be employed to circulate supercooled fluid such as liquid helium adjacent to the superconductive material. In one proposal for a propulsion system for a space vehicle, interchanges of electromechanical energy with the magnetic field of the earth are used to produce electrical energy for utilization by the space vehicle, and to reduce kinetic energy.

Generally, the principal means of propulsion for such types of vehicles would be magnetic. The magnetic fields can be used for take-off and landing, or hovering at a fixed altitude. Conventional types of solid fuel or liquid fuel boosters may be used for added thrust, or for directional control. Another proposal for boosting thrust or attitude control of a space vehicle within the atmosphere envisions the creation of high electrostatic charges on the surface of the vehicle, on the order of from 25,000 to 1,000,000 volts, by means of an electrostatic generator, although even such large electrostatic charges are generally so weak that they are insufficient for thrust or directional control of a large space vehicle, and would be suitable for only small objects. However, such electrostatic charges may be useful in limited instances for thrust and directional control of a space vehicle, and such charges may be used in a spinning vehicle for communication. Since a spinning charged space vehicle can emit visible radiation, by varying the rate of spin, different frequencies of light might be used for communication, since the magnetic field of the moving space vehicle would be likely to interfere with standard radio communication. Such conventional drive systems and electromechanical and electrostatic systems used in conjunction with a superconducting magnet propulsion system can subject a crew or passengers of the vehicle to high acceleration. To produce the high currents necessary to propel a space vehicle, either a superconducting generator or an ordinary generator charging a bank of superconducting capacitors may be used. Such a magnetic propulsion system using superconducting cables can be expected to generate extremely high magnetic fields of, for example, 10–20 or higher teslas.

In order to protect a crew from the extremely powerful electric and magnetic fields developed in such magnetic and electrostatic systems, it would be desirable to

provide such a space vehicle with a protective enclosure that would screen out magnetic and electric fields. It would also be desirable for such an enclosure to protect passengers or crew within the enclosure from acceleration and gravitational forces, preferably in three orthogonal axes.

SUMMARY OF THE INVENTION

Briefly, and in general terms, the present invention provides for a protective enclosure for a space vehicle with a magnetic propulsion system. The protective enclosure formed by an insulated Dewar vessel surrounded on all sides by superconducting walls which shield the interior of the enclosure from external magnetic and electric fields. The superconducting enclosure is also surrounded by superconducting magnets which serve to cushion passengers or crew within the enclosure from acceleration and gravitational forces by inducement of eddy currents in the superconducting enclosure walls.

The apparatus of the invention accordingly provides for a protective enclosure apparatus having an insulated housing with three orthogonal axes and three corresponding pairs of orthogonal walls formed of superconducting material and superconducting magnets disposed adjacent to each of the walls of the housing. Generator means are provided for generating electric current through each of the superconducting magnets connected to the superconducting magnets, and means are preferably provided for sensing acceleration in each of the three orthogonal axes. Means are also preferably provided for controlling the generator means responsive to the means for sensing acceleration.

In one preferred form of the invention, the housing walls form a Dewar vessel to insulate the enclosure. An inlet for air and water, protective padding on the inner surfaces of the walls, and means for controlling the temperature within the enclosure are preferably provided to support an environment for a crew and passengers within the enclosure.

These and other aspects and advantages of the invention will become apparent from the following detailed description, and the accompanying drawing, which illustrates by way of example the features of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a spherical magnetic space vehicle with which the protective enclosure apparatus may be used;

FIG. 2 shows an oblong magnetic space vehicle with which the protective enclosure apparatus may be used;

FIG. 3 shows a disk shaped magnetic space vehicle with which the protective enclosure apparatus may be used;

FIG. 4 is a diagram of the superconducting magnet of the propulsion system of the magnetic space vehicle encased in a Dewar flask;

FIG. 5 is a top plan view of a yoke for securing a superconducting magnet;

FIG. 6 is a cross-sectional view of the yoke of FIG. 5 taken along line 6—6;

FIG. 7 is a schematic circuit diagram of the magnetic space vehicle and protective enclosure;

FIG. 8 is a side elevational view of the protective enclosure of the invention for use in a magnetic space vehicle;

FIG. **9** is a top plan view of the protective enclosure of FIG. **8**;

FIG. **10** is a cross-sectional view of the protective enclosure taken along line **10—10** of FIG. **9**;

FIG. **11** is a perspective view of the protective enclosure illustrating the orthogonal magnetic fields arrayed around the enclosure;

FIG. **12** is a cross-sectional view of a current control device for use with the magnetic drive of the space vehicle and the protective enclosure; and

FIG. **13** is an illustrative diagram of the magnetic fields of superconducting loops geometrically representing the magnetic relationship of the earth and a magnetic space vehicle.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

The intensity of magnetic and electric fields used in a magnetic propulsion system for a space vehicle, and the accelerative and gravitational forces within such a vehicle, with or without other types of solid fuel or liquid fuel boosters, or high electrostatic charges on the surface of the vehicle, can be dangerous to the health and safety of a crew or passengers in such a vehicle.

As is illustrated in the drawings, the invention is embodied in a protective enclosure apparatus for a space vehicle having a magnetic propulsion system, for shielding the contents of the enclosure from forces of acceleration and magnetic and electric fields generated outside the enclosure.

Three different representative types of magnetic propulsion space vehicles are illustrated in FIGS. **1-3**. One proposed magnetic space vehicle **10** having a round or spherical configuration is illustrated in FIG. **1**, and includes a hull **12** formed from steel or titanium, for example, and an inner wall **14**, also of steel or titanium, covered by a silicon shield. A thick silicon shield **16** can also be disposed around a Dewar vessel **18**, which could be formed from quartz glass, for example, which in turn contains superconducting cable windings **20** about the superconducting magnet **22**, which may be formed from room temperature superconductor material, or ordinary Nb_3Sn superconductor material or highly stressed alloys which are superconductive, for the magnetic drive. The central magnet can preferably be hollow, in order to help minimize the overall weight of the vehicle, and can preferably be constructed in the form of a closed prolate ellipsoid. However, the central magnet may also take the form of an open cylinder or tube with means for producing current on both the inside and the outside of the cylinder. A superconducting piston is placed in the superconducting cylinder, to create flux compression and increase the strength of the magnetic field. The space vehicle preferably would include a crew chamber **24**, including living quarters, computers, and the like, and a section **26** for a cryostat and pump system for maintaining a cryogenic state of superconductivity in the superconducting cables. The space vehicle may also include a chamber **28** for tanks for fuel or chemicals such as $Ca(MnO_4)_2$ and H_2O_2 for generating steam. A chamber **30** for a turbine and generator, or alternator and rectifier, and a compartment **32** for wiring and other circuitry for the superconducting magnet and other electrical devices may also be provided. The vehicle would also preferably contain one or more sections **34** for a ventilation system, including pumps for air, vents for air conditioning, and Na_2O_2 to remove CO_2 and add oxygen.

As is illustrated in FIG. **2**, another type of magnetic space vehicle **36** could also be oblong. Such a vehicle would also include an outer skin **38** of steel or titanium, for example, an inner wall **40** of steel or titanium, and a Dewar vessel **42**. The windings of superconducting cable **44** and the superconducting magnet **46** having cavities **47** for weight reduction are preferably contained within the Dewar vessel. The magnetic drive may alternately utilize a flux compression magnetic system. Crew compartments and chambers (not shown) for life support and propulsion systems, and the like may also be provided.

With reference to FIG. **3**, the magnetic space vehicle may also be a disk shaped magnetic space vehicle **48**, also containing a crew chamber **50**, and sections for superconducting cable windings **52**, room temperature superconductor magnet **54** or flux compression magnet, and a superconductor generator **56**, for example. As is illustrated in FIG. **4**, in each of the embodiments of FIGS. **1-3**, the superconducting magnet of the magnetic propulsion system is sealed in a generally cylindrical Dewar flask **58** which may for example have a housing **60**, which contains a spill reservoir **62** for liquid helium or nitrogen, which may be particularly necessary if flux compression is used, an inlet valve **64** for liquid helium or nitrogen, and an outlet valve **66** from the Dewar container to the spill reservoir. A heating element **68** is provided to permit termination of the superconducting state of the superconducting magnet **70**. A seal **72** is provided for the superconducting fluid around the superconducting cable **73**, along with seals **74** around yokes **76** holding the superconducting magnet, and seals (not shown) for conducting electricity from the generator to the coils surrounding the superconducting magnet, which may be made of conventional Nb_3Sn superconducting materials or alloys of vanadium or titanium or the like, or room temperature superconducting material, for example. The current in the cables and the magnets inside the sealed Dewar flask will continue as long as superconductivity in them is maintained. The central magnet or magnet tube is subjected to extremely high magnetic fields, such as 10–20 teslas, or possibly higher, produced by powerful currents around the superconducting magnet, which can be adjusted so that the magnetic field of the ship is repelled or attracted to the earth, or other magnetic body, such as another planet, the sun, or a star. The central magnet of the ship acquires north and south poles, like a bar magnet, repelling or attracting itself in relation to a magnetic body such as the earth, so that takeoff from a planet such as the earth can be accomplished from the North or South magnetic poles, or magnetic fault zones elsewhere.

To effect a descent through the magnetic field of the earth with such a magnetic propulsion system, the superconducting windings can be allowed to revert to an ordinary state of conductivity, so that the repulsive force of the drive can be used to slowly lower the craft. Alternatively, current could be withdrawn from the magnet while superconductivity was maintained, allowing induced eddy currents in the magnet to maintain the ship's position over a magnetic fault zone, for example, or allow for a steady, slow descent. To hover, an oscillating current can be carried by the coil surrounding the magnet, to induce an alternating current in the magnet. For planets without a sufficient magnetic field, extremely large superconducting plates, on the order of at least the size of a football field, could be placed on the

surface of the planet. In this case, an alternating current can be conducted through the magnet, and the induced eddy currents in the superconducting plate would repel the craft. Travel to other planets lacking a magnetic field may also be facilitated with solid or liquid fuel booster rockets, which could also be used for braking and lift-off from a planet's surface.

With reference to FIGS. **4**, **5** and **6**, an exemplary yoke **76** for securing a superconducting magnet includes an aperture **78** for receiving the superconducting magnet lengthwise, and channels **80** and **82** through the yoke for the windings of the superconducting cables **73** about the magnet shown in FIGS. **4**, **5** and **6**. A plurality of such yokes are preferably secured to the superconducting magnet, such as by bolts or welding, at the apertures of the yokes, and the end of the yokes are preferably attached to the surrounding housing structure of the ship, which is preferably constructed from steel or titanium.

Referring to FIG. **7**, illustrating the major components of the electrical circuitry of the magnetic space vehicle, the electrical system of the vehicle includes an electrical generator **86** for providing electrical current to the superconducting magnet cable windings **88**. To produce the high currents required for the magnetic propulsion system, the generator is preferably a superconducting generator, but an ordinary generator may also be used which charges a bank of superconductor capacitors **90**. The capacitor bank can be drained to set up currents in the magnet, while a smaller generator or batteries run the air conditioning system, pumps, valves and cryostat. Alternatively, an alternator and rectifier may also be used for generating electrical current. The generator can be powered by many sources, such as compressed or cryogenic gases (if room temperature superconductor material is used), nuclear power, or steam, such as may be generated from 60% or higher concentrations of H_2O_2 and $Ca(MnO_4)_2$. The capacitor bank is preferably electrically connected in parallel to the coils of the superconducting magnet of the propulsion system with an interrupter switch **92**. The superconducting magnet is also preferably connected through switch **94** to transformer **96**, which is electrically connected to the generator. The transformer may also be connected through switch **98** to a rectifier **100** for charging storage batteries. The transformer may also be connected through a switch **102** to an electrostatic generator **104** which may also be provided so that the magnetic space vehicle may use static electric charges on the surface of the vehicle for altering speed or altitude. By rotating or accelerating the vehicle, the electric charges on the surface of the vehicle would also emit electromagnetic radiation. Thus if the spin or acceleration of the vehicle were sufficient, the ship could emit visible light, or other spectra of detectable radiation.

To protect the crew of the magnetic space vehicle from the high magnetic and electrical fields generated by the vehicle, both the generator and the crew quarters are preferably shielded by a protective, superconducting enclosure, since the external electric and magnetic fields vanish inside a superconductor. Six superconducting magnets **106** are therefore preferably arranged in pairs about the protective enclosure and are preferably energized by the superconducting cables **108** electrically connected to the generator and/or superconducting capacitor bank **110** for the protective enclosure, operating to counteract gravity and acceleration. The current flow through the enclosure superconducting magnet pairs are preferably governed by a control unit **112** such as a computer which is interfaced with one or more accelerometers **114** which may be situated at various points in the ship for sensing acceleration in each of three orthogonal axes of the enclosure and which operate to generate output signals to the control unit indicative of the force of acceleration along each of the axes.

A protective enclosure for the crew is illustrated in greater detail in FIGS. **8-11**. It will be apparent that with minor modifications the enclosure may be adapted to shield a generator. Thus, it can be seen that in a preferred embodiment the protective enclosure apparatus or sarcophagus **116** is generally cubical, and includes a housing **118** preferably having superconducting walls **120**, preferably formed of a room temperature superconducting material, arrayed in pairs about three corresponding axes and surrounded on the bottom and four side walls by a Dewar container **121**, as shown in FIG. **8**. In one preferred form of the invention, the Dewar container is formed from five orthogonal pairs of inner and outer walls **122** and **123** encasing the bottom and four side walls **120** of superconducting material. It is preferable to use room temperature superconductor plates attached to all sides of the crew enclosure or sarcophagus, although ordinary superconducting material may also be used. Gravitational and accelerative forces are counteracted by induced eddy currents in the plates, which are repelled by superconducting magnets disposed around the plates. As is illustrated in FIG. **9**, the enclosure may include a lid separate from the Dewar vessel. The lid is preferably connected to the Dewar vessel on one side by having hinges **124** or a flexible cryogenic tube, and a protective padding such as a foam rubber cushion **126** is preferably provided along the inside of the inner walls of the enclosure. The enclosure may also include one or more subcompartments **127**. Insulation may also be provided between the Dewar flask and the compartment which the crew occupies. An air and water inlet or vent **125** through the housing may also be provided for the crew. A console **129** and a device for controlling temperature control, such as a heater and thermostat (**3**) may be provided as well. As is best schematically illustrated in FIG. **11**, superconducting walls of the enclosure **116** are surrounded by three pairs of superconducting magnets **128***a,b* disposed adjacent to the corresponding walls of the enclosure and electrically connected to the electrical current source such as the generator and/or the superconducting capacitor bank for producing three pairs of orthogonal magnetic fields **130***a*, **130***b* about the orthogonal axes **132***a,b,c*. Thus, for example, in the case of accelerative or gravitational force in the +"x" direction, the magnet located along the +"x" direction is turned off, and the magnet located along the −"x" direction is turned on. Thus, as the enclosure superconductor walls move in the −"x" direction, by inertia the superconducting magnet induces eddy currents in the superconducting walls which grow stronger as the separation between the edge of the sarcophagus at the −"x" side and the magnet decreases. While this system could not counteract the tidal forces near a black hole or a neutron star, this system creates an opposing force on the sarcophagus, so that the passengers and crew would feel only a slight force as the eddy current force counteracts the accelerative or gravitational force, under ordinary circumstances.

With reference to FIG. **12**, associated with the control unit are one or more current control devices **134**, preferably including an electromagnet **136**, a chamber **138** for carrying cryogenic liquid flow having a sleeve **140** preferably covered with a protective material such as Teflon, about the superconducting cable **142**, which may typically be formed of lead or tin. Ordinary superconductors lose their ability to carry current if a critical value of the external magnetic field is exceeded. The electromagnet provides this field. The control unit is thus electrically connected to the electromagnet, which can by energized to instantaneously control the flow of current through the superconducting cables of the protective enclosure, to increase or decrease the repulsion between the superconducting material of the enclosure walls and the enclosure superconducting magnets in response to accelerational or gravitational forces along the orthogonal axes of the enclosure, to cushion and maintain the position of the enclosure. It is not envisioned that the passengers or crew would need to occupy the sarcophagi for more than a few minutes, even if the magnetic space vehicle undergoes gentle acceleration. For operation in the atmosphere, lower currents may be utilized.

With reference to FIG. **13**, for purposes of determining the thrust force which may be generated by such a magnetic space vehicle, based upon takeoff from the North or South magnetic poles of the earth, it is possible to assume that the magnetic fields of both the earth and the space vehicle can be given by calculations for a circular loop of wire inside or around the earth having a magnetic field plane **144**, and a circular loop of wire inside the space vehicle having a magnetic field plane **146**. It can then be assumed that the magnetic field of the earth can be replaced by a solenoid of a length $2R_o$, where R_6 is the radius of the earth, and that the magnetic field of the ship can be replaced by a solenoid having a length $2a$, where the ship has a coil of a radius 'a'. The coils can be assumed to be situated so that the coil for the earth is a radius R_o above the xy plane of the earth at its near terminus and a radius R_o below the plane at its far terminus. The coil of the ship is similarly assumed to be located at a distance 'z' above (or below) the xy plane of the earth. It may be further assumed that the magnetic induction B, as applied to both coils, is simply a multiple of the induction for two circular loops. The total current in the earth, expressed as N_eI_e, the current in a solenoid with N_e turns, may be derived from Equation 1:

$$B_{ze}=(u_o/2)((R_o^2N_eI_e)/(R_o^2+z^2)^{3/2}) \qquad Eq.\ 1$$

where

$u_o=1.26\times10^{-6}$ henry/meter;

$R_o=6.37\times10^6$ meters;

m (mass of the ship)$=9.072\times10^4$ kg.;

B_{ze} (z component of the earth's magnetic field at the North or South pole)$=6.0\times10^{-5}$ teslas;

N_s (number of turns of cables in the ship's magnet)$=100$; and

I_s (ship's current)$=1.00\times10^{10}$ amps/turn.

Solving for the total current in the earth N_eI_e for $z=R_o$ gives $N_eI_e=1.716\times10^9$ amperes.

The mutual inductance M_{es} can be given by Equation 2, as follows:

$$M_{es}=(u_o/4\pi)\oint_e\oint_{s\,r}\vec{dl_e}\cdot\vec{dl_s} \qquad Eq.\ 2$$

where 'r' is the distance from a differential element of length of the earth solenoid (dl_e) to a differential element of length on the ship solenoid (dl_s). Although this can vary from R_o+a, to R_o-a, since $R_o>>a$, the distance from dl_e to dl_s is then given by r, where $r=(R_o^2+z^2)^{\frac{1}{2}}$. With this simplification, we have:

$$M_{es}=(u_o/4\pi r)\oint_e\oint_s\vec{dl_e}\cdot\vec{dl_s} \qquad Eq.\ 3$$

$dl_e\text{-}dl_s=p_ep_sdO_edO_s$ (using cylindrical coordinates), where $p_e=R_o$ and $p_s=a$. Hence, Equation 3 becomes:

$$R_oa\oint_e\oint_s d\phi_e\,d\phi_s=(4\pi^2R_oa) \qquad Eq.\ 4$$

Therefore,

$$M_{es}=(\pi u_oR_oa)/(R_o^2+z^2)^{\frac{1}{2}} \qquad Eq.\ 5$$

and for $z=R_o$, where $a=10$ meters,

$$M_{es}=2.799\times10^{-5}$$

Neglecting gravitational force, to calculate an approximate velocity of the ship, one can compute the force and integrate from R_o to infinity. The force is given by:

$$F=+(N_eI_e)(N_sI_s)\frac{(\delta M_{es})}{\delta z}$$

Thus the work is given by:

$$E=(N_eI_e)\,(N_sI_s)\,(M_{es})$$

Using Equation 6 and the values of N_s, I_s, $N_eI_e=1.716\times10^9$ amperes, and the result from Equation 5 that $M_{es}=2.799\times10^{-5}$, the work E is 4.803×10^{16} joules. From the equation for velocity,

$$v=(2E/m)^{\frac{1}{2}} \qquad Eq.\ 7$$

Thus, velocity can be approximated at 1.029×10^6 meters/sec, or 639 miles/sec. This is of course an optimal value, and in actual practice the value would be less, unless it is possible to create a magnetic space vehicle weighing less than 100 tons, or larger coils or multiple windings and higher currents are feasible.

It will be apparent from the foregoing that while particular forms of the invention have been illustrated and described, various modifications can be made without departing from the spirit and scope of the invention. Accordingly, it is not intended that the invention be limited, except as by the appended claims.

What is claimed is:

1. A protective enclosure apparatus for a space vehicle for shielding the contents of the enclosure from forces of acceleration and magnetic and electric fields outside the enclosure, said enclosure having three orthogonal axes, and comprising:

a) three pairs of orthogonal walls formed of superconducting material disposed about said three orthogonal axes;

b) three pairs of superconducting magnet means disposed respectively adjacent to each of said six orthogonal superconducting walls, and means for energizing said superconducting magnet means;

c) generator means electrically connected to said means for energizing said superconducting magnet means for generating a flow of electric current through said means for energizing said superconducting magnet means;

d) means for sensing accelerative forces in each of said three orthogonal axes and operative to generate an output signal indicative of said accelerative forces along each of said axes; and

e) means connected to said means for sensing accelerative forces for controlling said flow of electric current through said means for energizing said superconducting magnet means responsive to said output signal from said means for sensing accelerative forces to protect said contents of said enclosure from said accelerative forces.

2. The apparatus of claim **1**, wherein said enclosure is encased about five of said walls by a Dewar container.

3. The apparatus of claim **1**, wherein at least one of said walls includes a lid having an inlet for air and water.

4. The apparatus of claim **1**, further including protective padding on the inner surfaces of said walls.

5. The apparatus of claim **1**, further including means for controlling temperature within said enclosure.

6. The apparatus of claim **1**, wherein said generator means comprises a superconductor generator.

7. The apparatus of claim **1**, wherein said generator means comprises a generator with superconductor charging capacitors.

8. The apparatus of claim **1**, wherein said means for controlling said flow of electric current comprises a superconducting cable disposed within a chamber for carrying cryogenic fluid flow, with said superconducting cable and chamber being disposed within an electromagnet operatively connected to said means for controlling said flow of electric current to control superconductivity of said superconducting cable.

9. A protective enclosure apparatus for a space vehicle for shielding the contents of the enclosure from forces of acceleration and magnetic and electric fields outside the enclosure, said enclosure having three orthogonal axes, and comprising:

a) a housing having top, bottom, and four side walls formed of superconducting material disposed about said three orthogonal axes;

b) three pairs of superconducting magnets disposed respectively adjacent to each of said six superconducting walls, and superconducting cable windings around said superconducting magnets for energizing said superconducting magnets;

c) a Dewar vessel encasing said bottom and four side walls and having a lid for covering said top wall;

d) generator means electrically connected to said cable windings for generating a flow of electric current through said superconducting cable windings;

e) means for sensing accelerative forces in each of said three orthogonal axes and operative to generate an output signal indicative of said accelerative forces along each of said axes; and

f) means connected to said means for sensing accelerative forces for controlling said flow of electric current through said superconducting cable windings to control the energizing of said superconducting magnets responsive to said output signal from said means for sensing accelerative forces to protect said contents of said enclosure from said accelerative forces.

10. The apparatus of claim **9**, wherein said lid includes an inlet for air and water.

11. The apparatus of claim **9**, further including protective padding on the inner surfaces of said walls.

12. The apparatus of claim **9**, further including means for controlling temperature within said enclosure.

13. The apparatus of claim **9**, wherein said generator means comprises a superconductor generator.

14. The apparatus of claim **9**, wherein said generator means comprises a generator with superconductor charging capacitors.

15. The apparatus of claim **9**, wherein said means for controlling said flow of electric current comprises a superconducting cable disposed within a chamber for carrying cryogenic fluid flow, with said superconducting cable and chamber being disposed within an electromagnet operatively connected to said means for controlling said flow of electric current to control superconductivity of said superconducting cable.

* * * * *

Appendix E. COLLECTION OF UFO AIRFOILS FROM PATENT ART

US005881970A

United States Patent [19]

Whitesides

[11] Patent Number: 5,881,970

[45] Date of Patent: Mar. 16, 1999

[54] LEVITY AIRCRAFT DESIGN

[76] Inventor: Carl Wayne Whitesides, 18975 Symeron Rd., Apple Valley, Calif. 92307

[21] Appl. No.: 434,981

[22] Filed: May 4, 1995

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 54,017, Apr. 29, 1993, abandoned.

[51] Int. Cl.[6] B64C 29/04; B64C 15/02; B64B 01/36

[52] U.S. Cl. ..... 244/23 C; 244/23 D; 244/12.2; 244/52

[58] Field of Search ..... 244/23 R, 23 C, 244/52, 12.2, 12.5, 73 B, 23 D

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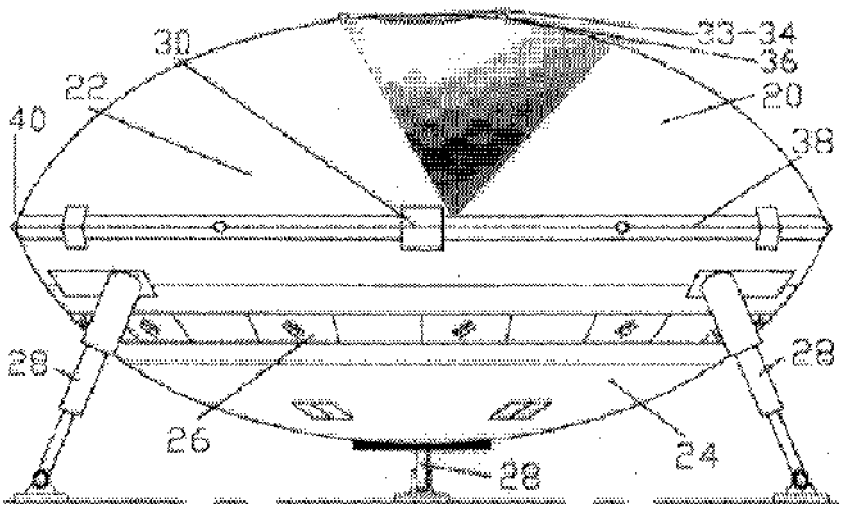
Primary Examiner—Verna Lissi Mojica

[57] ABSTRACT

An aircraft with automated means to transport. Spherical or one of its segments, without airfoils for lift or guidance. Means for flight are housed within the aircraft. The outermost surface is configured to disrupt the air-flow, over its surfaces, in flight. This, to reduce skin-friction and drag coefficients, and nullify heat build-up on the skins outer surfaces as speeds increase to and beyond mach 1. The weight of gas per unit volume, with temperature variations, is the means to reduce the gross-weight and adjust for temperature and weight changes during flight. Propulsion, within the propulsion component, is provided by turbojet engines. They are secured within an inner compression pod and an outer combustion pod. The compression pod and the attached vertical-air-duct, rotate through three hundred sixty degrees, as the means for directional guidance and direct thrust. Augmented power-thrust-tubes extend outward from the combustion pod to the mid-horizontal circumference of the aircraft. Control baffles, on each thrust-tube, check, deflect and regulate the engines' thrust to control the motivity of the aircraft. Struts retract for flight and are extended for landing. These electro-hydraulic struts, level, raise and lower the aircraft for direct ground level support operations. The aircraft has the means to maintain a horizontal flight attitude. For flight aptness the aircraft has an internal, mechanical and scientific means, for vertical ascent and vertical descent without horizontal motivity, to hover and maintain a position and altitude. And during horizontal flight, climb and descend, and perform heading changes. These flight means are all performed in the aircrafts' horizontal attitude.

14 Claims, 5 Drawing Sheets



US005836543A

United States Patent [19]

Kunkel et al.

[11] Patent Number: 5,836,543

[45] Date of Patent: Nov. 17, 1998

[54] **DISCUS-SHAPED AERODYNE VEHICLE FOR EXTREMELY HIGH VELOCITIES**

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[73] Assignee: **Klaus Kunkel**, Ratingen, Germany

[21] Appl. No.: **666,581**

[22] PCT Filed: **Oct. 16, 1995**

[86] PCT No.: **PCT/DE95/01430**

§ 371 Date: **Aug. 1, 1996**

§ 102(e) Date: **Aug. 1, 1996**

[87] PCT Pub. No.: **WO96/14504**

PCT Pub. Date: **May 17, 1996**

[30] **Foreign Application Priority Data**

Nov. 2, 1994 [DE] Germany 44 39 073.4

[51] **Int. Cl.**[6] **B64C 15/12**; B64C 30/00

[52] **U.S. Cl.** ..... **244/12.2**; 244/12.3; 244/12.4; 244/23 B; 244/23 C

[58] **Field of Search** ..... 244/6, 7 R, 12.1, 244/12.2, 12.3, 12.4, 23 B, 23 C, 74; 60/39.461, 205

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Journal of Spacecraft and Rockets, Bd. 19, Nr. 4, 294–306.

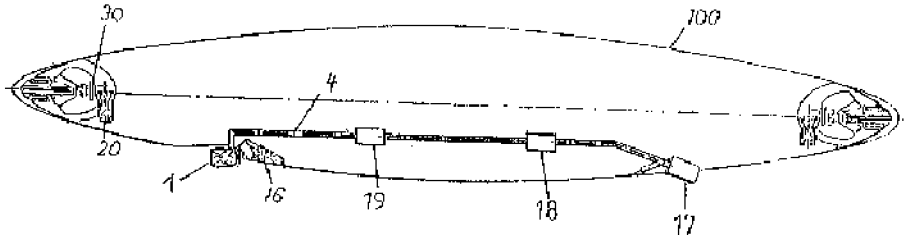
Primary Examiner William Grant

Attorney, Agent, or Firm—Herbert Dubno

[57] **ABSTRACT**

A discus-shaped aircraft is provided with a peripheral jet arrangement for generating lift and, in the bottom of the aircraft, at least one rocket engine supplied with silicon hydride and compressed air and operated under conditions in which the silicon hydride is reacted with nitrogen of the compressed air to form silicon nitride while the nitrogen of the silicon hydride compounds reacts with oxygen to form H_2O.

14 Claims, 2 Drawing Sheets



US005653404A

United States Patent [19]

Ploshkin

[11] **Patent Number: 5,653,404**

[45] **Date of Patent: Aug. 5, 1997**

[54] **DISC-SHAPED SUBMERSIBLE AIRCRAFT**

[76] Inventor: **Gennady Ploshkin**, 5987 Chippewa Rd., R.R. #5, Duncan, B.C., Canada, V9L 4T6

[21] Appl. No.: **422,897**

[22] Filed: **Apr. 17, 1995**

[51] Int. Cl.[6] **B64C 29/00**; B64C 11/46; B64C 27/10

[52] U.S. Cl. ..... **244/12.2**; 244/15; 244/23 C; 244/69; 244/73 C; 244/91

[58] Field of Search ..... 244/12.2, 12.4, 244/12.5, 15, 23 R, 23 B, 23 D, 67, 69, 73 C, 91, 23 C; 119/312, 337, 338

[56] **References Cited**

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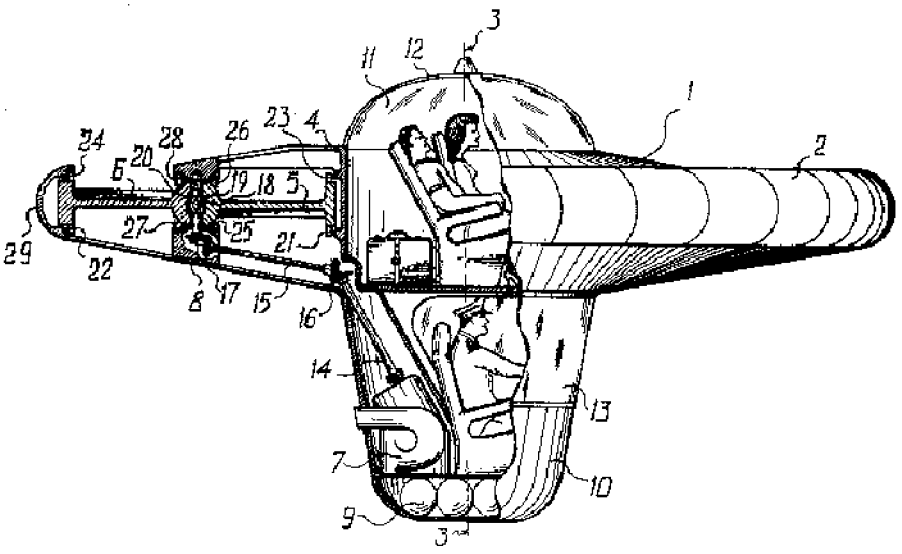
Primary Examiner—Andres Kashnikow
Assistant Examiner—Virna Lissi Mojica
Attorney, Agent, or Firm—Thomas W. Secrest

[57] **ABSTRACT**

An aircraft of disc-shaped configuration provides the capability of vertical take-off and landing; straight horizontal flight; and three-dimensional maneuverability in the air by means of a plurality of counter-rotating lifting rotors assembled of fixed pitch or of self-adjusting pitch aerofoil blade elements; and, submersibility of the aircraft in water is achieved by means of a marine propulsion module using two counter-rotating hydrofoil rotors for up or down thrust, and a tunneled conventional marine propeller for horizontal travel. The marine propulsion module is detachable for emergency and for use with the main frame aircraft of a variety of other detachable modules for different tasks and missions. Exceptionally adaptable for any existing power plant, including nuclear, it is best suited for the environment-friendly types, like integrated steam motor on hydrogen and oxygen burning. The simplicity of the design and its mechanical efficiency are combined with several novel safety features, while displaying an attractive technological continuity for any conventional aircraft manufacturer. The downstream of air from the lifting rotors utilized for maneuvering by a system of vanes positioned below the rotors.

86 Claims, 11 Drawing Sheets



US005520565A

United States Patent [19]

Ulysse

[11] Patent Number: 5,520,565

[45] Date of Patent: May 28, 1996

[54] **TOY FLYING DISC**

[76] Inventor: **Clark Ulysse**, 6930-54th Ave. No., #201, Crystal, Minn. 55428

[21] Appl. No.: **401,624**

[22] Filed: **Mar. 9, 1995**

[51] **Int. Cl.**[6] **A63H 27/00**; A63H 27/127

[52] **U.S. Cl.** ..... **446/46**; 446/36; 446/61; 244/23 C; 244/154; D12/335; D12/325; D21/85

[58] **Field of Search** ..... 446/46, 47, 48, 446/34, 36, 61, 66; 244/12.2, 23 C, 34, 39, 153 R, 154; D12/335, 325; D21/85, 86, 82

[56] **References Cited**

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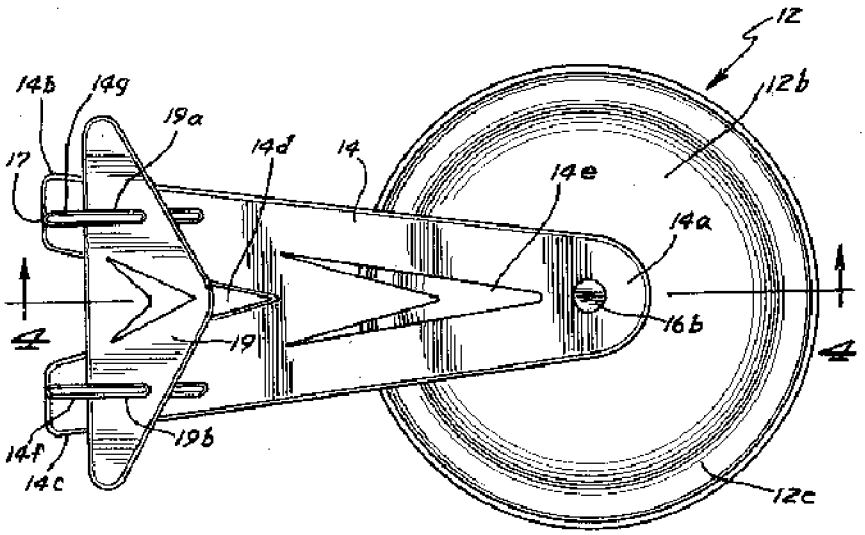
Primary Examiner—Mickey Yu
Assistant Examiner—D. Neal Muir
Attorney, Agent, or Firm—Leo Gregory

[57] **ABSTRACT**

A flying toy disc with a pivoted fuselage, the disc flying spinning in flight upon being thrust with a forward spinning motion, the disc having a particular transverse configuration which taken with the pivoted fuselage tends to stabilize the flight of the disc by having air streams co-act upon the lower and upper surface of the disc to stabilize the flight.

3 Claims, 2 Drawing Sheets



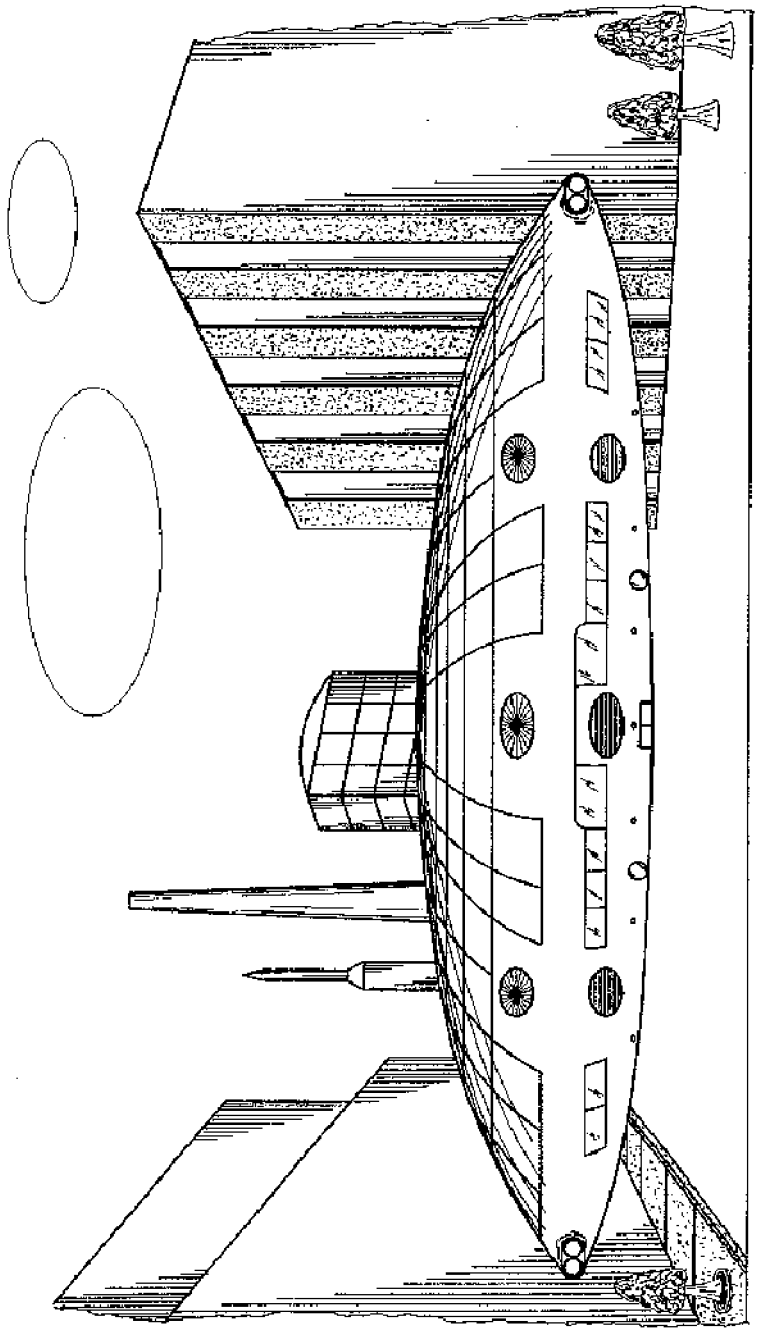


FIG. 1

US005344100A

United States Patent [19]

Jaikaran

[11] Patent Number: 5,344,100

[45] Date of Patent: Sep. 6, 1994

[54] VERTICAL LIFT AIRCRAFT

[76] Inventor: Allan Jaikaran, 136 Crest Camp, Fyzabad, Trinidad and Tobago

[21] Appl. No.: 18,101

[22] Filed: Feb. 17, 1993

[51] Int. Cl.[5] B64C 39/06

[52] U.S. Cl. ..... 244/12.2; 244/23 C

[58] Field of Search ..... 244/12, 23 A, 23 B, 244/23 D, 56; 384/616, 613, 620, 585

[56] References Cited

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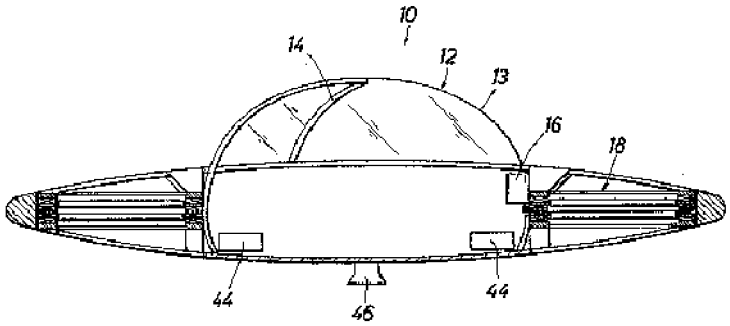
Primary Examiner—Galen L. Barefoot

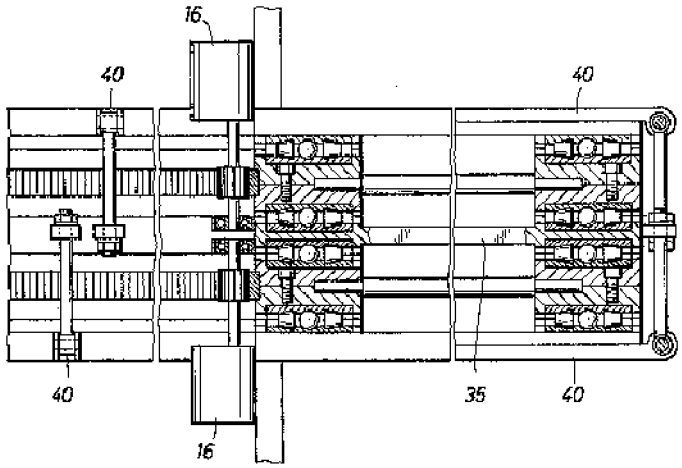
Attorney, Agent, or Firm—Gunn & Kuffner

[57] ABSTRACT

A vertical lift aircraft includes a central cabin and a set of concentric, circular, counter-rotating power blade assemblies. Gas turbine engines located in the central cabin provide power for rotating the power blade assemblies to cause lift and motion of the aircraft. The turbine engine exhaust gases are directed through a rotatable exhaust nozzle for aiding in the thrust and momentum of the aircraft. The gas turbine engines drive electric power generators which provide the necessary power for operation of the aircraft.

6 Claims, 5 Drawing Sheets





US005170963A

United States Patent [19]

Beck, Jr.

[11] Patent Number: 5,170,963

[45] Date of Patent: Dec. 15, 1992

[54] VTOL AIRCRAFT

[75] Inventor: August H. Beck, Jr., San Antonio, Tex.

[73] Assignee: August H. Beck Foundation Company, San Antonio, Tex.

[21] Appl. No.: 764,806

[22] Filed: Sep. 24, 1991

[51] Int. Cl.[5] B64C 29/02

[52] U.S. Cl. ..... 244/12.2; 244/23 C; 244/73 C

[58] Field of Search ..... 244/12.2, 236, 23 C, 244/34 A, 73 C

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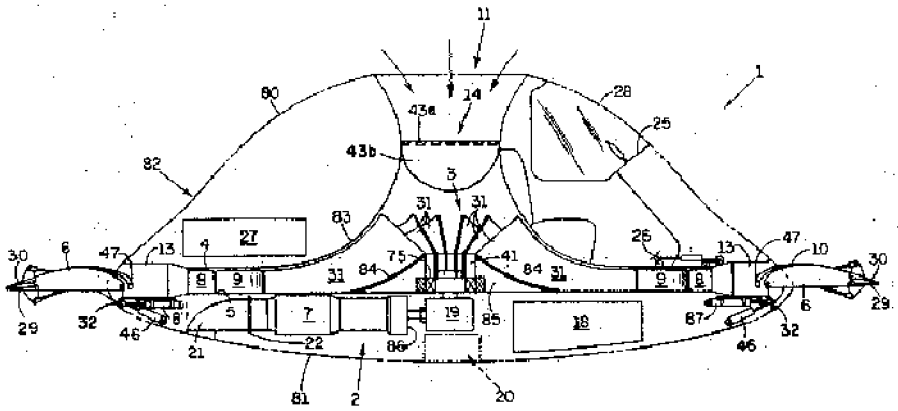
2540659	3/1977	Fed. Rep. of Germany	244/23 C

Primary Examiner—Galen Barefoot
Assistant Examiner—Virna Lissi Ansley
Attorney, Agent, or Firm—Charles W. Hanor

[57] ABSTRACT

The present invention provides a vertical takeoff and landing aircraft vehicle in which a ducted fan with upwardly directed inlet discharges air generally horizontally across a segmented circular wing. Said wing segments are individually controllable in pitch and each includes a spoiler and split flaps to increase effectiveness and sensitivity in lifting and controlling the aircraft. Directional stability and thrust for horizontal movement is provided by controls directing different proportions of total airflow to the various segments around the aircraft and varying the direction of said airflow both radially and vertically. Power failure protection is provided by means for maintaining free rotation of the fan until needed to provide lift at touchdown.

13 Claims, 8 Drawing Sheets



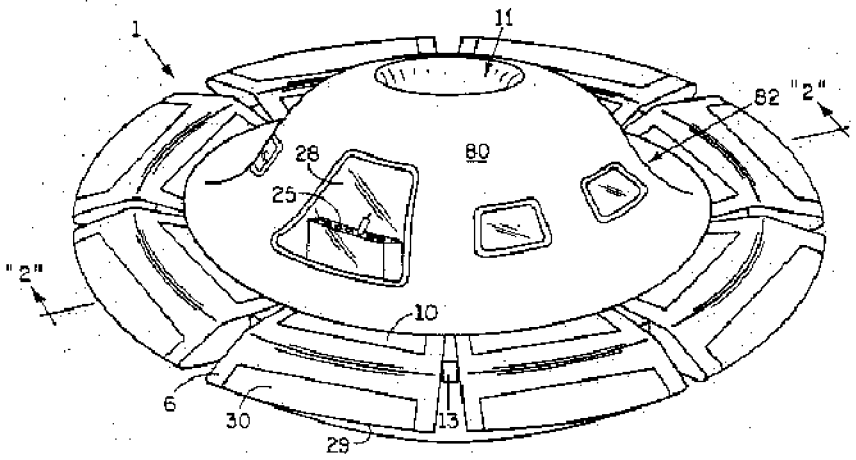


FIG. 1

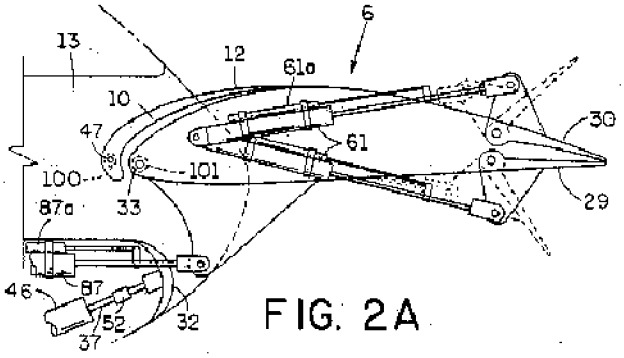


FIG. 2A

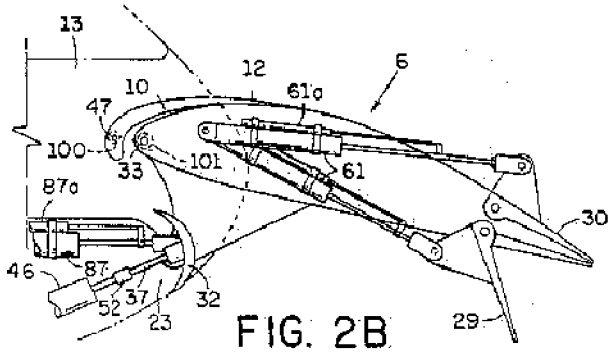


FIG. 2B

US005152478A

United States Patent [19]

Cycon et al.

[11] Patent Number: 5,152,478

[45] Date of Patent: Oct. 6, 1992

[54] **UNMANNED FLIGHT VEHICLE INCLUDING COUNTER ROTATING ROTORS POSITIONED WITHIN A TOROIDAL SHROUD AND OPERABLE TO PROVIDE ALL REQUIRED VEHICLE FLIGHT CONTROLS**

[75] Inventors: **James P. Cycon**, Orange; **Kenneth M. Rosen**, Guilford; **Andrew C. Whyte**, Norwalk, all of Conn.

[73] Assignee: **United Technologies Corporation**, Hartford, Conn.

[21] Appl. No.: **526,092**

[22] Filed: **May 18, 1990**

[51] **Int. Cl.**[5] **B64C 29/00**; B64C 39/06

[52] **U.S. Cl.** **244/12.2**; 244/26; 244/17.11

[58] Field of Search ..... 244/12.2, 23 C, 26, 244/17.23, 17.11; 416/128, 129

[56] **References Cited**

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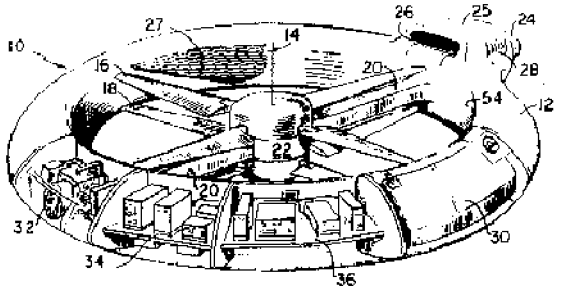
Primary Examiner—Galen Barefoot

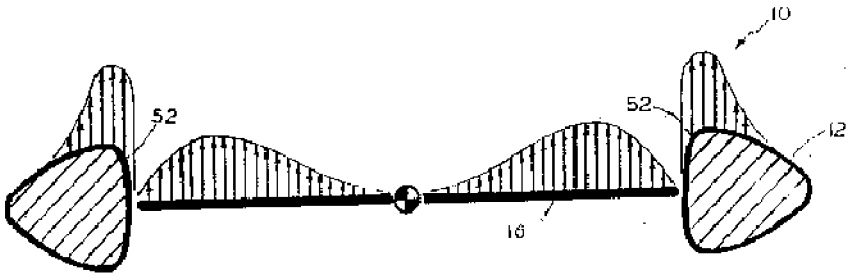
Attorney, Agent, or Firm—Vernon F. Hauschild

[57] **ABSTRACT**

An unmanned flight vehicle wherein two counter-rotating rotors are positioned within a toroidal fuselage and in which rotor pitch solely is utilized to generate all required lift, pitch, roll, yaw and vibration and stress control for the vehicle.

17 Claims, 8 Drawing Sheets





United States Patent [19]

Wright et al.

[11] Patent Number: 4,778,128

[45] Date of Patent: Oct. 18, 1988

[54] **FLYING DISC AIRCRAFT**

[76] Inventors: **Herbert H. Wright; Marcus A. Wright**, both of 6415 Cabin Branch Ct., Capital Hts, Md. 20743

[21] Appl. No.: 836,418

[22] Filed: Mar. 5, 1986

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 723,723, Apr. 17, 1985, abandoned, which is a continuation of Ser. No. 430,707, Sep. 30, 1982, abandoned.

[51] Int. Cl.[4] B64C 39/06

[52] U.S. Cl. ..... 244/23 C; 244/52

[58] Field of Search ..... 244/23 R, 23 C, 12.2, 244/34 A, 52

[56] **References Cited**

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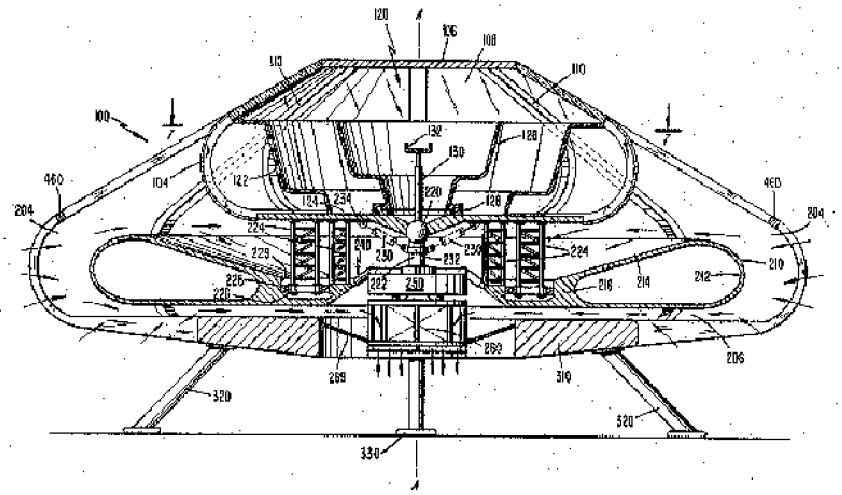
Primary Examiner—Sherman D. Basinger
Assistant Examiner—Rodney Corl
Attorney, Agent, or Firm—Wigman & Cohen

[57] **ABSTRACT**

A flying disc aircraft includes a symmetrical body housing pilot and/or passenger seating apparatus above, a thrust-generating apparatus below, and a rotation inertia disc located therebetween. The disc rotates within the body in a plane normal to the axis of symmetry, and provides inertial stability for the aircraft through a gyroscopic effect. Directional control is achieved by means of mechanical linkage elements connecting a control stick at the pilot seating apparatus with the thrust-generating apparatus, the linkage allowing the pilot to orient the thrust at various angles relative to the aircraft axis of symmetry. Lift occurs when ambient air is induced, by virtue of the thrust-generating apparatus, to flow over the disc. In an alternate embodiment, lift is generated by the thrust-generating apparatus, and a shroud located beneath the apparatus is employed for redirecting resulting thrust to therefore facilitate directional control of the aircraft.

15 Claims, 7 Drawing Sheets



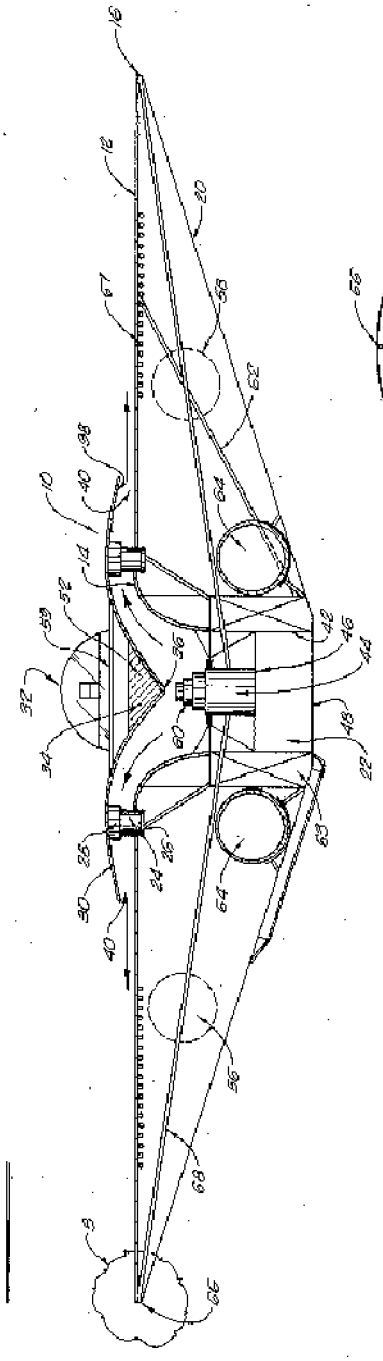


FIG. 1

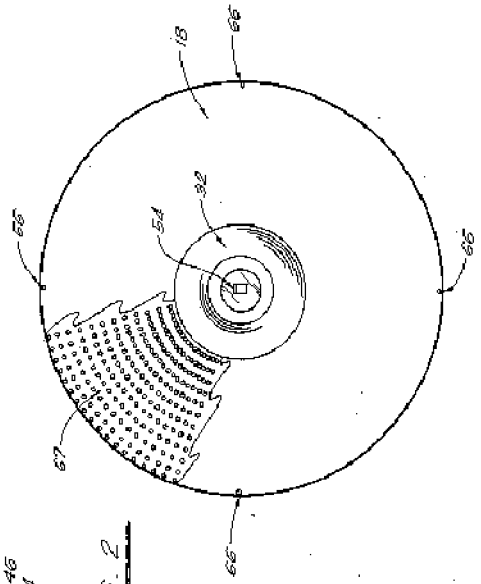


FIG. 2

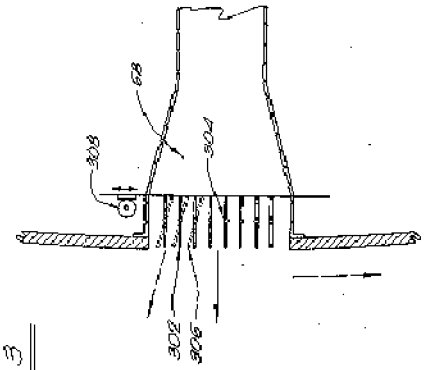


FIG. 3

F. Collection of other possible drive systems of interest

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JET ATOMIC SYSTEM

Filed July 15, 1955 3 Sheets-Sheet 1

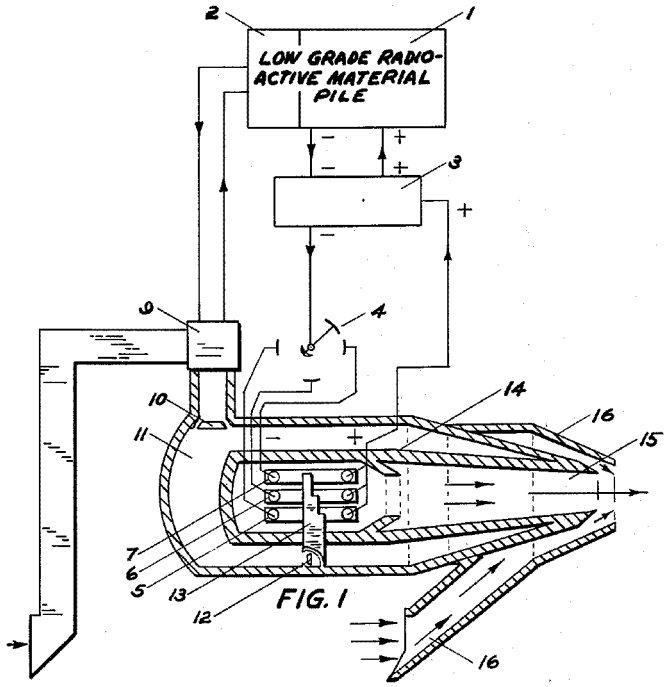

FIG. 1

INVENTOR, Bonnie Smith Jr

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JET ATOMIC SYSTEM
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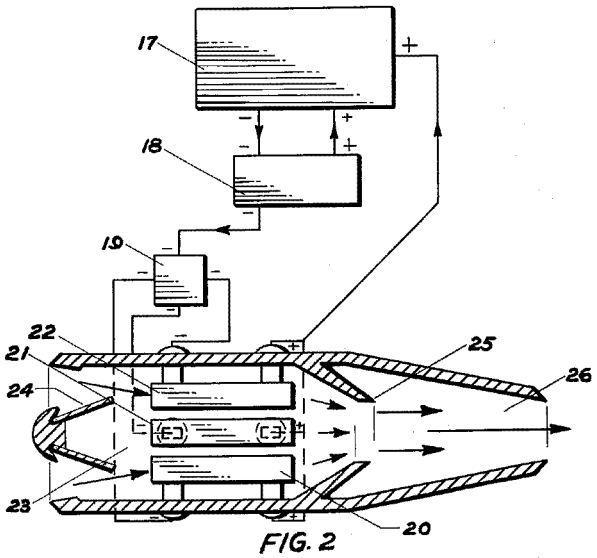

FIG. 2

INVENTOR, Bonnie Smith Jr.

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Filed July 15, 1955 3 Sheets-Sheet 3

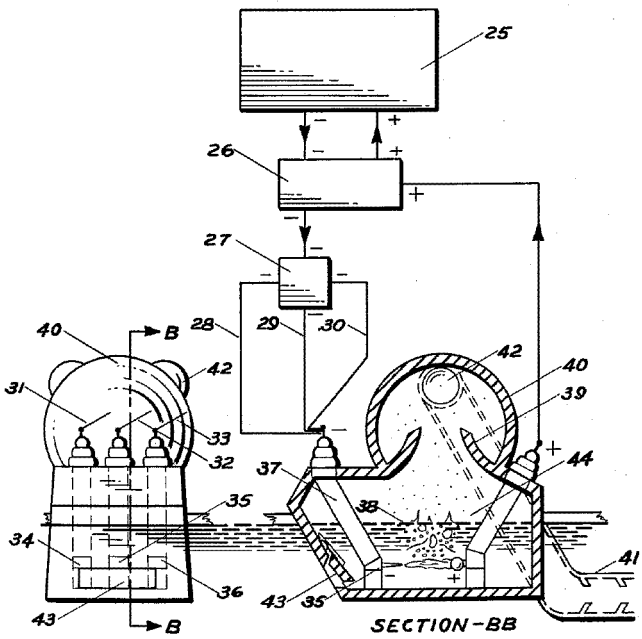

FIG. 3

INVENTOR, Bonnie Smith Jr.

April 2, 1963 W. C. BROWN 3,083,528

MICROWAVE ENGINES

Filed May 12, 1959 2 Sheets-Sheet 1

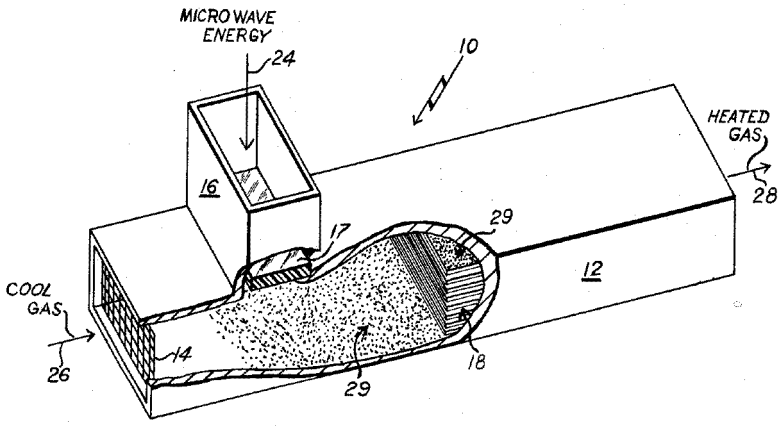

FIG. 1

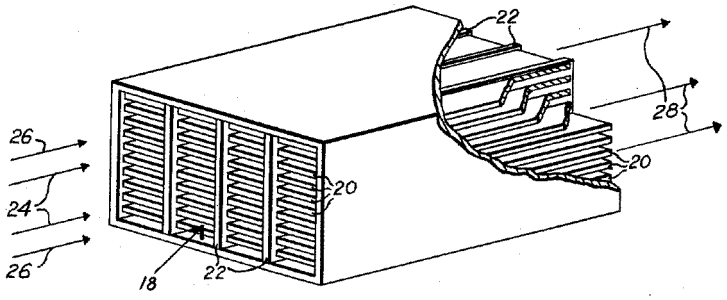

FIG. 2

INVENTOR
WILLIAM C. BROWN
BY H. Vincent Harsha
ATTORNEY

April 2, 1963 W. C. BROWN 3,083,528

MICROWAVE ENGINES

Filed May 12, 1959 2 Sheets-Sheet 2

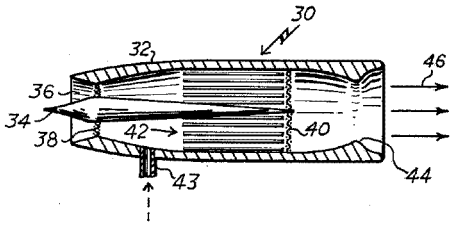

FIG. 3

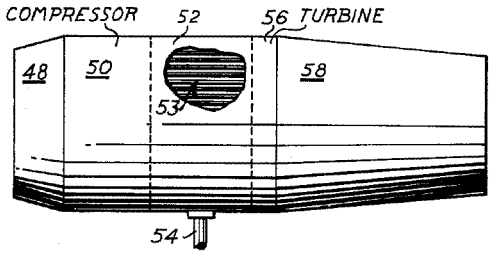

FIG. 4

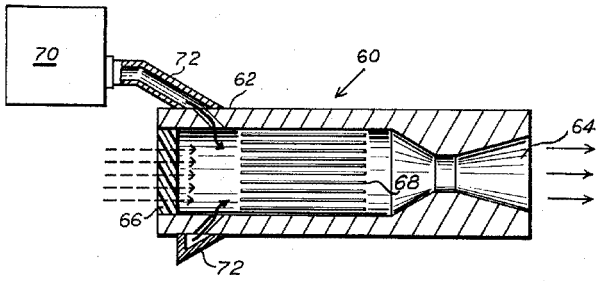

FIG. 5

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MICROWAVE ENGINES

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3 Claims. (Cl. 60—35.5)

This invention pertains generally to engines, and more particularly to engines adapted to be energized by means of microwave energy. The term "engine" is employed in the broad sense herein, and is intended to refer to any machine or apparatus by means of which physical power is applied to produce a physical effect, as, for example, in the utilization of radiant energy to produce a physical force. While the description that follows is directed primarily to jet engines for aircraft, space vehicles and the like, it will be understood that the jet engine is merely exemplary of the several forms which the apparatus of the present invention may take.

In general, there are two broad types of jet engines. One of these provides a propulsive jet consisting of highly heated, compressed atmospheric air usually admixed with the products of the combustion produced by the burning of a fuel in the air, with the thermal energy of the fuel being employed to raise the air temperature to the desired value. This type of jet engine is usually referred to as an air-breathing or thermal jet engine. In the other type of engine there is also a propulsive jet formed by generating large quantities of high-pressure, high-temperature gases, but this latter type of jet is the result of a chemical reaction which does not utilize atmospheric air, with both the fuel and an oxidizer therefor being carried as propellants in tanks or the like associated with the engine. This latter type of engine is the rocket engine.

As is well known, the air-breathing jet engines are generally classified as either ramjet, turbojet (closed or open cycle) or pulse jet. The first of these three types is the simplest, since it needs few, if any, moving parts. The simple ramjet depends upon motion through the atmosphere to force air through the inlet and into the diffuser section where the air is compressed preparatory to its combination with a suitable fuel in the combustion chamber. The hot gases produced by the combustion then flow through a suitable exhaust nozzle where they are expanded and finally discharged into the surrounding atmosphere to provide the desired propulsive thrust. The open-cycle turbojet engine differs from the ramjet in that the exhaust gases drive a turbine which, in turn, drives an air compressor for compressing the air introduced into the combustion chamber, and as a result the turbojet does not primarily rely on velocity relative to the surrounding atmosphere in order to achieve operation. In the closed-cycle turbojet engine a suitable gas in confined in a closed circuit including a compressor, a heat exchanger and a turbine, and shaft power from the turbine drives both the ingine compressor and a propulsion compressor (or a suitable propeller means in non-jet vehicles) communicating with the atmospheric air. The pulse jet differs from the ramjet in the main in the fact that the pulse jet is characterized by intermittent firing as opposed to the continuous firing of the ramjet.

With respect to rocket engines, there are two basic types, viz., those employing liquid propellants and those employing solid propellants.

As is evident, one or another of the aforementioned jet engines may be modified in such manner that the exhaust jet therefrom actuates a turbine having a rotary shaft output, instead of directly serving as a reaction stream propulsion means. With such a rotary shaft output from the engine, propulsion may be effected by means of a

propeller or the like attached to the rotary output shaft.

Irrespective of the particular one of the several aforementioned types of engines that one may choose to employ, in each such choice one must be prepared to supply a sufficient amount of fuel to be carried along with the engine in the craft which it is to propel, so that propulsive energy may be exerted throughout the intended power portion of the flight span of such craft. In the case of the air-breathing engines, all that need be supplied as an appropriate fuel for burning in the atmospheric air that is taken into the engine for the combustion process, while the rocket engines require the carrying of both a fuel and an oxidizer therefor. It is evident that these requirements place a limitation upon the operation and effectiveness of any craft which is to be propelled by such engines, whether for military or other purposes, since not only is the maximum time of continuous operation thereof limited by the amount of fuel or other propellants carried on board the craft, but the very fact that such fuel must be carried is effective in limiting the maximum range and operation time of such craft in view of the additional weight factor imposed by the presence of such fuels. In addition, a reduction of fuel weight would also permit a greater payload for a given total weight of the vehicle.

The utility of an aircraft, space vehicle or the like which is capable of sustained flight over an indefinitely long period of time without employing a local fuel supply is evident, the applications therefor are numerous. For example, a vehicle capable of perpetual operation (except for mechanical failure) and stationed in space above the surface of the earth, either within or without the atmosphere thereof, may perform alarm and surveillance tasks by radar techniques, along with guidance and protection of defense vehicles, and may simultaneously provide long-haul broadband communications. Systems of such vehicles or platforms may be established to provide radar and communication networks.

These desired operational characteristics are provided by a vehicle driven by the engine of the present invention, which engine is energized by means of transmitted microwave electromagnetic energy that is beamed toward the vehicle. The engine converts the microwave energy incident upon the vehicle into appropriate mechanical forces which produce the desired flight operation of the vehicle. The advantages attendant the utilization of microwave energy, in contrast to electromagnetic energy of other wavelengths, are readily apparent. Microwaves have been generally defined as radio waves whose wavelength is less than 30 centimeters, with a lower wavelength limit on the order of one millimeter or one centimeter sometimes being applied to what is called "the microwave region." The superiority of microwaves is due in part to the fact that it is generally necessary to focus the transmitted energy so as to achieve a desirably high power density at a remote point or area with respect to a given generator or transmitter power level. In accordance with the laws of optics, the sharpness of the beam produced by an antenna varies as the ratio of antenna dimensions to the wavelength of the transmitted energy. Thus, for a given or desired power density or beam sharpness, a decrease in wavelength of the transmitted energy permits a corresponding decrease in the dimensions of the antenna. From the standpoint of mechanical convenience, it is generally desirable to employ small antennas and other components, and it is therefore advantageous to employ energy of very short wavelength. In addition, the difficulties encountered in relatively long wave transmission as a result of natural and man-made interference or noise (which noise would interfere with the transmission of radar or communications intelligence via the micro-

wave power beam) do not occur with any appreciable significance at microwave frequencies. Also, where the space vehicle is to be operated at an altitude above the ionosphere, long wave transmission will generally be reflected by the reflecting layers thereof, while microwaves pass through such layers substantially unaffected.

In view of the several advantages stated above, it might appear desirable to employ the shortest wavelength possible commensurate with the power-generating capabilities of the transmitter at the wavelength chosen. A lower limit is fixed, however, for the wavelength that may be used in a practical radiating system in view of the increasing losses due to absorption occurring in the atmosphere at wavelengths below five to ten centimeters. In the one to two centimeter region there is a peak in absorption by water vapor, and even for dry air the absorption of electromagnetic energy increases very rapidly below one or two centimeters. It may thus be seen that microwaves in a region having the approximate bounds of two and thirty centimeters are readily adaptable to convenient radiation of energy to a remote point with small transmission loss, with the preferred wavelengths being of the order of five or ten centimeters in order to accomplish efficient focusing with a transmitting lens system of reasonable size without inflicting an intolerable power loss by absorption.

The key to the practical utilization of high-power electromagnetic beams for remote energization of the propulsion engine in aircraft, space vehicles and the like is a device which will generate large amounts of power within this wavelength region. In addition, many applications of such high-power beams require such refinements as broad electronic bandwidth and low phase distortion, placing the additional requirement of sophisticated performance on the high-power generator. A device which currently satisfies the dual requirements of high power output and refined performance is the Amplitron tube, a relatively new type of crossed-field vacuum tube which may be used as a compact, highly efficient, broadband amplifier capable of handling high peak and average powers, and which generally comprises a circular but non-reentrant, dispersive network matched at both ends over the frequency region of interest, and a reentrant electron beam originating from a continuously-coated (or nearly so) cathode coaxial with the network, with a D.C. potential being applied between the cathode and anode, and a magnetic field applied parallel to the axis of the cathode and transverse to the electric field between the anode and the cathode. For a more complete description of the Amplitron, reference may be had to my United States Letter Patent 2,933,723, issued April 19, 1960 for "Low Level Duplexer System." Amplitrons currently available are capable of producing 15 or 20 kilowatts of average radio-frequency power in the neighborhood of ten centimeters in wavelength, and future models are expected to yield 500 kilowatts or more average power, wtih 50 megawatt peak power.

Accordingly, it is a primary object of the present invention to provide an engine for propelling aircraft, space vehicles and the like in response to incident microwave electromagnetic energy.

A concomitant object of the invention is to provide a heat exchanger adapted to be energized by incident microwave energy.

An ancillary object of the invention is to provide an engine capable of producing a sustained propulsive thrust for an aircraft or the like without necessitating the carrying of a supply of fuel for energization of such engine.

A further object of the invention is to provide an engine for aircraft and the like which are adapted to be operated by means of remotely generated microwave energy.

Another object of the invention is to provide an air-breathing jet engine for a vehicle wherein the vehicle may be propelled by such engine for an indefinitely long time period without the transportation of fuel or other propellant by such craft.

Yet another object of the invention is to provide a jet engine of the rocket type for a vehicle wherein the vehicle need carry only a single light-weight propellant medium, with the energy for heating such propellant being in the form of remotely generated radiant energy.

In accordance with an exemplary form of the apparatus of the present invention, these and other objects are achieved by means of a jet engine including a heat exchanging container means adapted to be energized by microwave energy to heat a gaseous medium therein and cause expansion of same to produce a jet stream for providing a propulsive thrust. In one preferred form of the invention, the container means comprises an electromagnetic waveguide of lossy characteristics which produces heat upon energization by suitable electromagnetic energy to raise the temperature of a gaseous medium passing therethrough. A member of stacked and closely-spaced electrically lossy plates is preferably mounted within the waveguide to serve as the main means for absorbing microwave energy and converting same into heat. The plurality of closely spaced plates form therebetween a series of narrow passages through which passes the gaseous medium which is to be heated thereby. The microwave energy employed is of sufficiently high frequency to produce a pronounced skin effect in the waveguide and associated heat-exchanger, so that the energy expended in creating heat in the steady state condition is effectively and quickly transferred to the gaseous medium in which the particular conductor exhibiting the skin effect is immersed. This latter feature is particularly advantageous in transient state conditions with respect to the ability of the engine of this invention to provide almost instantaneous response to a change in the level of the applied microwave energy, since little or no time lag is involved in converting electromagnetic energy to heat and transferring it to the cooling gas.

As applied to the configurations of any of the aforementioned types of jet engines, the waveguide energy absorber and heat exchanger of the present invention will generally take the place of the combustion chamber. For example, in the air-breathing types of jet engines the compressed air will pass around and through the waveguide heat source and will subsequently be expanded in a suitable nozzle to provide the desired thrust. In the rocket type engine, a suitable gaseous propellant of low molecular weight (in order to achieve greater specific impulse) will pass over and through the heat source to be expanded and forced through a suitable nozzle to provide a reaction stream.

With the above considerations and objects in mind, the invention will now be described in connection with a preferred embodiment thereof given by way of example and not of limitation, and with reference to the accompanying drawings, in which:

FIG. 1 is a perspective view, partly broken away, of a preferred form of the basic elements of the engine of the present invention.

FIG. 2 is a perspective view, partly broken away, of an exemplary form of the heat exchanging member which is utilized in the preferred form of the apparatus of the invention.

FIG. 3 is a schematic representation, in vertical section, of a ramjet engine constructed in accordance with the present invention.

FIG. 4 is a side elevation schematic representation of a turbojet engine in accordance with the present invention.

FIG. 5 is a schematic representation, in partial vertical section, of a rocket engine in accordance with the present invention.

Referring now to FIG. 1, the reference numeral **10** therein indicates in a general manner the waveguide type heat source of the present invention. As may be seen, the waveguide **10** comprises a main hollow member **12** of rec-

tangular cross-section, having a suitable screen **14** near one end thereof through which a suitable gaseous medium is passed, as indicated by the arrow **26**. The screen **14** serves to define one terminus of the chamber in which the heating action is effected, and it will be understood that a similar screen (not shown) may be positioned across the main waveguide portion at the opposite end thereof to cooperate with other elements within the waveguide in defining the opposite terminus. A particular advantage derived from the use of such a second screen is the suppression of radio-frequency energy emission from such opposite end. These screens are of such construction as to provide an effective wall for the electromagnetic energy that is employed in energizing the apparatus of this invention, yet they are sufficiently foraminous to allow a desirable free flow of air or other gaseous medium through the waveguide from left to right as shown in FIG. 1.

Microwave energy of a suitably high amplitude may be collected by a suitable antenna or the like and then introduced into the waveguide **10** through a branch **16** (which includes means such as the microwave window **17** for preventing upward flow of the gas in branch **16** while passing the microwave energy downwardly therethrough), and a stack of electrically conductive plate-like members indicated generally at **18** is mounted by suitable means (not shown) within the main body of the waveguide. Alternatively, the incident R.-F. energy may fall directly upon the heat exchanger stack **18** without being collected by an antenna or the like. The stack **18** of conductive plates comprises a plurality of such plates in closely spaced-apart relationship, so as to provide therebetween a plurality of narrow passages through which the gaseous medium flows toward the right in FIG. 1. This construction is such as to provide a heat-transfer surface of large area in the plate stack **18** for a given amount of microwave energy introduced into the branch **16** of the structure.

FIG. 2 shows in greater detail the structure of a preferred form of the plate stack **18**, with the several plates **20** thereof being shown supported in horizontal position by several vertical support plates **22**. Arrows **24** represent the incoming microwave energy applied to the stack **18**, which energy may be transmitted via a waveguide as shown in FIG. 1, or which may constitute a radiated beam of microwave energy directed at the stack, and arrows **26** represent the cool gaseous propellant medium as it enters the stack to be heated, with the heated exhaust stream being indicated by the arrows **28**. The plates **22** are preferably a metal of a high specific resistance, such as materials sold under the trade names of Inconel and Nichrome, or may be fabricated from a suitable ceramic-metal mixture. Alternatively or additionally, the structural members (the plates **22** and the walls of the waveguide and heat exchanger as well) may be provided with an anechoic coating of a material of high specific resistance (such as that sold under the trade name of Kanthol), as indicated at **29** in FIG. 1.

In the operation o fthe apparatus shown in FIGS. 1 and 2, microwave energy is transmitted down the waveguide branch **16** and into the main body portion **12** of the waveguide member. This chamber is preferably several wavelengths long at the frequency of the applied microwave energy, and the chamber itself may be resonant at such frequency in order to enhance the operation thereof for lower power applications. This application of microwave energy to the chamber within the waveguide member **12** results in the absorption of energy by the plate stack **18** and the walls of the waveguide, with the energy so absorbed being converted into heat. Thus, the surfaces of the several members against which flows the gaseous medium passing through the waveguide from left-to-right in FIGS. 1 and 2 (as indicated by the arrows therein) will be heated, with the heat therein being transferred to the surrounding gaseous medium. With the application of a sufficient level of microwave energy, the gaseous medium flowing through the waveguide will be

heated to a sufficient extent to cause an expansion of the gaseous medium in the manner of the exhaust from the combustion chamber of the jet engines of the prior art.

As will be appreciated by those skilled in the art, microwave energy is sufficiently high in frequency to produce a pronounced skin effect, and the electrical current flowing in the conductive material of the waveguide or plate stack therein is confined to a very shallow penetration from the surface of such material. With the current flowing only on or very near to the surface of these members, the heat produced therein by such current flow will be generally confined to such surfaces or to such shallow penetration. Such operation results in the rather apparent advantage that the heat is produced at the surfaces of the conducting members, and this is where the gaseous medium to be heated is in contact with such members. In other words, the heat is produced at the very areas where it is desired. However, there is also a more subtle advantage to be gained by this operation, viz., the fact that the heat is generated in a very small volume or mass of the lossy material, thus dramatically reducing the size and weight in comparison to the heat exchangers of the prior art, and in addition, when it is desired to change the rate of application of the heat to the gaseous medium (as by changing the level of the applied microwave energy) there is little or no time-lag in adjusting to the new level of operation, since heat transfer is inversely proportional to the distance between the source (the surface exhibiting skin effect) and the sink (the gaseous medium), and such distance is so small in this structure. In comparison with the structures of the prior art, this engine may be constructed with thinner materials or with hollow members so as to provide a reduction in the weight.

FIG. 3 shows a ramjet engine constructed in accordance with the present invention, indicated generally at **30**. This engine comprises a substantially cylindrical outer member or housing **32**, with a central member **34** mounted therein in coaxial arrangement therewith. The opening **36** in member **32** includes the inlet opening for atmospheric air to enter the engine upon relative motion of the engine and the surrounding atmosphere, as well as the usual diffuser to decrease the velocity of the air so admitted to increase the pressure thereof.

A pair of foraminous screens **38** and **40** are employed to define the electromagnetic chamber but to permit the free passage of the compressed or heated air therethrough. Between such screens is mounted the "stack" **42** of heat exchanging plates, corresponding to the plate stack **18** of the earlier figures of the drawings, and it will be understood that this assembly **42** may include a plurality of flat plates as shown in connection with FIGS. 1 and 2, or it may equally well include a plurality of nested cylindrical or other-shaped metallic members spaced in such manner as to provide a plurality of narrow or thin passages therebetween through which the gaseous propellant is to pass. A suitable waveguide or transmission line branch **43** is provided in communication with the interior of member **32** for introducing radio-frequency electromagnetic energy therein.

To the right (in FIG. 3) of the screen **40** is a suitable exhaust nozzle **44**, such as the converging-diverging or De Laval nozzle, from which the heated propellant gas or air is expelled and expanded into the surrounding atmosphere to provide a jet stream affording a propulsive thrust on the engine **30**, such stream being indicated by the arrows **46**.

The operation of the ramjet engine of FIG. 3 is at once evident. Upon relative motion of sufficient degree betweeen the engine **30** and the surrounding atmosphere, the air entering the inlet-diffuser **36** is compressed and then passed into the central part of the chamber defined by the two foraminous screens **38** and **40**, where it passes around and between the several plates or other members of the heat-exchanging assembly **42**. The application of

microwave electromagnetic energy by means of the branch line 43 results in the absorption of such energy by the assembly 42, with heat being produced therein and being transmitted to the air passing therethrough. The air is thus heated to a temperature much greater than the entering temperature, and the hot air expands upon being expelled from the exhaust nozzle 44 and leaves the engine with a relatively greater velocity than that of entry, producing a thrust thereby.

The construction of a turbojet engine in accordance with the invention is quite similar to that of the ramjet engine of FIG. 3, and is shown schematically in FIG. 4. In the latter figure, the numeral 48 indicates the input or inlet section, next to which is a compressor 50. Following the compressor 50 is the heat-exchanging section 52, which includes a waveguide branch 54 for the introduction of microwave energy into the interior of the heat-exchanging section 52. This latter section also includes a suitable heat-exchanging stack or assembly 53 similar to those described in connection with the preceding figures of the drawings. Just downstream from the heat-exchanging section 52 is a turbine section 56 having a turbine therein operated by the heated gases coming from the heat-exchanging section 52. The turbine serves as the source of power for operating the compressor in the forward section 50. Following the turbine section 56 is the exhaust nozzle 58, which may take any suitable form for directing the heated gaseous medium (the atmospheric air taken into the forward inlet of the engine) into the atmosphere to provide a propulsive thrust on the engine.

The operation of the turbojet engine of FIG. 4 is immediately evident upon comparison with that of the ramjet engine of FIG. 3. In the turbojet engine of FIG. 4, air entering the inlet section 48 is directed into the compressor 50, where it is compressed before being passed to the heater section 52. The application of microwave energy through branch guide 54 into the interior of the heater section 52 causes the absorbing surfaces therein to absorb such energy and produce heat which is passed to the gaseous medium passing therethrough. The application of this heat to the propellant medium causes the latter to expand out through the nozzle 58 to apply the desired thrust to the engine.

FIG. 5 shows a rocket engine in accordance with the present invention indicated generally at 60 and comprising a substantially cylindrical housing 62 having an exhaust nozzle 64 associated therewith. The end of the housing 62 remote from that of nozzle 64 includes a "window" 66 for electromagnetic energy, such window providing a means for introducing microwave energy into the interior of the housing 62 while maintaining such housing a closed container except at the nozzle end, whereby heated gases within the housing are directed toward the exhaust nozzle. It will be understood, of course, that the microwave energy may equally well be fed to the interior of housing 62 through the nozzle 64 by means of a suitable funnel or other collector. The microwave energy so introduced into the interior of the housing is absorbed by the heat-exchanging assembly 68, which may be constructed as described in connection with the preceding figures of the drawings. In order to produce a propulsive thrust at the nozzle 64, a suitable gaseous propellant medium is supplied to the interior of the housing 62 from a tank or other reservoir 70 by means of a conduit and manifold 72, the latter preferably including a suitable control valve (not shown). The operation is apparent, with the gaseous propellant being fed into the housing 62 by means of the conduit 72, and microwave energy being applied thereto by means of the permeable window 66 to heat the heat-exchanging assembly, and the heat so produced is transferred to the gaseous propellant medium to be expelled through the exhaust nozzle 64.

The invention has been described above in considerable detail, and particularly with reference to its application to engines for producing a thrust by means of a jet stream. However, it will be apparent to those skilled in the art that the invention is broadly applicable to other engines, including those providing a rotary shaft output, as by feeding the described jet stream output through a turbine, with the shaft of the latter providing the motive power of the output. Further, as applied to rocket engines, the inventive concept of the present invention is not limited to the use of liquid propellants as described herein, but may be employed with suitable structures for heating a solid propellant in such an engine. Additionally, while the heat-exchanging means is disclosed herein as an assembly of closely-spaced conducting plates or the like, it will be understood that where sufficient microwave power is available, the absorbing and heat-exchanging surfaces may comprise the inner surfaces of a hollow waveguide only, with no additional heat exchanger being necessary. Hence, the invention is not to be considered as being limited to the particular details given, nor to the specific application to which reference has been made during the description of the apparatus, except insofar as may be required by the scope of the appended claims.

What is claimed is:

1. In a reaction engine including a fluid inlet and a nozzle through which fluid is expelled producing thrust, means between said inlet and nozzle for heating said fluid comprising an elongated chamber having walls of electrically conductive material, one end of said chamber being connected to said inlet and the other end of said chamber being connected to said nozzle, means in said chamber for absorbing microwave energy without substantially blocking the flow of fluid therethrough, means substantially transparent to microwave energy forming part of the walls of said chamber between said inlet and said absorbing means, and means between said inlet and said transparent means for reflecting microwave energy without substantially blocking the flow of said fluid therethrough.

2. A reaction engine as in claim 1, and said microwave energy absorbing means including a plurality of resistive vanes arranged parallel to each other and parallel to the longitudinal axis of said chamber.

3. A reaction engine as in claim 1, and said means for reflecting microwave energy including a screen of electrically conductive material disposed in a plane substantially perpendicular to the axis of said chamber.

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Neudecker et al.

[11] **3,724,215**

[45] **Apr. 3, 1973**

[54] **DECOMPOSED AMMONIA RADIOISOTOPE THRUSTER**

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[73] Assignee: **The United States of America as represented by the United States Atomic Energy Commission**

[22] Filed: **May 19, 1971**

[21] Appl. No.: **144,954**

[52] **U.S. Cl.** **60/203,** 165/105, 176/39

[51] **Int. Cl.**.....**F02k 11/00**

[58] **Field of Search** ..60/203, 225, 229, 266; 176/39; 250/106 S, 108 R; 165/105

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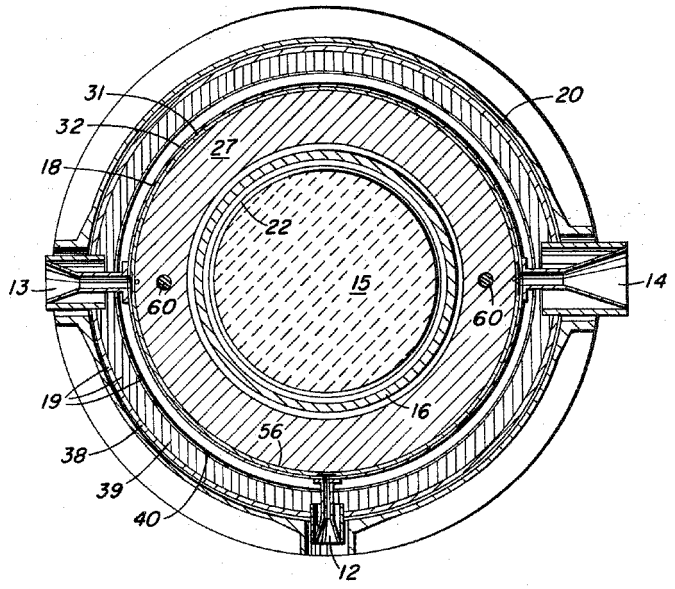
[57] **ABSTRACT**

A radioisotope heated propellant reaction control system wherein energy from the decay of plutonium-238 is used to heat and decompose ammonia propellant, and the decomposition products, nitrogen and hydrogen, are expanded through nozzles to provide desired increments of thrust. Three nozzles provide thrust levels of 10×10^{-3} to 100×10^{-3} lb_f at a specific impulse of 310 seconds in a pulsing mode.

4 Claims, 4 Drawing Figures



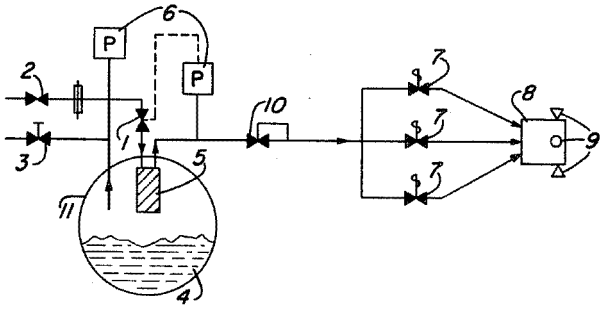


Fig. 1

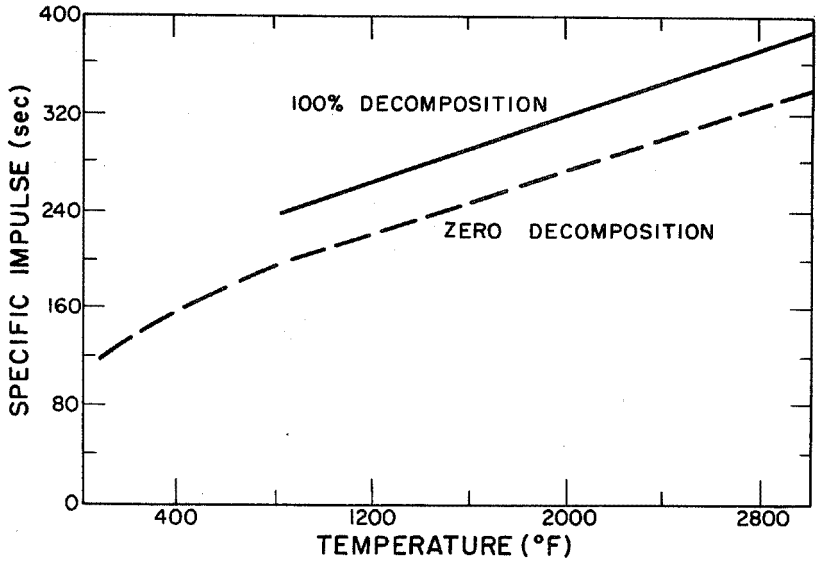


Fig. 2

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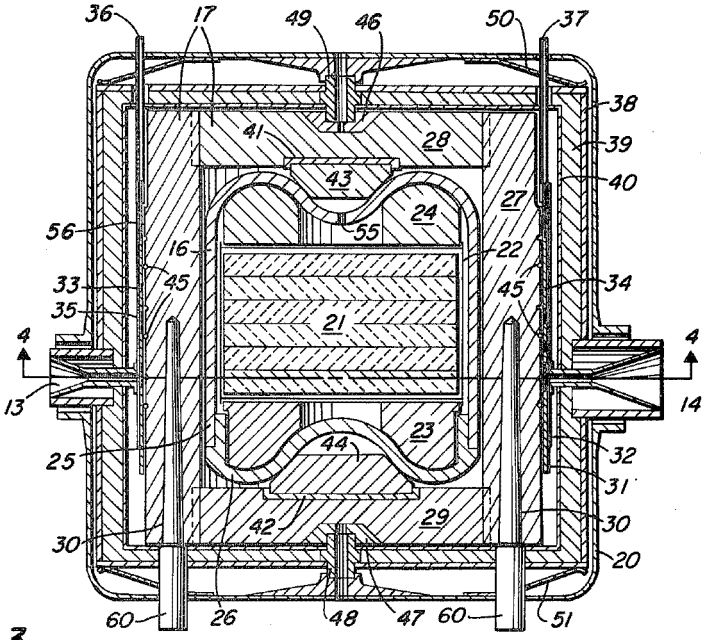

Fig.3

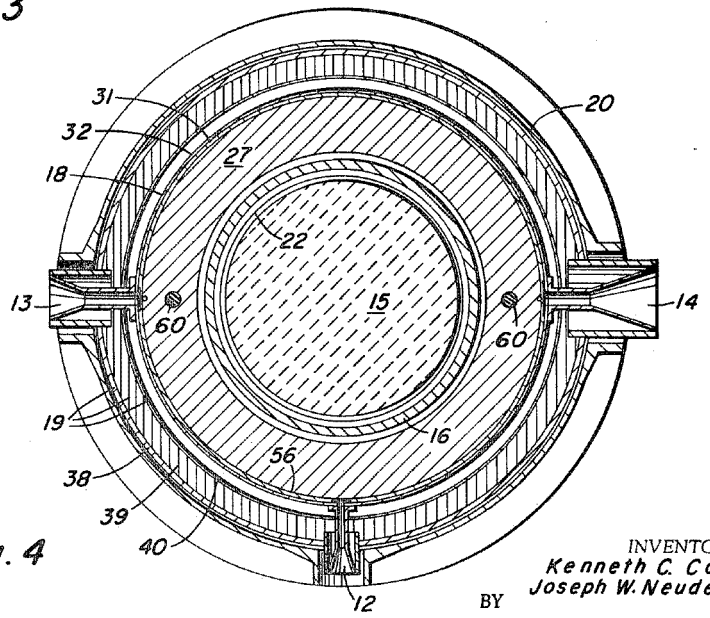

Fig. 4

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DECOMPOSED AMMONIA RADIOISOTOPE THRUSTER

BACKGROUND OF THE INVENTION

The invention described herein was made in the course of, or under, a contract with the U.S. ATOMIC ENERGY COMMISSION. It relates to radioisotope heated propellant reaction control systems and more particularly to a system wherein energy from the decay of a radioisotope is used to heat and decompose ammonia propellant, and the decomposition products, nitrogen and hydrogen, are expanded through a nozzle to provide desired increments of thrust.

Many communications and observational satellites require small "vernier" rocket engines for (1) orbital injection error correction, (2) station-keeping and repositioning, and (3) attitude acquisition and control. This is particularly true for a satellite placed in an earth synchronous or geosynchronous orbit which is a circular orbit in the equatorial plane with an orbital period of one sidereal day. In such an orbit the satellite will ideally remain fixed in space, relative to an observer on the earth. Satellites in these orbits typically perform missions as communications relays, navigational aids, and meteorological and strategic reconnaissance vehicles. Many of these missions require extremely close pointing accuracy and precise stationkeeping for a period of years.

A decomposed ammonia radioisotope thruster (DART) in which a radioisotope is used to heat and decompose ammonia prior to expansion through a nozzle offers significant improvement in specific impulse, weight, and reliability over chemical vernier engine propulsion systems now in use. However, any propulsion system utilizing a radioisotope energy source has several drawbacks not experienced by its chemical system counterparts. One is that it must meet nuclear safety specifications which require that the radioisotope remain completely contained within its fuel capsule during any launch pad or other accident and also during atmospheric reentry and impact. Another is that the radioisotope is a constant and essentially nonvariable heat source for satellite life spans up to 10 years. While this is an advantage in the vacuum of space, it requires that some form of cooling be employed in atmosphere to avoid materials degradation through oxidation caused by elevated temperatures.

A significant problem in the design of DART propulsion systems has been ensuring that the radioisotope fuel capsule will survive intact the thermal and pressure stresses and temperature it would be subjected to during atmospheric reentry. Efforts to resolve this problem heretofore have centered on placing the entire thruster unit within a reentry module.

We have now found that the radioisotope fuel capsule and its associated impact capsule can be effectively protected against the thermal and pressure stresses and temperature of atmospheric reentry by placing them within a reentry ablation capsule. All other parts of the DART unit, as for example, the thruster nozzles, insulation, and ammonia propellant heat transfer system, are outside the reentry capsule and would be allowed to burn up on reentry. The reentry capsule is required to be made of an ablative material having good thermal conductivity since during the operational

life of the DART unit heat must be effectively and efficiently transferred from the radioisotope through the reentry capsule to the ammonia propellant heat transfer system. We have found that ATJS graphite is an excellent ablative material for this purpose.

We have further found that by using heat pipes inserted into the reentry ablative capsule to transfer excess heat to the atmosphere, the temperature within the DART unit can be kept under 200° C, thus preventing refractory structural materials from oxidizing before the satellite is inserted into orbit. The heat pipes represent a truly passive coolant system since they require no auxiliary pumping or monitoring apparatus.

It is therefore an object of this invention to provide an improved vernier engine for precise satellite control and stabilization. Another object is to provide an improved vernier engine comprising a decomposed ammonia radioisotope thruster (DART) unit. A further object is to provide a DART unit in which the radioisotope fuel capsule will remain intact during a launch pad or other accident and during atmospheric reentry and impact. Still another object is to provide a method by which a DART unit can be passively cooled.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects of this invention will be apparent from the following description read in conjunction with the accompanying drawings wherein:

FIG. **1** is a schematic of a DART propulsion system.

FIG. **2** shows the theoretical specific impulse of ammonia as a function of temperature.

FIG. **3** is a cross-sectional view of the preferred embodiment of the DART unit.

FIG. **4** is a cross-sectional view taken as indicated by the line **4—4** in FIG. **3**.

The operation of a DART propulsion system is readily described with reference to the schematic of FIG. **1**. Liquid ammonia **4** is introduced into a propellant storage tank **11** through a fill valve **3** and stored under its own equilibrium vapor pressure. Located within tank **11** may be a heater **5** to supply adequate heat of vaporization for the ammonia and to maintain a minimum tank pressure should ambient temperature fall below approximately 50° F. By means of pressure transducers **6** and a pressure control valve **1**, pressure within tank **11** is prevented from becoming excessive. Should the pressure become too high, ammonia gas can be bled from tank **11** through relief valve **2**. Nominally, the temperature within tank **11** will be 70° F and the pressure will be about 200 psia. During operation of the system, gaseous ammonia is introduced into a radioisotope thruster unit **8** through electrically controlled pulsing inlet valves **7**. Nominally, pressure of ammonia to the inlet valves **7** is regulated at 50 psia by means of a fine pressure regulator **10**. Within radioisotope thruster unit **8** the gaseous ammonia is heated and decomposed into hydrogen and nitrogen. The hot mixture of hydrogen and nitrogen is then allowed to expand through thrust nozzles **9** to provide a desired increment of thrust. Each of the inlet valves **7** provides an ammonia flow for a particular thrust nozzle **9**. The invention described herein relates to radioisotope thruster unit **8**.

It is apparent from FIG. **2** that the specific impulse that can be achieved using ammonia as a propellant is

dependent on the temperature to which the ammonia is heated. At any particular temperature above the decomposition temperature of ammonia, a further substantial increase in specific impulse can be achieved if the ammonia is in fact completely decomposed to nitrogen and hydrogen and the mixture of these gases allowed to expand through a thrust nozzle.

PREFERRED EMBODIMENT

FIGS. **3** and **4** are cross-sectional views of the preferred embodiment of this invention. The DART unit attains an exit gas temperature of 1370° C (2500° F) through the thrust nozzles and provides thrust levels of 10×10^{-3} to 100×10^{-3} lb_f at a specific impulse of 310 seconds in a pulsing mode for a total satellite lifetime of seven years. There are three separate thrust nozzles **12**, **13**, and **14** with the following individual characteristics and thrust specifications:

Nozzle	12	13	14
Diameter of Throat	0.016 inch	0.031 inch	0.049 inch
Thrust	10 mlb	50 mlb	100 mlb
Maximum Pulses	5×10^6	5×10^6	5×10^6
NH_3 Total Flow	100 lb	100 lb	345 lb
NH_3 Flowrate (lb/sec)	3.25×10^{-5}	1.62×10^{-4}	3.25×10^{-4}
Maximum On-Time	200 msec	200 msec	200 msec
Minimum On-Time	20 msec	20 msec	20 msec
Minimum Off-Time	800 msec	2 sec	4 sec

In addition to nozzles **12**, **13**, and **14**, the other major components of the DART unit are the radioisotope heat source **15**, the impact capsule **16**, the ablative reentry capsule **17**, the heat transfer system **18**, the insulation system **19**, and the mounting can **20**.

Plutonium-238, which is an alpha emitter having a half-life of 89 years, serves as the heat source **15**. The plutonium is present in the form of cermet fuel wafers **21** which consist of hot pressed molybdenum-coated particles of either PuO_2—ThO_2 solid solution or solely PuO_2. Methods of fabricating these fuel wafers are given in Los Alamos Scientific Laboratory Reports LA-4476-MS and LA-4647-MS, available from National Technical Information Service, U. S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22151. A wafer **21** is approximately 2.2 inches in diameter and 0.22 inch thick and provides **40** watts of thermal power. Six wafers are deposited within fuel capsule **22** which is supported within impact capsule **16** by cushions **23** and **24**. These cushions consist of molybdenum foamed to 35 percent of theoretical density.

Certain requirements are imposed on the materials of fuel capsule **22** and impact capsule **16**. They must be strong at elevated temperatures, have a high creep and impact resistance over the temperature range from ambient to 1500° C, and be ductile both at ambient and elevated temperatures. In addition, they must not chemically react with the fuel at any temperature below 1800° C. Molybdenum-rhenium alloys selected from the range of Mo-46 wt. percent Re to Mo-20 wt. percent Re have been found to meet these overall requirements and hence are used as the material of fuel capsule **22** and impact capsule **16**. Although all Mo—Re alloys oxidize, those having a lower weight percent of rhenium tend to have lower oxidation rates, especially at elevated temperatures. Hence, alloy selection is a compromise between strength-ductility values and an acceptable oxidation rate. In the preferred embodiment of this invention, Mo-46 wt. percent Re is used for fuel capsule **22** and impact capsule **16**. Both capsules are assembled by welding, with impact capsule **16** being comprised of a female member **25** and a male member **26**.

The isotope fuel being an alpha emitter results in the gradual release of helium gas from the fuel wafers. Over a longer period of time this helium gas, if not provided with a path of egress, would cause pressure to build up inside the fuel capsule **22** and impact capsule **16**. The fuel capsule has a thin wall so that the helium gas pressure will rupture it quite easily. A 0.005-in. diameter vent hole **55** is provided in the impact capsule to permit the helium gas to vent to the vacuum of space.

The ablative reentry capsule **17** is composed of a cylinder **27** and two end plugs **28** and **29** of ATJS graphite. A reentry capsule must protect the impact capsule and the fuel against the heat generated during reentry by friction with the earth's atmosphere. Graphite is commonly used for the reentry capsule material, as it withstands high temperatures and absorbs some of the reentry heat by oxidative ablation of the surface.

Disposed immediately adjacent to but not in direct contact with graphite cylinder **27** is heat transfer system **18**. This system consists of an inner, thicker cylinder **31** and an outer thinner cylinder **32**. In the preferred embodiment of the invention, cylinders **31** and **32** are made of rhenium which is chemically inert to ammonia and its decomposition products, hydrogen and nitrogen, at temperatures up to 2500° C. It also catalyzes the decomposition of ammonia. Disposed within cylinder **31** and between cylinders **31** and **32** are three spiral grooves **33**, **34** and **35** through which ammonia flows and is decomposed. Each groove makes one complete spiral from an ammonia inlet to a thrust nozzle. The ammonia inlet for a particular thrust nozzle is located directly in line with the nozzle it serves. Thus, ammonia inlet **36** connects by means of groove **34** with thrust nozzle **13**, while ammonia inlet **37** connects by means of groove **35** with thrust nozzle **14**. Cylinders **31** and **32** are electron beam welded together between the spiraled grooves, thus forming each groove into a channel through which ammonia and its decomposition products flow.

For efficient operation of the DART unit it is essential that heat transfer system **18** be effectively insulated from the space environment. It is desirable that insulating system **19** function such that there is a minimum variation in temperature in heat transfer system **18** between full thrusting with maximum heat transfer to the propellant and zero thrust so as to maintain as closely as possible a nominal thruster operating temperature of 1370° C. To ensure this, insulating system **19** operates primarily by the principles of radiation heat transfer, in which the heat transfer varies as the fourth power of the temperature. In the preferred embodiment of the invention, insulating system **19** is composed of an outer insulation cup **38** made of stainless steel, insulation **39**, and an inner insulation cup **40** made of molybdenum. Insulation **39** consists of **90** layers of molybdenum foil, 0.0005-in. thick, each layer separated from its neighboring layers by zirconia

present either in the form of particles or as woven zirconia cloth.

The interdiffusion of materials becomes a problem at the elevated temperatures present in the DART unit. Therefore, some different materials must be separated from each other by diffusion barriers. These diffusion barriers are incorporated into the support structure; hence, they effectively serve dual purposes. The support structure separating Mo-Re impact capsule **16** from graphite ablative reentry capsule **17** consists of tantalum disks **41** and **42**, which carburize to tantalum carbide at elevated temperatures, and zirconium carbide support cones **43** and **44**. Rhenium heat transfer system **18** is separated from graphite ablative reentry capsule **17** by tantalum wire **45** wrapped around cylinder **27**. This provides a gap **56** about 10 mils wide between heat transfer system **18** and cylinder **27**. At operating temperatures, wire **45** becomes tantalum carbide which acts as a diffusion barrier. Ablative reentry capsule **17** is supported within insulation system **19** by tantalum carbide cones **46** and **47**, also good diffusion barriers. Mounting can **20** is attached to insulating system **19** by means of zirconia bushings **48** and **49** and held in proper orientation to insulating system **19** by the disk spring action of the flat ends of mounting can **20**. The outer insulation cup **38** is held in axial position by leaf springs **50** and **51**.

The DART unit, being insulated, attains an internal temperature of approximately 1400° C during operation in the vacuum of space. However, refractory structural materials such as rhenium and molybdenum begin to significantly oxidize at temperatures above 300° C. To prevent this, it is necessary during all time prior to launch to either isolate the unit from oxygen or cool it to temperatures below 300° C. The latter approach is the most feasible. In the preferred embodiment of this invention, two heat pipes using water as the working fluid provide the necessary cooling. Such heat pipes **60** are well described in the literature. The heat pipes are placed in wells **30** in cylinder **27** and extend through insulation system **19** and mounting can **20**. During storage of the DART unit or prior to launch, these heat pipes radiate and convect heat to the atmosphere. Before launch they are removed and the vehicle is launched expeditiously so that the unit is placed in orbit prior to attaining a temperature of 300° C. Alternatively to the use of heat pipes, cold nitrogen may be circulated through heat transfer system **18** to cool the unit before launch.

It will be apparent to one of ordinary skill in the art that what has been disclosed is a vernier rocket engine system having low electrical power requirements, relatively high specific impulse, high reliability of operation, a lifetime in excess of seven years, a propellant free of troublesome handling problems, excellent pulsing capabilities, and a weight less than that of comparable chemically fueled systems. It will be further apparent that the DART unit herein disclosed is but a specific embodiment of a more general family of decomposed ammonia radioisotope thruster vernier rocket engines, and that the design and operating parameters of the unit disclosed by example herein may readily be varied to meet a wide variety of orbital station keeping and attitude acquisition and control requirements.

What we claim is:

1. A radioisotope heated propellant reaction control system wherein energy from the decay of plutonium-238 is used to heat and decompose ammonia propellant, and the decomposition products, nitrogen and hydrogen, are expanded through nozzles to provide desired increments of thrust, comprising in combination,
   - a plutonium-238 fuel,
   - a fuel capsule for containing said fuel,
   - an impact capsule for containing said fuel capsule,
   - a graphite ablative reentry capsule,
   - a heat transfer system containing a plurality of channels wherein ammonia is heated and decomposed to nitrogen and hydrogen,
   - a plurality of ammonia inlet tubes connected to said heat transfer system, each of said tubes connected to the entrance end of a particular channel in said heat transfer system,
   - means for controlling the flow of ammonia through said inlet tubes,
   - a plurality of thrust nozzles, each of said nozzles connected to the exit end of a particular channel in said heat transfer system,
   - an insulating system disposed adjacent to the outer periphery of said heat transfer system, with said thrust nozzles extending through said insulating system, and
   - a mounting can,
   - said ablative reentry capsule encompassing said impact capsule and disposed between said impact capsule and said heat transfer system.

2. The reaction control system of claim 1 wherein said plutonium-238 fuel comprises wafers of hot-pressed molybdenum-coated PuO_2 particles.

3. The reaction control system of claim 1 wherein said plutonium-238 fuel comprises wafers of hot-pressed molybdenum-coated solid solution PuO_2—ThO_2 cermet particles.

4. The reaction control system of claim 1 containing a plurality of water heat pipes inserted into wells in said ablative reentry capsule to cool said system below 200° C, said heat pipes extending through the insulation system and the mounting can and being removable from said ablative reentry capsule before launch.

* * * * *

Suggested Reading

Underground bases
http://www.sauderzone.com/ubtlinks.htm

http://www.mt.net/~watcher/phils.html

Bob and the Oxygen Wars by Waves Forrest
http://www.maths.qmw.ac.uk/~ade/sld/sldocs/OxygenWars1.html

Electric Spacecraft Journal
http://www.electricspacecraft.com/

WORLD SPACE DRIVES ARCHIVES
http://www.spacedrives.org/index.htm

Electrogravitational Mechanics
http://www.electrogravity.com/

Additional papers of interest

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April 7, 1991

SEARLE1.ASC

John Searl and his flying disks.

a personal commentary by Anders Heerfordt

I heard a speech by John Searl around 5 Dec 1990. During the speech he claimed that he could produce antigravity and free energy effects, using special magnets, and that he had been building flying saucers. He also said that he had a special magnet bar and some magnetic cylinders with such unusual properties. He could not demonstrate the bar, he said, because British customs had prevented him from bringing the magnets.

According to Searl, many people had seen his flying disks. I tried to find somebody who had seen Searl demonstrate something. That turned out to be difficult.

During the speech Searl said that Gunnar Sandberg (a scientist at Sussex University) had seen him demonstrate perpetual motion with his magnet bar and his magnetic rollers. Sandberg was not present at the speech.

I visited Sandberg at Sussex University and asked him about the demonstration. Gunnar had seen the magnetic bar and the magnetic rollers, and Searl had told him a lot about them, but Searl had not demonstrated any unusual effects to him.

In this case Searl was apparently not being truthful.

I asked Searl if he could demonstrate the unusual effects to me, but he said that unfortunately he couldn't, because some of the magnets had been lost, and he no longer had a complete set.

I asked Searl to help me find someone who had known him in the past, so that I could ask them to confirm his claims. He tried to discourage me from searching for his past associates, saying that they had all died, or disappeared.

That he and others had spent thousands of pounds on advertising in newspapers to find old witnesses, but none had surfaced. I mentioned Sandberg, but Searl did not think I should talk to Sandberg. As he had claimed Sandberg was a witness, it seems strange that he should first say that no witnesses could be found, then acknowledge that Sandberg was available, then try to discourage me from talking to Sandberg.

I mentioned to Searl that he had been married, and one would assume that his family had known about his experiments, and that I would like to hear their story.

Searl said that his wife had been a very evil person, who had ridiculed his experiments, and who had prevented his children from seeing any of his experiments. Searl did not want me to talk to his family.

Sandberg, however, had managed to find a son, who had seen disks being suspended from wires, so that they could be photographed, but who hadn't seen any demonstration of antigravity or free energy.

I managed to find a Mr. Louis Avilio, who had worked with Searl for

5 years, and I asked him whether he could confirm the claims of Searl. He could not.

Searl has certainly told him a lot about such claims, but he had never seen Searl demonstrate his claims of perpetual motion or antigravity. He had however not known Searl in the fifties or sixties, where some experiments should have been done.

Louis Avillio had met somebody, who had worked with Searl during the fifties or sixties, but he hadn't seen any proof of the claims either.

Searl should have had a childhood friend. His father was a George Haynes. Searl and the friend made experiments together. They made the first free energy magnet together, and the friend's father paid for the materials.

The father is dead by now, but the son should still be alive, and should be able to tell about Searl's first experiments. I asked Searl for the name of the friend, but Searl said he couldn't remember it.

I asked him where his friend lived at the time, but again Searl evaded and said that he could not remember it. I had the impression that Searl did not want me to find his childhood friend.

Searl said his magnet bar with the unusual properties was made of neodymium, titanium and bakelite. A small chip of the bar was analyzed by a scientist at Sussex University. The results were published in Raum & Zeit. According to the analysis the bar was made of a magnetic mixture of iron and titanium.

There were some rare earth metals in the mixture, including neodymium. Iron-titanium magnetic powders were commercially available in fifties or sixties. A small amount of a rare earth mixture was included as an antioxidant .

Searl's magnet is apparently made from such a powder. It does not appear that Searl has been truthful about how his magnetic bar was made.

I asked Searl about news paper articles, but he did not think I should look for newspaper articles. He said however that there had been a lot of articles about his work back in 1981, when he was building a large flying saucer that could carry passengers.

He was then living in Mortimer, near Reading west of London. The work had stopped when he became very ill, and went to hospital.

Somebody then destroyed all his materials and models, and all that survived was his magnet bar and the magnetic rollers. When pressed he admitted that he had not gone to hospital, but he had gone to jail after a court case in June-July 1981 at a court in Reading.

He said he had been sentenced for not paying his electricity bill. He said he had only used electricity from his free energy generator, not from the public network.

I asked the court in Reading whether they could confirm this, but they said that the court records were not public.

I went through the issues of the London newspaper Times from June-July 1981 but there was no mention of Mrs Searl and his flying saucers.

I called the newspaper in Reading, but they said I would have to go to Reading myself and go through their archives, if I wanted to find anything from that period. I haven't been to Reading yet.

So I haven't used up all possibilities of research into the past of John Searl. If I went to Reading and went through the newspaper I might find that Searl was sentenced for something else than not paying his electricity bill.

Perhaps he was sentenced for fraudulently selling tickets to the Moon?

The research I have done, does not support that Searl ever made any flying disks or free energy machines, but rather it supports that he has a good fantasy.

The people who have met him say that he seems convinced that his claims are possible, which is strange, because he has no evidence to support them.

Perhaps antigravity and free energy can be demonstrated in a way similar to the one Searl describes. But as he doesn't seem to have demonstrated it himself, it seems strange that he should be so convinced that it can be done.

Anders Heerfordt, 1 Mar 91.
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June 23, 1991

SEARLE2.ASC

This file courtesy of Anders Heerfordt.

Today, 22 June 1991, I visited the village of Mortimer, Berkshire, England where John Searl lived 10 years ago at the address 17 Stephen's Close.

Searl described to me that he built many flying disks while living there, and made demonstrations to the local people. He also said that he was arrested in 1982 to stop his experiments, and his house was burnt down the next day to destroy his equipment. I visited the village to check the veracity of the information.

I saw the house, the fairground, the high-tension pylons, and I talked to three people who all remembered him. One of his neighbors said he didn't think there had been a fire in the house.

He did remember that Searl was arrested for trying to topple one of the high tension pylons visible from the house, and that (as far as he knew) he ended up in prison for it.

He did remember that Searl sometimes put up posters that he would demonstrate his flying disks at the fairground. He would charge people a lot of money for seeing a flying disk, but nobody ever saw a disk levitate. Searl always claimed that the failure was due to the weather or some such circumstance.

Many people wondered whether Searl was onto something, or whether he
was making a fool of himself. Nobody found any proof that he was

onto something. The neighbor didn't remember any problems between Searl and the electricity company before Searl tried to topple the pylon.

Another inhabitant of the village remembered visiting the room in Searl's house that was filled with electrical equipment, and remembered that many people in the village wondered whether he was onto something, but none saw any proof that he was. This inhabitant also didn't remember any trouble between Searl and the electricity company before Searl tried to topple the pylon.

A third inhabitant also remembered Searl, but didn't know of anyone who had seen any proof that he could make disks levitate or could do any other abnormal feat.

Searl's family no longer lived in the village. It can be said with

some certainty that Searl never made any public demonstrations of a flying disk, and that he probably never succeeded in levitating a disk, and that he was lying when he said his house was burnt down.

Vangard note...

> We should all be most appreciative of the time, energy and expense of Mr. Heerfordt in looking into the claims of John Searle.
>
> It is very odd that of all the experiments Searle claims to have carried out, there are no witnesses. Surely someone must be willing to come forth to recount what they had seen. One would think the villagers would have seen something supportive of Searle's claim.
>
> Mr. Heerfordt had personally interviewed Searle to gather

information and establish claims with dates and traceable information. As the above file seems to indicate, there is not much if anything, which lends credence to Searle's claim of building either a levitating disc OR a free energy device based on the levitation technology operating in a governed fashion.

If you have comments or other information relating to such topics as this paper covers, please upload to KeelyNet or send to the Vangard Sciences address as listed on the first page.
Thank you for your consideration, interest and support.

Jerry W. Decker.....Ron Barker.....Chuck Henderson
Vangard Sciences/KeelyNet

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NOTES FROM BILL B.

WARNING: If you charge this capacitor with even a feeble "static electric" high voltage supply, the capacitor will store energy at lethal, electrocution levels. If you aren't familiar with electrical safety regarding capacitors and high voltage, don't mess with this device.

This file is several years old and I've heard nothing from anyone who has built this device. I've called and left messages with the author twice and wrote once, all with no responses.

(Update: someone on freenrg-L contacted the author's family and found that he had been killed in a car accident.)

I don't understand why the author didn't include a patent number. A cursory search of 1930 patents shows nothing called "electric rocket" or similar, but a more intensive search could be done.

I wouldn't be surprised to discover that the article is a hoax, with the

goal being to get someone to put massive effort into building a foil-stack capacitor with thousands of layers, each made of many small parts! Fascinating idea though, and very much in line with T.T.Brown's work with the small apparent gravity forces generated by large capacitors at high voltage.

Note: the article doesn't mention high voltage, but it is apparent that a "Fitzeau's Condenser" is a high-voltage device akin to a Leyden jar. That's probably why the author requires two sheets of wax paper per layer: more sheets mean higher voltage can be attained without internal arcing.

WARNING: If you charge this capacitor with even a feeble "static electric" high voltage supply, the capacitor will store energy at lethal, electrocution levels. If you aren't familiar with electrical safety regarding capacitors and high voltage, don't mess with this device.

> question: have you actually tried to build the "Gravity emitting
> capacitor"?

Nope, nobody has as yet. Since it might be a hoax, cutting all that foil and paper is a whole lot of work. But even if it doesn't emit gravity fields, you'll end up with a spiffy high-voltage capacitor for home experiments.

Hint: tin foil is available from dental supply houses, and squares of wax paper can be had from restaurant supply outlets. It might be more efficient to have a die-cut print shop make a die-cut master and stamp out thousands of little tin foil sectors.

> It seems rather interesting, but I don't have the slightest
> clue how it would work.. it doesn't make much sense that a stored
> electric charge would produce a gravitational field.

True, but major new discoveries in science RARELY make sense. If they did, then someone would have already discovered them. The gravity-capacitor article states that the inventor stumbled across the effect accidentally. This is a good sign, since in the "weird science" arena there are lots of people with unusual THEORIES which lead to experiments which have never been tried before. Unusual theories rarely are correct. If, for example, I have some novel theory about gravity and capacitors,

and I have not tested my theory by doing an experiment, then the chances are almost certain that the experiment will not work. Alternative theories in physics rarely prove true. Yet on the other hand, if somebody reports that they have (accidently) performed an experiment which gives unexpected, unexplainable results, then chances are much better that it is real. Human beings occasionally stumble across phenomena which are not explained by contemporary science theory.

For example, Bequerel stumbled across the fact that uranium ore, when placed against a photographic plate, will expose the plate even if black paper is in the way. At the time, this made no sense at all. Magic light from a rock? Perpetual motion! And light which goes through opaque objects? Ridiculous! Fortunately the experiment was very easy to perform, and so the disbelieving scientists rapidly became convinced that the effect was real. They just couldn't explain it at the time. This and similar experiments led to modern theories of nuclear physics.

If the gravity capacitor is real, it requires that there be an upheaval in physics. A few years after the discovery makes the rounds, "electrogravity theory" would become part of mainstream science. Unfortunately, the experiment is not easy to perform, and even if the gravity-capacitor is built, there is a chance that the experimenter will make some mistake which causes the effect to fail. Also unfortunately, there IS a chance that the thing is a hoax, and therefore anyone who builds the capacitor might waste their time. (Actually, it is not a complete waste of time, since a high-voltage capacitor is the end result. Use it in a tesla coil or something. Don't electrocute yourself though! High voltage capacitors are not toys.)

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Subject: AntiGrav Report - USAF 1956

To: freenrg-list@eskimo.com
Date: Wed, 22 Nov 1995 15:56:03 -0600 (CST)

The following article was prepared for the USAF in 1956, and discusses the state of the electrogravitics industry at that time. The article was found by an independent researcher on a library shelf at Wright Patterson, and was declassified in 1990.

13-1-00034-5879

ELECTROGRAVITIC SYSTEMS

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dynamic counterbary and barycentric control.

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Inner Cover:
ELECTROGRAVITICS SYSTEMS

An examination of electrostatic motion,
dynamic counterbary and barycentric control.

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ELECTROGRAVITICS SYSTEMS

An examination of electrostatic motion, dynamic counterbary and barycentric control

It has been accepted as axiomatic that the way to offset the effects of gravity is to use a lifting surface and considerable molecular energy to produce a continously applied force that, for a limited period of time, can remain greater than the effects of gravitational attraction. The original invention of the glider, and evolution of the briefly self-sustaining glider, at the turn of the century led to progressive advances in power and knowledge. This has been directed to refining the classic Wright Brothers' approach. Aircraft design is still fundamentally as the Wrights adumbrated it, with wings, body, tails, moving or flapping controls, landing gear and so forth. The Wright biplane was a powered glider, and all subsequent aircraft, including the supersonic jets of the nineteen-fifties are also powered gliders. Only one fundamentally different flying principle has so far been adopted with varying degrees of success. It is the rotating wing aircraft that has led to the jet lifters and vertical pushers, coleopters, ducted fans and lift induction turbine propulsion systems.

But during these decades there was always the possibility of making efforts to discover the nature of gravity from cosmic or quantum theory, investigation and observation, with a view to discerning the physical properties of aviation's enemy.

It has seemed to Aviation Studies that for some time insufficient attention has been directed to this kind of research. If it were successful such developments would change the concept of sustentation, and confer upon a vehicle qualities that would now be regarded as the ultimate in aviation.

This report summarizes in simple form the work that has been done and is being done in the new field of electrogravitics. It also outlines the various possible lines of research into the nature and constituent matter of gravity, and how it has changed from Newton to Einstein to the modern Hlavaty concept of gravity as an electromagnetic force that may be controlled like a light wave.

The report also contains an outline of opinions on the feasibility of different electrogravitics systems and there is reference to some of the barycentric control and electrostatic rigs in operation.

Also included is a list of references to electrogravitics in successive Aviation Reports since a drive was started by Aviation Studies (International) Limited to suggest to aviation business eighteen months ago that the rewards of success are too far-reaching to be overlooked, especially in view of the hopeful judgement of the most authoritative voice in micro-physics. Also listed are some relevant patents on electrostatics and electrostatic generators in the United States, United Kingdom and France.

Gravity Research Group
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25 February 1956

DISCUSSION

Electrogravitics might be described as a synthesis of electrostatic energy used for propulsion - either vertical propulsion or horizontal or both - and gravitics, or dynamic counterbary, in which energy is also used to set up a local gravitational force independent of the earth's.

Electrostatic energy for propulsion has been predicted as a possible means of propulsion in space when the thrust from a neutron motor or ion motor would be sufficient in a dragless environment to produce astronomical velocities. But the ion motor is not strictly a part of the science of elctrogravitics, since barycentric control in an electrogravitics systems is envisaged for a vehicle operating within the earth's environment and it is not seen initially for space application. Probably large scale space operations would have to await the full development of electrogravitics to enable large pieces of equipment to be moved out of the region of the earth's strongest gravity effects. So, though electrostatic motors were thought of in 1925, electrogravitics had its birth after the War, when Townsend Brown sought to improve on the various proposals that then existed for electrostatic motors sufficiently to produce some visible manifestation of sustained motion. Whereas earlier electrostatic tests were essentially pure research Brown's rigs were aimed from the outset at producing a flying article. As a private venture he produced evidence of motion using condensers in a couple of saucers suspended by arms rotating round a central tower with input running down the arms. The massive-k situation was summarized subsequently in a report, Project Winterhaven, in 1952. Using the data some conclusions were arrived at that might be expected from ten or more years of

intensive development - similar to that, for instance, applied to the turbine engine. Using a number of assumptions as to the nature of gravity, the report postulated a saucer as the basis of a possible interceptor with Mach 3 capability. Creation of a local gravitational system would confer upon the fighter the sharp-edged changes of direction typical of motion in space.

The essence of electrogravitics thrust is the use of a very strong positive charge on one side of the vehicle and a negative on the other. The core of the motor is a condenser and the ability of the condenser to hold its charge (the k-number) is the yardstick of performance. With air as 1, current dielectrical materials can yield 6 and use of barium aluminate can raise this considerably, barium titanium oxide (a baked ceramic) can

offer 6,000 and there is promise of 30,000, which would be sufficient for supersonic speed.

The original Brown rig produced 30 fps on a voltage of around 50,000 and a small amount of current in the milliamp range. There was no detailed explanation of gravity in Project Winterhaven, but it was assumed that particle dualism in the subatomic structure of gravity would coincide in its effect with the issuing stream of electrons from the electrostatic energy source to produce counterbary. The Brown work probably remains a realistic approach to the practical realization of electrostatic propulsion and sustentation. Whatever may be discovered by the Gravity Research Foundation of New Boston a complete understanding and synthetic reproduction of gravity is not essential for limited success. The electrogravitics saucer can perform the function of a classic lifting surface - it produces a pushing effect on the under surface and a suction effect on the upper, but, unlike an airfoil, it does not require a flow of air to produce the effect.

First attempts at electrogravitics are unlikely to produce counterbary, but may lead to development of an electrostatic VTOL vehicle. Even in its development form this might be an advance on the molecular heat engine in its capabilities. But hopes in the new science depend on an understanding of the source and matter of gravity. It is fortuitous that lift can be produced in the traditional fashion and if an understanding of gravity remains beyond full practical control, electrostatic lift might be an adjunct of some significance to modern thrust producers. Research into electrostatics could prove beneficial to turbine development, and heat engines in general, in view of the usable electron potential round the periphery of any flame. Materials for electrogravitics and especially the development of commercial quantities of high-k material is another dividend to be obtained from electrostatic research even if it produces no counterbary. This is a line of development that Aviation Studies' Gravity Research Group is following.

One of the interesting aspects of electrogravitics is that a breakthrough in almost any part of the broad front of general research on the intranuclear processes may be translated into a meaningful advance towards the feasibility of electrogravitics systems. This demands constant monitoring in the most likely areas of the physics of high energy sub-nuclear particles.

It is difficult to be overoptimistic about the prospects of gaining so complete a grasp of gravity while the world's physicists are still engaged in a study of fundamental particles - that is to say those that cannot be broken down any more. Fundamental particles are still being discovered - the most recent was the Segre-Chamberlain-Wiegand attachment to the bevatron, which was used to isolate the missing anti-proton, which must - or should be presumed to - exist according to Dirac's theory of the electron.

Much of the accepted mathematics of particles would be wrong if the anti-proton was proved to be non-existent. Earlier Eddington has listed the fundamental particles as:-

e The charge of an electron.

m the mass of an electron.

M the mass of a proton.

h Planck's contant

c The velocity of light.

G The constant of gravitation, and

L The cosmological constant

It is generally held that no one of these can be inferred from the others. But electrons may well disappear from among the fundamental particles, though, as Russell says, it is likely that e and m will survive. The constants are much more established than the interpretation of them and are among the most solid of achievements in modern physics.

* * *

Gravity may be defined as a small scale departure from Euclidean space in the general theory of relativity. The gravitational constant is one of four dimensionless constants: first, the mass relation of the nucleon and electron. Second is e^2/hc, third, the Compton wavelength of the proton, and fourth is the gravitational constant, which is the ratio of the electrostatic

to the gravitational attraction between the electron and the proton.

One of the stumbling blocks in electrogravitics is the absence of any satisfacotry theory linking these four dimensionless quantities. Of the four, moreover, gravity is decidedly the most complex, since any explanation would have to satisfy both cosmic and quantum relations more acceptably and intelligibly even than in the unified field theory. A gravitational constant of around 10^-30 has emerged from quantum research and this has been used as a tool for finding theories that could link the two relations. This work is now in full progress, and developments have to be watched for the aviation angle. Hitherto Dirac, Eddington, Jordan and others have produced differences in theory that are too wide to be accepted as consistent. It means therefore that (i) without a cosmological basis, and (ii) with an imprecise quantum basis and (iii) a vague hypothesis on the interaction, much remains still to be discovered. Indeed some say that a single interacting theory to link up the dimensionless constants is one of three major unresolved basic problems of physics. The other two main problems are the extension of quantum theory and a more detailed knowledge of the fundamental particles.

All this is some distance from Newton, who saw gravity as a force acting on a body from a distance, leading to the tendency of bodies to accelerate towards each other. He allied this assumption with Euclidean geometry, and time was assumed as uniform and acted independently of space. Bodies and particles in space normally moved uniformly in straight lines according to Newton, and to account for the way they sometimes do not do so, he used the idea of a force of gravity acting at a distance, in which particles of matter cause in others an acceleration proportional to their mass, and inversely proportional to the

square of the distance between them.

But Einstein showed how the principle of least action, or the so-called cosmic laziness means that particles, on the contrary, follow the easiest path along geodesic lines and as a result they get readily absorbed into space-time. So was born

non-linear physics. The classic example of non-linear physics is the experiment in bombarding a screen with two slits. When both slits are open particles going through are not the sum of the two individually but follows a non-linear equation. This leads on to wave-particle dualism and that in turn to the Heisenberg uncertainty principle in which an increase in accuracy in measurement of one physical quantity means decreasing accuracy in measuring the other. If time is measured accurately energy calculations will be in error; the more accurate the position of a particle is established the less certain the velocity will be; and so on. This basic principle of the acausality of microphysics affects the study of gravity in the special and general theories of relativity. Lack of pictoral image in the quantum physics of this interrelationship is a difficulty at the outset for those whose minds remain obstinately Euclidean.

In the special theory of relativity, space-time is seen only as an undefined interval which can be defined in any way that is convenient and the Newtonian idea of persistent particles in motion to explain gravity cannot be accepted. It must be seen rather as a synthesis of forces in a four dimensional continuum, three to establish the position and one the time. The general theory of relativity that followed a decade later was a geometrical explanation of gravitation in which bodies take the geodesic path through space-time. In turn this means that instead of the idea of a force acting at a distance it is assumed that space, time, radiation and particles are linked and variations in them from gravity are due rather to the nature of space.

Thus gravity of a body such as the earth, instead of pulling object towards it as Newton postulated, is adjusting the characteristics of space and, it may be inferred, the quantum mechanics of space in the vicinity of the gravitational force. Electrogravitics aims at correcting this adjustment to put matter, so to speak, 'at rest'.

* * *

One of the difficulties in 1954 and 1955 was to get aviation to take electrogravitics seriously. The name alone was enough to put people off. However, in the trade much progress has been made and now most major companies in the United States

are interested in counterbary. Groups are being organised to study electrostatic and electromagnetic phenomena. Most of industry's leaders have made some reference to it. Douglas has now stated that it has counterbary on its work agenda but does not expect results yet awhile. Hiller has referred to new forms of flying platform, Glenn Martin say gravity control could be achieved in six years, but they add that it would entail a Manhattan District type of effort to bring it about. Sikorsky, one of the pioneers, more or less agrees with the Douglas verdict and says that gravity is tangible and formidable, but there must be a physical carrier for this immense trans-spatial force. This implies that where a physical manifestation exists, a physical device and be developed for creating a similar force moving in the opposite direction to cancel it. Clarke Electronics state thay have a rig, and add that in their view the source of gravity's force will be understood sooner than some people think. General Electric is working on the use of electronic rigs designed to make adjustments to gravity - this line of attack has the advantage of using rigs already in existence for other defence work. Bell also has an experimental rig intended, as

the company puts it, to cancel out gravity, and Lawrence Bell has said he is convinced that practical hardware will emerge from current programs. Grover Leoning is certain that what he referred to as an electro-magnetic contra-gravity mechanism will be developed for practical use. Convair is extensively committed to the work with several rigs. Lear Inc., autopilot and electronic engineers have a division of the company working on gravity research and so also has the Sperry division of Sperry-Rand. This list embraces most of the U.S. aircraft industry. The remainder, Curtiss-Wright, Lockheed, Boeing and North American have not yet declared themselves, but all these four are known to be in various stages of study with and without rigs.

In addition, the Massachusetts Institute of Technology is working on gravity, the Gravity Research Foundation of New Boston, the Institute for Advanced Study at Princeton, the CalTech Radiation Laboratory, Princeton University and the University of North Carolina are all active in gravity. Glenn L. Martin is setting up a Research Institute for Advanced Study which has a small staff working on gravity research with the unified field theory and this group is committed to extensive

programs of applied research. Many others are also known to be studying gravity, some are known also to be planning a general expansion in this field, such as the proposed Institute for Pure Physics at the University of North Carolina.

A certain amount of work is also going on in Europe. One of the French nationalized constructors and one company outside the nationalized elements have been making preliminary studies, and a little company money has in one case actually been committed. Some work is also going on in Britain where rigs are now in existence. Most of it is private tenure work, such

as that being done by Ed Hull, a colleague of Townsend Brown who, as much as anybody, introduced Europe to electrogravitics. Aviation Studies' Gravity Research Group is doing some work, mainly on k studies, and is sponsoring dielectric investigations.

One Swedish company and two Canadian companies have been making studies, and quite recently the Germans have woken up to the possibilities. Several of the companies have started digging out some of the early German papers on wave physics. They are almost certain to plan a gravitics program. Curiously enough the Germans during the war paid no attention to electrogravitics. This is one line of advance that they did not pioneer in any way and is still basically a U.S. creation. Townsend Brown in electrogravitics is the equivalent of Frank Whittle in gas turbines. This German overlooking of electrostatics is even more surprising when it is remembered how astonishingly advanced and prescient the Germans were in nuclear research. (The modern theory of making thermonuclear weapons without plutonium fission initiators returns to the original German idea that was dismissed, even ridiculed. The Germans never went very far with fission, indeed they doubted that this chain would ever be made to work.) The German air industry, still in the embryo stage, has included electrogravitics among the subjects it intends to examine when establishing the policy that the individual companies will adopt after the present early stage of foreign licence has enabled industry to get abreast of the other countries in aircraft development.

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It is impossible to read through this summary of the widening efforts being made to understand the nature of matter of gravity without sharing the hope that many groups now have, of major theoretical breakthroughs occurring before very long.

Experience in nucleonics has shown that when attempts to win knowledge on this scale are made, advances are soon seen. There are a number of elements in industry, and some managements, who see gravity as a problem for later generations. Many see nothing in it all and they might be right. But as said earlier, if Dr. Vaclav Hlavaty thinks gravity is potentially controllable that surely should be justification enough, and indeed inspiration, for physicists to apply their minds and for management to take a risk. Hlavaty is the only man who thinks he can see a way of doing the mathematics to demonstrate Einstein's unified field theory - something that Einstein himself said was beyond him. Relativity and the unified field theory go to the root of electrogravitics and the shifts in thinking, the hopes and fears, and a measure of progress is to be obtained only in the last resort from men of this stature.

Major theoretical breakthroughs to discover the sources of gravity will be made by the most advanced intellects using the most advanced research tools. Aviation's role is therefore to impress upon physicists of this calibre with the urgency of the matter and to aid them with statistical and peripheral investigations that will help to clarify the background to the central mathematics and physical puzzles. Aviation could also assist by recruiting some of these men as advisers. Convair has taken the initiative with its recently established panel of advisers on nuclear projects, which include Dr. Edward Teller of the University of California. At the same time much can be done in development of laboratory rigs, condenser research and dielectric development, which do not require anything like the same cerebral capacity to get results and make a practical contribution.

As gravity is likely to be linked with the new particles, only the highest powered particle accelerators are likely to be of use

in further fundamental knowledge. The country with the biggest tools of this kind is in the best position to examine the

characteristics of the particles and from these countries the greatest advances seem most likely.

Though the United States has the biggest of the bevatrons - the Berkeley bevatron is 6.2 bev - the Russians have a 10 bev accelerator in construction which, when it is completed, will be the world's largest. At Brookhaven a 25 bev instrument is in development which, in turn, will be the biggest. Other countries without comparable facilities are of course at a great disadvantage from the outset in the contest to discover the explanations of gravity. Electrogravitics, moreover, unfortunately competes with nuclear studies for its facilities. The clearest thinking brains are bound to be attracted to locations where the most extensive laboratory equipment exists. So, one way and another, results are most likely to come from the major countries with the biggest undertakings. Thus the nuclear facilities have a direct bearing on the scope for electrogravitics work.

The OEEC report in January made the following points:-

The U.S. has six to eight entirely different types of reactor in operation and many more under construction. Europe has now two different types in service.

The U.S. has about 30 research reactors plus four in Britain, two in France.

The U.S. has two nuclear-powered marine engines. Europe has none, but the U.K. is building one.

Isotope separation plants for the enrichment of uranium in the U.S. are roughly 11 times larger than the European plant in Britain.

Europe's only heavy water plant (in Norway) produces somewhat less than one-twentieth of American output.

In 1955 the number of technicians employed in nuclear energy work in the U.S. was about 15,000; there are about 5,000 in Britain, 1,800 in France, and about 1,000 in the rest of Europe. But the working party says that pessimistic conclusions should not be drawn from these comparisons. European nuclear energy effort is evenly divided at the moment, but some countries have notable achievements to their credit and important developments in prospect. The main reason for optimism is

that, taken as a whole, "Europe's present nuclear effort falls very far short of its industrial potential".

Though gravity research, such as there has been of it, has been unclassified, new principles and information gained from the nuclear research facilities that have a vehicle application is expected to be withheld.

The heart of the problem to understanding gravity is likely to prove to be the way in which the very high energy sub-nuclear particles convert something, whatever it is, continuously and automatically into the tremendous nuclear and electromagnetic forces. Once this key is understood, attention can later be directed to finding laboratory means of duplicating the process and reversing its force lines in some local environment and returning the energy to itself to produce counterbary. Looking beyond it seems possible that gravitation will be shown to be a part of the universal electro-magnetic processes and controlled

in the same way as a light wave or radio wave. This is a synthesis of the Einstein and Hlavaty concepts. Hence it follows that though in its initial form the mechanical processes for countering gravity may initially be massive to deal with the massive forces involved, eventually this could be expected to form some central power generation unit. Barycentric control in some required quantity could be passed over a distance by a form of radio wave. The prime energy source to energise the waves would of course be nuclear in its origins.

It is difficult to say which lines of detailed development being processed in the immediate future is more likely to yield significant results. Perhaps the three most promising are: first, the new attempt by the team of men led by Chamberlain working with the Berkeley bevatron to find the anti-neutron, and to identify more of the characteristics of the anti-proton* and each of the string of high energy particles that have been discovered during recent operations at 6.2 bev.

A second line of approach is the United States National Bureau of Standards program to pin down with greater accuracy the acceleration values of gravity. The presently accepted figure

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*The reaction is as follows: protons are accelerated to 6.2 bev,

and directed at a target of copper. When the proton projectile hits a neutron in one of the copper atoms the following emerge: the two original particles (the projectile and the struck neutron) and a new pair of particles, a proton and anti-proton. The anti-proton continues briefly until it hits another proton, then both disappear and decay into mesons.

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of 32.174 feet per second per second is known to be not comprehensive, though it has been sufficiently accurte for the limited needs of industry hitherto. The NBS program aims at re-determining the strength of gravity to within one part of a million. The present method thas been to hold a ball 16 feet up and chart the elapsed time of descent with electronic measuring equipment. The new program is based on the old, but with this exceptional degree of accuracy it is naturally immensely more difficult and is expected to take 3 years.

A third promising line is the new technique of measuring high energy particles in motion that was started by the University of California last year. This involves passing cosmic rays through a chamber containing a mixture of gas, alcohol and water vapour. This creates charged atoms, or positive ions, by knocking electrons off the gas molecules. A sudden expansion of the chamber results in a condensation of water droplets along the track which can be plotted on a photographic plate. This method makes it easier to assess the energy of particles and to distinguish one from the other. It also helps to establish the characteristics of the different types of particles. The relationship between these high energy particles, and their origin, and characteristics, have a bearing on electrogravitics in general.

So much of what has to be discovered as a necessary preliminary to gravity is of no practical use by itself. There is no conceivable use, for instance, for the anti-proton, yet its discovery even at a cost of $9-million is essential to check the mathematics of the fundamental components of matter. Similarly it is necessary to check that all the nuclear ghosts that have been postulated theoretically do in fact exist. It is not, moreover, sufficient, as in the past, only to observe the particles by

radiation counters. In each instance a mechanical maze has to be devised and attached to a particle accelerator to trap only the particle concerned. Each discovery becomes a wedge for a deeper probe of the nucleus. Many of the particles of very high energy have only a fleeting existence and collisions that give rise to them from bevatron bombardment is a necessary prerequisite to an understanding of gravity. There are no shortcuts to this process.

Most of the major programs for extending human knowledge on gravity are being conducted with instruments already in use for nuclear research and to this extent the cost of work exclusively on gravitational examinations is still not of major proportions. This has made it difficult for aviation to gauge the extent of the work in progress on gravity research.

* * *

CONCLUSIONS

1. No attempts to control the magnitude or direction of the earth's gravitational force have yet been successful. But if the explanation of gravity is to be found in the as yet undetermined characteristics of the very high energy particles it is becoming increasingly possible with the bevatron to work with the constituent matter of gravity. It is therfore reasonable to expect that the new bevatron may, before long, be used to demonstrate limited gravitational control.

2. An understanding and identification of these particles is on the frontiers of human knowledge, and a full assessment of them is one of the major unresolved puzzles of the nucleus. An associated problem is to discover a theory to account for the cosmic and quantum relations of gravity, and a theory to link the gravitational constant with the other three dimensionless constants.

3. Though the obstacles to an adequate grasp of microphysics

still seem formidable, the transportation rewards that could follow from electrogravitics are as high as can be envisaged. In a weightless environment, movement with sharp-edged changes of direction could offer unique manoeuvrability.

4. Determination of the enviroonment of the anti-proton, discovery

of the anti-neutron and closer examination of the other high energy particles are preliminaries to the hypothesis that gravity is one aspect of electromagnetism that may eventually be controlled like a wave. When the structure of the nucleus becomes clearer, the influence of the gravitational force upon the nucleus and the nature of its behaviour in space will be more readily understood. This is a great advance on the Newtonian concept of gravity acting at a distance.

5. Aviation's role appears to be to establish facilities to handle many of the peripheral and statistical investigations to help fill in the background on electrostatics.

6. A distinction has to be made between electrostatic energy for propulsion and counterbary. Counterbary is the manipulation of gravitational force lines; barycentric control is the adjustment to such manipulative capability to produce a stable type of motion suitable for transportation.

7. Electrostatic energy sufficient to produce low speeds (a few thousand dynes) has already been demonstrated. Generation of a region of positive electrostatic energy on one side of a plate and negative on the other sets up the same lift or propulsion effect as the pressure and suction below and above a wing, except that in the case of electrostatic application no airflow is necessary.

8. Electrostatic energy sufficient to produce a Mach 3 fighter is possible with megavolt energies and a k of over 10,000.

9. k figures of 6,000 have been obtained from some ceramic materials and there are prospects of 30,000.

10. Apart from electrogravitics there are other rewards from

investment in electrostatic equipment. Automation, autonetics and even turbine development use similar laboratory facilities.

11. Progress in electrogravitics probably awaits a new genius in physics who can find a single equation to tie up all the conflicting observations and theory on the structure and arrangement of forces and the part the high energy particles play in the nucleus. This can occur any time, and the chances are improved now that bev energies are being obtained in controlled laboratory conditions.

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APPENDIX I

EXTRACTS FROM AVIATION REPORT

-21-

ANTI-GRAVITATION RESEARCH

The basic research and technology behind electro-anti-gravitation is so much in its infancy that this is perhaps one field of development where not only the methods but the ideas are secret. Nothing therefore can be discussed freely at the moment. Very few papers on the subject have been prepared so far, and the only schemes that have seen the light of day are for pure research into rigs designed to make objects float around freely in a box. There are various radio applications, and aviation medecine departments have been looking for something that will enable them to study the physiological effects on the digestion and organs of an environment without gravity. There are however long term aims of a more revolutionary nature that envisage equipment that can defeat gravity.

Aviation Report 20 August 1954

MANAGERIAL POLICY FOR ANTI-GRAVITICS

The prospect of engineers devising gravity-defeating equipment - or perhaps it should be described as the creation of pockets of weightless environments - does suggest that as a long term policy aircraft constructors will be required to place even more emphasis on electro-mechanical industrial

plant, than is now required for the transition from manned to unmanned weapons. Anti-gravitics work is therefore likely to go to companies with the biggest electrical laboratories and facilities. It is also apparent that anti-gravitics, like other advanced sciences, will be initially sponsored for its weapon capabilities. There are perhaps two broad ways of using the science, one is to postulate the design of advanced type projectiles on their best inherent capabilities, and the more critical parameters (that now constitutes the design limitation) can be eliminated by anti-gravitics. The other, which is a longer term plan, is to create an entirely new environment with devices operating entirely under an anti-gravitic envelope.

Aviation Report 24 August 1954

THE GREATER THE EASIER

Propulsion and atomic energy trends are similar in one respect: the more incredible the long term capabilities are, the easier it is to attain them. It is strange that the greatest of nature's secrets can be harnessed with decreasing industrial effort, but greatly increasing mental effort. The Americans went through the industrial torture to produce tritium for the first thermonuclear experiment, but later both they and the Russians were able to achieve much greater results with the help of lithium 6 hydride. The same thing is happening in aviation propulsion; the nuclear fuels are promising to be tremendously powerful in their effect, but excessively complicated in their application, unless there can be some means of direct conversion as in the strontium 90 cell. But lying behind and beyond the nuclear fuels is the linking of electricity to gravity, which is an incomparably more powerful way of harnessing energy than the only method known to human intellect at present - electricity and magnetism. Perhaps the magic of barium aluminum oxide will perform the miracle in propulsion that lithium 6 hydride has done in the fusion weapon. Certainly it is a well-known material in dielectrics, but when one talks of massive-k, one means of course five figures. At this early stage it is difficult to relate k to Mach numbers with any certainty, but realizable k can, with some kinds of arithmetic, produce astounding velocities. They are achievable, moreover, with decreasing complexity, indeed the ultimate becomes the easiest in term of engineering, but the most hideous in terms of theory. Einstein's general theory of relativity is, naturally, and important factor, but some of the postulates appear to depend

on the unified field theory, which cannot yet be physically checked because noone knows how to do it. Einstein hopes to find a way of doing this before he dies.

Aviation Report 31 August 1954

GRAVITICS FORMULATIONS

All indications are that there has still been little cognizance of the potentialities of electrostatic propulsion and it will be a major

undertaking to re-arrange aircraft plants to conduct large-scale research and development into novel forms of dielectric and to improve condenser efficiencies and to develop the novel type of materials used for fabrication of the primary structure. Some extremely ambitious theoretical programs have been submitted and work towards realization of a manned vehicle has begun. One the evidence, there are far more definite indications that the incredible claims are realizable than there was, for instance, in supposing that uranium fission would result in a bomb. At least it is known, proof positive, that motion, using surprisingly low k, is possible. The fantastic control that again is feasible, has not yet been demonstrated, but there is no reason to suppose the arithmetic is faulty, especially as it has already led to a quite brisk example of actual propulsion. That first movement was indeed an historic occasion, reminiscent of the momentous day at Chicago when the first pile went critical, and the phenomenon was scarcely less weird. It is difficult to imagine just where a well-organized examination into long term gravitics would end. Though a circular planform is electrostatically convenient, it does not necessarily follow that the requirements of control by differential changes would be the same. Perhaps the strangest part of this whole chapter is how the public managed to foresee the concept, though not of course the theoretical principles that gave rise to it, before physical tests confirmed that the mathematics was right. It is interesting also that there is no point of contact between the conventional science of aviation and the New: it is a radical offshoot with no common principles. Aerodynamics, structures, heat engines, flapping controls, and all the rest of aviation is part of what might be called the Wright Brothers era, even the Mach 2.5 thermal barrier piercers are still Wright Brothers concepts, in the sense that they fly and they stall, and they run out of fuel after a short while, and they defy the earth's pull

for a short while. Thus this century will be divided into two parts - almost to the day. The first half belonged to the Wright Brothers who foresaw nearly all the basic issues in which gravity was the bitter foe. In part of the second half, gravity will be the great provider. Electrical energy, rather irrelevant for propulsion in

the first half becomes a kind of catalyst to motion in the second half of the century.

Aviation Report 7 September 1954

ELECTRO-GRAVITICS PARADOX

Realization of electro-static propulsion seems to depend on two theoretical twists and two practical ones. The two theoretical puzzles are: first, how to make a condenser the centre of a propulsion system, and the second is how to link the condenser system with the gravitational field. There is a third problem, but it is some way off yet, which is how to manipulate kva for control in all three axes as well as for propulsion and lift. The two practical tricks are first how, with say a Mach 3 weapon in mind, to handle a 50,000 kva within the envelope of a thin pancake of 35 feet in diameter and second how to generate such power from within so small a space. The electrical power in a small aircraft is more than a fair sized community the analogy being that a single rocketjet can provide as much power as can be obtained from the Hoover Dam. It will naturally take as long to develop electro-static propulsion as it has taken to coax the enormous power outputs from heat engines. True there might be flame in the electro-gravitic propulsion system, but it would not be a heat engine - the temperature of the flame would be incidental to the function of the chemical burning process.

The curious thing is that though electro-static propulsion is the antithesis of magnetism,* Einstein's unified field theory is an attempt to link gravitation with electro-magnetism. This all-embracing theory goes on logically from the general theory of relativity, that gives an ingenious geometrical interpretation of the concept of force which is mathematically consistent with gravitation but fails in the case of electro-magnetism, while the special theory of relativity is concerned with the relationship between mass and energy. The general theory of relativity fails to account for the electro-magnetism because the forces are proportional

to the charge and not to the mass. The unified field theory is one of a number of attempts that have been made to bridge this gap, but it is baffling to imagine how it could ever be observed. Einstein himself thinks it is virtually impossible. However, Hlavaty claims to have solved the equations by assuming that gravitation is a manifestation of electro-magnetism.

This being so it is all the more incredible that electro-static

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*Though in a sense this is true, it is better expressed in the body of this report than it was here in 1954.

propulsion (with kva for convenience fed into the system and not self-generated) has actually been demonstrated. It may be that to apply all this very abstruse physics to aviation it will be necesary to accept that the theory is more important than this or that interpretation of it. This is how the physical constants, which are now regarded as among the most solid of achievements in modern physics, have become workable, and accepted. Certainly all normal instincts would support the Einstein series of postulations, and if this is so it is a matter of conjecture where it will lead in the long term future of the electro-gravitic science.

Aviation Report 10 September 1954

ELECTRO-GRAVITIC PROPULSION SITUATION

Under the terms of Project Winterhaven the proposals to develop electro-gravitics to the point of realizing a Mach 3 combat type of disc were not far short of the extensive effort that was planned for the Manhattan District.* Indeed the drive to develop the prime mover is in some respects rather similar to the experiments that led to the release of nuclear energy in the sense that both involve fantastic mathematical capacity and both are sciences so new that other allied sciences cannot be of very much guide. In the past two years since the principle of motion by means of massive-k was first demonstrated on a test rig, progress has been slow. But the indications are now thet the Pentagon is ready to sponsor a range of devices to help further the knowledge. In effect the new family of TVs would be on the same tremendous scope that was envisaged by the X-1,2,3,4 and 5 and the D.558s that were all created for the purpose of destroying the sound barrier - which they effectively did, but it is a process that is taking ten solid years of hard work to complete. (Now after 7 years the X-2 has yet to start its tests and the X-3 is still in

performance testing stage). Tentative targets ...<illegible> anticipate that the first disc should be complete before 1960 and it would take the whole of the sixties to develop it properly, even though some combat things might be available ten years from now.

One thing seems certain at this stage, that the companies likely to dominate the science will be those with the biggest

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*The proposals, it should be added, were not accepted.

computors to work out the ramifications of the basic theory. Douglas is easily the world's leader in computor capacity, followed by Lockheed and Convair. The frame incidentally is indivisible from the engine. If there is to ba any division of responsibility it would be that the engine industry might become responsible for providing the electrostatic energy (by, it is thought, a kind of flame) and the frame maker for the condenser assembly which is the core of the main structure.

Aviation Report 12 October 1954

GRAVITICS STUDY WIDENING

The French are now understood to be pondering the most effective way of entering the field of electro-gravitic propulsion systems. But not the least of the difficulties is to know just where to begin. There are practically no patents so far that throw very much light on the mathematics of the relation between electricity and gravity. There is, of course, a large number of patents on the general subject of motion and force, and some of these may prove to have some application. There is, however, a series of working postulations embodied in the original Project Winterhaven, but no real attempt has been made in the working papers to go into the detailed engineering. All that had actually been achieved up to just under a year ago was a series of fairly accurate extrapolations from the sketchy data that has so far been actually observed. The extrapolation of 50 mph to 1,800 mph, however, (which is what the present hopes and aspirations amount to) is bound to be a rather vague exercise. This explains American private views that nothing can be reasonably expected from the science for yet awhile. Meanwhile, the NACA is active, and nearly all of the Universities are doing wokr that borders close to what is involved here, and something fruitful is likely to turn up before very long.

Aviation Report 19 October 1954

GRAVITIC STEPS

Specification writers seem to be still rather stumped to know what to ask for in the very hazy science of electro-gravitic

propelled vehicles. They are at present faced with having to plan the first family of things - first of these is the most realistic type of operational test rig, and the second the first type of test vehicle. In turn this would lead to sponsoring of a combat disc. The preliminary test rigs which gave only feeble propulsion have been somewhat improved, but of course the speeds reached so far are only those more associated with what is attained on the road rather than in the air. But propulsion is now known to be possible, as it is a matter of feeding enough KVA into condensers with better k figures. 50,000 is a magic figure for the combat saucer, it the is the amount of KVA and this amount of k that can be translated into Mach 3 speeds.

Meanwhile Glenn Martin now feels ready to say in public that they are examining the unified field theory to see what can be done. It would probably be truer to say that Martin and other companies are now looking for men who can make some kind of sense out of Einstein's equations. There's nobody in the air industry at present with the faintest idea of what it is all about. Also, just as necessary, companies have somehow to find administrators who know enough of the mathematics to be able to guess what kind of industrial investment is likely to be necessary for the company to secure the most rewarding prime contracts in the new science. This again is not so easy since much of the mathematics just cannot be translated into words. You either understand the figures, or you cannot ever have it explained to you. This is rather new because even things like indeterminacy in quantum mechanics can be more or less put into words.

Perhaps the main thing for management to bear in mind in recruiting men is that essentially electro-gravitics is a branch of wave technology and much of it starts with Planck's dimensions of action, energy and time, and some if this is among the most firm and least controversial sections of modern atomic physics.

Aviation Report 19 November 1954

ELECTRO-GRAVITICS PUZZLE

Back in 1948 and 49, the public in the U.S. had a surprisingly clear idea of what a flying saucer should, or could, do. There has never at any time been any realistic explanation of

what propulsion agency could make it do those things, but its ability to move within its own gravitation field was presupposed from its manoeuvrability. Yet all this was at least two years before electro-static energy was shown to produce propulsion. It is curious that the public were so ahead of the empiricists on this occasion, and there are two possible explanations. One is that optical illusions or atmospheric phenomena offered a preconceived idea of how the ultimate aviation device ought to work. The other explanation might be that this was a recrudescence of Jung's theory of the Universal Mind which move up and down in relation to the capabilities of the highest intellects and this may be a case of it reaching a very high peak of perception.

But for the air industries to realize an electro-gravitic aircraft means a return to basic principles in nuclear physics, and a re-examination of much in wave technology that has hitherto been taken for granted. Anything that goes any way towards proving the unified field theory will have as great a bearing on electro-gravitics efforts as on the furtherance of nuclear power generally. But the aircraft industry might as well face up to the fact that priorities will in the end be competing with existing nuclear science commitments. The fact that electro-gravitics has important applications other than for a weapon will however strengthen the case for governments to get in on the work going on.

Aviation Report 28 January 1955

MANAGEMENT NOTE FOR ELECTRO-GRAVITICS

The gas turbine engine produced two new companies in the U.S. engine field and they have, between them, at various times offered the traditional primes rather formidable competition. Indeed GE at this moment has, in the view of some, taken the Number Two position. In Britain no new firms managed to get a footing, but one, Metro-Vick, might have done if it had put its whole energies into the business. It is on the whole unfortunate for Britain that no bright newcomer has been able to screw up competition in the engine field as English Electric have

done in the airframe business.

Unlike the turbine engine, electro-gravitics is not just a new propulsion system, it is a new mode of thought in aviation and communications, and it is something that may become all-embracing. Theoretical studies of the science unfortunately have to extend right down to the mathematics of the meson and there is no escape from that. But the relevant facts wrung from the nature of the nuclear structure will have their impact on the propulsion system, the airframe and also its guidance. The airframe, as such, would not exist, and what is now a complicated stressed structure becomes some convenient form of hard envelope. New companies therefore who would like to see themselves as major defence prime contractors in ten or fifteen years time are the ones most likely to stimulate development. Several typical companies in Britain and the U.S. come to mind - outfits like AiResearch, Raytheon, Plessey in England, Rotex and others. But the companies have to face a decade of costly research into theoretical physics and it means a great deal of trust. Companies are mostly overloaded already and they cannot afford it, but when they sit down and think about the matter they can scarcely avoid the conclusion that they cannot affor not to be in at the beginning.

Aviation Report 8 February 1955

ELECTRO-GRAVITICS BREAKTHROUGHS

Lawrence Bell said last week that he thought that the tempo of development leading to the use of nuclear fuels and anti-gravitational vehicles (he meant presumabley ones that create their own gravitational field independently of the earth's) would accelerate. He added that the breakthroughs now feasible will advance their introduction ahead of the time it has taken to develop the turbojet to its present pitch. Beyond the thermal barrier was a radiation barrier, and he might have added ozone poisoning and meteorite hazards, and beyond that again a time barrier. Time however is not a single calculable entity and Einstein has taught that an absolute barrier to aviation is the environmental barrier in which there are physical limits to any kind of movement from one point in space-time continuum to another. Bell (the company not the man) have a reputation as

experimentalists and are not so earthy as some of the other U.S. companies; so while this first judgement on progress with electrogravitics is interesting, further word is awaited from the other major elements of the air business. Most of the companies are now studying several forms of propulsion without heat engines though it is early days yet to determine which method will see the light of day first. Procurement will open out because the capabilities of such aircraft are immeasureably greater than those envisaged with any known form of engine.

Aviation Report 15 July 1955

THERMONUCLEAR-ELECTROGRAVITICS INTERACTION

The point has been made that the most likely way of achieving the comparatively low fusion heat needed - 1,000,000 degrees provided it can be sustained (which it cannot be in fission for more than a microsecond or two at a time) - is by use of a linear accelerator. The concentration of energy that may be obtained when accelerators are rigged in certain ways make the production of very high temperatures feasible but whether they could be concentrated enough to avoid a thermal heat problem remains to be seen. It has also been suggested that linear accelerators would be the way to develop the high electrical energies needed for creation of local gravitation systems. It is possible therefore to imagine that the central core of a future air vehicle might be a linear accelerator which would create a local weightless state by use of electrostatic energy and turn heat into energy without chemical processes for propulsion. Eventually - towards the end of this century - the linear accelerator itself would not be required and a ground generating plant would transmit the necessary energy for both purposes by wave propagation.

Aviation Report 30 August 1955

POINT ABOUT THERMONUCLEAR REACTION REACTORS

The 20 year estimate bye the AEC last week that lies between present research frontiers and the fusion reactor

probably refers to the time it will take to tap fusion heat. But it may be thought that rather than use the molecular and chemical processes of twisting heat into thrust, it would be more appropriate to use the new heat source in conjunction with some

form of nuclear thrust producer which would be in the form of electrostatic energy. The first two Boeing nuclearjet prototypes now under way are being designed to take either molecular jets or nuclear jets in cse the latter are held up for one reason or another. But the change from molecular to direct nuclear thrust production in conjunction with the thermonuclear reactor is likely to make the aircraft designed around the latter a totally different breed of cat. It is also expected to take longer than two decades, though younger executives in trade might expect to live to see a prototype.

Aviation Report 14 October 1955

ELECTROGRAVITICS FEASIBILITY

Opinion on the prospects of using electrostatic energy for propulsion, and eventually for creation of a local gravitational field isolated from the earth's has naturally polarized into the two opposite extremes. There are those who say it is nonsense from start to finish, and those who are satisfied from performance already physically manifest that it is possible and will produce air vehicles with absolute capabilities and no moving parts. The feasibility of a Mach 3 fighter (the present aim of studies) is dependent on a rather large k extrapolation, considering the pair of saucers that have physically demonstrated the principle only achieved a speed of some 30 fps. But, and this is important, they have attained a working velocity using a very inefficient (even by today's knowledge) form of condenser complex. These humble beginnings are surely as hopeful as Whittle's early postulations.

It was, by the way, largely due to the early references in Aviation report that this work is gathering momentum in the U.S. Similar studies are beginning in France, and in England some men are on the job full time.

Aviation Report 15 November 1955

ELECTRO-GRAVITICS EFFORT WIDENING

Companies studying the implications of gravitics are said, in a new statement, to include Glenn Martin, Convair, Sperry-Rand, Sikorsky, Bell, Lear Inc. and Clark Electronics. Other companies who have previously evinced interest include Lockheed, Douglas and Hiller. The remainder are not disinterested, but have not given public support to the new science - which is widening all the time. The approach in the U.S. is in a sense

more ambitious than might have been expected. The logical approach, which has been suggested by Aviation Studies, is to concentrate on improving the output of electrostatic rigs in existence that are know to be able to provide thrust. The aim would be to concentrate on electrostatics for propulsion first and widen the practical engineering to include establishment of local field forcelines, independent of those of the earth's, to provide unfettered vertical movement as and when the mathematics develops.

However, the U.S. approach is rather to put money into fundamental theoretical physics of gravitation in an effort first to create the local gravitational field. Working rigs would follow in the wake of the basic discoveries. Probably the correct course would be to sponsor both approaches, and it is now time that the military stepped in with big funds. The trouble about the idealistic approach to gravity is that the aircraft companies do not have the men to conduct such work. There is every expectation in any case that the companies likely to find the answers lie outside the aviation field. These would emerge as the masters of aviation in its broadest sense.

The feeling is therefore that a company like A.T. & T. is most likely to be first in this field. This giant company (unknown in the air and weapons field) has already revolutionized modern warfare with the development of the junction transistor and is expected to find the final answers to absolute vehicle levitation. This therefore is where the bulk of the sponsoring money should go.

Aviation Report 9 December 1955

* * *

APPENDIX II

ELECTROSTATIC PATENTS

The following patents derive from P. Jolivet (Algiers), marked 'A' and from N.J. Felici, E. Gartner (Centre National des Recherches Scientifique - CRNS) later also by R. Morel, M. Point, etc... (S.A. des Machines Electrostatiques -SAMES- and of Societe d'Appareils de Controle et d'Equipment des Moteurs SACEM), marked 'G' (because the

development was centred at the University of Grenoble).

Mark of Applicant	Application Date	England	America	France	Germany	Title
G	9-11-44 14-8-45	637,434	2,486,140 56,027	993,017	860,649	Electrostatic Influence Machine
G	17-11-44	639,653	2,523,688	993,052	815,667	Electrostatic Influence Machine
A	28-2-45		912,444			Inducteurs de Machines el'static
G	3-3-45	643,660	2,519,554	995,442	882,586	El'static Machines
A	8-8-45		915,929			Machines electrostatiques a flasques
A	16-8-45		918,547			Generatrice el'statique
G	20-9-45 21-9-45	643,664	2,523,689 56,356	998,397	837,267	Electrostatic Machines
A	4-2-46		923,593			Generatrice el'statique
G	17-7-46	643,579	2,530,193	1002,031	811,595	Generating Machines
G	20-2-47	671,033	2,590,168			Ignition device
G	21-3-47	655,474	2,542,494 Re-23,560	944,574	860,650	El'static Machines
G	6-6-47	645,916	2,522,106	948,409	810,042	El'static Machines
A	16-6-47		947,921			Generatrice el'statique
G	16-1-48	669,645	2,540,327	961,210	810,043	El'static Machines
G	21-1-49	669,454	2,617,976	997,991	815,666	El'static Machines
G	7-2-49	675,649	2,649,566	1010,924	870,575	El'static Machines
G	15-4-49	693,914	2,604,502	1011,902	832,634	Commutators for electrical machine

G	9-11-49	680,178	2,656,502	1004,950	850,485 El'static Generate
G	9-10-50	702,494	2,675,516	1030,623	El'static Generate 20-2-51
G	29-11-50	702,421		1028,596	El'static Generate 20-2-51
G	21-11-51	719,687		1051,430	F10421 El'static Machines
G	20-8-52	731,773	2,702,869		938,198 El'static Machines
G	6-11-52	745,489			El'static Generator
G	12-2-53	745,783			Rotating El'static Machines
G	8-1-52	715,010	2,685,654	1047,591	Rotating El'static Machines producing a periodical discharge

	Appl'n No	
G	27-2-54	5726/55 El'static Machines
G	8-3-54	6790/55 El'static Machines
G	28-1-55	2748/56 El'static Machines

Note: ALL THE LISTED PATENTS ARE STILL IN FORCE

<which may have changed since 1956...>

ELECTRIC GRAVITY?

Evidence For A Charge Related Gravitational Field

Kedrick F. Brown, November 12, 1998

Introduction:

The special relativistic formula E = mc^2 shows that gravitational charge (i.e. mass) is equivalent to energy (electromagnetic radiation). So it seems very logical to assume that electromagnetic charge is also equivalent to energy. In fact a point charge is describable as a cloud of virtual photons (electromagnetic radiation) surrounding a point in space, and charges radiate energy when they accelerate.

Einstein's mass-energy equivalence formula above can be arrived at by simple dimensional analysis, and brings to mind the question of whether there is a charge-energy equivalence formula that can be obtained in the same manner. If there is such a formula, it has to be:
$E = Q \sqrt{(K/G)}\, c^2$
where G is the gravitational constant, K is the Coulomb's law constant and Q is charge. This would mean that there is an energy density associated with any charge density, just as there is an energy density associated with any mass density.

Well, the important thing about this is that all energy densities produce gravitational fields. Of course, charge does not contribute to a particle's mass (whether inertial or gravitational) because it is massless. However, its energy density should contribute to the particle's gravitational potential / field. So, the gravitational potential due to charge that surrounds a charged particle should be:
$\phi = -G [E / c^2] / r$
$= -\sqrt{(GK)}\, Q / r$

For the electron, we thus see that the gravitational potential due to charge should be about 21 orders of magnitude greater than that due to its mass. Dalton [1] arrived at an identical result after developing an entire theory in which electromagnetism is assumed to be the source of gravitation. We see here that simple dimensional analysis yields the same result.

A Simple Experiment:

This hypothesis can be easily tested by an experiment (see diagram) in which you:
1) Place a charged sphere underneath a shielding plate or in a shielded box
2) Measure the gravitational acceleration over the plate using a gravitometer or measure the weight of objects over the plate with a scale

[ ] gravitometer
--- shielding plate
O charged sphere
__ floor

The sphere's electric field will be blocked by the shielding plate from interfering with the gravitometer, but if there is a gravitational field related to charge it should NOT be shieldable by the plate and so should affect the gravitometer. Also the grav. field due to a positively charged sphere should be opposite that due to a negatively charged sphere.

So for example if the gravitometer is 0.1m away from a sphere charged with -10^{-4} C (behind a shielding plate), you should measure an approximate reduction in g of 0.01 m/sec^2 (i.e. 0.1%). This reduction should be proportional to the charge on the sphere, and becomes an increase if the sphere is positively charged.

Discussion:

Of great interest is the fact that a positive gravitational potential should surround a negative point charge. This is a consequence of the fact that according to the formula above negatively charged particles such as the electron should have net negative energy densities due to their charge. Negative energy densities are known to be required for exotic spacetime propulsion and vacuum engineering methods, as theorized for example by Alcubierre [2] and Morris and Thorne [3]. The effect on neutral matter of the true gravitoelectric field associated with charge has likely been obscured in the past by larger static electric effects due to dielectric polarization.

Obviously, this field is quite small, but brings to mind questions about the possible gravitational uses of ultrahigh energy electromagnetic radiation. These are topics that can hopefully be studied in the future if this charge related

gravitational field is ultimately observed.

Sources Used:

[1] K. Dalton, LANL Preprint gr-qc/9512027 , also published in Hadronic J. 17, 483 (1994)
[2] M. Alcubierre, Class. Quant. Grav. 11, L73 (1994)
[3] M. S. Morris and K. S. Thorne, Am. J. Phys. 56 (5) (1988)

Links:

GRAVITATIONAL ENGINEERING PAGE

NUCLEAR GRAVITY? A Scientific Examination Of The Wallace Patents

Questions? Comments? Email:

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A SUMMARY OF

"NUCLEAR GRAVITY? A Scientific Examination of the Wallace Patents"

Copyright January 1998, Kedrick F. Brown
Updated November 1998

In 1971, Henry Wallace patented a device [1] that he claimed produced a changing gravitational field in the space surrounding it. According to him, his device worked because when materials containing half-integral spin nuclei are placed in relative rotation to one another at close proximity, a gravitomagnetic field (which he named the "kinemassic field") is produced between them. Causing this "kinemassic" field to vary with time produces a phase-related gravitoelectric field in the surrounding space through induction. Please see the main "NUCLEAR GRAVITY?" page for more details on Wallace's device.

A detailed examination of the above patent (U.S. Patent 3,626,605 -- "Method and Apparatus For Generating A Secondary Gravitational Force Field") and its supporting patents [2,3] yields the conclusion that unless his results were spurious (i.e. he was either mistaken or a fraud), the following must be true:

THE GRAVITOMAGNETIC FIELD CREATED IN WALLACE'S DEVICE CANNOT BE CREATED BY THE ANGULAR MOMENTUM OF ANYTHING KNOWN IN HIS DEVICE

Nothing known in his device (i.e. either the rotor or the nuclei in it) has even nearly enough angular momentum to produce a noninfinitesmal gravitomagnetic field, as he claims is produced. This is partially due to the extremely minute value of the gravitomagnetic permeability of free space (approximately 10E-26 m/kg). Furthermore, the rotor's angular momentum is only about 10 Js, which is approximately 11 orders of magnitude greater than the total ground state angular momentum of all the nuclei in it.

We can also discount the possibility that the nuclei in his device somehow acquire a large amount of angular momentum through the rotational polarization process. They would have to acquire a total angular momentum

numerous orders of magnitude greater than that of the rotor itself in order produce a noninfinitesmal gravitomagnetic field. If the nuclei in the rotor did in fact acquire a total angular momentum of this magnitude, the gyroscopic counter-torque created by rotating the rotor about an axis perpendicular to its axis of rotation (as Wallace did) would most likely have destroyed his experiment.

We also know that ONLY ROTATIONAL POLARIZATION OF NUCLEI CAN PRODUCE WALLACE'S RESULTS

Wallace's results are unique effects arising from the method of rotational polarization of nuclei (as opposed to electromagnetic polarization of nuclei). Nuclear Magnetic Resonance (NMR), the electromagnetic induction of a high frequency changing nuclear polarization in a sample, would be a much simpler way to reproduce his results in [1] if electromagnetic methods of nuclear spin polarization produced identical effects. However, no gravitational anomalies have been associated with NMR in any form. This clearly indicates that nuclei in nonrotating systems do not emit gravitomagnetic fields that are stronger than commonly believed. It is identically evident, then, that Wallace's rotational method of nuclear polarization (based on Barnett's effect [4]) must cause these nuclei to emit significantly stronger gravitomagnetic fields than their angular momentum could create. If Wallace's results are legitimate, these fields are most likely a strong force related gravitational effect.

As the strong force must be largely responsible for creating these anomalous nuclear gravitomagnetic fields that arise in rotating nuclear systems (please see my main page for details), nuclei with higher levels of strong force saturation should produce stronger gravitomagnetic fields. Wallace thus claims [1] that Bismuth is the ideal material for his experiment, as it has the highest number of nucleons of any stable element. Along these lines, an element with 298 total nucleons (element 114) has been theorized to be stable [5]. If, when this element is discovered it is also found to have a stable isotope with an odd number of nucleons (i.e. having half integral net nuclear spin), this would of course be an even more preferable material for Wallace's experiment than Bismuth due to its higher level of strong force saturation.

Wallace's results seem relevant in the wake of claims by Podkletnov and colleagues (e.g. [6,7]) that gravitoelectric effects have been observed around superconductors under the influence of electromagnetic fields. A rotating superconductor should have its nuclei polarized due to this rotation, and electromagnetic fields might be capable of changing this polarization over time.

MAIN "NUCLEAR GRAVITY?" PAGE

ELECTRIC GRAVITY? Evidence For A Charge Related Gravitational Field

GRAVITATIONAL ENGINEERING PAGE

Sources Used

[1] H. W. Wallace, U.S. Patent 3,626,605 (1971)
[2] H. W. Wallace, U.S. Patent 3,626,606 (1971)
[3] H. W. Wallace, U.S. Patent 3,823,570 (1974)
[4] S. J. Barnett, Phys. Rev. 10, 7 (1917)
[5] W. Loveland and G. Seaborg, New Scientist, August 31, 1991
[6] E. Podkletnov and R. Nieminen, Physica C 203, 441 (1992)
[7] E. Podkletnov, LANL Preprint cond-mat/9701074 v2 (1997)

Comments? Questions? Email:
kfbrown@worldnet.att.net

See the messages below.

Interesting effect... but is it yet another Newsgroup hoax? The message seems vaguely familiar. I recall seeing it a couple of years ago, maybe.

Weight change can come from air jets, so any motorized "antigrav" device needs to be placed inside a plastic bag, to eliminate reaction force from ejected air. Also, I wouldn't trust any commercial balance or scales to give correct readings when vibrated. Therefore the experimenters need to try inserting some vibration isolation, to assure that the measured weight change is still the same when the measuring device is vibrated less.

Maybe the device is thrusting upwards, rather than decreasing in weight. Turn it upside-down, and does it weigh more? Hang it from a string as a pendulum, mount it turned sideways, and does it deflect its position (by sideways thrust?)

What is REALLY interesting is the reported effect on CRTs and fluorescent lights. Spinning magnets shouldn't do such things. If it were me, I would want to eliminate the electric motor as a possible noise source. Try operating the device with the magnets disk removed, to see if the effects on CRTs and lighting is from the drive motor or from the spinning magnets.

From: ecogen@iol.ie (Chris Eccles)
Newsgroups: sci.physics.electromag
Subject: Mystified by Results
Date: Mon, 5 Oct 1998 08:49:02 +0100
Organization: genesis
Message-ID:
NNTP-Posting-Host: dialup-042.ennis.iol.ie
Mime-Version: 1.0
Content-Type: text/plain; charset=ISO-8859-1
Content-Transfer-Encoding: 8bit
X-Newsreader: MacSOUP 2.3
Lines: 44
Xref: hub1.ispnews.com sci.physics.electromag:8005

I don't often post to news but, this time, I feel that someone out there might offer me an answer to a weird outcome of an experiment.

I have spent my entire career in mainstream physics research and have always been amused (often annoyed) by the "crankies" who believe in teleportation, spoon-bending, etc etc etc, and have consistently held

the view that these fringe things belong firmly outside what I call physics.

A few weeks back, my lab assistant got some stuff off the net about a "magneto-gravity" device, accompanied by some notes by Tom Bearden. This swatch of paper was lying about in the lab office and I happened to read it. Out of nothing but bemused interest, I said to my team, "Lets build this crap and see what happens...."

We constructed a variant of the device shown in the drawings which accompanied the data. This consisted of a Duralumin disc (350mm dia) which could be spun on a motor shaft, using a Picador bearing which we had lying about. The disc was made to spin 1.5mm eccentric and was fitted with twelve button magnets around its periphery, with all their N poles facing outwards, by fixing the magnets to 90-degree offcuts of alloy angle. The whole thing was then mechanically balanced by adding extra thin strips of copper busbar (!) to compensate for the eccentricity. When tested, the disc displayed some imbalance but this was easily corrected until we had it running smoothly at 2850 rpm from a mains-powered 750W motor. So far so good.

We then rigged an enclosing fence of alloy strip around the disc, on which we mounted twelve more button magnets with their S poles facing inwards. The clearance between the disc-mounted magnets and the peripheral ones varied by ±0.75mm as the disc turned.

The whole shazam was mounted on an acrylic base plate and weighed. It was 14.26 kg. When we switched the motor in, the weird shit happened. The balance showed a loss of grav mass of the assembly of some 550 grams (3.85%) and every computer terminal and fluorescent lamp in the lab went ape !

Is this real, or should I take a holiday ?

Can anyone offer an explanation ?

Chris

Since the first test of the device, we have not done a great deal but the

interest shown by subscribers to this group (reflected in the pile of email I have received) has made me reserve some more lab time for further investigations.

To the many who wrote to me (rightly skeptical) I have to say unequivocally that this is NOT some kind of hoax. It's nowhere near April 1st and I am 50 years old, a serious researcher with a healthy career in mainstream electronic physics, and not given to the kind of tom-foolery that belongs in the student common-room during rag-week.

What we are talking about here is the possibility of some kind of hitherto-unknown relationship between dynamically-changing tensor fields. Magnetism, particularly intrinsic, remnant magnetism, is one of the few phenomena that remain relatively badly delineated by current quantum theory and I, for one, am prepared to admit that there are huge holes in my own fundamental understanding of it. If a simple, but rarely-occurring-in-nature, juxtaposition of non-scalar fields is capable of either creating (or destroying) spin-2, zero mass mediating particles, then there is the real possibility of manipulating and engineering the gravitational field. It becomes an exciting prospect but not one which should lead any of us into assuming that the Sinclaire device actually manifests such an effect.

The secondary EM effects are quite interesting. Has anyone else built anything which comes close to displaying the same anomalies ?

Please feel free to email me direct and suggest guidelines for a concerted research pathway on this. There is too much indiscipline and disorganization in "fringe" physics for anyone to feel secure about such work. Lack of published matter in mainstream journals (for obvious and valid reasons) gives rise to the feeling that one is trying to "swim through treacle" even commencing such a program of research.

It is, I think, fundamentally important to distinguish between a mass-shielding effect (where a device purports to alter the measured strength of the Earth's [or any] grav field "above" the device), and an effect which indicates that an entire, physically-linked, chunk of equipment can be made to behave as though it has shed grav mass. The one case illustrates that a tensor field can be manipulated vectorally (and few would find fault with the math of this); the other possibly is suggesting that a property of matter which we have all believed to be sacrosanct and writ-in-stone for several centuries is, in fact, a deal more woolly than we believed it to be.

I remain very puzzled.

Author: Chris Eccles
Email: ecogen@iol.ie
Date: 1998/10/18
Forums: sci.physics.electromag

I have just been told by someone in the lab that what we actually have built is nearly a replica of something called the Searl Levi-Disk. It is exceedingly difficult to get any sound and reliable information from anyone on this device !

I appreciate the email from Mr Sterniman; it seems well-reasoned and I am replying soon when I have attempted to set the math of it straight in my own terms.

I am unused to newsgroups and their etiquette, and I hope regular readers will forgive the inevitable confusion of a novitiate ?

It seems that we can summaries as follows:

When the flux of an N-pole cuts the flux of an S-pole such that the tensor fields experience the maximum tendency to repel (pi/2), we create an electric field in whatever gap exists between the sources of the flux. We will also, a priori, because of the fact that the disk does not rotate its magnets in concentricity with those on the outer wall, be setting up a variation of transfer of angular momentum of the electromagnetic field associated with the electric field cutting flux all the time the disk is turning. This eccentricity has an interesting locus and traces out a cylindrical path of wall-thickness equal to twice the original eccentricity of the magnet ring on the disk (when stationary).

We are going to run the device again soon, using a remote spring balance to ascertain the apparent mass loss so that there is no chance of an interaction between the pan balance and the device. Also, in answer to many queries, "No, it's not electromagnetic interference from the motor which caused the strange effects." Running the motor free is fine. It came from a vacuum pump which had been running in the lab for ages ! Anyway, after thirty years in physics, I've yet to encounter a 50Hz mains induction motor that could dim-out flu-tubes and blow up LCD's.

More news when we have it.

Please keep ideas flowing in - this device threatens to prevent me from building the HV/HF switches which we are supposed to be producing !!!!!

Chris

Electrogravitics Reference List

Date: Fri, 1 Mar 1996 15:40:06 -0600 (CST)
From: Robert Stirniman
Subject: Updated Electrogravitics List

This file contains an electrogravitics reference list, copied ad hoc from various other files and sources, with commentary by yours truly.
Prepared by: Robert Stirniman (robert@wwa.com)
This Update: March 1, 1996

Danger Will Robinson! Some of the following information is serious, and some is nonsense. Some of the things that might at first seem to be nonsense, are not. And some things referenced below, which come from serious credentialed scientists, are in fact nonsense. Whatever the case, it's been included. Good luck sorting it out.
Understanding gravity is a matter of time.

SHORTCUTS

Internet Sites

Patents

Hooper's work

Spin/superconductor papers

NASA papers

T. T. Brown

Graneau

Poliakov Gravitonics

Other researc papers

Internet Sites

Elektromagnum web site by David Jonsson:
http://www.newphys.se/elektromagnum/

KeelyNet:
http://www.keelynet.com/
http://www.newphys.se/elektromagnum/physics/KeelyNet/

Los Alamos National Lab Physics E-Print Archive:
http://xxx.lanl.gov/

Center for Gravitational Physics and Geometry:
http://vishnu.nirvana.phys.psu.edu/

Bill Beaty's Weird Science, Anomalous Physics, Free-Energy, Tesla Society:
http://www.eskimo.com/~billb/
http://www.eskimo.com/~billb/freenrg/antigrav.html

The Institute For New Energy, Patrick Bailey, homepage :
http://www.padrak.com/ine/

Digital Equipment Corp's Alta Vista web search engine. If
you can't find it with this, it ain't out there yet.
http://www.altavista.digital.com/

Elsevier Science. Search or browse the table of contents of more
than 900 science and technology journals. Data since early 1995.
http://www.elsevier.nl/cas/estoc/

Norman Redington's website, The Net Advance of Physics, recent preprints and papers describing new developments in physics:
http://pobox.com/~redingtn

Embry-Riddle Aeronautical University's Aerospace Virtual Library:
http://macwww.db.erau.edu/www_virtual_lib/aerospace.html

Jack R. Hunt Memorial Library (aerospace):
http://amelia.db.erau.edu/

American Institute of Aeronautics & Astronautics (AIAA) home page:
http://www-leland.stanford.edu/group/aiaa/national

NASA Langley Research Center Library:
http://blearg.larc.nasa.gov/library/larc-lib.html

NASA Scientific and Technical Information:
http://www.sti.nasa.gov/STI-homepage.html

University of Alabama at Hunstville. Dr Ning Li and Dr Douglas Torr.
Microgravity research consultants to NASA's Marshall Space Center.
http://isl-garnet.uah.edu/RR93/uahmatsci.html

The Microgravity Research Experiments (MICREX) Data Base
http://samson2.msfc.nasa.gov/fame/exps/kaw-sl3.html

Interstellar Propulsion Society:
http://www.digimark.net/ips/

National Science Foundation World Wide Web Server.
Find out where your science tax dollars are going.
http://stis.nsf.gov/

Nexus magazine web page:
http://www.peg.apc.org/~nexus/

Home page of New Scientist magazine:
http://www.newscientist.com/pstourist/index.html

The Farce of Physics:
http://www.germany.eu.net/books/farce

The World Wide Web Virtual Library: Sumeria/Technology
http://lablinks.com/sumeria/tech.html

The Society for the Advancement of Autodynamics website:

http://www.webcom.com/~saa

Popular Mechanics' Tech Update Article Archive:
http://popularmechanics.com/cgi-bin/wais.pl

Fortean web site:
http://www.clas.ufl.edu/anthro/fortpages.html.

Homepage of Apeiron Magazine:
http://montreal.aei.ca:80/~apeiron/

Borderland Sciences Research Foundation ftp site:
ftp: northcoast.com/pub/bsrf

Homepage of the International Society of Unified Science,
for advancing the Reciprocal System Theory of Dewey B. Larson:
http://infox.eunet.cz/interpres/sr/isus/index.html

Frank Lofaro's homepage, including alternative science links,
and two articles by Whittaker written in 1903 and 1904 about
scalar field theory and free energy:
http://www.unlv.edu/~ftlofaro/

Homepage of the Oppositely Charged Twin Monopole (OCTM) theory
of matter, "Gravity is a Push", US patent number 5,377,936:
http://www.epicom.com/gravitypush

Dr Eujin Jeong's Dipole Theory of Gravity homepage:
http://www.realtime.net/~ejeong

Levesque's (laurent@ee.umanitoba.ca) web site:
http://www.ee.umanitoba.ca/~laurent

UFOs and the New Physics:
http://www.hia.com/hia/pcr/ufo.html

There is a fairly large body of evidence which supports the idea
of a strong relationship, and possibly an equivalent fundamental
source, for electromagnetism and gravitation. Many references to this
effect are contained in this resource list. But for now, let's forget
about the experimental evidence and theoretical ideas which are
presented here, and begin with first principles.

What if our knowledge of physics had evolved differently?

What if no one had ever given a thought to any theory of gravitation,
before we discovered the principles and theories of electromagnetics
and the two nuclear forces. We might have developed some fairly good
theories which unify the "three" forces. We would know that clumps of
matter are held together primarily by electromagnetic forces. And we
would find experimentally that if we separate some of these clumps of
matter, a small force continues to exist which trys to bring them back
together. Would it seem rational to speculate that this force is something
entirely new and completely different from electromagnetics? Would it
not be a great foolishness to invent something new and call it gravity
and claim that it has no relationship with the known forces, and then
write elaborate mathematical theories which describe it solely as geometry?
Or, would it be more rational to see it as what it probably is --
a manifestation of the electromagnetic forces which we already know
to hold matter together?

Could it be that electric charge is a fundamental thing, and inertial
mass is merely a shadow of something primal, and what we know as a
gravitational field is merely the net result of other primary fields?
Geometrize it if you find it useful to do so, but please recognize that
defining gravity as geometry lends no information to the understanding
of its cause.

Of all the forces we know, there is none stronger than a paradigm.
-- Robert Stirniman

GENERAL RELATIVITY & QUANTUM COSMOLOGY, ABSTRACT GR-QC/9512027
From: kldalton@cs.clemson.edu
Date: Tue, 12 Dec 1995 11:30:30 -0500
Author(s): Kenneth Dalton
Journal-ref: Hadronic J. 17 (1994) 483-501

Hypothesis: The electromagnetic field is the source of gravitation.
This treatment of gravitation is consistent with the quantum theory
of matter, which holds that electric charge (or `generalized
charge') is the most fundamental attribute of matter. Experimental
predictions of the theory include: (1) any massive body generates a
time-dependent gravitational field; (2) there is a linear
correlation between the gravitational red-shift of a stellar source
and the energy of cosmic rays emitted by that source, given by $
{\Delta \nu}/{\nu_0} = energy (eV)/10^{27} $; (3) the maximum energy
of cosmic rays is $ 10^{27} $ eV; (4) this limit is associated with
an infinitely red-shifted stellar object, an ``electrostatic
black-hole,'' at the potential $ c^2/G^{1/2} = 10^{27} $ volts.
Finally, the theory predicts that the gravitational potential near
any charged elementary particle is many orders of magnitude greater

than the Newtonian value.

HIGH ENERGY PHYSICS - THEORY, ABSTRACT HEP-TH/9601066
From: Kenichi Horie
Date: Sat, 13 Jan 1996 14:41:29 +0900
Geometric Interpretation of Electromagnetism in a Gravitational Theory with Torsion and Spinorial Matter
Author(s): Kenichi Horie (KEK Japan)
Comments: Ph.D. thesis, 98 pages, LaTeX file, ca 276kB
Possible geometric frameworks for a unified theory of gravity and electromagnetism are investigated: General relativity is enlarged by allowing for an arbitrary complex linear connection and by constructing an extended spinor derivative based on the complex connection. Thereby the spacetime torsion not only is coupled to the spin of fermions and causes a four-fermion contact interaction, but the non-metric vector-part of torsion is also related to the electromagnetic potential. However, this long-standing relation is shown to be valid only in a special U(1) gauge, and it is a formal consequence of the underlying extended geometry.

Salem, Kenneth G.
The new gravity : a new force, a new mass, a new acceleration : unifying gravity with light / Kenneth G. Salem. 1st ed. Johnstown, PA : Salem Books, c1994. xiii, 181 p. : ill. ; 22 cm.
LC CALL NUMBER: QC794.6.G7 S26 1994
SUBJECTS: Unified field theories. Gravitation. Electromagnetic interactions.
ISBN: 0962539813

Green, James A.
Gravitation & the electroform model : from general relativity to unified field theory / by James A. Green. 7th ed. [Wichita, Kan.] : Greenwood Research, c1994. 33 p. : ill. ; 24 cm.
LC CALL NUMBER: QC178 .G68 1994
SUBJECTS: Gravitation. Unified field theories. Astrophysics.
"Wichita State University Physics Graduate Seminar, Dec.1993 and Dec. 1994"

Another very interesting research on anti-gravity is done (and still going on) by the Japanese prof. Shinishi SEIKE. He published his findings in the book " The Principles of Ultra Relativity ".
For his highly mathematical (no nonsense) book write to:

Shinichi SEIKE
G Research Institute
Box 33

UWAJIMA/Ehime (798)
JAPAN

Patents for anti-gravity devices and systems have been issued to
Brown, Hooper, Wallace, and others.

US Patents Awarded to Townsend Brown --

300,311 T.T.Brown	Nov. 15, 1928	A Method of and an Apparatus or Machine for Producing Force or Motion
1,974,483 T.T.Brown	Sept. 25, 1934	Electrostatic Motor
2,949,550 T.T.Brown	Aug. 16, 1960	Electrokinetic Apparatus
3,022,430 T.T.Brown	Feb. 20, 1962	Electrokinetic Generator
3,187,206 T.T.Brown	June 1, 1965	Electrokinetic Apparatus
3,296,491 T.T.Brown	Jan. 3, 1967	Method and Apparatus for Producing Ions and Electrically-Charged Aerosols
3,518,462 T.T.Brown	June 30, 1970	Fluid Flow Control System

Dr. late William J. Hooper, BA, MA, PhD in Physics was affiliated with
the University of California at Berkley, and was Professor Emeritus,
when he died in 1971. His works are documented and he gained two U.S.
patents for his "ALL-ELECTRIC MOTIONAL FIELD GENERATOR".
He claimed use of the "Motional Electric Field" to produce gravity and
anti-gravity for use in SPACECRAFT and AIRCRAFT. Indeed, in U.S. patent
#3,610,971 you can see a Flying Saucer diagram is used as an example
in Figure 7.
-- James Hartman, CaluNET Future Science Administrator

US Patent #3,610,971. "All Electric Motional Electric Field Generator",
Awarded to William Hooper, April 1969

US Patent # 3,656,013. "Apparatus for Generating Motional Electric Field",
Awarded to William Hooper, April 1972

Hooper, W. J. (1974). New Horizons in Electric, Magnetic and
Gravitational Field Theory, Electrodynamic Gravity, Inc. 1969

Frances G. Gibson, "THE ALL-ELECTRIC FIELD GENERATOR AND ITS POTENTIAL",
Electrodynamic Gravity, Inc., 1983

"Electric Propulsion Study", Dr. Dennis Cravens, SAIC Corp,
prepared for USAF Astronautics Lab at Edwards AFB, August 1990
-- Section 3.7 Non-Inductive Coils

Several authors have suggested that v x B term in the Lorentz expression should be called into question. Several unverified experimental results have ever been made. An experiment is suggested to test one or several of these theoretical views. This is an area where the experimental procedure is workable and the outcome could have direct results in the area of inertia forces.

During the late 60's William J. Hooper put forth an interesting theory involving the v x B terms dynamic electrical circuits. There was and is uncertainty as to the exact physical understanding of the Biot-Savart-Lorentz law and Ampere's law involving the set of reaction forces. Peter Graneau has studied these expressions. Hoopers view was that there are three different types of electric fields due to the distribution of electric field, and two due to induction.

At the heart of the issue is the connection of the magnetic field and its source in the charged particles. EM theory is presently consistent with the idea that spinning magnetic dipoles create effects indistinguishable from charged particles. There has been no critical experiment which can disprove whether a magnetic flux rotates with its source. If it does co-move with its source then it is logical to assume that a motional electric field in a fixed reference frame of the current induces a magnetic field. This concept is likewise consistent with a field-free interpretation such as Ampere's original laws.

(with 4 pages more about Hooper's theories)

FREE FALL OF ELEMENTARY PARTICLES: ON MOVING BODIES AND THEIR ELECTROMAGNETIC FORCES, by Nils Rognerud 1994 (nils@ccnet.com)
(available at the elektromagnum web site)

This paper is a review of the problem of the observable action of gravitational forces on charged particles. The author discusses the induced electric fields and the sometimes overlooked unique physical properties. He analyzes several experiments, showing the reality of the induced electric fields. The current interpretation, based on the idea of only one electric field, with certain characteristics, is compared with alternative approaches.

The Hooper Coil:

The author has tested a setup by pulsing strong currents, opposite and equal, through multiple parallel conductors. The configuration of the conductors in this type of experiment will cancel the B-fields, while still producing an Em field, in accordance with Eq. 4.2. This is

similar to an experiment by Hooper (W. J. Hooper), who successfully predicted and measured the motional electric field - all in zero resultant B-field.
Interestingly, all of the above experiments can influence an electron with a zero B-field, in the region of the electron. This has some profound implications - one of which is that the motional electric force field is immune to electrostatic or magnetic shielding.
Experimentally, it can be confirmed that the motional electric field is immune to shielding and follows the boundary conditions of the magnetic (not electric) field. The only way to shield a motional electric field is to use a magnetic shield around the source of the magnetic flux - containing it at the source. These effects are not startling if one remembers that the motional electric field is a magnetic effect and that a magnetic field has a different boundary condition than the electric field.

US Patent #3626605 -- "Method and Apparatus for Generating a Secondary Gravitational Force Field"
Awarded to Henry Wm Wallace of Ardmore PA Dec 14, 1971

US Patent #3626606 -- "Method and Apparatus for Generating a Dynamic Force Field"
Awarded to Henry Wm Wallace of Ardmore PA Dec 14, 1971

US Patent #3823570 -- "Heat Pump" (based on technology similar to the above two inventions)
Awarded to Henry Wm Wallace of Freeport NY July 16, 1973

Gravity is a PUSH!
United States Patent Number 5,377,936
NET KINETIC ENERGY DIFFERENTIAL GUIDANCE AND PROPULSION SYSTEM FOR
SATELLITES AND SPACE VEHICLES

In the early 1960s, Erwin Saxl conducted a series of experiments which seemed to illustrate a non-zero coupling between EM and gravitational fields. He claimed to see a change in the period of a torque pendulum when its electric potential was raised.

US Patent # 3357253 -- "Device and Method for Measuring Gravitational and Other Forces", awarded to E.J. Saxl, December 1967

"An Electrically Charged Torque Pendulum", by E.J. Saxl,

Nature 203, Page 136, July 11 1963.

US patent number #5,076,971.
Barker places radioactive elements inside the sphere of a Van de Graaff generator, runs it at a negative potential for several minutes/hours/days -- and finds that the rate of radioactive decay is extremely enhanced -- with some relationship to the magnitude of the negative potential.

The principal investigator undertook a series of experiments to test the "Barker effect" and the "Keller Catalytic Process" in changing the rate of radioactive decay of heavy elements (elements heavier than lead, such as radium, thorium, or uranium, all of which are radioactive). Barker claims that subjecting radioactive materials to high electrostatic potentials (50,000 volts to 500,000 volts) can increase or decrease the rate of radioactive decay, with short exposures of the high voltage capable of inducing erratic decay rates which slowly return to normal over a period of weeks. Keller claims that subjecting radioactive materials to the high heat and fusing reaction of a chemical process (Keller Catalytic Process) can eliminate the radioactivity completely.
-- Michael Mandeville http://www.aa.net/~mwm/dexmrad1.html

Carr, Otis (1959). "Amusement Device," (i.e. A Flying Saucer), US Patent No. 2,912,244.

Otis Carr's work involved counter-rotating charged discs that supposedly produced thrust when they reached a certain speed in relation the the earth's rotational speed and became activated by free energy from space. Maybe he did have something."
-- James E. Cox

Carr's work is similar in some respects to Hooper's inventions. In both cases, an anti-gravitational effect is reported to result from equal and opposite electric currents. Furthermore, one of Hooper's embodiments, the pancake coil, has an uncanny resemblance to the gravitational shielding experiments which were recently conducted in Tampere Finland (1992 and 1995). Except that in the Tampere experiments, the equal and opposite current is generated in a superconductor disk by way of the Meissner effect. Will we soon begin to recognize value of the discoveries that Carr made nearly 40 years ago, and Hooper made over 25 years ago?
-- Robert Stirniman

EXPERIMENTAL RESULTS OF HOOPER'S GRAVITY-ELECTROMAGNETIC COUPLING CONCEPT

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH. MILLIS, MARC G. WILLIAMSON, GARY SCOTT JUN. 1995 12 PAGES Presented at the 31st Joint Propulsion Conference and Exhibit, San Diego CA, 10-12 Jul. 1995; sponsored by AIAA, ASME, SAE, and ASEE NASA-TM-106963 E-9719 NAS 1.15:106963 AIAA PAPER 95-2601 Avail: CASI HC A03/MF A01

Experiments were conducted to test assertions from Patent 3,610,971, by W.J. Hooper that self-canceling electromagnetic coils can reduce the weight of objects placed underneath. No weight changes were observed within the detectability of the instrumentation. More careful examination of the patent and other reports from Hooper led to the conclusion that Hooper may have misinterpreted thermal effects as his 'Motional Field' effects. There is a possibility that the claimed effects are below the detection thresholds of the instrumentation used for these tests.

CASI Accession Number: N95-28893

I have two problems with the methodology used by the NASA scientists in the above experiment.

First -- The amount of ampere-turns used in the NASA experiment was substantially lower than the amount used by Hooper. Hooper found that his effect increased in proportion the square of the current. If you were motivated to verify that the Hooper effect exists, would you not try to conduct the experiment with MORE current, rather than less?

Second -- NASA conducted it's tests by energizing the coils and making measurements in an immediate on-off mode, rather than letting things run for a while as Hooper did. NASA's reason for doing this was to avoid errors due to thermal effects. This makes sense. But what does not make sense is that if you are trying to verify an original experiment and you make changes, you have an obligation to also conduct the experiment in it's original mode. To do otherwise is bad science.

But what could be wrong with testing things in an immediate on-off mode? Well, it can be seen in other experiments that a gravitational effect sometimes results from macroscopic spin alignment of the quantum angular momentum of a large number of microscopic particles. It has been demonstrated in other experiments that it takes time for these particles to come into alignment. For example in the inventions of Henry Wallace it sometimes took minutes for the "kinemassic" gravito-magnetic field to fully manifest itself. The reason that it takes time for particles to come into alignment, could be much the same reason that it takes time to permanently magnetize a magnet. Wallace found that the "kinemassic" effect occurs with elemental materials which have a component of unpaired spin in the atomic nucleus. This includes all common isotopes of copper, which of course is the material used in Hooper's coils.

Incidently, NASA essentially has an economic monopoly in the lucrative
market for microgravity materials research.
-- Robert Stirniman

The Hooper effect can be readily demonstrated in the "Two Moving
Magnets Experiment". In this experiment, magnetic flux is provided by
equal strength opposite pole magnets, moving uniformly in opposite
directions. The induced motional electric field that is generated
in a conductor, is found to be twice that which would result from
a single magnet, while remarkably, the sum of the magnetic B field
is zero. This experiment is easy to setup and verify in any electronics
laboratory with a pair of magnets, a wire, and a voltmeter. In fact,
you may wrap the conductor, in electrostatic or magnetic shielding,
and find the same result.
-- Nils Rognerud

Oleg Jefimenko, "Causality, Electromagnetic Induction, and Gravitation",
Electret Scientific, Star City, (1992)

Oleg Jefimenko, "Force Exerted on a Stationary Charge by a Moving
Electric Current or a Moving Magnet", American Journal of Physics,
Vol 61, pages 218-222 (1993)

Apparently, there are some VERY interesting clues to the nature of the
universe that are related to the phenomenon of SPIN. It might get very
interesting if someone were to make a project of assembling in one place
all the information that has been observed, alleged, suspected, or
speculated about concerning unexpected effects related to spin, along
with all the traditional Newtonian results, stir, add some seasoning,
and see what comes out.
For example, in quantum mechanics, if you want to measure the spin axis
of an electron, you do an experiment in which you ASSUME an axis, make a
measurement of the correlation (the dot product) of that axis with
the actual axis of spin for that electron, and theory says you can
determine at least how close your guess was.
It was a major surprise for the first expermienters with this to find that
the guess was always right: whatever spin axis you assume turns out to be
correct, exactly dead accurate. You must be a VERY good guesser. Out of
this experimental result came the concept of "isospin". Which in itself
is kind of weird in that objects with zero radius can still exhibit spinx.
But I find the idea that the spin is wherever you guess it might be to be
even weirder and to need a better model that predicts this result.
-- John Sangster

Paper: gr-qc/9311036
From: jaegukim@cc.kangwon.ac.kr
Date: Tue, 30 Nov 93 13:47:52 +0900
Gravitational Field of a Moving Spinning Point Particle,
by Jaegu Kim, 7 pages,
The gravitational and electromagnetic fields of a moving charged spinning point particle are obtained in the Lorentz covariant form by transforming the Kerr--Newman solution in Boyer--Lindquist coordinates to the one in the coordinate system which resembles the isotropic coordinates and then covariantizing it. It is shown that the general relativistic proper time at the location of the particle is the same as the special relativistic one and the gravitational and electromagnetic self forces vanish.

Jaegu Kim, "Gravitational Field of a Moving Point Particle", Journal of the Korean Physical Society, Vol 27 No 5, Oct 94, Pages 484-492

Jaegu Kim, "Gravitational Field of a Moving Spinning Point Particle", Journal of the Korean Physical Society, Vol 27 No 5, Oct 94, Pages 479-483

In the above papers, Dr. Kim derives solutions for the Einstein-Maxwell equations for: a charged massless point particle, a point particle having mass but no charge, a point particle having mass and charge, a massless point particle with charge and spin, and finally -- a point particle having charge, mass, and spin. He determines that there is a region of space around a charged spinning mass in which the gravitational force is negative.

The ability to generate a negative gravity effect may come as no surprise to experimenters who have worked with Bose-Einstein condensates, superfluids, or superconductor material in which the angular momentum of quantum level particles can become aligned along a "macroscopic" spin axis. And it is probably also not a surprise to those who have looked at devices such as the inventions of Henry Wallace, in which a macroscopic body is mechanically spun at high speed in order to cause a "kinemassic" gravito-magnetic field due to spin alignment of the nucleus of elemental materials having an odd number of nucleons (un-paired spin).

Paper: GR-QC/9504023
Date: Mon, 17 Apr 1995 10:43:50 +0900
Title: Pure spin-connection formulation of gravity and classification
of energy-momentum tensors
Author: Mathias PILLIN
Report-no: YITP/U-95-12
It is shown how the different irreducibility classes of the

energy-momentum tensor allow for a pure spin-connection formulation. Ambiguities in this formulation especially concerning the need for constraints are clarified.

From: R.Bursill@sheffield.ac.uk (R Bursill)
Subject: Hi Tc SC and gravitational shielding
Date: Fri, 6 Oct 1995 03:14:41 GMT

Is anyone familiar with the experiments in Tampere Finland, by Podkletnov et al on weak gravitational shielding from a Meissner levitating, rotating disk of high-Tc superconducting material?
The paper is: E. Podkletnov and R. Nieminen, Physica C 203 (1992) 441.
E. Podkletnov and A. D. Levit have another paper now, a Tampere University of Technology report, January 1995 (Finland), the experiment having being repeated (I assume no one believed it the first time?).
In the 1st experiment a 5 g sample of silicon dioxide was found to loose around 0.05 % of its weight when placed at a distance of 15 mm from the SC disk. The SC disk had diameter 145 mm and thickness 6 mm. Under rotation of the disk the effect increased up to 0.3 %.
In the 2nd experiment samples of different composition and weight (10-50 g) were placed at distances of 25 mm to 1.5 m from the disk. The mass loss went as high as around 2 %.
I found out about this through a theoretical preprint by Giovanni Modanese, a Von Humboldt Fellow from the Max Plank institute. The preprint no. is MPI-PhT/95-44, May 1995. A colleage got it from hep-th@babbage.sissa.it, paper 9505094. Modanese thinks that it is something to do with the bose condensate from the SC interacting with the gravitational field. He uses some non-perturbative quantum theory on the Regge lattice to attempt to understand the effect.
Must be a little bit like explaining cold fusion with the standard tools - couldn't be done. We all know what happened to cold fusion but at the time a professor from my department said in a public lecture that the product of the believability and the potential importance if true was of order 1.
- Robert Bursill

E. Podkletnov and R. Nieminen, "A Possibility of Gravitational Force Shielding by Bulk YBa2Cu3O7-x Superconductor", Physica C 203 (1992) pp 441-444.

E. Podkletnov and A.D. Levi, "Gravitational Shielding Properties of Composite Bulk YBa2Cu3O7-x Superconductor Below 70 C Under Electro-Magnetic Field", Tampere University of Technology report

MSU-95 chem, January 1995.

HEP-TH/9505094
Theoretical analysis of a reported weak gravitational shielding effect
Author: G. Modanese (Max-Planck-Institut, Munich)
Report-no: MPI-PhT/95-44 May 1995
Under special conditions (Meissner-effect levitation and rapid rotation) a disk of high-Tc superconducting material has recently been found to produce a weak shielding of the gravitational field. We show that this phenomenon has no explanation in the standard gravity theories, except possibly in the non-perturbative quantum theory on the Regge lattice. More data, and independent repetitions of the experiment are however necessary.

ABSTRACT SUPR-CON/9601001
From: Modanese Giovanni
Date: Wed, 17 Jan 1996 21:54:45 +0100 (MET)
Updating the analysis of Tampere's weak gravitational shielding experiment
Author: Giovanni Modanese
Report-no: UTF-367/96
The most recent data about the weak gravitational shielding produced in Tampere by Podkletnov and coworkers through a levitating and rotating HTC superconducting disk show a very weak dependence of the shielding value ($\sim 1 \%$) on the height above the disk. We show that whilst this behaviour is incompatible with an intuitive vectorial picture of the shielding, it is consistently explained by our theoretical model. The expulsive force observed at the border of the shielded zone is due to energy conservation.

NASA is conducting experiments similar to the anti-gravity shielding experiments done in Tampere Finland. A scientist named Ning Li at the University of Alabama Huntsville, is reported to be consulting with NASA. She has written some interesting articles about the relationship between superconductors and gravtiation. Here are references to some of her published articles, and a few related items:

AUTHOR(s): Li, Ning and Torr, D.G.
TITLE(s) Effects of a Gravitomagnetic Field on pure superconductors
In: Phys. Rev. D,
JAN 15 1993 v 43 n 2 Page 457

AUTHOR(s): Torr, Douglas G. Li, Ning
TITLE(s): Gravitoelectric-Electric Coupling via Superconductivity.
In: Foundations of physics letters.
AUG 01 1993 v 6 n 4 Page 371

AUTHOR(s): Li, Ning and Torr, D.G.
TITLE(s): Gravitational effects on the magnetic attenuation of superconductors.
In: Physical review. b, condensed matter.
SEP 01 1992 v 46 n 9 Page 5489

AUTHOR(s): Peng, Huei
TITLE(s): A New Approach to Studying Local Gravitomagnetic Effects on a Superconductor.
In: General relativity and gravitation.
JUN 01 1990 v 22 n 6 Page 609

AUTHOR(s): Mashhoon, Bahram Paik, Jung Ho Will, Clifford M.
TITLE(s): Detection of the gravitomagnetic field using an orbiting superconducting gravity gradiometer. Theoretical principles.
In: Physical review. D, Particles and fields.
MAY 15 1989 v 39 n 10 Page 2825

I haven't had the opportunity to read the articles by Drs. Li and Torr, but I am told that in one of her articles, Dr Li provides the following interesting comment --

" a detectable gravitomagnetic field, and in the presence of a time-dependent applied magnetic vector potential field, a detectable gravitoelectric field could be produced"

There is also some information about Dr Ning Li at:
http://isl-garnet.uah.edu/RR93/uahmatsci.html

Dr Li is with the Applied Materials Lab at the University of Alabama at Huntsville. She works closely with Dr Douglas Torr. One of their primary interests is development and production of exotic materials in a microgravity environment -- a peculiar coincidence, or maybe not, with the writing of physical theories about how to produce anti-gravity in the laboratory.

Here's an unusual article from the website.

Can gravity be 'made' in the laboratory?

A theory that might lead to the creation of measurable manmade gravitational fields has been developed by physicists at UAH.

If the theoretical work is borne out in the laboratory, it will prove that physicist Albert Einstein was correct in predicting that moving

matter generates two kinds of gravitational fields: gravito-magnetic and gravito-electric. The 'artificial' gravitational field would be generated inside a container made of a superconducting material, said Dr. Douglas Torr, a research professor of physics and director of UAH's Optical Aeronomy Laboratory. "I think we can at the very least generate a microscopic field ..." If Einstein was right, the amount of gravito-magnetic energy produced by an object is proportional to its mass and its movement, explained Dr. Ning Li, a research scientist in UAH's Center for Space Plasma and Aeronomic Research. To create the artificial gravitational fields, Torr and Li propose placing a superconducting container in a magnetic field to align ions that are spinning or rotating in tiny circles inside the superconducting material. Their theory predicts the existence of ionic spin or rotation in a superconductor in a magnetic field.

There are persistent rumors among UFO-buffs that NASA already has an operating microgravity chamber, located in Houston TX and/or Huntsville AL. One person, Robert Oechsler, reports that he has personally been inside NASA's antigrav chamber. But, that's another story. For more info, see the books "Alien Contact" and "Alien Update" by Timothy Good.

Paper: hep-th/9412243
From: Vu.Ho@sci.monash.edu.au
Date: Sat, 31 Dec 1994 17:06:38 +1100
Title: Gravity as a coupling of two electromagnetic fields
Author: Vu B Ho

A discussion on a possibility to represent gravity as a coupling of two equal and opposite electrogmanetic fields. Classically the existence of equal and opposite electromagnetic fields can be ignored altogether. However, the problem can be viewed differently if we want to take into account possible quantum effects. We know that in quantum mechanics the potentials themselves may be significant and they may determine the dynamics of a particle in a region where the fields vanish. (Aharonov and Bohm 1959, Peshkin and Tonomura 1983)

AN EXPERIMENT TO TEST THE GRAVITATIONAL AHARONOV-BOHM EFFECT
Ho, Vu B. Morgan, Michael J. Monash University, Clayton, Victoria, Australia 1994 8 PAGES, Australian Journal of Physics (ISSN 0004-9506) vol. 47, no. 3 1994 p. 245-252 HTN-95-92507

The gravitational Aharonov-Bohm (AB) effect is examined in the weak-field approximation to general relativity. In analogy with the electromagnetic AB effect, we find that a gravitoelectromagnetic 4-vector potential gives rise to interference effects. A matter wave interferometry experiment, based on a modification of the gravity-induced quantum interference experiment of

Colella, Overhauser and Werner (COW), is proposed to explicitly test the gravitoelectric version of the AB effect in a uniform gravitational field.
CASI Accession Number: A95-87327

I recommend you get a copy of Aharonov and Bohm's classic paper "Significance of Electromagnetic Potentials in the Quantum Theory" published in The Physical Review in 1959. One of the important things that Aharonov and Bohm did was to demonstrate that the electromagnetic potentials are richer in properties than the Maxwell fields. The field is an artifical mathematical construct from which emerges the whole idea of a continuum. When you can wean yourself of this intellectual crutch you will be ready to do real physics. Both GR and QM are addicted to the same falsehood.
-- Charles Cagle

In the Aharonov-Bohm effect it has been determined theortically and experimentally that there is a measurable effect on a charged particle due to the electromagnetic vector potential. Which of course would be no surprise, except that the effect occurs even in areas of space where the value of the classical electromagnetic fields vanish. A quantum phase shift, detectable via particle interferometry, is found to occur due to the magnetic vector potential A. The effect on a charged particle occurs in regions which are completely shielded from classical electromagnetic fields.

A dual of the Aharonov-Bohm effect is the Aharonov-Casher effect, where it is shown that measurable effects of spin-precession of a particle's magnetic moment can occur due to the electric potential, even in areas of space where the classical electrical field is completely absent.

Prior to the revolutionary paper by Aharonov and Bohm in 1959, the importance of the electomagnetic potential and related interferometry effects, was suggested in articles by Edmund Whittaker in 1903 and 1904. And, what is now known as the Aharonov-Bohm effect, was explicitly identified in an earlier paper on electron optics by Ehrenberg and Siday in 1949.

E.T. Whittaker, "On the partial differential equations of mathematical physics," Mathematische Annalen, Vol 57, 1903, pages 333-355.
In this paper Whittaker demonstrates that all scalar EM potentials have an internal, organized, bidirectional EM plane-wave structure. Thus there exists an electromagnetics that is totally internal to the scalar EM potential. Since vacuum/spacetime is scalar potential, then this

internal EM is in fact "internal" to the local potentialized vacuum/ spacetime.
-- Tom Bearden

E.T. Whittaker, "On an expression of the electromagnetic field due to electrons by means of two scalar potential functions," Proceedings of the London Mathematical Society, Series 2, Vol 1, 1904, pages 367-372.
In this paper Whittaker shows that all of classical electromagnetics can be replaced by scalar potential interferometry. This ignored paper anticipated the Aharonov-Bohm (AB) effect by 55 years, and drastically extended it as well. Indeed, it prescribes a macroscopic AB effect that is distance-independent, providing a direct and engineerable mechanism for action-at-a-distance. It also provides a testable hidden-variable theory that predicts drastically new and novel effects.
-- Tom Bearden

W. Ehrenberg and R. W. Siday, Proc. Phys. Soc. London, B62, 8 (1949)
Ten years earlier than Aharonov and Bohm, Ehrenberg and Siday formulated the science of electron optics by defining the electron refractive-index as a function of electromagnetic potential. Near the end of their paper, they discuss "a curious effect", which is exactly the AB effect. On the two sides of a magnetic flux, the vector potential has different values. This means a different refractive index for two geometrically equivalent paths. This difference in refractive index would cause an observable phase shift.
-- Jun Liu

Y. Aharonov and D. Bohm, "Significance of Electromagnetic Potentials in the Quantum Theory," Physical Review, Second Series, Vol 115 no 3, pages 485-491 (1959)
Effects of potentials on charged particles exist even in the region where all the fields (and therefore the forces on the particles) vanish, contrary to classical electrodynamics. The quantum effects are due to the phenomenon of interference. These effects occur in spite of Faraday shielding. The Lorentz force does not appear anywhere in the fundamental quantum theory, but appears only as an approximation that holds in the classical limit. In QM, the fundamental physical entities are the potentials, while the fields are derived from them by differentiation.

Herman Erlichson, "Aharonov-Bohm Effect and Quantum Effects on Charged Particles in Field-Free Regions," American Journal of Physics, Vol 38 No 2, Pages 162-173 (1970).

M. Danos, "Bohm-Aharonov effect. The quantum mechanics of the electrical transformer," American Journal of Physics, Vol 50 No 1, pgs 64-66 (1982).

Bertram Schwarzschild, "Currents in normal-metal rings exhibit Aharonov-Bohm Effect," Physics Today, Vol 39 No 1, pages 17-20 (Jan 1986)

S. Olariu and I. Iovitzu Popescu, "The quantum effects of electromagnetic fluxes," Reviews of Modern Physics, Vol 57 No2, April 1985.

Yoseph Imry and Richard Webb, "Quantum Interference and the Aharonov-Bohm Effect", Scientific American, April 1989, pages 56-62

E. Merzbacher, "Single Valuedness of Wave Functions", American Journal of Physics, Vol 30 No 4, pages 237-247 (April 1962)

Yoseph Imry, "The Physics of Mesoscopic Systems", Directions in Condensed Matter Physics, World Scientific Publishing (1986)

Richard Webb and Sean Washburn, "Quantum Interference Fluctuations in Disordered Metals", Physics Today, Vol 41 No 12 pages 46-53, Dec 1989

"STAR WARS NOW! The Bohm-Aharonov Effect, Scalar Interferometry, and Soviet Weaponization" By T. E. Bearden, Tesla Book Company

Peshkin M. and Lipkin H.J. "Topology, Locality, and Aharonov-Bohm Effect with Neutrons" Physical review letters APR 10 1995 v 74 n 15

Yakir Aharonov and Ady Stern, "Origin of the geometric forces accompanying Berry's geometric potentials", Physical Review letters. DEC 21 1992 v 69 n 25 Page 3593

Yakir Aharonov, Jeeva Anandan, and Sandu Popescu, "Superpositions of time evolutions of a quantum system and a quantum time-translation machine." Physical review letters. JUN 18 1990 v 64 n 25 Page 2965

QUANTUM PHYSICS, ABSTRACT QUANT-PH/9506038
From: "Jun Liu"
Date: Sun, 25 Jun 1995 03:25:05 -0400
Potential Effect: Aharonov-Bohm Effect of Simply Connected Region
Author: Jun Liu
Comments: Prediction of a new effect. Numerical estimate given for experimental verification. The referees disagree with each other on the existence of this effect.

We study a generalization of Aharonov-Bohm effect, the potential effect. The discussion is focused on field-free effects in simply connected region, which obviously can not have any local field-flux. Among the published discussions about this kind of effects, it is

generally agreed that this kind of effect does not exist due to gauge invariance. However, there are also opinions that this effect is a trivial variation of Aharonov-Bohm effect and therefore there is no need to check its existence. To my knowledge, it has never been tested. My first goal here is to supply enough theoretical reason to motivate the experimental test of this effect. I start with an intuitive derivation, then I introduce a wave-front theory as a theoretical consideration. Logically, the existence of potential effect implies the existence of the AB effect, but not vice versa. The purpose of this paper is to provide a physical connection in the opposite direction.

QUANTUM PHYSICS, ABSTRACT QUANT-PH/9510004
From: "Jun Liu"
Date: Thu, 5 Oct 1995 04:30:27 -0400
The Real Significance of the Electromagnetic Potentials
Author(s): J`un L'iu

The importance of the potential is revealed in a newly discovered effect of the potential. This paper explore the same issue introduced in quant-ph/9506038 from several different aspects including electron optics and relativity. Some people fail to recognize this effect due to a wrong application of gauge invariance.

In the above two papers, Dr Liu proposes a theory of the electromagnetic potential which is a radical extension of the well known Aharonov-Bohm effect. In the second paper he is barely able to contain his frustration about repeated publication rejections over the last four years from leading physics journals. He provides a theoretical foundation for his potential theory, as well as some relatively straight forward suggestions for experiments which might confirm the theory. But there is an enormous problem. Liu's theory violates the concept of invariance of physical parameters under an electromagnetic gauge transformation. Electromagnetic gauge invariance is a cornerstone in the foundation of quantum theory and QED, and it is also part and parcel linked with the dogma of light speed invariance. In other words, heresy.

The AB effect is invariant under an electromagnetic gauge transformation. While a phase-shift occurs in the AB effect, it can be identified only over a closed path and is impossible to identify with any specific "local" region of space. Furthermore, in the AB effect, there is no interaction relating to a transfer of energy or momentum. Maintaining the idea of gauge invariance is a little harder to do in the Aharonov-Casher effect, but it can be accomplished by "gauging away" the physical effects of magnetic spin precession by using a combination of factors from the classical Maxwell fields along with the electromagnetic potential. It

has the look of an elaborate parlor trick, but so does most of QED.

Liu's theory predicts that the electromagnetic potential acts like a kind of "refractive index" to wave propogation, and is similar in some respects to what was predicted in the earlier paper on electron optics by Ehrenberg and Siday in 1949. The result is that in some circumstances an electromagnetic potential causes a change in wavelength, and in other circumstances causes a change in phase (AB effect). An effect on wavelength would be manifested as a change in the envelope of the interference pattern, rather than merely a shift in the pattern. In Liu's theory an exchange of energy and momentum becomes possible. His theory is relatively easy to test and verify, but oddly or not, no one has yet done so. Maybe because we already "know" it can't be true?

One interesting prediction of Liu's theory is that electromagnetic potential will result in time dilation. He doesn't appear to be aware that there is already experimental evidence that this occurs. See references to inventions and experiments by people such as Saxl, Barker, and Keller, which demonstrate time dilation in an electric potential. Time dilation can be viewed equivalently as a shift in wavelength. Liu wishes for someone to conduct an experiment to test for a change in wavelength by using a quantum interferometer. A fine idea. But what about those experimenters who have already measured this effect with a clock? Also see a variety of references here to theories and experiments which relate the scalar electric potential to the gravitational field, and time dilation is a well know, and experimentally verified, prediction of general relativity.

The Aharonov-Bohm effect has sparked a revolution in physical thought. There are a variety of new ideas and experiments, such as verification of Liu's theory, which could soon begin to fan it to a flame. When the flame becomes sufficiently illuminating, watch the political scientists begin to scramble for a comfortable seat nearer the fire.
-- Robert Stirniman

Over the last five years, there have been over 300 papers published about various aspects of Aharonov-Bohm and Aharonov-Casher effects, and quantum interferometry. The subject relates to nearly all aspects of modern physics. Here are selected examples:

AUTHOR(s): Semon, Mark D.
TITLE(s): The Aharonov-Bohm Effect: Still a Thought-Provoking Experiment.
In: Foundations of physics.
JUL 01 1988 v 18 n 7 Page 731

AUTHOR(s): Furuya, Kazuhito
TITLE(s): Transient Response of the Aharonov-Bohm Effect.
In: Japanese journal of applied physics. part 1,
FEB 01 1989 v 28 n 2 Page 303

AUTHOR(s): Chetouani, L. Guechi, L. Hammann, T.F.
TITLE(s): Exact path integral solution of the coulomb plus Aharonov-Bohm potential.
In: Journal of mathematical physics.
MAR 01 1989 v 30 n 3 Page 655

AUTHOR(s): Lee, Patrick A.
TITLE(s): Gauge field, Aharonov-Bohm Flux, and high-Tc superconductivity.
In: Physical review letters.
AUG 07 1989 v 63 n 6 Page 680

AUTHOR(s): Bezerra, V.B.
TITLE(s): Gravitational analogs of the Aharonov-Bohm effect.
In: Journal of mathematical physics.
DEC 01 1989 v 30 n 12 Page 2895

AUTHOR(s): Reznik, B. Aharonov, Y.
TITLE(s): Question of the nonlocality of the Aharonov-Casher effect.
In: Physical review. D, Particles and fields.
DEC 15 1989 v 40 n 12 Page 4178

AUTHOR(s): Stovicek, P.
TITLE(s): The Green function for the two-solenoid Aharonov-Bohm effect.
In: Physics letters: [part A]
NOV 27 1989 v 142 n 1 Page 5

AUTHOR(s): Ellis, J.R.
TITLE(s): Dirac magnetic monopole and the Aharonov-Bohm solenoid in the Poincare gauge.
In: Journal of physics A: Mathematical and general.
JAN 07 1990 v 23 n 1 Page 65

AUTHOR(s): Gerber, A. Deutscher, G.
TITLE(s): AC-to-DC conversion and Aharonov-Bohm effect in percolating superconducting films.
In: Physical review letters.
MAR 26 1990 v 64 n 13 Page 1585

AUTHOR(s): Hagen, C.R.
TITLE(s): Exact equivalence of spin-1/2 Aharonov-Bohm and Aharonov-Casher effects.
In: Physical review letters.
MAY 14 1990 v 64 n 20 Page 2347

AUTHOR(s): Afanase'ev, G.N.
TITLE(s): Old and new problems in the theory of the Aharonov-Bohm effect.
In: Soviet journal of particles and nuclei.
JAN 01 1990 v 21 n 1 Page 74

AUTHOR(s): Silverman, M.P.
TITLE(s): Two-solenoid Aharonov-Bohm experiment with correlated particles.
In: Physics letters: [part A]
AUG 13 1990 v 148 n 3/4 Page 154

AUTHOR(s): Gornicki, Pawel
TITLE(s): Aharonov-Bohm Effect Vacuum Polarization.
In: Annals of physics.
SEP 01 1990 v 202 n 2 Page 271

AUTHOR(s): Gal'tsov, D.V.
Voropaev, S.A.
TITLE(s): Bremsstrahlung polarization in the Aharonov-Bohm effect.
In: Moscow University physics bulletin.
1990 v 45 n 1 Page 8

AUTHOR(s): Padmanabhan, T.
TITLE(s): Vacuum polarization around an Aharonov-Bohm solenoid.
In: Pramana.
MAR 01 1991 v 36 n 3 Page 253

AUTHOR(s): Hagen, C.R.
TITLE(s): Spin dependence of the Aharonov-Bohm Effect.
In: International journal of modern physics A.
JUL 30 1991 v 6 n 18 Page 3119

AUTHOR(s): Dupuis, Nicolas Montambaux, Gilles
TITLE(s): Aharonov-Bohm flux and statistics of energy levels in metals.
In: Physical review B: Condensed matter.
JUN 15 1991 v 43 n 18 Page 14390

AUTHOR(s): Ortiz, M.E.

TITLE(s): Gravitational anyons, Chern-Simons-Witten gravity and the gravitational Aharonov-Bohm effect.
In: Nuclear physics. b.
SEP 30 1991 v 363 n 1 Page 185

AUTHOR(s): Bezerra, V.B.
TITLE(s): Gravitational Aharonov-Bohm effect in a locally flat spacetime.
In: Classical and quantum gravity.
OCT 01 1991 v 8 n 10 Page 1939

AUTHOR(s): Sitenko, Y.A.
TITLE(s): The Aharonov-Bohm effect and the inducing of vacuum charge by a singular magnetic string.
In: Nuclear physics. b.
MAR 23 1992 v 372 n 3 Page 622

AUTHOR(s): March-Russell, John Preskill, John Wilczek, Frank
TITLE(s): Internal frame dragging and a global analog of the Aharonov-Bohm effect.
In: Physical review letters.
APR 27 1992 v 68 n 17 Page 2567

AUTHOR(s): Krive, I.V. Rozhavsky, A.S.
TITLE(s): Non-Traditional Aharonov-Bohm Effects in Condensed Matter.
In: International journal of modern physics. B.
MAY 10 1992 v 6 n 9 Page 1255

AUTHOR(s): Krive, I. V. Zvyagin, A. A.
TITLE(s): Aharonov-casher effect in half-integer spin antiferromagnets.
In: Modern physics letters. B, Condensed matter ph
JUN 20 1992 v 6 n 14 Page 871

AUTHOR(s): Zubkov, M.A. Polikarpov, M.I.
TITLE(s): Aharonov-Bohm effect in lattice field theory.
In: JETP letters.
APR 25 1993 v 57 n 8 Page 461

AUTHOR(s): Duru, I. H.
TITLE(s): Casimir Force Between Two Aharonov-Bohm Solenoids.
In: Foundations of physics.
MAY 01 1993 v 23 n 5 Page 809

AUTHOR(s): Takai, Daisuke Ohta, Kuniichi
TITLE(s): Aharonov-Bohm effect in the presence of magnetic flux and

electrostatic potential.
In: Physical review. b, condensed matter.
JUL 15 1993 v 48 n 3 Page 1537

AUTHOR(s): Allman, B.E. Cimmino, A. Klein, A.G.
TITLE(s): Observation of the scalar Aharonov-Bohm effect by neutron interferometry.
In: Physical review. A.
SEP 01 1993 v 48 n 3 Page 1799

AUTHOR(s): Jensen, Bjorn Kucera, Jaromir
TITLE(s): On a gravitational Aharonov-Bohm effect.
In: Journal of mathematical physics.
NOV 01 1993 v 34 n 11 Page 4975

AUTHOR(s): Maeda, J. Shizuya, K.
TITLE(s): Aharonov-Bohm and Aharonov-Casher effects and electromagnetic angular momentum.
In: Zeitschrift fur Physik C; particles and fields.
1993 v 60 n 2 Page 265

AUTHOR(s): Afanasiev, G.N.
TITLE(s): Toroidal solenoids in an electromagnetic field and toroidal Aharonov-Casher effect.
In: Physica scripta.
OCT 01 1993 v 48 n 4 Page 385

AUTHOR(s): Moreau, William Ross, Dennis K.
TITLE(s): Complementary electric Aharonov-Bohm effect.
In: Physical review. A, Atomic, molecular, and opt
JUN 01 1994 v 49 n 6 Page 4348

AUTHOR(s): Ho, Vu B. Morgan, Michael J.
TITLE(s): An Experiment to Test the Gravitational Aharonov-Bohm Effect.
In: Australian journal of physics.
1994 v 47 n 3 Page: 245

AUTHOR(s): Zeiske, K. Zinner, G. Helmcke, J.
TITLE(s): Atom interferometry in a static electric field: Measurement of the Aharonov-Casher phase.
In: Applied physics. b, lasers and optics.
FEB 01 1995 v 60 n 2/3 Page: 205

AUTHOR(s): Sazonov, S.N.
TITLE(s): On Aharonov-Bohm Effect in Multiconnected Superconductor.

In: Acta physica Polonica, A.
DEC 01 1994 v 86 n 6 Page 987

AUTHOR(s): Reznik, B.
TITLE(s): Gravitational analogue of the Aharonov-Casher effect.
In: Physical review d: particles, fields, gravitat
MAR 15 1995 v 51 n 6 Page 3108

AUTHOR(s): Oh, Sangchul Ryu, Chang-Mo
TITLE(s): Persistent spin currents induced by the Aharonov-Casher effect in mesoscopic rings.
In: Physical review B: Condensed matter.
MAY 15 1995 v 51 n 19 Page 13441

AUTHOR(s): Leadbeater, M. Lambert, C.J.
TITLE(s): Mesoscopic Superconducting Analogs of the Aharonov-Bohm-Casher Effect.
In: Physical review letters.
MAY 29 1995 v 74 n 22 Page 4519

AUTHOR(s): Cook, Richard J. Fearn, Heidi Milonni, Peter W.
TITLE(s): Fizeau's experiment and the Aharonov-Bohm effect.
In: American journal of physics.
AUG 01 1995 v 63 n 8 Page 705

AUTHOR(s): Yi, J. Jeon, G. S. Choi, M. Y.
TITLE(s): Dual Aharonov-Casher effect and persistent dipole current.
In: Physical review B: Condensed matter.
SEP 15 1995 v 52 n 11 Page 7838

AUTHOR(s): Audretsch, Jurgen Jasper, Ulf Skarzhinsky, Vladimir D.
TITLE(s): Bremsstrahlung of relativistic electrons in the Aharonov-Bohm potential.
In: Physical review d: particles, fields, gravitat
FEB 15 1996 v 53 n 4 Page 2178

AUTHOR(s): Skarzhinsky, Vladimir D. Audretsch, Jurgen Jasper, Ulf
TITLE(s): Electron-positron pair production in the Aharonov-Bohm potential.
In: Physical review d: particles, fields, gravitat
FEB 15 1996 v 53 n 4 Page 2190

Time out for a summary.

. Hooper, as well as Carr, Rognerud, Jefimenko, et al, find that a

electromagnetic effect which is not shieldable, and hence difficult to distinguish from gravitation, results from equal and opposite electric currents (dipole-current), and that a similar effect can also be generated by a moving magnet or a moving electric current.

. Recent experiments in Tampere Finland, discover a gravitational shielding effect from a levitated rotating superconductor disk. This is similar in some respects to Hooper's invention, with the equal-and-opposite electric current being generated in a superconductor disk via the Meissner effect.

. Sansbury, Volkov, Brown, Teller, Blackett, Zollner, et al, provide theoretical arguments as well as some experimental indications that equal-and-opposite electric charge (dipole-charge) is similar, or equivalent, to a static gravitational field. And that alignment of electric dipoles in matter and in vacuum polarization, can result in a force which is not shieldable, and not easily distinguishable from gravity. Conversely, it is well know that a gravitational field, an acceleration, or a mechanical force, causes a dipole moment (polarization) to occur within a dielectric material.

. Wallace, Laithwaite, Barnett, et al, discover that gravitational and electromagnetic field effects occur due to alignment of the microscopic spin of quantum particles with the angular momentum spin axis of a larger macroscopic body.

. Aharonov and Bohm discover that an effect can occur on an electrically charged particle due to the magnetic vector potential, in regions of space where the classic Maxwell fields vanish. Originally -- on the outside of infinitely long solenoid coil (with the magnetic field cancelled by equal-and-opposite currents). Others have conducted this experiment using a toroidal coil coated with superconductor material (generating an equal-and-opposite current) to cause the Maxwell magnetic field to vanish. A similar effect, Aharonov-Casher is disovered to occur due to the electric scalar potential, in regions of space where the Maxwell electric field vanishes.

. Whittaker, and Eherenberg and Siday, have written theories which are precursors to Aharonov-Bohm, suggesting that the electromagnetic potential is a far richer and more fundamental thing than the Maxwell fields. The classical Maxwell fields are regarded as artifical abstractions. We can also note that Maxwell's theory itself, was originally much richer in variables (20 equations and 20 unknowns), before it was simplified by Gibbs and Heaviside, to the vector formlation which we know as "Maxwell's" equations.

. Vu Ho authors a recent paper suggesting experiments relating the electromagnetic potential and the Aharonov-Bohm effect to gravitation. And in a more recent paper, using the mathematics of differential geometry and general relativity, Dr Ho demonstrates that gravity can be expressed mathematically as a coupling of two equal-and-opposite electromagnetic fields.

. Jun Liu authors recent papers suggesting that the electromagnetic potential is of paramount importance. Liu's theory predicts that "local" effects can result from the potential in regions where the Maxwell fields vanish -- a violation of the theory of invariance under electric gauge transformations. Liu theory predicts that time dilation will occur in an electric potential. Saxl, Barker, and Keller have conducted earlier experiments which demonstrate time dilation in an electric potential.

. Ning Li, a consulting scientist to NASA's Marshall Space Center, who we might presume to know something, authors papers about the relationship of gravito-electric and and gravito-magnetic forces to the electromagnetic potential, and methods for generation of gravitational effects with superconductor material. According to Dr Li -- "a detectable gravitomagnetic field, and in the presence of a time-dependent applied magnetic vector potential field, a detectable gravitoelectric field could be produced."

How many clues do we need? Equal-and-opposite electric sources (dipole-charges and/or dipole-currents) appear to effect the electromagnetic potential in ways which are indistinguishable from gravitation. And you know what they say about things that look like a duck.

The net sum of equal and opposite electromagnetic vectors is a zero vector, but it is NOT the same situation as no vector. For skeptics and diehards who are still having a hard time accepting the idea of electro-gravitics, here's a simple experiment. Stand on a train track between two locomotives which are pushing on you with equal force in opposite directions. You will exhibit no net motion. None the less, you may soon begin to notice that something important is happening.
-- Robert Stirniman

Jorge Pullin
Wed, 1 Feb 1995 22:55:17 -0500 (EST)
Matters of Gravity, a newsletter for the gravity community
Author: Jorge Pullin (PSU), editor.

Loops, knots, gauge theories and quantum gravity

Rodolfo Gambini and Jorge Pullin ; foreword by Abhay Ashtekar.
New York: Cambridge University Press, 1996.
Cambridge monographs on mathematical physics
ISBN 0-521-47332-2 (hc)

A number of reports which have been prepared for the USAF are publicly available, These reports can be obtained from the "Defense Technical Information Center" (DTIC). Cameron Station, Alexandria VA 22304, 800-225-3842

Cravens D.L., "Electric Propulsion Study", Prepared for the Astronautics Laboratory, Air Force Space Technology Center, at Edwards AFB. August 1990. AL-TR-89-040

Mead F.B. Jr, et al, Advanced Propulsion Concepts - Project Outgrowth, AFRPL-TR-72-31, (JUN 1972).

Mead F.B. Jr, "Exotic Concepts for Future Propulsion and Space Travel", In Advanced Propulsion Concepts, 1989 JPM Specialist Session, (JANNAF) Chemical Propulsion Information Agency, CPIA Publication 528, p.93-99, (May 24, 1989).

Talley R.L, "Twenty First Century Propulsion Concept", Veritay Technology Inc, East Amherst NY. Prepared for the Phillips Laboratory, Air Force Systems Command, Propulsion Directorate, Edwards AFB. May 1991. PL-TR-91-3009

Talley R.L., 21st Century Propulsion Concept, AFAL-TR-88-031, Apr 88.

Talley R.L., Final report on NYS contract no. (88)-166 of NYS Science and Technology Foundation with Veritay Technology, Inc., P.O. Box 305, East Amherst NY 14051.

Forward R.L., 21st Century Space Propulsion Study, AL-TR-90-030, Final Report on Contract FO4611-87-C-0029, Air Force Astronautics Lab (AFSC), (Oct 1990). --AND-- Forward,R.L., 21st Century Space Propulsion Study (Addendum), PL-TR-91-3022, Final (Addendum), OLAC Phillips Lab, formally known as Air Force Astronautics Lab (AFSC), (June 1991).

Electric Propulsion Study by Dennis L. Cravens:

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AUTHOR(s): Woyk, E.
TITLE(s): Gravitomagnetics in Stationary Media.
In: The Astrophysical journal.
SEP 20 1994 v 433 n 1 p 1 Page 357

AUTHOR(s): Shahid-Saless, Bahman
TITLE(s): Local gravitomagnetic perturbations of the lunar orbit.
In: Physical review. D, Particles and fields.
DEC 15 1992 v 46 n 12 Page 5404

AUTHOR(s): Blockley, C.A. Stedman, G.E.
TITLE(s): Gravitomagnetic effects along polar geodesics about a slowly rotating spherical mass in the PPN formalism.
In: Physics letters: [part A]
JUL 09 1990 v 147 n 4 Page 161

AUTHOR(s): Zhang, Xiao-He
TITLE(s): Interactions of magnetohydrodynamic waves with gravitomagnetic fields, and their possible roles in black-hole magnetospheres.
In: Physical review. D, Particles and fields.

DEC 15 1989 v 40 n 12
Page: 3858

AUTHOR(s): Khanna, Ramon
Camenzind, Max
TITLE(s): The Gravitomagnetic Dynamo Effect in Accretion Disks of Rotating Black Holes.
In: The Astrophysical journal.
NOV 10 1994 v 435 n 2 p 2

AUTHOR(s): Casotto, S. Ciufolini, I. Vespe, F.
TITLE(s): Earth satellites and gravitomagnetic field.
In: Il nuovo cimento delle societa italiana di fisic
MAY 01 1990 v 105 n 5 Page 589

AUTHOR(s): Mashhoon, Bahram Paik, Jung Ho Will, Clifford M.
TITLE(s): Detection of the gravitomagnetic field using an orbiting superconducting gravity gradiometer. Theoretical principles.
In: Physical review. D, Particles and fields.
MAY 15 1989 v 39 n 10 Page 2825

AUTHOR(s): Nordtvedt, K.
TITLE(s): Gravitomagnetic interaction and laser ranging to Earth satellites.
In: Physical review letters.
DEC 05 1988 v 61 n 23 Page 2647

There is a reprint of an article that appeared in "Interavia, Volume XI - No. 5, 1956" a March 23, 1956 article titled "Towards Flight without Stress or Strain... or Weight" This article has a photograph of T.T.Brown holding one of his flying disks, and another photograph of the flying disk by itself. There is some info on the opperation of the electrokinetic apparatus.

The 1956 paper "The Gravitics Situation" (prepared by Gravity Rand Ltd., a division of Aviation Studies Ltd. This includes six appendices with papers by various authors including the text from T. Townsend Brown's 1929 gravitor patent.

Many documents on Gravitoelectrics/Electrogravitation refer back to the 1952 Project Winterhaven. That project is said to contain

information on a Mach 3 Combat Disc. Also, have any records related to other Projects with Mr. T.T. Brown been produced. I have seen his Lab notes 1 - 3 - 4. I was looking for 2 - 5 & 6. Also, the Bahnson et al Brown lab notes during his research days at Bahnson Labs in North Carolina 1957-60 period or about. I have a poor chopped up Lab Video on the subject. I'm looking for the full video the 45 minute one. Mine is a mere 23 minutes.

I have yet to track down an original document entitled: "The Flying Saucer: The Application of the Biefeld-Brown Effect to the Solution of Space Navigation" by Mason Rose. This 50's document details how a flying saucer operates. I have a copy of a re-write and it is outstanding.
And I'm also looking for a document as seen on SIGHTINGS TV entitled: "PROJECT SILVER BUG" the 1955 USAF Flying Saucer Tests.
Also, seeking a copy of PROJECT WINTERHAVEN by Thomas Townsend Brown on a MACH-3 Combat Disc. The British had a stake in as well as the USAF.
It to is from the 1950's.
-- James Hartman, CaluNET - Future Science Admin.

The Biefeld-Brown (spelling is correct) effect is described generally as the anomalous tendency of high voltage flat capacitors to display movement towards (usually) the positive pole. Effects are most often seen at potentials above 50kv. Thomas Townsend Brown held a few patents on devices using it. It's very controversial and is part of the subject of "electrogravitics", as some say that the BB effect is actually polar gravity peeking out from behind a high electrical gradient within a dielectric. Claims are that the mass of the dielectric is a factor in the magnitude of the effect as well as the capacitance and the gradient intensity. Should be fairly easy for the home-workshop experimenter to get a look at, but the difficulty seems to be in isolating the effect from ionic wind and simple electrostatic propulsive effects. Skeptics claim that those forces are all it ever was, but a few reports indicate that they may be wrong.
-- Rick Monteverde, Honolulu HI

The experiments involved freely suspended electrically charged capacitors, which were determined to possess angular momentum yet did not rotate. Source: Albert Einstein: Philosopher-Scientist, P. Schilpp, editor, 3rd ed., 1988, pp 522-523.

Schilpp, Paul Arthur, 1897- ed.
Albert Einstein: philosopher-scientist. [3d ed.] La Salle, Ill., Open Court [1970] xviii, 781 p. illus., facsim., ports. 25 cm.
LC CALL NUMBER: QC16.E5 S3 1970

>From Richard Feynman's Lectures on Physics we learn that there is intrinsic field energy and momentum density associated with a static electro-magnetic field configuration. When there is a change in the magnetic field, this field energy and momentum can be directly converted into kinetic energy and mechanical momentum. Feynman illustrates this with an electromagnetic carousel paradox. In this paradox, a dielectric disk (which is embedded with small charged spheres along its circumference) rotates without any apparent "counter" torque in the system. Before this rotation occurs, the dielectric disk is immersed in a static magnetic field. The subsequent rotation occurs as a consequence to reducing the previously static magnetic field to zero. The angular momentum and rotational kinetic energy comes directly from the initial static magnetic field.
"The Feynman Lectures on Physics" by Richard Feynman, R.B. Leighton, and M. Sands, Volume II p 17-6

A Report on the T. Townsend Brown Conference:
"Focus on Unconventional Energies: A Symposium on Electrical Propulsion & the Technology of Electro-Gravity"
April 15-16, 1994 Philadelphia Community College, Philadelphia, PA

This conference was held in tribute to Thomas Townsend Brown and I feel that it was a great success. About 15 speakers and 80 attendees provided a brief overview of Zero Point Energy theories, Free Energy devices, electrostatics theory, and antigravity experiments and documentation. Attendees came from as far away as California and Washington.
The conference program advertised the following topics: "A Review of Advanced Energy Devices: Evidence, Promises, and Dangers" by Patrick Bailey (VP INE); "Thomas Townsend Brown's Electro-Gravities Research in the 1950's" by Tom Valone (Integrity Institute); "The Role of Electro-Statics" by Charles Yost (Electric Spacecraft Journal); "Thomas Townsend Brown's Research: A Challenge to Modern Science" by Elizabeth Rauscher (Tecnic Research Laboratories); "Electro-Gravitic Theory: Explaining the Operating Principle of Brown's Electric Disks" by Paul LaViolette (The Starburst Foundation); "A Panel Discussion on Biefeld-Brown and Beyond;" "Vortices in the Zero Point Energy" by Moray King; "Design of a Compact Marx Generator Triggered by a Blumlein Capacitor" by George Hathaway; "Thomas Townsend Brown's Final Gravito-Electric Research" by Josh Reynolds (New Wave Partners); "Townsend Brown Effects Reviewed" by Ron Kovac; "Pushing the Boundaries: Electro-Hydro Dynamic Potentials ..." by Henry Monteith, and "Gravity Drop Tests" by Don Kelly (SEA).
- Patrick Bailey

I have the audio tapes from the T.T. Brown conference, 11 tapes in all, and I got a lot of good information from it.
- Bob Reim (reim@advantor.com)

There is a connection between Townsend Brown and UFOs. Brown was the founder of NICAP (National Investigations Committee on Aerial Phenomena) Project Skylight, and Brown served as Vice Chairman pro tempore during during NICAP's organizational period in 1956.

Partial biography of Thomas Townsend Brown:
1922-23, private research laboratory, Pasadena, California; 1924-25, special electronics research, Denison University, Department of Physics; 1926-30, private research laboratory (astrophysics), Zanesville, Ohio, in collaboration with Dr. Paul Biefeld, Swazey Observatory, Granville, Ohio; 1930-33, Naval Research Laboratory (radiation and spectroscopy), Washington, DC; ... 1938, Assistant Engineering Officer (Lt. jg USNR) shakedown cruise USS NASHVILLE to Europe; 1939-40, Materials and Processes Engineer (aircraft), Glenn L. Martin Company, Baltimore; 1940-41, Officer-in-charge (Lt. USNR), Magnetic and Acoustic Minesweeping, Research and Development, Bureau of Ships, Navy Department, Washington, D. C.; 1942-43, Officer-in-charge (Lt. Comdr. USNR), Atlantic Fleet Radar Materiel School and Gyro-compass School, Naval Operating Base, Norfolk, Virginia; 1944-45, Radar Consultant, Advanced Design Section, Lockheed Aircraft Corporation, Burbank, California; ...

Also, there was a T.T. Brown on the Condon committee for UFO studies. And some of Brown's above described Navy duties are coincident with some of the times and places in stories about the Montauk Project/ Philadelphia Experiment.

Quotation from a letter to William Moore from T. Townsend Brown dated 12/17/76 --

"I am still working on petroelectricity and the project is housed largely at Stanford Research Institute with additional assistance being provided by the University of California - Berkeley and the Ames Research center of NASA. Unfortunately, under the circumstances, while this project is being evaluated for funding by ERDA we should not and cannot publish details..."

"Your next question concerns the airfoils. As far as I am aware, no rf is radiated. There is, of course, a static d.c. field which accompanies the airfoils in flight."

It is very interesting to note that Townsend Brown was the pioneer in

this field, and was not able to obtain very much support for his work until the 1950's. During that time, there was much discussion of gravity and antigravity within the aerospace industry and in the magazine "Aviation Week." Then the Gravity Research Group (GRG) published a detailed summary report of their review of research into "Electrostatic Motion, Dynamic Counterbary, and Barycentric Control" (i.e. "Antigravity"). This report is the last public report that any researchers have been able to find for us that deals with the physical effects of electrostatics, electrodynamics, and gravity control. (It is also worth noting that this report was found in the Wright Patterson Air Force Base Library "TL 565 A9" and was not listed in the library catalog). So, after the mid-1950's to the present, no other information regarding the technology of electrodynamics and its effect on gravity has been able to be found in any of the un-classified U.S. literature.
- Patrick Bailey

I have the FIVE (5) lab books of TT Brown's R&D at the Bahnson Co. in Salem, N. Carolina 1958-9. I also have some other letters and drawings of the lab plus the only surviving 16mm colour film of the various stages of his work at Bahnson Labs.

I was in contact with Dr Brown in 1983 by phone and by mail. He died of lung cancer not long after in Oct of 1985. He told me that a lot of people including Bill Morre had attributed more to his work than he had really done. In particular, he was only marginally connected with the Philadelphia Experiment as such. His main theme of R&D was dielectrics and the Biefeld-Brown effect. He was not an electromagnetics man... only electrostatics.

From 1983 to 1991 or so I was in frequent communication with J. Frank King who was TT Brown's boss at the Bahnson Co. J. Frank was a good man and a good friend of mine. He, too, died in Dec 1989. Before he died I was given rights to reproduce and share letters, files, drawings, patent submissions, films etc from his personal files on TT Brown, George Adamski, Dr Ilka, T Henry Moray and others.

J Frank warned me a long time ago to take what TT Brown said with a 'grain of salt' because Townsend had a habit of 'stretching the truth' a bit to get funding which he was always in need of.... So, I warn you now in good faith: If you seek lost or hidden technology in Brown's lab notes, I don't think you will find it there; however, I am prepared to make photocopies available to you.

There are about 750 pages in all. I would need to charge you AUS$50 per notebook which would include the air mail charges as well. In US$ that would be about US$38 per notebook. The film is available as are the notebooks (I think) from The Electric Spacecraft Journal in the US (Charles Yost on 704-252-8083, FAX 202-683-3511.

-- Stan Deyo

As far as I know, the last thing Brown published before his death was, "On The Possibilities of Optical-Frequency Gravitational Radiation", 2/14/1976 and 8/30/1976. I don't know where it was originally published. But you can get copy from:

Rex Research, P.O. Box 19250, Jean NV 89019

It is part of NR 046-BT2/B17-BRV "T. Brown: Petro-Voltaics" (Gravito-Electric Conversion). Most people think Brown was just into flying capacitors he was into much much more...
-- Bob Paddock

Here are some titles by Townsend Brown:

"The Wizard of Electro-Gravity: The Man Who Discovered how UFOs are powered." by William L. Moore. In UFO Report magazine. Unfortunately the issue date is not on this copy, and the magazine is at work.

A lot of the same information can be found in the book "The Philadelphia Experiment: Project Invisibility" by William L. Moore with Charles Berlitz. Chapter 10 "The Force Fields of Townsend Brown". These two items are the same, I just don't know which one came first.

Also there is more than one book with the title "The Philadelphia Experiment". You want the one with ISBN 0-449-20526-6.

"The Townsend Brown Electro-Gravity Device: A Comprehensive Evaluation by the Office of NAVAL Research" 15 September 1952.

Such as "How I Control Gravity by T. Townsend Brown" from Science and Invention Magazine Aug. 1929.

"Townsend Brown and his Anti-Gravity Discs" by Gaston Burridge in Fate Magazine. No issue date is visible.

"Electrical Self-Potential in Rocks" by T.Townsend Brown, some time after 1/1976, but again no source is visible.

"Another Step Toward Anti-Gravity" by Gaston Burridge in The American Mercury, June 1958, p77.

"Towards Flight without Stress or Strain... or Weight" by Intel, Washington, D.C. [Doesn't make since but that is what it says.]

Some one just on the list here just reinvented "The Fluid Pump" by T.Townsend Brown for the Whitehall-Rand Group, Washington DC

Paper: gr-qc/9207002
From: RCAPOVI%CINVESMX.BITNET@ricevm1.rice.edu
Date: Tue, 21 Jul 1992 17:52 CST

Title: Remarks on Pure Spin Connection Formulations of Gravity
Authors: Riccardo Capovilla and Ted Jacobson
Abstract: In the derivation of a pure spin connection action
functional for gravity two methods have been proposed. The first
starts from a first order lagrangian formulation, the second from a
hamiltonian formulation. In this note we show that they lead to
identical results for the specific cases of pure gravity with or
without a cosmological constant.

Paper: hep-th/9210110 (Phys. Rev. D47, R5214 (1993).)
From: pullin@mail.physics.utah.edu (Jorge Pullin)
Date: Tue, 20 Oct 92 11:18:14 MDT
QUANTUM EINSTEIN-MAXWELL FIELDS: A UNIFIED VIEWPOINT FROM THE LOOP REPRESENTATION, R. Gambini, J. Pullin, 13pp. no figures.
We propose a naive unification of Electromagnetism and General
Relativity based on enlarging the gauge group of Ashtekar's new
variables. We construct the connection and loop representations and
analyze the space of states. In the loop representation, the
wavefunctions depend on two loops, each of them carrying information
about both gravitation and electromagnetism. We find that the
Chern-Simons form and the Jones Polynomial play a role in the model.

Paper: gr-qc/9301012
From: porrati@MAFALDA.PHYSICS.NYU.EDU (Massimo Porrati)
Date: Wed, 13 Jan 93 20:17:21 -0500
Massive Spin-5/2 Fields Coupled to Gravity: Tree-Level Unitarity vs. the Equivalence Principle, Massimo Porrati, 6 pages.
I show that the gravitational scattering amplitudes of a spin-5/2
field with mass $m\ll M_{Pl}$ violate tree-level unitarity at
energies $\sqrt{s}\approx\sqrt{mM_{Pl}}$ if the coupling to gravity
is minimal. Unitarity up to energies $\sqrt{s}\approx M_{Pl}$ is
restored by adding a suitable non-minimal term, which gives rise to
interactions violating the (strong) equivalence principle. These
interactions are only relevant at distances $d\lequiv 1/m$.

Paper: gr-qc/9303014
From: ISTVAN@RMK520.RMKI.KFKI.HU
Date: Wed, 10 Mar 1993 16:24:01 +0100 (WET)
MAXWELL FIELDS IN SPACETIMES ADMITTING NON-NULL KILLING VECTORS, by Istvan
Racz, 7 pages,PACS numbers: 04.20.Cv, 04.20.Me, 04.40.+c
We consider source-free electromagnetic fields in spacetimes
possessing a non-null Killing vector field, ξ^a. We assume
further that the electromagnetic field tensor, F_{ab}, is
invariant under the action of the isometry group induced by ξ^a.
It is proved that whenever the two potentials associated with the

electromagnetic field are functionally independent the entire content of Maxwell's equations is equivalent to the relation $\n^aT_{ab}=0$. Since this relation is implied by Einstein's equation we argue that it is enough to solve merely Einstein's equation for these electrovac spacetimes because the relevant equations of motion will be satisfied automatically. It is also shown that for the exceptional case of functionally related potentials $\n^aT_{ab}=0$ implies along with one of the relevant equations of motion that the complementary equation concerning the electromagnetic field is satisfied.

Paper: gr-qc/9310007 (Physica Scripta 48, 649 (1993))
From: harald@nordita.dk (Harald H. Soleng)
Date: Mon, 4 Oct 93 13:18:04 +0100
INVERSE SQUARE LAW OF GRAVITATION IN (2+1)-DIMENSIONAL SPACE-TIME AS A
CONSEQUENCE OF CASIMIR ENERGY, H. H. Soleng, 10 pages, LaTeX, Report: UPR-0540-T, To appear in Physica Scripta.

The gravitational effect of vacuum polarization in space exterior to a particle in (2+1)-dimensional Einstein theory is investigated. In the weak field limit this gravitational field corresponds to an inverse square law of gravitational attraction, even though the gravitational mass of the quantum vacuum is negative. The paradox is resolved by considering a particle of finite extension and taking into account the vacuum polarization in its interior.

Paper: gr-qc/9310019
From: rri!bri@rri.ernet.in (B.R.Iyer)
Date: Tue, 12 Oct 93 12:44:52 IST
THE FRENET SERRET DESCRIPTION OF GYROSCOPIC PRECESSION B.R.Iyer and C.V.Vishveshwara , 37 pages, Paper in Latex.

The phenomenon of gyroscopic precession is studied within the framework of Frenet-Serret formalism adapted to quasi-Killing trajectories. Its relation to the congruence vorticity is highlighted with particular reference to the irrotational congruence admitted by the stationary, axisymmetric spacetime. General precession formulae are obtained for circular orbits with arbitrary constant angular speeds. By successive reduction, different types of precessions are derived for the Kerr - Schwarzschild - Minkowski spacetime family. The phenomenon is studied in the case of other interesting spacetimes, such as the De Sitter and Godel universes as well as the general stationary, cylindrical, vacuum spacetimes.

Paper: gr-qc/9310030
From: khatsymovsky

Date: Thu, 21 Oct 93 16:39:25 +0100
Can wormholes exist? V.Khatsymovsky, 10 pages, Plain LaTeX, preprint UUITP-20/1993

Renormalized vacuum expectation values of electromagnetic stress-energy tensor are calculated in the background spherically-symmetrical metric of the wormhole's topology. Covariant geodesic point separation method of regularization is used. Violation of the weak energy condition at the throat of wormhole takes place for geometry sufficiently close to that of infinitely long wormhole of constant radius irrespectively of the detailed form of metric. This is an argument in favour of possibility of existence of selfconsistent wormhole in empty space maintained by vacuum field fluctuations in the wormhole's background.

Paper: hep-th/9402046
From: LANDI@SUHEP.PHY.SYR.EDU
Date: Tue, 08 Feb 1994 15:09:39 -0500 (EST)
GRAVITY AND ELECTROMAGNETISM IN NONCOMMUTATIVE GEOMETRY, Giovanni Landi,
Nguyen Ai Viet, Kameshwar C.Wali, 1 + 11 pages, Report # SU-4240-566,

We present a unified description of gravity and electromagnetism in the framework of a Z2 noncommutative differential calculus. It can be considered as a ``discrete version'' of Kaluza-Klein theory, where the fifth continuous dimension is replaced by two discrete points. We derive an action which coincides with the dimensionally reduced one of the ordinary Kaluza-Klein theory.

Paper: gr-qc/9404016
From: David Garfinkle
Date: Sun, 10 Apr 1994 17:44:50 -0400
Generating new magnetic universe solutions from old. By David Garfinkle and M.A. Melvin. 17 pages

In this paper we apply the techniques which have been developed over the last few decades for generating nontrivially new solutions of the Einstein-Maxwell equations from seed solutions for simple spacetimes. The simple seed spacetime which we choose is the "magnetic universe" to which we apply the Ehlers transformation. Three interesting non-singular metrics are generated. Two of these may be described as "rotating magnetic universes" and the third as an "evolving magnetic universe." Each is causally complete - in that all timelike and lightlike geodesics do not end in a finite time or affine parameter. We also give the electromagnetic field in each case. For the two rotating stationary cases we give the projection with respect to a stationary observer of the electromagnetic field into electric and magnetic components.

Paper: gr-qc/9404065 (Phys. Rev. D50 (1994) 6190)
From: carroll@marie.mit.edu (Sean Carroll)
Date: Sun, 1 May 1994 16:35:00 -0400
Energy-Momentum Restrictions on the Creation of Gott Time Machines, by Sean M. Carroll, Edward Farhi, Alan H. Guth, and Ken D. Olum. Plain TeX, 41 pages incl. 9 figures. MIT-CTP #2252.

The discovery by Gott of a remarkably simple spacetime with closed timelike curves (CTC's) provides a tool for investigating how the creation of time machines is prevented in classical general relativity. The Gott spacetime contains two infinitely long, parallel cosmic strings, which can equivalently be viewed as point masses in (2+1)-dimensional gravity. We examine the possibility of building such a time machine in an open universe. Specifically, we consider initial data specified on an edgeless, noncompact, spacelike hypersurface, for which the total momentum is timelike (i.e., not the momentum of a Gott spacetime). In contrast to the case of a closed universe (in which Gott pairs, although not CTC's, can be produced from the decay of stationary particles), we find that there is never enough energy for a Gott-like time machine to evolve from the specified data; it is impossible to accelerate two particles to sufficiently high velocity. Thus, the no-CTC theorems of Tipler and Hawking are enforced in an open (2+1)-dimensional universe by a mechanism different from that which operates in a closed universe. In proving our result, we develop a simple method to understand the inequalities that restrict the result of combining momenta in (2+1)-dimensional gravity.

Paper: gr-qc/9405050
From: MATSAS@IFT.UESP.ANSP.BR
Date: Mon, 23 May 1994 15:01 BSC (-0300 C)
DO INERTIAL ELECTRIC CHARGES RADIATE WITH RESPECT TO UNIFORMLY ACCELERATED
OBSERVERS?, George E.A. Matsas, 6 pages (REVTEX 3.0), IFT-P017/94.

We revisit the long standing problem of analyzing an inertial electric charge from the point of view of uniformly accelerated observers in the context of semi-classical gravity. We choose a suitable set of accelerated observers with respect to which there is no photon emission coming from the inertial charge. We discuss this result against previous claims [F. Rohrlich, Ann. Phys. (N.Y.) vol: 22, 169 (1963)]. (This Essay was awarded a Honorable Mention for 1994 by the Gravity Research Foundation.)

Paper: gr-qc/9406032
From: wam@tdo-serv.lanl.gov (Warner A. Miller)
Date: Mon, 20 Jun 94 14:44:42 MDT
Spin Dynamics of the LAGEOS Satellite in Support of a Measurement of the

Earth's Gravitomagnetism, Salman Habib, Daniel E. Holz, Arkady Kheyfets, Richard A. Matzner, Warner A. Miller and Brian W. Tolman, 16 pages, RevTeX, LA-UR-94-1289. (Part I of II, postscript figures in Part II).

LAGEOS is an accurately-tracked, dense spherical satellite covered with 426 retroreflectors. The tracking accuracy is such as to yield a medium term (years to decades) inertial reference frame determined via relatively inexpensive observations. This frame is used as an adjunct to the more difficult and data intensive VLBI absolute frame measurements. There is a substantial secular precession of the satellite's line of nodes consistent with the classical, Newtonian precession due to the non-sphericity of the earth. Ciufolini has suggested the launch of an identical satellite (LAGEOS-3) into an orbit supplementary to that of LAGEOS-1: LAGEOS-3 would then experience an equal and opposite classical precession to that of LAGEOS-1. Besides providing a more accurate real-time measurement of the earth's length of day and polar wobble, this paired-satellite experiment would provide the first direct measurement of the general relativistic frame-dragging effect. Of the five dominant error sources in this experiment, the largest one involves surface forces on the satellite, and their consequent impact on the orbital nodal precession. The surface forces are a function of the spin dynamics of the satellite. Consequently, we undertake here a theoretical effort to model the spin ndynamics of LAGEOS. In this paper we present our preliminary results.

Paper: gr-qc/9407003
From: William Bruckman
Date: Tue, 5 Jul 94 09:06:49 EDT
Generation of Electro and Magneto Static Solutions of the Scalar-Tensor Theories of Gravity, William Bruckman, 28 pages, LaTeX.

The field equations of the scalar-tensor theories of gravitation are presented in different representations, related to each other by conformal transformations of the metric. One of the representations resembles the Jordan-Brans-Dicke theory, and is the starting point for the generation of exact electrostatic and magnetostatic exterior solutions. The corresponding solutions for each specific theory can be obtained by transforming back to the original canonical representation, and the conversions are given for the theories of Jordan-Brans-Dicke, Barker, Schwinger, and conformally invariant coupling. The electrostatic solutions represent the exterior metrics and fields of configurations where the gravitational and electric equipotential surfaces have the same symmetry. A particular family of electrostatic solutions is developed, which includes as special case the spherically symmetric solutions of the scalar-tensor theories. As expected, they reduce to the well-known Reissner-Nordstrom metric when the scalar field is set equal to

a constant. The analysis of the Jordan-Brans-Dicke metric yields an upper bound for the mass-radius ratio of static stars, for a class of interior structures.

Paper: gr-qc/9407030
From: Marco SISSA +39(40)3787522
Date: Thu, 21 Jul 1994 15:10:04 +0200
QUANTUM ELECTROMAGNETIC WORMHOLES AND GEOMETRICAL DESCRIPTION OF THE ELECTRIC
CHARGE by Marco Cavaglia 13 pages, PLAIN TEX, Report No: SISSA 92/94/A (to appear in Phys. Rev. D15).

I present and discuss a class of solutions of the Wheeler-de Witt equation describing wormholes generated by coupling of gravity to the electromagnetic field for Kantowski-Sachs and Bianchi I spacetimes. Since the electric charge can be viewed as electric lines of force trapped in a finite region of spacetime, these solutions can be interpreted as the quantum corresponding of the Ein-stein--Rosen--Misner--Wheeler electromagnetic geon.

Paper: gr-qc/9409060 (Annals of Physics vol. 240 432--458 (1995))
From: soleng@surya11.cern.ch (Harald SOLENG)
Date: Thu, 29 Sep 94 14:01:03 +0100
Modification of the Coulomb potential from a Kaluza-Klein model with a Gauss-Bonnet term in the action, by H. H. Soleng and O. Gron, 27 pages, compressed and uuencoded postscript file with unpacking instructions; major revision to section IV.D.2 on pages 15-16 ("Corrections to the Coulomb potential at short distances") and to the figure on page 27,
to be published in The Annals of Physics (NY), NORDITA 94/50

In four dimensions a Gauss-Bonnet term in the action corresponds to a total derivative, and it does not contribute to the classical equations of motion. For higher-dimensional geometries this term has the interesting property (shared with other dimensionally continued Euler densities) that when the action is varied with respect to the metric, it gives rise to a symmetric, covariantly conserved tensor of rank two which is a function of the metric and its first and second order derivatives. Here we review the unification of General Relativity and electromagnetism in the classical five-dimensional, restricted (with g55 = 1) Kaluza-Klein model. Then we discuss the modifications of the Einstein-Maxwell theory that results from adding the Gauss-Bonnet term in the action. The resulting four-dimensional theory describes a non-linear U(1) gauge theory non-minimally coupled to gravity. For a point charge at rest, we find a perturbative solution for large distances which gives a mass-dependent correction to the Coulomb potential. Near the source we find a power-law solution which seems to cure the short-distance divergency of the Coulomb potential. Possible ways to obtain an

experimental upper limit to the coupling of the hypothetical
Gauss-Bonnet term are also considered.

Paper: hep-th/9410046
From: M.J. Duff
Date: Fri, 7 Oct 94 13:04:15 BST
KALUZA-KLEIN THEORY IN PERSPECTIVE, M. J. Duff, 38 pages latex, NI-94-015
The Kaluza-Klein idea of extra spacetime dimensions continues to pervade current attempts to unify the fundamental forces, but in ways somewhat different from that originally envisaged. We present a modern perspective on the role of internal dimensions in physics, focussing in particular on superstring theory. A novel result is the interpretation of Kaluza-Klein string states as extreme black holes.(Talk delivered at the Oskar Klein Centenary Nobel Symposium, Stockholm, September 19-21, 1994.)

Paper: gr-qc/9509018
From: nunez@venus.fisica.unlp.edu.ar (NUNEZ Carlos)
Date: Fri, 8 Sep 95 15:05:13 EST
Title: On Pseudospherically Symmetric Repulsive Gravitational Field
Authors: Luis A. Anchordoqui, Graciela S. Birman, Jose D. Edelstein and Carlos Nunez Report-no: La Plata-Th 95/23
The solution of Einstein vacuum equation, for a static pseudospherically symmetric system, is presented. It describes a singular solution that produces a repulsive gravitational field with an event horizon. We analyse particle motion in such a gravitational field and comment on some interesting features of the solution.

"The Origin of the Electromagnetic Interaction in Einstien's Unified Field Theory", Antoci,S. General Relativity and Gravitation, Vol 23 No 1, 1991
Recently it has been shown that, if sources are appended in a certain way to the field equations of Einstein's unified theory, the contracted Bianchi identities and the field operations appear endowed with definite physical meaning. The theory looks like a gravoelectrodynamics in a polarizable Riemmannian continuum. The wealth of the implied possibilities is far richer than in the so-called Einstein-Maxwell theory.

Paper: HEP-TH/9411092
From: hssong@phyy.snu.ac.kr
Date: Mon, 14 Nov 94 15:19:29 KST
Title: Factorization and polarization in linearized gravity
Authors: S.Y. Choi, J.S. Shim, H.S. Song
Comments: 45 pages, figures are included (uses pictex), RevTex

Report-no: KEK-TH-415, HYUPT-94/10, SNUTP 94-03,
We investigate all the four-body graviton interaction processes:
gX -> gamma X, gX -> gX, and gg -> gg,
with X as an elementary particle of spin less than two in the
context of linearized gravity except the spin-3/2 case. We show
explicitly that gravitational gauge invariance and Lorentz
invariance cause every four-body graviton scattering amplitude to be
factorized. We explore the implications of this factorization
property by investigating polarization effects through the covariant
density matrix formalism in each four-body graviton scattering
process.

Causality, electromagnetic induction, and gravitation : a different approach
to the theory of electromagnetic and gravitational fields/ Oleg D. Jefimenko.
Star City [West Virginia] : Electret Scientific Co., c1992. xii, 180 p. :
LC CALL NUMBER: QC665.E4 J44 1992
SUBJECTS: Electromagnetic fields. Gravitational fields. Causality.
Maxwell Equations.

COUNTER-GRAVITATION: The sustaining of an object in space by means of a counter-gravitational effect produced through the action of an electric field upon the object. Associated with the effects of levitation in this manner, is a simultaneous appearance of a strange luminous halo that appears at about 500,000 volts.

Sources: American Philosophical Society, Proceedings. Philadelphia, PA, years 1914-1929. Articles on Charles F. Brush's experiments.

Electrical Experimenter. "Can Electricity Destroy Gravitation?", New York, March 1918.

Electrical Experimenter. "Piggott's Electro-gravitation Experiment", Vol. 8, 1920.

Hooper, William J., New Horizons in Electric, Magnetic, and Gravitational Field Theory, Principia College, Elsah, IL, 1974.

The Scientific Papers of James Clerk Maxwell. Vol. II, W.D. Niven (ed.), Constable & Co., London, 1965. "Le Sage Theory of Gravitation".

Transactions of the Academy of Science. "Nipher's Gravitation Experiments", Vol. 23, pp. 163-192+, St. Louis, 1916.

US patent No. 1,006,786, Piggott.
3,518,462, Brown.
3,610,971, Hooper.

"Journal of Propulsion and Power" of the AIAA, R.H. Woodward Waesche, Science Applications International Corporation, Editor in Chief.
This Journal is devoted to the advancement of the science and technology of aerospace propulsion and power through the dissemination of original archival papers contributing to advancements in airbreathing, electric, and advanced propulsion; solid and liquid rockets; fuels and propellants; power generation and conversion for aerospace vehicles; and the application of aerospace science and technology to terrestrial energy devices and systems. It is intended to provide readers of the Journal, with primary interests in propulsion and power, access to papers spanning the range from research through development to applications. Papers in these disciplines and the sciences of combustion, fluid mechanics, and solid mechanics as directly related to propulsion and power are solicited.

Published Bimonthly
AIAA Members $42.00 per year ($72.00 outside North America)
Institutions $300.00 per year ($360.00 outside North America)

I have recently come into possession of a paper on magneto-gravitics and field resonance systems, presented by A.C. Holt from NASA Johnson Space Center to the American Institute of Aeronautics and Astronautics' 16th Joint Propulsion Conference, June 30-July 2, 1980.
Holt presents a project using an already existing system known as the Coherent Field and Energy Resonance System (CoFERS) [probably located at Los Alamos Labs' High Magnetic Field Research Laboratory].
CoFERS utilizes a toroidal-shaped energy guide with megagauss magnetic field sources located along radius vectors equally spaced around the toroid. CoFERS is shaped like a thick flying disc.
Holt goes on to say: "By converying an object's normal space-time energy pattern to an energy pattern which differs substantially from the normal pattern, the gravitational forces acting on the object are changed. The object's new pattern interacts with the surrounding space-time and virtual energy patterns, such that the interactive forces are substantially altered. The alteration of the characteristics of the continuous field of force results in the apparent motion of the object *through space-time*."
[...] "Since the gravitational forces acting on the propulsion system can be

quickly altered to achieve the desired motion, the *spacecraft* can make right-angle turns at very-high velocities without adversely affecting the crew or system elements. The effective gravitational field the *spacecraft/ aircraft* experiences can be nearly simultaneously reoriented at a 90-degree angle, resulting in a smooth continuous motion as far as the occupants are concerned." [...] "The gravimagnetic system is perhaps best suited for use in and around ... a large mass such as the Earth." "While the gravimagnetic system is likely to be the first field-dependent propulsion system developed, the field resonance system will **bring stellar and galactic travel out of the realm of science fiction**. The field resonance system artificially generates an energy pattern which precisely matches or resonates with a virtual pattern associated with a distent space-time point. According to the model, if a fundamental or precise resonance is established, (using hydromagnetic wave fine-tuning techniques), the spacecraft will be very strongly and equally repelled by surrounding virtual patterns. At the same time, through the virtual many-dimensional structure of space-time, a very strong attraction with the virtual pattern of a distant space-time point will exist. ...this combination of very strong forces will result in the translocation of the spacecraft from its initial position through the many-dimensional virtual structure to the distant space-time point. [...] "A space-time 'jump' already appears to be supported by astrophysical research."

Should you wish the entirety of this report, "Prospects for a Breakthrough in Field Dependent Propulsion" by A.C. Holt, you can order it from AeroPlus Dispatch, 1722 Gilbreth Road, Burlingame, CA 94010; phone: (800)-662-AERO. The paper/conference number is AIAA-80-1233 (American Institute of Aeronautics and Astronautics, June 30-July 2, 1980 - 16th Annual Conference.
-- Rich Boylan

There is also a great article discussing the work of A.C. Holt in the Electric Spacecraft Journal: Issue No. 5, June 30, 1992.

GENERAL RELATIVITY & QUANTUM COSMOLOGY, ABSTRACT GR-QC/9601024
From: MONTANARI@axpfe1.fe.infn.it
Date: Wed, 17 Jan 1996 13:01:16 +0100 (CET)
Coherent Interaction of a Monochromatic Gravitational Wave with both Matter and Electromagnetic Circuits
Author(s): Enrico Montanari (1) , Pierluigi Fortini (1) ((1) University of Ferrara,INFN sezione di Ferrara, Italy)

The interaction of a gravitational wave with a system made of an RLC circuit forming one end of a mechanical harmonic oscillator is investigated. We show that, in some configurations, the coherent interaction of the wave with both the mechanical oscillator and the RLC circuit gives rise to a mechanical quality factor increase of

the electromagnetic signal. When this system is used as an amplifier of gravitational periodic signals a sensitivity of 10^{-30} on the amplitude of the metric could be achieved.

GENERAL RELATIVITY & QUANTUM COSMOLOGY, ABSTRACT GR-QC/9602004
From: wells@cfaitamp2.harvard.edu (Jack Wells)
Date: Thu, 1 Feb 1996 16:50:06 -0500
Gravitational Interaction of Spinning Bodies, Center-of-Mass Coordinate and Radiation of Compact Binary Systems
Author(s): I.B. Khriplovich, A.A. Pomeransky

Spin-orbit and spin-spin effects in the gravitational interaction are treated in a close analogy with the fine and hyperfine interactions in atoms. The proper definition of the cener-of-mass coordinate is discussed. The technique developed is applied then to the gravitational radiation of compact binary stars. Our result for the spin-orbit correction differs from that obtained by other authors. New effects possible for the motion of a spinning particle in a gravitational field are pointed out. The corresponding corrections, nonlinear in spin, are in principle of the same order of magnitude as the ordinary spin-spin interaction.

HIGH ENERGY PHYSICS - THEORY, ABSTRACT HEP-TH/9601119
From: gonzalez@fyma.ucl.ac.be
Date: Tue, 23 Jan 1996 10:03:41 +0100 (MET)
Spinning Relativistic Particle in an External Electromagnetic Field
Author(s): M. Chaichian , R. Gonzalez Felipe , D. Louis Martinez

The Hamiltonian formulation of the motion of a spinning relativistic particle in an external electromagnetic field is considered. The approach is based on the introduction of new coordinates and their conjugated momenta to describe the spin degrees of freedom together with an appropriate set of constraints in the Dirac formulation. For particles with gyromagnetic ratio $g=2$, the equations of motion do not predict any deviation from the standard Lorentz force, while for $g \neq 2$ an additional force, which corresponds to the magnetic dipole force, is obtained.

HIGH ENERGY PHYSICS - PHENOMENOLOGY, ABSTRACT HEP-PH/9601280
From: MAREK@taunivm.tau.ac.il
Date: 16 Jan 96 19:19 IST
The Strange Spin of the Nucleon
Authors: John Ellis (CERN) , Marek Karliner (Tel-Aviv Univ.)
Comments: Invited Lectures at the International School of Nucleon Spin Structure, Erice, August 1995.

The recent series of experiments on polarized lepton-nucleon scattering have provided a strange new twist in the story of the nucleon, some of whose aspects are reviewed in these lectures. In

the first lecture, we review some issues arising in the analysis of the data on polarized structure functions, focusing in particular on the importance and treatment of high-order QCD perturbation theory. In the second lecture some possible interpretations of the ``EMC spin effect'' are reviewed, principally in the chiral soliton (Skyrmion) approach, but also interpretations related to the axial $U(1)$ anomaly. This lecture also discusses other indications from recent LEAR data for an $\bar{s} s$ component in the nucleon wave function, and discusses test of a model for this component. Finally, the third lecture reviews the implications of polarized structure functions measurements for experiments to search for cold dark matter particles, such as the lightest supersymmetric particle and the axion, after reviewing briefly the astrophysical and cosmological evidence for cold dark matter.

"Mechanical Propulsion From Unsymmetrical Magnetic Induction Fields"
by: R.L. Schlicher A.W. Biggs W.J. Tedeschi
31st AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit,
July 10-12 1995

A method is presented for generating mechanical spacecraft propulsion from unsymmetrical magnetic induction fields. It is based on an unsymmetrical three-dimensional loop antenna structure driven by a repetitively-pulsed high-current power supply. Antenna geometry is optimized for generating propulsive thrust rather than radiating electromagnetic energy. A magnetic field density gradient imbalances the magneto-mechanical forces that result from the interations of the internal magnetic induction field with the current in the conductors of the antenna structure.

From Richard Feynman's Lectures on Physics we learn that there is intrinsic field energy and momentum density associated with a static electro-magnetic field configuration. When there is a change in the magnetic field, this field energy and momentum can be directly converted into kinetic energy and mechanical momentum. Feynman illustrates this with an electromagnetic carousel paradox. In this paradox, a dielectric disk (which is embedded with small charged spheres along its circumference) rotates without any apparent "counter" torque in the system. Before this rotation occurs, the dielectric disk is immersed in a static magnetic field. The subsequent rotation occurs as a consequence to reducing the previously static magnetic field to zero. The angular momentum and rotational kinetic energy comes directly from the initial static magnetic field.

"The Feynman Lectures on Physics" by Richard Feynman, R.B. Leighton, and M. Sands, Volume II p 17-6

"Nonlinear Electromagnetic Propulsion System and Method", R.L. Schlicher

Nineteenth Power Modulation Symposium of the IEEE, 1990 Page 139

"Classical Electrodynamics" by C.D. Jackson, 2nd Edition, John Wiley and Sons, New York, 1975

"The Feynman Lectures on Physics" Richard Feynman, R.B. Leighton, and M. Sands, Volume II p 27-9

US Patent #5142861, "Nonlinear Electromagnetic Propulsion System", R.L. Schlicher et al. 1992

Dr Peter Graneau has conducted experiments which he claims provide a demonstration of departure from classical electrodynamics at high currents levels. A force is found to exist in a direction longitudinal to current flow. Graneau ran a variety of types of experiments with a metal rod conductor immersed in a conductive fluid (mercury, or saline solution). With high amperage passing through the solution the metal rod is found to move in a longitudinal direction. There is no known explanation in conventional EM theory. This force may be similar to the force (v X B) that William Hooper finds in a noninductive coil. Or Graneau's longitudinal force may be a coupling between the electromagnetic and inertial/gravitational fields, which is predicted by some 5-D unified EM/gravitational theories -- predicted to result from a divergence of the electric current vector field. Graneau's experiments should be relatively easy to duplicate. I can find no record that anyone has ever done so. Graneau has also discovered apparently anomalous forces and effects in high energy electromechanical devices such as rail guns and induction motors.

AUTHOR: Graneau, Peter.
TITLE: Ampere-Neumann electrodynamics of metals/Peter Graneau.
PUBL.: Nonantuma, MA. : Hadronic Press,
FORMAT: ix, 311 p. : ill. ; 23 cm.
DATE: 1985
SUBJECT Metals--Electric properties--History.
Free electron theory of metals--History.
Electrodynamics--History.
Electric conductors--History.
ISBN: 0911767371

AUTHOR: Graneau, Peter
TITLE: Electromagnetic Jet Propulsion in the Direction of Current Flow
In: Nature

June 18, 1982 No 295 Page 311

AUTHOR(s): Graneau, P.
TITLE(s): Ampere force calculation for filament fusion experiments.
In: Physics letters. a
MAR 22 1993 v 174 n 5/6 Page 421

AUTHOR(s): Graneau, P.
TITLE(s): Comment on "The motionally induced back-EMF in railguns".
In: Physics letters: [part A]
DEC 02 1991 v 160 n 5 Page 490

AUTHOR(s): Graneau, Peter
TITLE(s): The Difference between Newtonian and Relativistic Forces.
In: Foundations of physics letters.
OCT 01 1993 v 6 n 5 Page 491

AUTHOR(s): Graneau, P.
TITLE(s): Electrodynamic momentum measurements.
In: Journal of physics d: applied physics.
DEC 01 1988 v 21 n 12 Page 1826

AUTHOR(s): Graneau, P.
TITLE(s): Far-action versus contact action.
In: Speculations in science and technology.
1990 v 13 n 3 Page 191

AUTHOR(s): Graneau, Peter
TITLE(s): Inertia's Riddle.
Summary: Inertia has been misunderstood ever since the time of Galileo says Dr. Graneau.
In: Electronics world + wireless world.
JAN 01 1990 v 96 n 1647 Page 60

AUTHOR(s): Graneau, P.
TITLE(s): Longitudinal forces in Ampere's wire-arc experiment.
In: Physics letters: [part A]
MAY 08 1989 v 137 n 3 Page 87

AUTHOR(s): Graneau, P. Thompson, D.S. Morrill, S.L.
TITLE(s): The motionally induced back-emf in railguns.
In: Physics letters: [part A]
APR 30 1990 v 145 n 8/9 Page 396

AUTHOR(s): Graneau, Peter
TITLE(s): Nonlocal Action in the Induction Motor.

In: Foundations of physics letters.
OCT 01 1991 v 4 n 5 Page 499

AUTHOR(s): Graneau, P. Graneau, N.
TITLE(s): The role of Ampere forces in nuclear fusion.
In: Physics letters: [part A]
MAY 04 1992 v 165 n 1 Page 1

AUTHOR: Graneau, Peter.
TITLE: Underground power transmission : the science, technology, and economics of high voltage cables / Peter Graneau.
PUBL.: New York : Wiley,
FORMAT: x, 515 p. : ill. ; 24 cm.
DATE: 1979
SUBJECT: Electric cables
Electric power transmission
Electric lines--Underground
ISBN: 0471057576

I see that Graneau has devoted himself to the electric railgun. I looked a bit into this phenomena in 1994. I will now be able look a bit further. It seems that Graneau beleives in free energy in vacuum. The railgun and the theories about it are very controversial. There is a conflict between PhD Witalis, who works for the Swedish Defense, and the established plasmaphysiscists here in Uppsala. Witalis has condemned controlled hot fusion.
-- David Jonsson

MAGNETORESISTANCE IN METALS, by Pippard, A.B.

Pippard provides the first systematic account of magnetoresistance in metals, the study of which has provided solid-state physicists with valuable information about electron motion in metals.

The electrical resistance of a metal is usually changed when a magnetic field is applied to it, and at low temperatures the change may be very large indeed. Every metal behaves differently, and the effect has been widely used to elucidate details of electron motion in individual metals. Because there has been no systematic account of the phenomena, apart from review articles addressing special points, this book fills an obvious gap. Making no great demand on mathematical ability, it should be a valuable reference work for readers with a basic knowledge of undergraduate solid-state physics. The text is copiously illustrated with real experimental results.

Cambridge Studies in Low Temperature Physics 2
1989 6 x 9 272 pp. 3 halftones 113 line diagrams

Hardback 0-521-32660-5 $84.95 (£50.00)

Albert C. Crehore published "New Electrodynamics" in 1950. In this book he described how the motion of protons in the nucleus would produce gravitational field effects. Gravitational field effects such as counter-bary are used in the mainstream effort to develop non-areodynamic non-rocket flight systems that usually referred to as "anti-gravitational". By making use of the Crehore Paradigm it is possible to derive a method of producing counter-bary. It's most likely Crehore had no knowledge of Brown's 1928 British patent for a gravitator device that would have been a macroscopic analog of a Crehore atom.

Crehore, Albert C. (Albert Cushing), b. 1868.
The mystery of matter and energy; recent progress as to the structure of matter, by Albert C. Crehore ... New York, D. van Nostrand company, 1917
LC CALL NUMBER: QC173 .C8
SUBJECTS: Matter--Constitution.

Crehore, Albert C. (Albert Cushing), b. 1868.
The atom, by Albert C. Crehore ... New York, D. Van Nostrand company, 1920.
xvi, 161 p. diagrs. 19 cm.
LC CALL NUMBER: QC173 .C75

A man named Gerry Vassilator is an electrogravity experimenter.
Last I know (in 1991) he runs an information service called
MUUDO Experimental Videos
Delmar Ave
Staten Island, NY 10312.
(718)-356-9373.

There are many books available about anti-gravity and
other weird science subjects from:
International Tesla Society
330-A West Uintah Street - Suite 215
Colorado Springs CO 80905-1095

The Anti-Gravity Handbook (revised ed.)
Compiled by D. Hatcher Childress
Published by - Adventures Unlimited Press
303 Main St., Kempton, Illnois 60949 USA
ISBN: 0-932813-20-8

Pub date: 1993 (First edition was in 1985)

Anti-gravity and the world grid / edited by David Hatcher Childress. 1st ed.
Stelle, IL : Adventures Unlimited Press, c1987. 267 p. : ill. ; 26 cm.
LC CALL NUMBER: BF1999 .A6386 1987
SUBJECTS: Antigravity. Grids (Cartography). Occultism.
Childress, David Hatcher, 1957-
ISBN: 0932813038 (pbk.) : $12.95

The Anti-gravity handbook / compiled by D. Hatcher Childress. 1st ed.
Stelle, Ill. : Adventures Unlimited Press, c1985 (1986 printing) 195 p.
LC CALL NUMBER: QC178 .A58 1985
SUBJECTS: Antigravity.
Childress, David Hatcher, 1957-
ISBN: 0932813011 (pbk.) : $12.95

Pages, Marcel J. J.
Le defi de l'antigravitation: techniques antiponderales, utilisation de
l'energie de l'espace [par] M. J. J. Pages. Paris, Chiron [1974] 306 p.
LC CALL NUMBER: QC178 .P23
SUBJECTS: Antigravity. Force and energy.
ISBN: 2702703097

Nipher, Francis Eugene, 1847-
Electricity and magnetism. A mathematical treatise for advanced
undergraduate students. By Francis E. Nipher ...
2d ed., rev., with additions.
St. Louis, Mo., J. L. Boland book and stationery co.,
1895 i.e. 1898 xi, 430 p. diagrs. 20 cm.

"My library research shows that as early as 1917, a Professor Nipher had found that the weight of substances could be reduced (become negative) by the application of electrostatic charges. (Science, Sept. 21, 1917, page 173).
Dr. Charles Brush, in a series of reports in the PROCEEDINGS OF THE AMERICAN PHILOSOPHICAL SOCIETY around 1922 found, in some well-thought-out-experiments, that weight was not only proportional to mass, but was affected by the atomic structure of the substances. For example, he found that for a given unit of mass and shape, BISMUTH falls faster than zinc or aluminum, in complete contradiction to Newton's Law of Gravity which they are still teaching in colleges today!
So far, the literature hasn't given me an answer. Incidentally,

Otis Carr's work involved counter-rotating charged discs that supposedly produced thrust when they reached a certain speed in relation the the earth's rotational speed and became activated by free energy from space. Maybe he did have something."
-- James E. Cox

When individual molecules are not permanently magnetized, it is possible in some cases to have a relative magnetic permeability u which is less than one. Such a material, like hydrogen or BISMUTH, is called diamagnetic. It tends to expel magnetic field, and is repelled from regions of stronger magnetic field. The names paramagnetic and diamagnetic are sometimes confused: paramagnetic is analogous to a dielectric in an electric field, while diamagnetic is quite the opposite.

It is not possible to give a simple argument of why diamagnetism can occur. it is strictly speaking a quantum effect. However, one can see that there might be diamagnetic tendencies if electric currents can flow within molecules. An increasing magnetic field always tends to induce currents to flow in such a way as to tend to prevent the increase in the field. This is (at least temporarily) a diamagnetic kind of effect.

Thus the case where the relative magnetic permeablility $u < 1$, is connected with the flow of electric charges in a magnetic field. There is no analogous case with electric fields since isolated magnetic poles do no, so far as is known exist.
- "The New Physics" edited by Paul Davies

GE engineer Henry Wallace found unusual gravitational effects in spinning odd atomic nulceide metals. Odd atomic nucleide metals are those in which the sum of the protons are not equal to the number of neutrons, i.e. more neutrons. See US patents 3626605 and 3626606.
-Ron Kita

"Also indicated in the embodiment is the orientation of the flux within the mass circuit, the latter being constructed preferredly of BISMUTH."
- Henry Wallace, US patent # 3626605, Method and Apparatus for Generating a Secondary Gravitational Force Field

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AUTHOR(s): Uyeda, C. Yamanaka, T. Miyako, Y.

TITLE(s): Magnetic rotation of diamagnetic oxide crystals and the origin of diamagnetic anistropies.

In: Physica B. Condensed matter.
MAY 01 1995 v 211 n 1/4 Page: 342

A while back I had the need to take a peek at a copy of the periodic table of elements. So I grabbed my old, dusty college chemistry book that I could never quite bring myself to toss. It's called "Chemical Principles", published WAY back in 1970. While looking through the book, I was stunned when I came across a discussion of the possibilities of new elements.

"What lies ahead for the synthesis of transuranium elements? Will there be more radioactive and extremely short-lived species such as 97 through 104? It now appears as if there is a chance of reaching a new zone of stability that might even include some none radioactive elements. Calculations with nuclear shell models have led to the expectation that element 114, with 114 protons and 184 neutrons (both magic numbers in the new shell theory) would be an island of stability in a sea of instability."

I noted that some information was taken from an article in the April 1969 (pages 57-67) issue of "Scientific American" by Dr. Glenn Seaborg. In this article, there are excellent graphics showing the expected half-lives of all the heavyweights. They predict a fission half-life for the most stable isotope of 114 of 10 to the 16th years, and a alpha-decay half-life of 1,000 years. They didn't go into the same level of detail for 115, but it looks like the stuff would clock out considerably sooner by way of beta decay.

BTW, according to the article, the proper terminology to denote an undiscovered element in a periodic column is the prefix "eka". Therefore element 115 should be eka-BISMUTH. Lose this Un-un-pentium crap!

- Tom Mahood

Lazar is not the only one to theorize that the 114/115 area is stable. Check out the August 31, 1991 issue of New Scientist -- that respected peer-reviewed periodical. Find Glenn Seaborg's article called "The search for the missing elements." Seaborg is a renowned scientist who won the Nobel Prize for Chemistry in 1951. He and his research group at the Lawrence Berkeley Laboratory have discovered 10 of the transuranium elements. His article is very technical and interesting, and in it he has two separate graphs that show islands of stability at the 114/115 area. There is a sea of instability around these "islands."

AUTHOR(s): Bhattacharyya, S. Ghoshal, A. Ghatak, K.P.
TITLE(s): On the field emission from bismuth in the presence of a quantizing magnetic field.
In: Fizika; a journal of experimental and theoretic
APR 01 1991 v 23 n 2 Page 159

AUTHOR(s): Byrne, A. P. Birkental, U. Hubel, H.
TITLE: High-Spin States in 205Bi.
In: Zeitschrift fur Physik. A, Atomic nuclei
1989 v 334 n 3 Page: 247

AUTHOR(s): Vezzoli, G.C. Chen, M.F. Craver, F.
TITLE(s): Magnetically-related properties of bismuth containing high Tc superconductors.
In: Journal of magnetism and magnetic materials.
AUG 01 1990 v 88 n 3 Page 351

AUTHOR(s): Bannerjee, D. Bhattacharya, R.
TITLE(s): Magnetic Properties of Single Crystals of Bismuth Doped with Lead and Tin.
In: Physica status solidi. b: basic research.
JAN 01 1990 v 157 n 1 Page 443

AUTHOR(s): Zhilyaev, I. N.
TITLE(s): Observation of kinetic paramagnetic effect in bismuth in a transverse magnetic field.
In: Soviet journal of low temperature physics.
SEP 01 1988 v 14 n 9 Page 502

AUTHOR(s): Mondal, M. Banik, S.N. Ghatak, K.P.
TITLE(s): Effect of a quantizing magnetic field on the Einstein relation in bismuth.
In: Canadian journal of physics.
JAN 01 1989 v 67 n 1 Page 72

AUTHOR(s): Zheng, Q. Zeng, Z. Lai, W.
TITLE(s): The influence of Al on the electronic structure and magnetic properties of doped MnBi with huge enhancement of Kerr rotation.
In: Journal of magnetism and magnetic materials.
FEB 01 1992 v 104/107 p 2 Page 1019

CONDENSED MATTER, ABSTRACT COND-MAT/9601068
From: arghya@mri.ernet.in ("Arghya Taraphder")
Date: Wed, 17 Jan 1996 14:30:54 +0500

The Exotic Barium Bismuthates
Authors: A. Taraphder, Rahul Pandit, H.R. Krishnamurthy, T.V. Ramakrishnan
We review the remarkable properties, including superconductivity, charge-density-wave ordering, and metal-insulator transitions, of lead- and potassium-doped barium bismuthate. We discuss some of the early theoretical studies of these systems. Our recent theoretical work, on the negative-$U\/$, extended-Hubbard model for these systems, is also described. Both the large- and intermediate-$U\/$ regimes of this model are examined, using mean-field and random-phase approximations, particularly with a view to fitting various experimental properties of these bismuthates. On the basis of our studies, we point out possibilities for exotic physics in these systems. We also emphasize the different consequences of electronic and phonon-mediated mechanisms for the negative $U.\/$ We show that, for an electronic mechanism, the \secin \,\,phases of these bismuthates must be unique, with their transport properties {\it dominated by charge $\pm 2e$ Cooperon bound states}. This can explain the observed difference between the optical and transport gaps. We propose other experimental tests for this novel mechanism of charge transport and comment on the effects of disorder.

Huston, David L.
The nature and possible significance of the Batamote copper-bismuth-silver anomaly, Pima County, Arizona / by David L. Huston and Paul K. Theobald.
Washington : U.S. G.P.O. ; Denver, CO : For sale by the Books and Open-File Reports Section, U.S. Geological Survey, 1990. v, 19 p. : ill., maps
LC CALL NUMBER: QE75 .B9 no. 1907 (ALTERNATE CLASS QE390.2.C6)
SUBJECTS: Copper ores--Arizona--Batamote Mountains Region.
U.S. Geological Survey bulletin ; 1907

Beck, Sherwin M.
Measured electron conversion ratios for the 1064-keV gamma ray of bismuth-207, by Sherwin M. Beck. Washington, National Aeronautics and Space Administration; [for sale by the Clearinghouse for Federal Scientific and Technical Information, Springfield, Va.] 1970. 39 p. illus. 27 cm.
LC CALL NUMBER: TL521 .A3525 no. 6057
SUBJECTS: Bismuth--Isotopes. Nuclear counters.
NASA technical note, NASA TN D-6057

The following is an excerpt from a telephone interview between Stanton Friedman (F) and Dr. Robert Sarabacher (S). Sarabacher was a prominent, US government scientist who had a secret briefing with Canadian scientist Wilbert Smith in 1950 and told Smith that that facts in a recent popular book about a UFO crash at Aztec, New Mexico were

"essentially true" and that UFO's were classified by the US government 2 points higher than the H bomb. Sarabacher died in July 1986. Before Sarabacher died, Stanton Friedman did a phone interview with him. In between Friedmann's attempts to dig more UFO info out of Sarabacher, there was a lot of small talk, and since Sarabacher was fairly old, he tended to ramble a bit. However, a most interesting statement was made by Sarabacher:

F: Were you guys talking about nuclear powered flight at that time?

S: Oh, we were possibly, yes, but I held, had certain ideas see, one of the problems today, we really don't know what gravity is. We don't know and I had an idea, I'm willing to work on it in one of my theses but then my professor didn't believe me, but I had determined that BISMUTH did not obey the laws of gravity. So I thought that, "Gee, there's a leak". I might be able to get nature to tell me something.

So where exactly is Bismuth on the Periodic Table of Elements? Why directly above where 115 would fall if it exists. And the way the table works, (generally speaking) elements in the same column have similar properties. So, just what the hell was Sarabacher referring to? I don't know, but it's sure intriguing! It appears it was back when he was a grad student, in maybe the 30s or 40s. Whatever it was, it was at the very edge of the ability of equipment at the time. Does Bismuth possess any very subtle anomolous physical properties?
-- Tom Mahood

In the Wallace patent, #3626606, Figs. 7A and 7B are side views of a gravity-NEUTRALIZING FLYING SAUCER, or, if anchored to the ground, a ZERO-GRAVITY CHAMBER. Each oval diagram shows a motor spinning a central disc at a very high speed, about 28,000 RPM, and also rotating two other discs sandwiched around the first disc, via gears, at a much slower speed, perhaps 2,800 RPM, in the opposite direction. The two outer discs have extensions [counter-balanced via off-center axis] that, as they rotate, alternately make contact with two wide extensions from opposite walls of the spacecraft. The central disc should have shallow spiral-shaped grooves on both sides for air-bearings, to allow the needed very close contact with the two outer discs. Each of the two outer discs has ONLY ONE [counter-balanced] extension, each one pointed opposite (180 degrees) the extension of the other disc.
The most important factor making it work is that the discs, extensions, and outer walls of the spacecraft MUST be

made of any material(s) in which a very large majority of the
atoms are of isotopes having "HALF-INTEGRAL ATOMIC SPINS",
such as copper (3/2).
- Robert E. McElwaine

AUTHOR(s): Sun, W. Stephen, J.T. Wu, Y.
TITLE(s): Rotation-Induced Resonance and Second-Order Quadrupolar Effects on Spin Locking of Half-Integer Quadrupolar Nuclei.
In: Journal of magnetic resonance. series a.
OCT 01 1995 v 116 n 2 Page: 181

AUTHOR(s): Seliger, J. Blinc, R.
TITLE(s): Orientation dependences of quadrupolar spin-lattice relaxation rates of spin-3/2 nuclei subject to a random two-site exchange in a high magnetic field: a theoretical study.
In: Journal of physics. Condensed matter : an Inst
DEC 13 1993 v 5 n 50 Page: 9401

Thanks for the patent info about Wallace, I got them a few days ago
and found it quite enjoyable. Actually, many people have had this
notion at one time or another, I think Oleg Jefimenko wrote a book
relating to this subject.
-- Keith Nagel

AUTHOR: Jefimenko, Oleg D.
TITLE: Electricity and magnetism : an introduction to the theory of electric and magnetic fields / Oleg D. Jefimenko.
EDITION: 2nd ed.
PUBL.: Star City, W. Va. : Electret Scientific Co.,
DATE: 1989
SUBJECT: Electromagnetism
ISBN: 0917406081

AUTHOR: Jefimenko, Oleg D.
TITLE: Electrostatic motors; their history, types, and principles of operation (by) Oleg D. Jefimenko. With many illus., of which 57 are by David K. Walker.
PUBL.: Star City (W. Va.) Electret Scientific Co.
DATE: 1973
SUBJECT: Electrostatic apparatus and appliances

AUTHOR: Jefimenko, Oleg D.

TITLE: Causality, electromagnetic induction, and gravitation: a different approach to the theory of electromagnetic and gravitational fields" b
PUBL: Star City [West Virginia] : Electret Scientific Co.,
DATE: 1992.
SUBJECTS: Electromagnetic fields. Gravitational fields. Causality. Maxwell Equations.

AUTHOR(s): Jefimenko, Oleg D.
TITLE(s): Direct calculation of electric and magnetic forces from
In: American journal of physics.
JUL 01 1990 v 58 n 7 Page 625

AUTHOR(s): Jefimenko, Oleg D.
TITLE(s): Direct calculation of the electric magnetic fields of an electric point charge moving with constant velocity.
In: American journal of physics.
JAN 01 1994 v 62 n 1 Page 79

AUTHOR(s): Jefimenko, Oleg D.
TITLE(s): Force exerted on a stationary charge by a moving electric current or by a moving magnet.
In: American journal of physics.
MAR 01 1993 v 61 n 3 Page 218

AUTHOR(s): Jefimenko, Oleg D.
TITLE(s): Retardation and relativity: The case of a moving line charge.
In: American journal of physics.
MAY 01 1995 v 63 n 5 Page 454

AUTHOR(s): Jefimenko, Oleg D.
TITLE(s): Retardation and relativity; Derivation of Lorentz-Einstein transformation from retarded integrals for electric and magnetic fields.
In: American journal of physics.
MAR 01 1995 v 63 n 3 Page 267

AUTHOR(s): Jefimenko, Oleg D.
TITLE(s): Solutions of Maxwell's equations for electric and magnetic fields in arbitrary media.
In: American journal of physics.
OCT 01 1992 v 60 n 10 Page 899

"Anti-Gravity Electronics", H. Aspden, Electroncis & Wireless World,

Jan 1 1989, Vol 95 No 1635
Reinterpretation of Netwon's third law of motion suggests that it depends upon an electronic action. Electronic interaction therefore explains the paradoxical anti-gravity properties of the force precessed gyroscope.

"The Anti-Gravity Puzzle", Mark Ander, Professional Pilot, Aug 1 1989
Exploring the possibility of exceptions to Newton's inverse-square law of gravity, scientists pursue evidence in strange locations.

"The Latest Antigravity Gossip", Rock & Ice, Nov 1 1994 No 64

"Propulsion by Gyro", Eric Laithwaite, Space, Sep 1989 Vol 5 No 5
In an attempt to reveal the strange, hidden properties of gyroscopes, Professor Eric Laithwaite explains the physics behind the idea that a propulsion system could be built using gyros.

"Negative Mass in General Relativity", H. Bondi, Reviews of Modern Physics, Vol 29, July 1957, pp 423-428

"Looking for New Gravitational Forces with Antiprotons", M.M. Nieto and B.E. Bonner, Proceedings RAND Workshop on Anti Proton Science and Technology, World Scientific, Singapore, 1988 pp 328-341

"Negative and Imaginary Proper Masses", Y.P Terletskii, Paradoxes in the Theory of Relativity, Plenum, New York 1968, Chapter VI pp 83-115

"Gravitational Coupling of Negative Matter", A. Inomata and D. Peak, Nuovo Cimento, Vol B63 Sep 1969 pp 132-142

"Negative-Mass Lagging Cores of the Big Bang", B.D. Miller, Astrophysical Journal, Vol 208, Sep 1976 pp 275-285

"The Cosmological Term, the Shielding of Gravitation and the Negative Mass Hypothesis", A.A. Baranov, Izvestiya VUZ Fizika, Vol 14 Nov 1971 pp 118-120

"Negative Masses and the Energy-Sources of the Universe", Y.P. Terletskii, Experimentelle Technik der Physik, Vol 29 April 1981 pp 331-332

ELECTROMAGNETIC-GRAVITATIONAL CONVERSION CROSS SECTIONS IN EXTERNAL
ELECTROMAGNETIC FIELDS
International Centre for Theoretical Physics, Trieste (Italy). LONG, HOANG NGOC SOA, DANG VAN TRAN, TUAN A. SEP. 1994 11 PAGES DE95-613589

IC-94/285 Avail: CASI HC A03/MF A01 (US Sales Only)
The classical processes: the conversion of photons into gravitons in the static electromagnetic fields are considered by using Feynman perturbation techniques. The differential cross sections are presented for the conversion in the electric field of the flat condenser and the magnetic field of the solenoid. A numerical evaluation shows that the cross sections may have the observable value in the present technical scenario.
CASI Accession Number: N95-30637

I have an excerpt from a paper presented under the auspices of Northrop Corp. in 1968 that gives an idea of why you would want to bother with high voltage fields. To achieve the effects described involved relatively small high voltage. The true electrogravitational effects are significant at higher E field strength. In any case, this was only the state of the art in 1968. Their involvement in the B-2 began much later, after considerably more research.

Electroaerodynamics In Supersonic Flow
by M. S. Cahn and G. M. Andrew, Northrop Corporation, Hawthorne, California
Presented at AIAA 6th Aerospace Sciences Meeting, January 22-24, 1968
- Tom Capizzi (tcapizzi@world.std.com)

ELECTRO-AERODYNAMICS: Electric charges are applied to high-speed vehicles for the purpose of reducing air drag or eliminating sonic booms. High-speed ions are projected forward from the leading edges of the craft, the corona glow propagates forward and repels air molecules away from the oncoming surfaces, thus a shock wave cannot be mechanically produced.

Sources: Dudley, Horace C., Analog Science Fact & Fiction. "The Electric Field Rocket", November 1960.

Product Engineering. "Sonic Boom Experiments", Vol. 39, New York, pp. 35-6, March 11, 1968.

US Patent No. 3,095,167, Dudley.

The paper entitled the "U.S. Antigravity Squadron" paper appears with others in the book "ELECTROGRAVITICS SYSTEMS: Reports on a New Propulsion Methodology" edited by Thomas Valone (Washington, D.C.: Integrity Research Institute, 1994); ISBN 0-9641070-0-7.

In addition to this paper, this book also includes the following:

1) The 1956 paper "Electrogravitics Systems" (prepared by the Special Weapons Study Unit of Aviation Studies Ltd., a UK-based aviation industry intelligence firm). It was declassified from a confidential status some time prior to 1985 and entered the public domain as a result of a request I placed through the Wright-Patterson Air Force Base Technical Library.

2) The 1956 paper "The Gravitics Situation" (prepared by Gravity Rand Ltd., a division of Aviation Studies Ltd. This includes six appendices with papers by various authors including the text from T. Townsend Brown's 1929 gravitor patent.

3) A paper by Banesh Hoffman entitled "Negative Mass as a Gravitational Source of Energy in the Quasistellar Radio Sources.

4) A collection of diagrams copied from various patents by T. Townsend Brown.

You may order a copy from:
Starburst Publications, 1176 Hedgewood Lane,
Schenectady NY 12309, USA

Also available from Starburst Publications is the book "Subquantum Kinetics: The Alchemy of Creation" (ISBN 0-9642025-0-6). Subquantum kinetics is a new approach to microphysical theory that utilizes concepts from the fields of nonlinear chemical kinetics, irreversible thermodynamics, and general system theory, replacing the current mechanistic foundation of physics with a reaction-kinetic model. This new approach resolves a number of problems that plague classical and modern physics also may provide some insights into the electrogravitic connection that Brown was researching. In particular, chapter 9 gives some background information on Townsend Brown's electrogravitics.

Scott, W.B. "Black World engineers, scientists encourage using highly classified technology for civil applications." Aviation Week & Space Technology, March 9, 1992, pp. 66,67.

Brown, T.T. "How I Control Gravity." Science and Invention Magazine, August 1929. Reprinted in Psychic Observer 37(1) pp.14 - 18.

Burridge, G. "Another Step Towards Antigravity." The American Mercury 86(6) (1958):77 - 82.

Sigma, Rho, "Ether Technology: A Rational Approach to Gravity Control." Lakemont, GA: CSA Printing & Bindery, 1977, p. 44-49, quoteing a letter from T. Townsend Brown dated February 14, 1973.

Intel. "Towards Flight Without Stress or Strain...Or Weight." Intervia Magazine 11(5) (1956):373-374

Rose, M. "The Flying Saucer: The Application of the Biefeld-Brown Effect to the Solution of the Problems of Space Navigation." University for Social reesearch, April 8, 1952.

LaViolette, P.A. "An Introduction to Subquantum Kinetics: Part Journal of General Systems, Special Issue on Systems Thinking in Physics" 11(1985):295-328.

LaViolette, P.A. "Subquantum Kinetics: The Alchemy of Creation." Schenectady, NY, 1994.

LaViolette, P.A. "Beyond the Big Bang: Ancient Myth and the Science of Continuous Creation." Rochester, VT:Inner Traditions Intl., 1994.

LaViolette, P.A. "A Theory of Electrogravtics." Electric Spacecraft Journal, Issue 8, 1993, pp. 33 - 36.

LaViolette, P.A. "A Tesla Wave Physics for a Free Energy Universe." Proceedings of the 1990 International Tesla Symposium, Colorado Springs, CO: International Tesla Society, 1991, pp. 5.1 - 5.19.

Aviation Studies (International) Ltd. "Electrogravitic Systems: An Examination of Electrostatic Motion, Dynaimc Counterbary and Barycentric Control." Report GRG 013/56 by Aviation Studies, Special Weapons Study Unit, London, February 1956. (Library of Congress No. 3,1401,00034,5879; Call No. TL565.A9).

LaViolette, P. "Electrogravitics: Back to the Future." Electric Spacecraft Journal, Issue 4, 1992, pp. 23 - 28.

LaViolette, P. "Electrogravtics: An Energy-Efficient Means of Spacecraft Propulsion." Explore 3 (1991): 76 - 79; idea No. 100159 submitted to NASA's 1990 Space Exploration Outreach Program.

Aviation Studies (International) Ltd. "The Gravitics Situation". prepared by Gravity Rand Ltd. - a divison of Aviation Studies,

London, December 1956.

Northrup Studying Sonic Boom Remedy." Aviation Week & Space Technology, Jan. 22, 1968, p.21.

Rhodes, L. "Ex-NASA Expert Says Stealth Uses Parts from UFO." Arkansas Democrat, Little Rock, AR., April 9, 1990.

Scott, W.B. "Inside the Stealth Bomber" Tab/Aero Books: New York, 1991.

One of the most famous researchers in this area is John Searl, who noticed that spinning metal would accumulate electrons on the rim, possibly through some kind of centrifugal thrust. The initial test was a metal disk attached to a breakaway coupling driven by a gasoline engine. It was carried out in the country and as the disk reached higher and higher speeds, tremendous electrostatic forces were generated which were estimated at 10 to the 6th volts! That's when the disk began to glow blue, broke the coupling, rose to about 30 feet, continued to accelerate, turned pink and shot off into space. Searl claims this happened with many of his early tests and as a result he lost the device each time. Later he learned how to control the device. The neat thing about it, the Searl disk is self-propelling using a magnetic drive.
-- Jerry Decker

THE SEARL EFFECT
(The Introduction)
[To contact WCVE write to:
23 Sesame Street
Richmond VA, 23235
or phone: 804-320-1301
or fax: 804-320-8729]

ANTIGRAVITY: The Dream made Reality
[The Story of John R. R. Searl]
by John A. Thomas Jr.
Published by Direct International Science Consortium
13 Blackburn, Low Strand, Grahame Park Estate, London NW95NG England

Available in this country through John A. Thomas, Jr.
373 Rock Beach Rd.

Rochester, NY 14617-1316
Phone: (716) 467-2694

Thomas, John A., Jr.
Antigravity : the dream made reality : the story of John R.R. Searl / by John A. Thomas Jr. London : Direct International Science Consortium, c1993.
1 v. (various pagings) : ill. (some col.) ; 28 cm.
LC CALL NUMBER: QC178 .T46 1993
SUBJECTS: Searl, John R. R. (John Roy Robert), 1932-. Antigravity.
ISBN: 1898827990 (spiral)

NEXUS Magazine
Volume 2, Number 17
P.O. Box 177
Kempton, IL 60946
Phone: (815) 252-6464
Fax: (815) 253-6300

Extraordinary Science
Volume VI. Issue 2
ISSN 1043-3716

Aspden, Harold A. (1989). "The Theory of the Gravitation Constant," Physical Essays, Vol. 2, No. 2, pages 173-179.

Aspden, Harold A. (1991). "The Theory of Antigravity," Physical Essays, Vol. 4, no. 1, pages 13-19.

Electrogravitic Systems: Reports on a New Propulsion Methodology
by Thomas Valone, M.A., P.E.

The Anti-Gravity Handbook
by D. Hatcher Childress

Ether-Technology: A Rational Approach to Gravity-Control
by Rho Sigma

Sigma, Rho.
Forschung in Fesseln : das Ratsel d. Elektro-Gravitation / von Rho Sigma.
Wiesbaden-Schierstein : Ventla-Verl., 1972. 272 p. : ill. ; 21 cm.
LC CALL NUMBER: TL789 .S524 1972
SUBJECTS: Unidentified flying objects. Gravitation.

ISBN: DM24.00

There is also a good book written by an Aerospace Engineer who worked for General Electric, named John Ackerman. The book is called "To Catch a Flying Star". It is available from Univelt, Inc., P.O. Box 28130, San Diego, CA. 92128 ISBN 0-912183-03-9.

AUTHOR: Ackerman, John.
TITLE: To catch a flying star : a scientific theory of UFOs / by John Ackerman ; with a forward by Walter H. Andrus, Jr.
PUBL.: San Diego, Calif. : Univelt,
DATE: 1989
SUBJECT: UNIDENTIFIED FLYING OBJECTS, SPACECRAFT, UFOs, INTERSTELLAR SPACECRAFT, INTERSTELLAR TRAVEL LONG DURATION SPACE FLIGHT, ASTRONAUTICS FLIGHT CONTROL
ISBN: 0912183039 (pbk.)

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I highly recommend this semi-pro publication.
Buy all the back issues too! It's not just 'counterbary',
but has articles on energy anomalies, Tesla, unconventional
hobby projects, unconventional physics, etc.

SPACE ENERGY NEWS The Space Energy Association is dedicated
PO Box 11422 to the pioneering work of several sci-
Clearwater FL 34616 entists and inventors, including Nikola
Suscription info:$35, 4 issu/yr Telsa, Viktor Schauberger, T. Henry Moray,
Editors: Donald A. Kelly T.T. Brown, Alfred Hubbard, T.J.J. See,
Michael Marino Erwin Saxl, Hans Coler and others.

_

"Antigravity" by R.M. Santilli
The Institute for Basic Research,
PO Box 1577
Palm Harbor FL 34682

Recently I had read a book from Hans A. Nieper with the title "Konversion von Schwerkraft-Feld-Energie" (transformation of gravity field energy). This book tells from transformers of the types Fluxtransformer

(electrodynamic system) and Capacitor Discharge (solid state method).
My problem is that I find nowhere informations about these machines.
So I hope that YOU can give me hints whre I can find informations (books,
files,articles ...) about these machines and theories. I am also grateful
for your opinions about these theory and these machines.
-- Michael Bell Berlin, Germany

Revolution in Technik, Medizin, Gesellschaft. English.
Revolution in technology, medicine and society : conversion of gravity field
energy / Hans A. Nieper. Extended ed. in English, 1. ed. Oldenburg : MIT
Verlag, 1985. 384 p. : ill. ; 22 cm.
LC CALL NUMBER: TJ163.7 .R4813 1985
SUBJECTS: Power (Mechanics)--Congresses.
Translation of: Revolution in Technik, Medizin, Gesellschaft.
Cover title: Dr. Nieper's Revolution in technology, medicine, and society.
Includes proceedings of the Symposium on Energy Technology, Hannover, Nov.
27-28, 1980, and the First International Symposium on Non-Conventional Energy
Technology, Oct. 23-24, Toronto, Oct. 23-24, 1981.
ISBN: 392518807X

Nieper, Hans A. Zur Theorie der Schwerkraftwirkungen.
In "Revolution in Technik Medizin Gesellschaft",

Bearden, T. E. Maxwell's lost Unified Field Theory of Electromagnetics
and Gravitation. In "New Energy Technology", pg. 25. Published by The
Planetary Association for Clean Energy, nc. Ottawa/Hull, Canada.

Bearden, Thomas E. (1988). "Maxwell's Original Quaternion Theory Was a
Unified Field Theory of Electromagnetics and Gravitation," Proceedings
of the International Tesla Society, 1988, ITS Books.

Moretti, Angelo. Possibility of Non-Zero Mass in Synchrotron Radiation.
In "What Physics for the next century?" pg. 397 - Inediti No. 59,
Societ_Editrice Andromeda, Bologna

Gunnufson, Craig. Neuere Neutrinomessungen aus der Sonne unterstuetzen
eine neue Theorie. Lecture held at a congress on Gravity Field Energy in
Toronto, Oct. 1981. In Nieper, "Revolution in Technik Medizin
Gesellschaft", Illmer Verlag, Hannover

Seike, Shinichi. Lecture held at Energy Symposium in Hannover,
November 1980. In Nieper, Revolution in Technik Medizin Gesellschaft.

Anyone ever see Stan Deyo's book Cosmic Conspiracy? He talked about an

ElectroGravitics society I think it was.

These things must have some sort of high voltage resonating circuitry, in a round shape obviously. They can recharge over high power lines. They can apparently become invisible. They also must be able to change their mass so they can accelerate at very high rates.

For anyone interested, he wrote a second book called "The Vindicator Scrolls" which contains more information.

"Space Warps: A Review of One Form of Propulsionless Transport," _Journal of the British Interplanetary Society_ 42 (Nov. 1989): 533-542.

"Negative Matter Propulsion," _Journal of Propulsion and Power_ 1 (Jan.-Feb. 1990): 28-37.

Vonsovskii, S, Ferromagnetic Resonance, 1966.
Feynman, R, Feynman Lectures on Physics, v2, 1964
Chikazumi, S, Physics of Magnetism, 1964
Soohoo, R, Microwave Magnetics, 1988
Herlach, F, Strong and Ultrastrong Magnetic Fields, 1985

---

[1] The Feynman Lectures on Physics, 1963, v1 chp13 p8.

[2] Bottcher, C., Theory of Electric Polarization, 1973, v1 pp71,289.

[3] Albert Einstein: Philosopher-Scientist, 1949, pp522-523.

Feynman's Lectures Vol II Chapter 10, Page 10-8, describes an electrostatic effect that may be related to the Biefeld-Brown effect. Feynman shows that a force results on a dielectric due to the gradient of the square of the electrical field.

There have been quite a few people who have also looked at 'gravitationless' universes, such as:

Ralph Juergens, 'Reconciling Celestial Mechanics', Pensee Fall 1992.
C E R Bruce, A New Approach to Astrophysics and Cosmogony, London 1944

Problems of Atmospheric and Space Electricity, Elsevier, 1965
Eric Crew, Electricity in Astronomy, SIS Review, Vol 1 No 1-4.
Earl Milton, Electric Stars in a Gravity-Less Electrified Cosmos
SIS Review, Vol V, No 1.

Ian Tresman
London, UK

AUTHOR: Driscoll, R.B.
TITLE: Comments on the paper "Gravitational lift via the Coriolis force" by Leon R. Dragone.
In: Hadronic journal.
JUL 01 1988 v 11 n 4 Page: 177

Paper: gr-qc/9503060
From: linet@ccr.jussieu.fr (Bernard LINET)
Date: Thu, 30 Mar 1995 14:55:07 +0200
Title: Vacuum polarization induced by a uniformly accelerated charge
Author: B. Linet
Report-no: GCR-941003
We consider a point charge fixed in the Rindler coordinates which describe a uniformly accelerated frame. We determine an integral expression of the induced charge density due to the vacuum polarization at the first order in the fine structure constant. In the case where the acceleration is weak, we give explicitly the induced electrostatic potential.

Paper: gr-qc/9504023
From: Mathias PILLIN
Date: Mon, 17 Apr 1995 10:43:50 +0900
Title: Pure spin-connection formulation of gravity and classification of energy-momentum tensors
Author: Mathias PILLIN
Report-no: YITP/U-95-12
It is shown how the different irreducibility classes of the energy-momentum tensor allow for a pure spin-connection formulation. Ambiguities in this formulation especially concerning the need for constraints are clarified.

Paper: gr-qc/9504041
From: SHORE@crnvma.cern.ch
Date: Tue, 25 Apr 95 17:22:56 SET
Title: ``Faster than Light'' Photons in Gravitational Fields -- Causality, Anomalies and Horizons

Authors: G.M. Shore
Report-no: SWAT-95/70
A number of general issues relating to superluminal photon propagation in gravitational fields are explored. The possibility of superluminal, yet causal, photon propagation arises because of Equivalence Principle violating interactions induced by vacuum polarisation in QED in curved spacetime. Two general theorems are presented: first, a polarisation sum rule which relates the polarisation averaged velocity shift to the matter energy-momentum tensor and second, a `horizon theorem' which ensures that the geometric event horizon for black hole spacetimes remains a true horizon for real photon propagation in QED. A comparision is made with the equivalent results for electromagnetic birefringence and possible connections between superluminal photon propagation, causality and the conformal anomaly are exposed.

Paper: hep-th/9506035
From: Gary Gibbons
Date (revised): Sun, 27 Aug 95 11:31:39 BST
Title: Electric-Magnetic Duality Rotations in Non-Linear Electrodynamics
Authors: G W Gibbons, D A Rasheed -- To appear in Nucl Phys B
Report-no: DAMTP preprint # R95/46.
We show that there is a function of one variable's worth of Lagrangians for a single Maxwell field coupled to gravity whose equations of motion admit electric-magnetic duality.

Paper: gr-qc/9506053
From: ESPOSITO@napoli.infn.it
Date: Mon, 26 Jun 1995 10:24:36 +0200 (CET-DST)
Title: Euclidean Maxwell Theory in the Presence of Boundaries
Author: Giampiero Esposito
Comments: 18 pages, plain-tex, to appear in: Heat-Kernel Techniques and Quantum Gravity, Discourses in Mathematics and Its Applications, No. 4, edited by S.A. Fulling (Texas A&M University, College Station, Texas, 1995)
Report-no: DSF preprint 95/31
This paper describes recent progress in the analysis of relativistic gauge conditions for Euclidean Maxwell theory in the presence of boundaries. The corresponding quantum amplitudes are studied by using Faddeev-Popov formalism and zeta-function regularization, after expanding the electromagnetic potential in harmonics on the boundary 3-geometry. This leads to a semiclassical analysis of quantum amplitudes, involving transverse modes, ghost modes, coupled normal and longitudinal modes, and the decoupled normal mode of Maxwell theory.

Paper: gr-qc/9507050
From: Luis Octavio Pimentel
Date: Tue, 25 Jul 1995 11:19:44 -0500 (CDT)
Title: Electromagnetic Field in Some Anisotropic Stiff Fluid Universes
Authors: Pimentel L O
Report-no: UAMI-AG-95-29
The electromagnetic field is studied in a family of exact solutions of the Einstein equations whose material content is a perfect fluid with stiff equation of state (p = $\epsilon $). The field equations are solved exactly for several members of the family.

El Escorial Summer School on Gravitation and General Relativity 1992: Rotating objects and relativistic physics: Proceedings of the El Escorial Summer School on Gravitation and General Relativity (1992) Held at El Escorial, Spain, 24-28 August 1992 / F.J. Chinea, L.M. Gonzalez-Romero, eds. Berlin ; New York : Springer-Verlag, c1993. 302p.
LC CALL NUMBER: QC178 .E36 1992
SUBJECTS: Gravitational fields. General relativity. Astrophysics
Chinea, F. J. (Francisco Javier), 1949-
Gonzalez-Romero, L. M. (Luis Manuel), 1962-
ISBN: 354057364X (Berlin : acid-free paper) : DM90.00
038757364X (New York : acid-free paper) : $62.00

"Propulsion Techniques: Action and Reaction",
Peter J. Turchi, editor, Ohio State University
This is the first of three volumes devoted to space propulsion part of a new series of titles with articles taken from the pages of Aerospace America. The three volume collection of over 150 articles rescues the insights, concerns and dreams of dozens of space propulsion experts for the next generation of aerospace scientists and engineers. Written by well-known figures in space propulsion, including Werner von Braun, Martin Summerfield, Ernst Stuhlinger and Jerry Grey, these books provide readily accessible source material for design courses in astronautical engineering. This first volume surveys the technologies of rocketry in the traditional categories of liquid, solid, hybrid, nuclear and electric propulsion. Historical trends and cycles are displayed in each category as articles describe concepts and progress from the early visions of Goddard, Oberth and Tsiolkovsky to proposed (and re-proposed) ideas for advanced space thrusters. In addition to descriptions of rocket engines of various types, including photon and laser propulsion, associated technologies for propellants and space-electrical power systems are discussed.

Spring 1995, 350 pp, illus, Paperback
ISBN 1-56347-115-9
(Available from the AIAA)

I have a book from Russia that may interest you. Its in Russian and its called "Experimental Gravity", and is jointly authored by a father and son, S.M. Poliakov and O.M. Poliakov. It describes "gyro-gravity" and "ferromagnetic-gravity" and also how to produce gravity. It's 130 pages and contains a lot of pictures and diagrams and equations (that's about all I understand from it). To judge from the pictures the Russians must have conducted a lot of research in this topic (Many different devices are on the pictures). The question is now: How do I get a translator?
-- David Jonsson

INTRODUCTION TO EXPERIMENTAL GRAVITONICS

Abstract of book by S.M.Poliakov and O.S.Poliakov

The experiments part covers the following subjects:
1. Light-beam curvature and optical-radiation frequency shift is created and investigated in an artificial nonhomogeneous gravitational field.
A new gravitational effect, named "quadrature" frequency shift in the curved light beam is predicted and calculated.
2. Magnetostriction is at last explained as a secondary gravitational effect. An equation derived for magnetostriction permits to calculate the magnetostriction curve.
3. The propagation velocity of gravitational radiation (generated by a laboratory source) was measured for "quadrupole" - 9x10E20 cm/s or squared light velocity.
4. It was demonstrated that gravitation is only one of NONLINEAR-MECHANICS EFFECT, that can be created in mechanical system or in ferromagnetic.

The book was published at the author's expense in 1991. Most powerful experimental result described in this book is more than 1200 gramms of pulsed G-force. Several mechanical systems and systems using ferrites are detailed here.

Second edition in English is ready for copy process (disket's text). Editors and investors are interested in joint project for publication can get direct contact with Dr. Poliakov by address: Moscow area, 141120, FRIAZINO, 60-let str., 1-167. Phone 7-095-4658822.

Alexander V. Frolov
P.O.Box 37, St.-Petersburg, 193024, Russia. E-mail: alex@frolov.spb.ru

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Super-weapon designer Edward Teller has written an article entitled:
"Electromagnetism and Gravitation", Proc. Nat. Acad. Sci. USA Vol 74,
No 4. P. 2664-2666. Teller's article is referenced in the book by
the Poliakov brothers about Russian experiments in gravitation control.

I wrote already about Poliakov's book "Experimental Gravitonics". He wrote
it in 1991 and published in Russian. Now he have English version as
MSDOS text on diskett. If you wish help for Dr.Poliakov, write for him
and buy book in Russian or copy of text in English. Here is more
information.
-- Alex Frolov

"Experimental Gravitonics" Spartak M. Poliakov, Oleg S. Poliakov
Russia 141120 Moscow area, Friazino, 60-let SSSR str., 1 - 167.

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3. Uniquantum gravitational mass (postulated) p.27
4. Equivalent charge and radius of a uniquantum. p.27
5. Tangential velocity of uniquantum rotation p.29
6. Uniquantum magnetic field p.30
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1. H.E.Puthoff, The energetic vacuum: implications for energy research, Speculations in science and technology, vol.13, No.3, p.247.

2. Thomas Valone, Inertial propulsion... Newsletter of Planetary Association for Clean Energy, vol.7 No.1, p.6-12. Published by PACE, Inc. 100 Bronson Av.,Suite 1001, Ottawa, Ontario K1R 6G8, Canada.

3. Re NASA electrostatic levitation experiments and Thomas Townsend Brown's research look the Newsletter of Planetary Association for Clean Energy, vol.7 No.4.p.7. July, 1994. "Electrogravitics developments" reprinted from NEXUS Special.

4. "The Swiss Methernitha-Linden Converter", p.3-6. Space Energy Newsletter, June 1993, vol.4 No.2. Published by Space Energy Association, P.O.Box 11422, Clearwater, FL 34616, USA. My understanding of this electrostatic machine allows development of a simple scheme: self-rotating thanks to electrostatic forces disk and ordinary electrical generator connected with axis of disk.

5. Conception of Edmund Whittaker (papers of 1903-1904) is developed by T.E.Bearden in his book "Gravitobiology", published by Tesla Book Co., P.O.Box 121873, Chula Vista, CA 91912, USA.

6. P.D. Ouspensky, A New Model of the Universe, New York, 1971.p.433 in Russian edition of 1993.

7. Example of joint demonstration of "gravity/chronal/over-unit power" effect is invention of Ivan Stepanovitch Filimonenko of 1960. His version of cold fusion system produced: 1. Heat power 2. Motive force without fling back of mass 3. Influence on time-period of half-decay. Article of N.E.Zaev published in "Izobretatel i Razionalizator", Russia, No.1 1995, p.8-9.

8. Alexander V. Frolov, The Application of Potential Energy for Creation of Power, New Energy News, vol.2, No.1, May 1994. Published by Institute for New Energy, P.O.Box 58639, Salt Like City, UT 84158-8639, USA.

9. V.V.Lensky, General for Many-Polarity, Irkutsk, Russia, 1986. Published in Russian by Irkutsk University.

10. N.A.Kozyrev, Selected works, 1991, published by University of St.-Petersburg, in Russian.

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SCIENTISTS.

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APPLICATIONS AND ADVANTAGES IN MAGNETIC FIELD GENERATION," 27TH IECEC, PAGES 4.311-4.313.

HATHAWAY, GEORGE D. (1991). "FROM ANTI-GRAVITY TO ZERO-POINT ENERGY: A TECHNICAL REVIEW OF ADVANCED PROPULSION CONCEPTS," AIDAA/AIAA/DGLR/JSASS 22ND INTERNATIONAL ELECTRIC PROPULSION CONFERENCE, VIAREGGIO, ITALY.

LAVIOLETTE, PAUL A. (1991). "SUBQUANTUM KINETICS: EXPLORING THE CRACK
IN THE FIRST LAW," 26TH IECEC, VOL. 4, PAGES 352-357.

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VALONE, THOMAS (1991). "NON-CONVENTIONAL ENERGY AND PROPULSION METHODS," 26TH IECEC, VOL. 4, PAGES 439-444.

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VALONE, THOMAS (1991). "THE ONE-PIECE FARADAY GENERATOR: RESEARCH RESULTS," 26TH IECEC, VOL. 4, PAGES 473-478.

AUTHOR :Znidarsic, Frank
TITLE :Elementary antigravity / Frank Znidarsic.
LANGUAGE :ENGLISH
PUBLISHED :New York : Vantage Press ; 1989
PHYSICAL DESC :53 p. ; 21 cm.
SUBJECT :Gravitation, Antigravity

Title: THE SOURCE OF INERTIAL AND GRAVITATIONAL MASS
Author: Frank Znidarsic P.E. FZNIDARS@GPU.COM, ELECTRICAL ENGINEER WITH THE PENN ELECTRIC CO. JOHNSTOWN, Pa.
COMMENTS: 8 PAGES ASCII TXT FILE. NEW ENERGY PROJECT, Submitted to the Canadian Journal of Physics, July 94 resubmitted Jan 95
Texted in the DOS editor.
(Available at Elektromagnum web site)

Title: GENESIS OF AND ZERO POINT ENERGY
Author: FZNIDARSIC@GPU.COM, F. Znidarsic Electrical
Engineer with the Pennsylvania Electric Co. Johnstown Pa.
Comments: ASCII *.TXT, 5 PAGES, Texted on DOS editor
submitted to the Canadian Journal of Physics July 94,
Resubmitted Jan 95 Report_no: Special Energy Prog.
(Available at Elektromagnum web site)

The Jackson text is entirely wrong if it does discuss magnetic fields without a potential - the electromagnetic 4-potential A always applies to the conservation of 4-momentum (energy and momentum) by electromagnetic interactions.

See GRAVITATION by Misner, Thorne, and Wheeler.

The causative agent of gravitational gradients (Potential) was first enumerated G. L. Le Sage in 1784. H. A. Lorentz and G. H. Darwin evaluated Le Sage's postulate mathematically and rejected it when, as a result of their evaluation, it was found that although the postulated process could describe all observed gravitational phenomena (and inherently results is GR), the mechanism REQUIRED a continuous overall LOSS of energy (apparently disappearing into matter, in a clear violation of the conservation of energy). I could go on to suggest that mining this concept and process could lead one to significant "pay dirt" in terms of understanding how GR relates to QM.

The kinetic model of Le Sage does lead to a valid model for physical processes. The key is Super-Fluid theory. Both GR and QM are fully described as well as why each dominates at the scales they do. Hemholtz proved that a superfluid vortex ring is infinitely stable and without a boundary dis-continuty can not be created or destroyed. Kelvin mathematically proved that the equations that describe small linear disturbances in a a superfluid vortex sponge are IDENTICAL to the equations that describe the propogation of light through space. A EXCELLENT book on this topic is "A History of the Theories of Aether and Electricity" by Sir Edmund Whitaker, Dover Reprint 1989 and I can not give any reference a higher recommendation. Why is this information not known, that sir is a very long and interesting story.
- Paul Stowe

For a much more current model, than LeSage, of a sink-source interpretation

of gravity, see O.C. Hilgenberg's "Gravitation, Tromben, und Wellen in bewegten Medien" (1931), GieSmann & Bartsch. It's in German. It's in the National Union Catalogue. If you don't read German, then Carl Frederick Krafft's "Ether and Matter" (1945), Dietz Printing Co., contains some portions translated from Hilgenberg's work. Hilgenberg developed a quantum numbering system of the atoms based upon Krafft's ether-vortex atom model, entitled "Quantenzahlen, Wirbelring-Atommodelle und Heliumsechserring-Aufbauprinzip des Periodensystems der chemischen Elemente" Which means roughly: A Quantum Number, Vortex Atom model and Hexagonal-ring construction principle of the periodic system of the chemical elements. Krafft saw the quantization of energy as a logical consequence of a system of particles consisting of, basically, pumps, which could take in and give out energy and ether/space at limited rates, based on rotations of the various rings.

In his model, as opposed to LeSage's, the flux terminates in what he called equipotential zones, much as one would see if two jets of water were to collide coaxially. So, the intake of two bodies "squirting" out ether, will be on the back sides of both bodies, and hence, they are pushed together. LeSage saw each body acting as sheilds to the ultramundane particles racing in all directions in space (cosmic rays forseen in the 18th century!) Thus the two bodies move into each others 'shadow'.

Louis Kevran's work on low energy transmutations of the elements was predicted by Krafft's model. And there was a man named Nemos who claimed to have developed a television type microscope not limited by the optical paths of standard microscopes, and I have a photo he took which shows, it is claimed, the nucleous of an iron atom, as a collection of vortices arranged peripherally (non-coaxially). It's like looking down on pearl-like smoke rings connected by vibrating jets. It's an amazing photo(?) Krafft's prediction was that the proton and electron would be double vortex structures, and the neutron a triple vortex structure. The picture seems to confirm that. So much for my two bits. The work of Krafft is not heavily laden with math. The beauty of it to me is it can be visualized. (Note: Nemo's "microscope" may be based on the technology very recently developed which is known as magnetic microscopy.)

I have a neat little book written by Carl Krafft, back in the 30s. He was an avid developer of an ether-vortex theory of atomic and gravitational forces. His theory was underpinned by the writings of O.C. Hilgenberg and Hermanne Fricke of Germany, pre-Nazi. Hilgenberg's views included a vertical ether sink as the cause of gravity, and the consequent development of mass in the enterior of the earth. Hence the earth expanded over time, with periodic explosive expansions and contractions. Meanwhile, Krafft developed the idea of combining vortices in face to face rolling contact, which provides four basic forms: single vortice=neutrino; double vortice, with rolling contact drawing ether into the periphery-proton; with rolling

contact into the poles-electron; then the neutron which is three vortices combining forming a neutral, polarizeable particle drawing ether into one end, out the sides, in the sides out the other end. Krafft's books were all self published.
-- Roger Cathey

Is there anyone out there who is familiar with modern Kaluza-Klein theory? Or even with the kind Kaluza got Einstein to buy into in 1921 or whenever it was...? This is supposed to unify gravity and electromagnetics in a five-dimensional model. Would it not predict the kind of effects Brown was experimenting with, if true?
-John Sangster

Kaluza and Klein had the idea of extending GR to 5 dimensions. When they did Maxwell's eqns. just sort of pop out. Unfortunately the weak and strong nuclear forces don't. So people try expanding GR into 10, 11 or even 26. It's interesting to do the reverse. Expand Maxwell's eqns. into 5 dimensions. I did it and soon I'll (hopefully) give some details. But essentially you get two out of three of Newton's gravitational equations. You get something similar to the third eqn. but I haven't convinced myself that mine is a generalization of Newton's.
-Ray Cote, KSC

Kaluza-Klein theories are an attempt to give a general relativistic explaination for all the forces of nature not just gravity. The original Kaluza-Klein idea was hatched in 1920 by Kaluza and in 1926 by Klein. The basic idea is that there are 4 space dimensions and 1 time dimension (a 5 dimensional maifold) rather than the 3 space dimensions and 1 time dimesnions that there appear to be. Then generalizing Einsteins field equations to this 5 dimensional space (and making the assumption that one of the dimensions gets "curled" up or "compactified") you find that you get Einsteins 4D field equations plus Maxwell's equations. The way that this happens is one of the most beautiful aspects of this theory, and it really makes you (or at least it makes me) think that there should be at least some aspect of this theory that has some correspondence in reality.

Kaluza-Klein theories were revived in the mid seventies by A. Chodos (I think) who showed how you can incorparte all the interactions that we know about now (the strong and the weak forces which weren't unified with gravity in Kaluza's original theory, which only unified EM and gravity) by taking spacetime to be 11 dimensional (10 space dimensions and

1 time).

I can't really think of a good laymans intro to Kaluza-Klein,
but there is a Physics Report in 1985 and 1986 that gives a
review of Kaluza-Klein theories by Bailin and Love (?). And
there is a Frontiers of Physics book edited by T. Appelquist
which reprints most of the important articles on the subject.
- Doug Singleton

"The Possibly Unifying Effect of the Dynamic Theory", May 1983,
by P.E. Williams
This is part of a series of works by Williams. The novel aspect
of the work it that Williams starts from thermodynamics instead
of the usual general relativistic and Newtonian approach.
Williams develops the 5-D field equations and the neo-coulombic
potential. The equations allow for inductive coupling between
the electric and gravitational fields.
-- Dennis Cravens

Kaku, Michio.
Hyperspace : a scientific odyssey through parallel universes, time warps,
and the 10th dimension / Michio Kaku. New York : Oxford University Press,
LC CALL NUMBER: QC793.3.F5 K35 1994 *CIP
SUBJECTS: Kaluza-Klein theories. Superstring theories. Hyperspace.
ISBN: 0195085140 (alk. paper)

THE INTERACTION OF MAGNETIZATIONS WITH AN EXTERNAL
ELECTROMAGNETIC FIELD
AND A TIME-DEPENDENT MAGNETIC AHARONOV-BOHM EFFECT
Joint Inst. for Nuclear Research, Dubna (USSR). AFANASEV, G.N. NELHIEBEL, M.
STEPANOVSKIJ, YU. P. AB(Technische Univ., Vienna, Austria.) AC(Academy of
Sciences of the Ukraine, Kharkov, Ukraine.) 1994 20 PAGES DE95-613463
JINR-E-2-94-297 Avail: CASI HC A03/MF A01 (US Sales Only)
We investigate how the choice of the magnetization distribution inside the
sample affects its interaction with the external electromagnetic field. The
strong selectivity to the time dependence of the external electromagnetic
field arises for the particular magnetizations. This can be used for the
storage and ciphering of information. We propose a time-dependent
Aharonov-Bohm-like experiment in which the phase of the wave function is
changed by the time-dependent vector magnetic potential. The arising
time-dependent interference picture may be viewed as a new channel for the
information transfer.
CASI Accession Number: N95-30368

AUTHOR :Doughty, Noel A. (Noel Arthur)
TITLE :Lagrangian interaction : an introduction to relativistic symmetry in electrodynamics and gravitation / Noel A. Doughty.
PUBLISHED :Sydney ; Readwood City, Calif. : Addison-Wesley, c1990.
DESC :xix, 569 p. : ill. ; 23 cm.
SUBJECT :Electrodynamics, Gravitation, Relativity, Symmetry

GENERALIZED HALL ACCELERATION FOR SPACE PROPULSION
SASOH, AKIHIRO AATohoku University, Sendai, Japan In: International Symposium on Space Technology and Science, 18th, Kagoshima, Japan, May 17-22, 1992. Vols. 1 & 2 . A95-82299 Tokyo, Japan ISTS Editorial Board 1992
6 PAGES 1992 p. 403-408
The operation characteristics of electric propulsion devices which utilize Hall effect have been generalized. The electrostatic acceleration is enhanced by thermoelectric effect; an ion kinetic energy can be higher than that associated with the electrostatic potential. Depending on the extent of this effect, there exist two acceleration modes, an electrostatic and an electrostatic/electrothermal hybrid one, the latter characterized by low voltage.

ABSTRACTS OF THE AMERICAN MATHEMATICAL SOCIETY:

vol. 12 (1991)p.572 Abstract *91T-81-200 by Alexander Abian:
"The inertia of Time and the energy spent on moving Time forward"

vol. 13 (1992)p.344 Abstract *92T-81-79 by Alexander Abian:
"The universal Time"

vol. 15 (1994)p.437 Abstract *94T-81-92 by Alexander Abian
"Time has inertia. Equivalence of Time and mass"

vol. 15 (1994)p.585 Abstract *94T-81-164 by Alexander Abian
"Time has inertia. Equivalence of Time and mass. How to measure the mass of Time"

Look up a paper published by Miguel Alcubierre in Classical and Quantum Gravity 11 (1994) pp. L73-L77. It's titled "The Warp-Drive: Hyper-Fast Travel within General Relativity". If you can follow a lot of math (or at least the gist of it) it is fascinating.
-Ian McBride

"The Warp drive: hyper-fast travel within general relativity"

by: Miguel Alcubierre
Department of Physics and Astronomy, University of Wales,
College of Cardiff, PO Box 913, Cardiff CFI 3YB, UK

Article taken from the May 1994 issue of "Classical and
Quantum Gravity", a scientific magazine wich you are not
likely to find at your local newsagent.

ABSTRACT. It is shown how, within the framework of general relativity and without the introduction of wormholes, it is possible to modify a spacetime in a way that allows a spaceship to travel with an arbitarily large speed. By a purely local expansion of spacetime behind the spaceship and an opposite contraction in front of it, motion faster than the speed of light as seen by observers outside the disturbed region is possible. The resulting distortion is reminicent of the 'warp drive' of science fiction. However, just as happens with wormholes, exotic matter will be needed in order to generate a distortion of spacetime like the one discussed here.

Anomalous Info Nexus
S P A C E D R I V E S PO Box 228
Kingston Springs, TN
Introductory Reading List U S A 37O82-O228

Anomalous Info Nexus, 615.952.5638, 3/12/24/96/14.4 Kbps v.32bis, for Space Drive Info, Files, and graphics.

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Clarke, Arthur C., PROFILES OF THE FUTURE, Bantam Books, New York 1964, # H2734, pp. 46-6O, 235

Clarke, Arthur C., RENDEVOUS WITH RAMA, Ballantine Books New York 1974, # 24175, pp. 113-4, 2O7-8, 265-6 (Fiction)

Davis, William O., Jr., "The Fourth Law Of Motion," ANALOG, May 1962, pp. 83-1O4

Dean, Norman L., "System For Converting Rotary Motion Into Unidirectional Motion," (Dean Drive) U.S. Patent # 2,886,976

Electric Spacecraft Journal, 73 Sunlight Dr, Leicester, NC 28748,

704.683.0313 Voice / 704.683.3511 FAX / 615.952.5638 BBS
Published since 1991, Quarterly, Subscription Rate: $24/Yr
(Only U.S. publication dedicated to Space Drives R&D)

Forward, Robert L., "Spin Drive To The Stars," ANALOG, Apr 1981, pp. 64-7O

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Kidd, Alexander D. (Aka Sandy), "Gyroscopic Apparatus", U.S. Patent # 5,O24,112

Pournelle, Jerry, A STEP FARTHER OUT, Ace Books, New York, 1983, #78586, pp. 17O-187, 229-238

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Stine, G. Harry, "Detesters, Phasers, and Dean Drives," ANALOG, Jun 1976, pp. 68-8O

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David Jonsson Voice&Fax +46-18-24 51 52
P.O Box 353 Postal giro 499 40 54-7
S-751 06 UPPSALA Internet E-mail t89djo@tdb.uu.se
SWEDEN ++++++Cold EMISSION before the end of the century++++++

AUTHOR: Terletskii, IAkov Petrovich, 1912-
Paradoksy teorii otnositelnosti. Russian/English
TITLE: Paradoxes in the theory of relativity, by Yakov P. Terletskii. With a foreword by Banesh Hoffmann.
PUBL.: New York, Plenum Press, 1968
NOTES: Translation of Paradoksy teorii otnositelnosti.

QUANTUM FLUCTUATIONS AND SEMICLASSICAL GRAVITY THEORY PH.D. THESIS
Tufts Univ., Medford, MA. KUO, CHUNG-I. 1994, 119 PAGES
Avail: Univ. Microfilms Order No. DA9419336
Semiclassical gravity theory should serve as a working model before the final theory of quantized gravity is known, or as an approximation for manageable calculations even when the final theory is known. We deal with the important

issue of the applicability of the semiclassical theory of gravity, specifically considering the effects of quantum fluctuations of the matter fields and the induced metric perturbations. The quantum fields with negative energy densities are proposed to be the cases where the semiclassical theory is no longer valid. We start with a discussion of the basic notions and developments of semiclassical gravity theory, and continue with a discussion of the establishment of a meaningful measurement of the deviation from semiclassical theory. The measure is a normalized dispersion of the energy density. The non-positive-definiteness of the energy density of quantum fields is derived and discussed. Important cases, like squeezed states and the Casimir effect, which exhibit negative energy densities, are discussed and the deviations from semiclassical theory are checked. A test particle method using a generalized Langevin equation is formulated for the physical description of systems for which the semiclassical theory can not be used. Quantum fields around straight infinite cosmic string is another example of where the negative energy densities may arise. We examine the validity of semiclassical theory for this case. The Casimir force due to the zero-point fluctuations of the electromagnetic fields in the presence of a conducting plate is another case where the quantum fluctuations are large and naive classical consideration should be modified. Using the test particle method, we are able to show that it is a relaxation phenomenon and that a notion of effective temperature can be associated with it.
CASI Accession Number: N95-29527

ELECTROMAGNETIC-GRAVITATIONAL CONVERSION CROSS SECTIONS IN EXTERNAL
ELECTROMAGNETIC FIELDS
International Centre for Theoretical Physics, Trieste (Italy). LONG, HOANG NGOC SOA, DANG VAN TRAN, TUAN A. SEP. 1994 11 PAGES DE95-613589 IC-94/285 Avail: CASI HC A03/MF A01 (US Sales Only)
The classical processes: the conversion of photons into gravitons in the static electromagnetic fields are considered by using Feynman perturbation techniques. The differential cross sections are presented for the conversion in the electric field of the flat condenser and the magnetic field of the solenoid. A numerical evaluation shows that the cross sections may have the observable value in the present technical scenario.
CASI Accession Number: N95-30637

THE PHYSICS OF TACHYONS. 3: TACHYON ELECTROMAGNETISM
DAWE, ROSS L. HINES, KENNETH C. University of Melbourne, Parkville, Australia 1994 34 PAGES Australian Journal of Physics (ISSN 0004-9506) vol 47, no 4 1994 p 431-464 Research supported by the ARC and the University of Melbourne HTN-95-01061
A new formulation of the theory of tachyons using the same two postulates

as in special relativity is applied to electro-magnetism. Tachyonic transformations of the electromagnetic fields E and B are rigorously derived from Maxwell's equations and are shown to be the same as for bradyonic transformations. Tachyonic tranformations of current density, charge density, scalar and vector potentials are also derived and discussed. Tachyonic optics and the four-potential of a moving tachyonic charge are also discussed, along with generalized four-vector transformations and electromagnetic four-tensors in extended relativity. Use is made of a switching principle to show how tachyons automatically obey the law of conservation of electric charge in any inertial reference frame, even though the observed tachyon electric charge is not an invariant between observers. The electromagnetic field produced by a charged tachyon takes the form of a Mach cone, inside which the electromagnetic field is real and detectable, while outside the cone the field generated by the tachyon is imaginary and undetectable.
CASI Accession Number: A95-90247

Franklin, Allan, 1938-
The rise and fall of the "Fifth Force" : discovery, pursuit, and justification in modern physics / Allan Franklin. New York : American Institute of Physics, c1993. 141 p. : ill. ; 25 cm.
LC CALL NUMBER: QC6 F673 1993
SUBJECTS: Physics--Methodology. Gravitation.

Michlo, George, 1942-
The push of gravity / George Michlo ; illustrated by Warwick Humphries. 1st ed. New York : Vantage Press, c1993. xv, 101 p. : ill. ; 24 cm.
LC CALL NUMBER: QC178 .M49 1993
SUBJECTS: Gravitation.
ISBN: 0533091330

Doughty, Noel A. (Noel Arthur)
Lagrangian interaction : an introduction to relativistic symmetry in electrodynamics and gravitation / Noel A. Doughty. Sydney ; Readwood City, Calif. : Addison-Wesley, c1990. xix, 569 p. : ill. ; 23 cm.
LC CALL NUMBER: QC631 .D68 1990
SUBJECTS: Electrodynamics. Gravitation. Relativity. Symmetry.
ISBN: 0201416255 (U.S.) : $33.95

Alexander, S.
Gravity and inertia : the mechanism / by S. Alexander. Santa Barbara, Calif. : G.E.C. Research, c1985. 64 p. : ill. ; 23 cm.
LC CALL NUMBER: QC178 .A44 1985
SUBJECTS: Gravitation. Inertia (Mechanics)
ISBN: 0939525054

Harrigan, Gregory Leo, 1919-
The great gravity myth / Gregory Leo Harrigan. 2nd ed., rev. and enl.
Minneapolis : Shanty Press, 1991. p. cm.
LC CALL NUMBER: QC178 .H28 1991 *CIP - NOT YET IN LC*
SUBJECTS: Gravitation--Miscellanea. Serendipity in science.
ISBN: 0916403033 (lib. bdg.) : $8.95

Soldano, B. A.
A new look at Maxwell's equations and the permittivity of free space / by
B.A. Soldano. Greenville, S.C., U.S.A. : Grenridge Pub., 1982. 50 p.
LC CALL NUMBER: QB341 .S65 1982
SUBJECTS: Gravitation. Maxwell equations.

Gallimore, J. G.
Transverse paraphysics : the new science of space, time, and gravity control
J.G. Gallimore. Millbrae, Calif. : Tesla Book Co., 1982. ix, 359 p.
LC CALL NUMBER: QC173.59.S65 G35 1982
SUBJECTS: Space and time. Gravitation.

Mancini Ridolfini, Niccolo.
Elettricita e magnetismo; rotazione elettro-magnetica gravitazionale.
Bologna, L. Cappelli, 1931. vii, 506 p. illus. 25 cm.
LC CALL NUMBER: QC518 .M36
SUBJECTS: Electromagnetic theory. Space and time. Gravitation.

King, Moray B.
Tapping the zero-point energy / Moray B. King. Provo, UT : Paraclete Pub.,
c1989. iii, 169 p. : ill. ; 22 cm.
LC CALL NUMBER: QC178 .K5575 1989
SUBJECTS: Antigravity. Radiation. Electromagnetics. Force and energy.
ISBN: 0962335606 : $9.95

The Large N expansion in quantum field theory and statistical physics : from
spin systems to 2-dimensional gravity / editors, Edouard Brezin, Spenta R.
Wadia. Singapore ; River Edge, NJ : World Scientific, c1993. xiv, 1130 p.
LC CALL NUMBER: QC174.45 .L37 1993
SUBJECTS: Quantum field theory. String models. Gauge fields (Physics)
ISBN: 9810204558

Magnetic susceptibility of superconductors and other spin systems / edited by
Robert A. Hein, Thomas L. Francavilla, and Donald H. Liebenberg. New York :
Plenum Press, c1991. xx, 606 p. : ill. ; 26 cm.
LC CALL NUMBER: QC611.97.M34 M34 1991
SUBJECTS: Superconductors--Magnetic properties--Magnetic susceptibility
United States. Office of Naval Research.

Office of Naval Research Workshop on Magnetic Susceptibility of Superconductors and Other Spin Systems (1991 : Coolfont, W. Va.)
"Proceedings of the Office of Naval Research Workshop on Magnetic Susceptibility of Superconductors and Other Spin Systems, held May 20-23, 1991, in Coolfont, Berkeley Springs, West Virginia"--T.p. verso.
ISBN: 0306441977

Spin waves and magnetic excitations / volume editors, A.S. Borovik-Romanov, S.K. Sinha. Amsterdam ; New York : North-Holland ; New York, N.Y. : Sole distributors for the U.S.A. and Canada, Elsevier Science Pub. Co., 1988.
LC CALL NUMBER: QC762 .S66 1988
SUBJECTS: Spin waves. Magnons. Dielectrics--Magnetic properties. Metals--Magnetic properties.
Modern problems in condensed matter sciences ; v. 22
ISBN: 0444870687 (v. 1)

Aono, Osamu, 1937-
Rotation of a magnetic field / Osamu Aono and Ryo Sugihara. Nagoya, Japan : Institute of Plasma Physics, Nagoya University, 1986. 6 p. ; 30 cm.
LC CALL NUMBER: QC717.6 .N35 no. 792 (ALTERNATE CLASS QC754.2.M3)
SUBJECTS: Magnetic fields. Electrodynamics.
Research report (Nagoya Daigaku. Purazumu Kenkyujo) ; IPPJ-792.

Handbook of electron spin resonance : data sources, computer technology, relaxation, and ENDOR / edited by Charles P. Poole, Jr. and Horacio A. Farach. New York : American Institute of Physics, c1994. x, 660 p. : ill. ; 25 cm.
LC CALL NUMBER: QC762 .H32 1994
SUBJECTS: Electron paramagnetic resonance.
Electron nuclear double resonance spectroscopy. Relaxation phenomena.
ISBN: 1563960443 (acid-free)

Mims, W. B.
The linear electric field effect in paramagnetic resonance / W. B. Mims. Oxford : Clarendon Press, 1976. 339 p. : ill. ; 24 cm.
LC CALL NUMBER: QC762 .M55
SUBJECTS: Electron paramagnetic resonance. Electric fields.
ISBN: 0198519443 : L9.75

Morrison, Clyde A. (Clyde Arthur), 1926-
Angular momentum theory applied to interactions in solids / C.A. Morrison. Berlin ; New York : Springer-Verlag, c1988. 159 p. ; 25 cm.
LC CALL NUMBER: QD475 .M68 1988
SUBJECTS: Crystal field theory. Angular momentum.
ISBN: 0387189904 (U.S. : pbk.)

Mirman, R.

Massless representations of the Poincare Group : electromagnetism, gravitation, quantum mechanics, geometry / R. Mirman. Commack, N.Y. : Nova Science Publishers, 1995. p. cm.
LC CALL NUMBER: QC20.7.G76 M57 1995 *CIP - NOT YET IN LC*
SUBJECTS: Representations of groups. Poincare series. Electromagnetism. Gravitation. Quantum theory. Geometry. Mathematical physics.
ISBN: 1560722592

Antunez de Mayolo, Santiago, 1887-1967.
The neutral element base of matter and probable cause of gravitation / Santiago Antunez de Mayolo. Lima, Peru : Universidad Nacional Mayor de San Marcos, 1948. 36 p. : ill. ; 22 cm.
LC CALL NUMBER: MLCS 94/12050 (Q)
SUBJECTS: Nuclear physics. Matter--Constitution.
Translation of "Work presented in Spanish to the IV. South American Chemistry Congress, Santiago, Chile, March 1948."

Ciufolini, Ignazio, 1951-
Gravitation and inertia / Ignazio Ciufolini and John Archibald Wheeler. Princeton, N.J. : Princeton University Press, c1995. xi, 498 p.
LC CALL NUMBER: QC173.59.G44 C58 1995
SUBJECTS: Geometrodynamics. General relativity. Gravitation. Inertia.
ISBN: 0691033234 (acid-free paper)

TITLE: Excalibur Briefing
AUTHOR: Thomas E. Bearden
COPYRIGHT DATE: 1980, 1988
PUBLISHER: Strawberry Hill Press/A Walnut Hill Book
ISBN# 0-89407-060-6
PURCHASED FROM: Tesla Book Co. or Fry's INC. INQ.
COMMENTS ....
According to the front and rear covers this book explains paranormal phenomena and the interaction of mind and matter. There are 4 chapters plus a glossary and bibliography. 332 pages, 42 photographs, and 40 illustrations. Chapter one is called... A Sampling of Specific Paranormal Phenomena. Some of the subjects in this chapter are...Remote Viewing The Moray Radiant Energy Device, Thought Photography, Pavlita's Psychotronic Generators, UFO's, Kirlian Photograpy, Psychic Surgery Chapter Two is called...A Theoretical Background for Understanding PT, UFO's and PSI Phenomena...Some of the subjects are.... Unexplained Mysteries of Physics, Two Slit Experiment, Radionics, Biofields and Maverick Worlds Chapter Three is called...New Military Applications of PSI Research Some of the subjects covered are...Background to Psychotronic Research in the U.S and the U.S.S.R., Radiation of the

U.S. Embassy, Hyperspace Howitzer operation, Virtual States and Hyperspaces, Feynman diagrams The Neurophone, Soviet Woodpecker signals The last chapter covers Soviet Phase Conjugate Directed Energy Weapons (Weapons that use time reversed Electromagnetic Waves) The Glossary is about 30 pages long and is very useful.

Bearden, T. E. (Thomas E.), 1930-
Excalibur briefing / Thomas E. Bearden ; foreword by John White ; special drawings by Hal Crawford. San Francisco : Strawberry Hill Press, c1980.
LC CALL NUMBER: BF1999 .B387 1980
SUBJECTS: Occultism. Unidentified flying objects.
ISBN: 0894070150 (pbk.) : $8.95

TITLE: Magnetism:An Introductory Survey
AUTHOR: E.W. Lee
COPYRIGHT DATE: 1963,1970
PUBLISHER: Dover Publications Inc. New York
ISBN# 0-486-24689-2
PURCHASED FROM: Lindsay Publications
COMMENTS ....
Paperback, 280 pages, Some photographs and Illustrations
Some of subjects covered are....Atomic Theory of Matter, Earth's Magnetism History of Magnetism, Magnetism in Scientific Research, Paramagnetism and Diamagnetism

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TITLE: Tesla: The Lost Inventions
AUTHOR: George Trinkhaus
COPYRIGHT DATE: 1988
PUBLISHER: High Voltage Press
ISBN# N/A
PURCHASED FROM: Lindsay Publications
COMMENTS ....
Paper, 33 Pages, 42 Illustrations. Describes Tesla's lost inventions in plain, easy to understand English. According to the author, patents are hard to understand. In the illustrations he shows the patent number. Some of the inventions include...
Disk Turbine Rotary Engine
Magnifying Transmitter
Transport
Free Energy Receiver

TITLE: Tesla: Man out of Time
AUTHOR: Margaret Cheney
COPYRIGHT DATE: 1981

PUBLISHER: Laurel Book by Dell Publishing Co.
ISBN# 0-440-39077-X
PURCHASED FROM: Tesla Book Co. or Lindsay Publications
COMMENTS ....
Paperback 320 Pages, 8 Pages of Rare Photographs
Good biography of Tesla. 30 Chapters plus Reference Notes.
Chapter 29 deals with Tesla's papers and what may have happened to them after he died.

TITLE: The Cosmic Conspiracy
AUTHOR: Stan Deyo
COPYRIGHT DATE: 1978
PUBLISHER: West Australian Texas Trading
ISBN# 0-908477-00-7
PURCHASED FROM: Tesla Book Co.
COMMENTS ....
Paperback 200 Pages. The book is divided into 3 sections with each section containing at least 6 chapters. Plus there are 7 Appendices.
At the end of each section there is a Suggested reading list for that section. Section One deals with research into Electro-Gravitic Propulsion Tesla, Weather Warfare, Conspiracys.
Section Two deals with Mysticism and Numerology, mystery schools, Illuminati Section Three deals with Religious Ideas
In the appendices there are articles on Townsend Brown, Einstein's Relativity error, Michelson Morley experiment, Electo-Dynamic Propulsion, Practical Ion Craft. Very fascinating book.

TITLE: The Philadelphia Experiment: Project Invisibilty
AUTHOR: William L. Moore, Charles Berlitz
COPYRIGHT DATE: 1979
PUBLISHER: Fawcett Crest New York
ISBN# 0-449-24280-3
PURCHASED FROM: Waldenbooks
COMMENTS ....
Paperback 288 pages.
Book on the alleged Navy experiment to make a ship invisible; to radar or optically or both. Supposedly the ship not only became invisible but dematerialized and rematerialized at a distant location, then re-materialized at the original location (Philadelphia Navy Yard). Plus there were severe side effects to the crew members. Some of the crew were said to have disappeared into another dimension. Some never to return.
Chapter 9 (The Unexpected Key) is very interesting because it describes an interview with a scientist who was involved with the Philadelphia experiment when it was being planned.

The best introduction to dyads and dyadic analysis in electromagnetism in my opinion is the following book:

Hollis C Chen, Theory of Electromagnetic Waves: A Coordinate-Free Approach (1983, McGraw-Hill; 1992, TechBooks).

It's already a proven fact that angular momentum will generate an opposing force to gravity in the way you describe. This is a purely General Relativistic effect. There's an article in the 1988 Foundations of Physics "An Exact Solution to Einstein's Field Equations: Gravitational Force Can Also Be Repulsive!"

It requires an immensely huge angular momentum to get any decent repulsion, such that you're not going to get it by any mechanical means

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For those of you who are not familiar with the obscure aspects of General Relativity, hopefully this will steer you in the right direction for further research and knowledge. Non-Newtonian gravitational fields, which may be either attractive or repulsive, can be generated from three effects. These are that of rotating masses, moving masses, or fluctuating masses relative to a stationary, non-rotating body. These effects are similar to centrifugal, Coriolis, and other inertial forces and were first described by W. de Sitter in 1916 and Hans Thirring in 1918. Dr. Robert L. Forward published his Guidelines to Antigravity in March 1963 in the American Journal of Physics. Dr. Forward is an expert in General Relativity and Gravity Research and studied under Weber at the University of Maryland. In his guidelines article, he discusses the dipole effect of gravity as predicted by General Relativity. Unfortunately, the forces generated are extremely weak without very dense mass or extremely high angular velocities. I suggest that everyone with an interest in such aspects obtain a copy of this article and read it through before passing any judgements as to these forces existing or being generated!
-- Phillip Carpenter

Might a mass (gravitational charge) in motion also produce another type of field much like a magnetic one?
Something like this is "gravitomagnetic effect" is theoretically predicted. If you were in such a field, it would simply give the impression that you were in a locally rotating frame of reference, so moving objects would experience coriolis forces, even when you

were not rotating relative to distant reference points. As the effect is of the order of v1 v2/c^2 where v1 is the speed of the gravitational source and v2 is the speed of the test object, it is extremely small and has not yet been measured.
Note also that a rotating massive object is expected to give rise to a similar field in the same way as a current loop gives rise to a magnetic field. This is known as the Lense-Thirring effect.
A first-order Special Relativity approximation (which only applies for a locally inertial frame of reference where space isn't significantly curved) is simply that the rotation field is (v1 x g)/c^2 where g is the Newtonian acceleration vector v1 is the velocity of the source object. The acceleration that field generates for a body moving with velocity v2 is v2 x (v1 x g)/c^2. Note for comparison that the magnetic field is B = (v1 x E)/c^2 so the magnetic force is q v2 x (v1 x E)/c^2.
The gravitational rotation field calculated in this way is equal to 2w where w is the apparent angular velocity of rotation.
It is hoped that "conscience-guided" satellite experiments may confirm this effect within a few years, but at present there are too many other disturbances which make it too difficult to measure such a small effect.
The rotation field, whether caused by a linearly moving mass or a rotating object, only affects moving masses. However, there is of course a much stronger associated acceleration field which affects all masses. From the subjective point of view, the acceleration field may appear to be partly linear acceleration and partly "centrifugal" force associated with rotary motion, but this is a higher-order effect.
-- Jonathan Scott

Some scientists in Boulder, CO (USA) have suceeded in cooling down matter into the elusive Bose-Einstein condensate. The kinetic energy of the atoms in this state have been removed. If you could maintain this state in stable form and spin it, the angular momentum would repel the earth and lift many times its own mass. Outside of the atmosphere, this could produce the desired gravitational dipole effect.

Bonaldi, M., et al., "Inertial and Gravitational Experiments With Superfluids: A Progress Report," Proceedings of the Fourth Marcel Grossmann Meeting on General Relativity, Elsevler Science Publishers B.V., 1985, pp. 1309-1317.

Title: ANGULAR MOMENTUM PARADOXES WITH SOLENOIDS AND MONOPOLES
In: Phys.Lett.118B:385,1982
Date/Source: August 1982

Fermilab Library: FERMILAB-PUB-82/53-THY -- Preprint -- Available

Title: Long range effects in asymptotic fields and angular momentum of classical field electrodynamics
Date/Source: February 1995
Fermilab Library: CALL NUMBER DESY-95-035 -- Preprint -- Available

Title: Angular Momentum
Authors: Brink, D. M. (David Maurice), and G.R. Satchler
Date/Source: Oxford : Clarendon Press ; New York : Oxford University Press, 1993.
Fermilab Library: CALL NUMBER QC793.3.A5 B75 1993 -- Book -- Available

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AUTHOR(s): Hayasaka, Hideo Takeuchi, Sakae
TITLE: Gravitation and Astrophysics.
Summary: Anomalous weight reduction on a gyroscope's right rotations around the vertical axis on the Earth.
In: Physical review letters.
DEC 18 1989 v 63 n 25 Page 2701

AUTHOR(s): Starzhinskii, V.M.
TITLE: An exceptional case of motion of the Kovalevskaia gyroscope.
In: PMM, Journal of applied mathematics and mechanic
1983 v 47 n 1 Page 134

From: sphinx@world.std.com (John Sangster, SPHINX Technologies)
Subject: Weight Reduction in Spinning Masses
Date: Fri, 3 Nov 1995 06:04:35 GMT

Recently Hideo Hayasaka and Sakae Takeuchi of the Engineering Faculty at Tohoku University in Japan have published an experimental result of this sort. They found that gyroscopes spinning clockwise as seen from above, at their location, exhibited a decrease in relative mass of 5.07 x 10^-5 and 4.22 x 10^-5 respectively for the two gyroscope configurations studied. (Weight was multiplied by 1-e where e is the relative factors given above, if I haven't botched up in my arithmetic.) The effect as plotted in the paper I saw appears to be perfectly linear to within reasonable experimental error, thus giving a rotational velocity at which the weight would go to zero which I made out to be 3.27 MHz (million rotations per second) in the first case and 3.95 MHz in the second.
That was with CLOCKWISE rotation as seen from above. With COUNTERclockwise rotation, the same experimental setup showed ZERO EFFECT. Zip. Nada. Nichts. Nyechevo. You get the idea. For one thing, this result makes it

almost certain that they are NOT dealing with bad lab technique. Not to mention the fact that they spent nearly a year and a half going over and over their setup and trying to answer all objections by the reviewers of their Physical Review Letters paper (it eventually appeared in PRL (63 2701)). As far as I know, nobody has published a theoretical model that accounts for these observations. The idea of a physical phenomenon that appears only in one direction of rotation is rather unprecedented. I know of only one other mathematical/physical phenomenon that does this, and I'm trying to understand how the two might be related, but without success as yet.
-- John Sangster

Physicist Alex Harvey wrote an article about the Hayakawa-Taguechi experiment. The article was published in:

Nature, Aug 23 1990, Vol 346 Page 705

You'll also find other references there. Harvey shows mathematically that an angular momentum vector aligned antiparallel to the local gravitational field violates the equivalence principle. He also shows that the path of a spinning body under gravity need not be geodesic. Here are two "holes" in GR that seem to account for the behavior of H & T's gyros. New experiments should be designed to force the asymmetry to appear, as predicted by theory, rather than passively leave the results to chance.
There is a dimensional error of Hayasaka and Takeuchi which CAN be corrected by supplying a quantity that restores proper dimensionality. In simplest terms, H and T's result looks like: { deltaN = - (proportionality constant) m w r } where deltaN is the weight change in Newtons, m is the mass of the rotor in kg, w is the rotation frequency in angular units and r is the radius of the rotor in meters. The units of the missing quantity are radians per second. The rotation, w, has already been counted. The missing quantity is the precession, Wp. With clockwise rotation, the vector J points down the spin axis, while the precession vector, Wp, points up the spin axis.
Physicist Alex Harvey, writing about H and T's results, confirmed that there is no (symmetrical) weight gain, no effect at all, with counter-clockwise rotation, J (up).
In this case, says Harvey, "[J] is parallel to the gravitational field."
-- laradex3@sj.znet.com

AUTHOR(s): Harvey, Alex
TITLE(s): Complex Transformation of the Kasner Metric.
In: General relativity and gravitation.
OCT 01 1989 v 21 n 10 Page 1021

AUTHOR(s): Harvey, Alex
TITLE(s): Cosmological models.
In: American journal of physics.
OCT 01 1993 v 61 n 10 Page 901

AUTHOR(s): Harvey, Alex
TITLE(s): Identities of the scalars of the four-dimensional Riemannian manifold.
In: Journal of mathematical physics.
JAN 01 1995 v 36 n 1 Page 356

AUTHOR(s): Harvey, Alex
TITLE(s): Will the Real Kasner Metric Please Stand Up.
In: General relativity and gravitation.
DEC 01 1990 v 22 n 12 Page 1433

> Maybe I've missed it, but I've looked seriously, and there seems
> to be no information in undergraduate or graduate level physics
> reference books which mentions the relationship between
> macroscopic and microscopic angular momentum -- much less
> provides any analysis or explanation linking quantum angular
> momentum to macroscopic angular momentum.

You're catching on. The subject of compound angular momentum, or internal and external angular momentum, or intrinsic and extrinsic angular momentum has been a repressed subject for about 2 and half decades. Add to that list, spherical pendulums, Coriolis effect, except as applied to balistics and meteorology as used by the US military, and Shafer's pendulum, that neat little device used as the artifical horizon of aircraft.

> How does quantum angular momentum become organized from a
> microscopic to a macroscopic level? Has anyone ever published
> any work about this? I can't find any.

There isn't any that I know of, though back in the late fifties, there was a fellow named Edward Condon at the University of Colorado who was fairly proficient on the subject. So much so that he wrote the rotational dynamics section, called noninertial dynamics at the time, of the reference "The Handbook of Physics" which he also co-edited (Chapter 5).

I don't recall offhand who the publisher was (Harcourt/Brace?), though
it was endorsed by the American Institute of Physics.
Later, when Mr Condon was the head of the USAF project 'Blue Book', he
labored to supress his own work when the directive was handed down from
the Navy's Turtle Island project.
-- James Youlton

In the Barnett effect a long iron cylinder, when rotated at high
speed about its longitudinal axis, is found to develop a measurable
component of magnetization, the value of which is proportional to
the angular speed. The effect is attributed to the influence of the
impressed rotation upon the revolving electronics systems due to
the mass property of the unpaired electrons within the atoms.
-- Henry Wallace

Barnett, S.J., "Magnetization By Rotation," The American Physical Society,
Second Series, vol. VI, No. 2, Jun., 1915, pp. 171-172.

Barnett, S.J., "Magnetization By Rotation," The Physical Review, Second
Series, vol. VI., No. 4, Oct., 1915, pp. 239-270.

The Barnett Effect is known to me as the effect of a change in
volume of a magnetic material in response to a change in it's
magnetization strength. If a ferrite material is exposed to a
higher magnetization field (more current through the coil) the
ferritd will change in volume. I was not aware that this has anything
to do with alignment to a spinning axis. For further information about
this aspect of the Barnett effect, see: Ref. Handbook of Magnetic
Phenomena, by Harry S Burk, Van Nostrand Reinhold 1986 Page 262.
-- William Clymer

Magnetic systems with competing interactions : frustrated spin systems /
edited by H.T. Diep. Singapore ; River Edge, N.J. : World Scientific, c1994.
xiv, 335 p. : ill. ; 24 cm.
LC CALL NUMBER: QC754.2.S75 M34 1994
SUBJECTS: Magnetization. Rotational motion. Spin waves. Ferromagnetism.
CONTENTS:
 Nonlinear phenomena and chaos in magnetic materials / P.E. Wigen --
 Some nonlinear effects in magnetically ordered materials / H. Suhl --
 Spin-wave instability processes in ferrites / M. Chen & C.E. Patton --
 Spin-wave dynamics in a ferrimagnetic sphere: experiments and models / P.H.
 Bryant, D.C. Jeffries, & K. Nakamura -- Spin-wave auto-oscillations in YIG

spheres driven by parallel pumping and subsidiary resonance / S.M. Rezende & A. Azevedo -- Strong chaos in magnetic resonance / M. Warden -- Magnetostatic modes in thin films / R.D. McMichael & P.E. Wigen -- Fractal properties in magnetic crystal / H. Yamazaki -- Spin-wave envelope solitons in magnetic films / A.N. Slavin, B.A. Kalinikos, & N.G. Korshikov.
ISBN: 9810210051

Hence the Wilson-Blackett proportionality between the angular momentum of planets, stars etc and their magnetic moment.
For more information see Science News Aug 6 '94 p82.

AUTHOR(s): Bloxham, Jeremy Gubbins, David
TITLE(s): The Evolution of the Earth's Magnetic Field.
Summary: The origin of the field has fascinated more than a dozen generations of physicists. Molten iron in the outer core, driven by convection and influenced by the earth's rotation, acts as a dynamo that generates the field. Now historical records of magnetic-field changes yield new insights into the process and into how the field may behave in the future.
In: Scientific American. DEC 01 1989 v 261 n 6 Page 68

AUTHOR(s): Malov, I.F.
TITLE(s): Angle between the magnetic field and the rotation axis in pulsars.
In: Soviet astronomy.
MAR 01 1990 v 34 n 2 Page 189

AUTHOR(s): Marsheva, N. M.
TITLE(s): Permanent rotation of a heavy rigid body in a magnetic field.
In: Moscow university mechanics bulletin. 1989 v 44 n 1

AUTHOR(s): Vitale, S. Bonaldi, M. Falferi, P.
TITLE: Magnetization by rotation and gyromagnetic gyroscopes.
Summary: We discuss how the general phenomenon of magnetization by rotation may be used probe the angular velocity of the laboratory with respect to a local frame of inertia. We show that gyroscope with no moving parts based on this pheno-
In: Physical review B: Condensed matter.
JUN 01 1989 v 39 n 16 p B Page 11993

CONDENSED MATTER THEORY, ABSTRACT COND-MAT/9509141
From: Erwin Frey
Date: Fri, 22 Sep 1995 09:43:52 +0200
Critical Dynamics of Magnets
Authors: Erwin Frey , Franz Schwabl (TU Muenchen)
Comments: Review article (154 pages, figures included)
We review our current understanding of the critical dynamics of magnets above and below the transition temperature with focus on the effects due to the dipole--dipole interaction present in all real magnets. Significant progress in our understanding of real ferromagnets in the vicinity of the critical point has been made in the last decade through improved experimental techniques and theoretical advances in taking into account realistic spin-spin interactions. We start our review with a discussion of the theoretical results for the critical dynamics based on recent renormalization group, mode coupling and spin wave theories. A detailed comparison is made of the theory with experimental results obtained by different measuring techniques, such as neutron scattering, hyperfine interaction, muon--spin--resonance, electron--spin--resonance, and magnetic relaxation, in various materials. Furthermore we discuss the effects of dipolar interaction on the critical dynamics of three--dimensional isotropic antiferromagnets and uniaxial ferromagnets. Special attention is also paid to a discussion of the consequences of dipolar anisotropies on the existence of magnetic order and the spin--wave spectrum in two--dimensional ferromagnets and antiferromagnets. We close our review with a formulation of critical dynamics in terms of nonlinear Langevin equations.

Paper: cond-mat/9501029
From: Kazuhiro Kuboki
Date: Mon, 09 Jan 1995 10:40:11 EST
Title: Proximity-induced time-reversal symmetry breaking at Josephson junctions between unconventional superconductors
Author: Kazuhiro Kuboki and Manfred Sigrist
We argue that a locally time-reversal symmetry breaking state can occur at Josephson junctions between unconventional superconductors. Order parameters induced by the proximity effect can combine with the bulk order parameter to form such a state. This property is specifically due to the intrinsic phase structure of the pairing wave function in unconventional superconductors. Experimental consequences of this effect in high-temperature superconductors are examined.

Paper: cond-mat/9501088

From: David Benedict Bailey
Date: Thu, 19 Jan 1995 11:34:10 -0800 (PST)
Title: Gapless Time-Reversal Symmetry Breaking Superconductivity
Authors: A. M. Tikofsky and D. B. Bailey
We consider a layered superconductor with a complex order parameter whose phase switches sign from one layer to the next. This system is shown to exhibit gapless superconductivity for sufficiently large interlayer pairing or interlayer hopping. In addition, this description is consistent with experiments finding signals of time-reversal symmetry breaking in high-temperature superconductors only at the surface and not in the sample bulk.

Paper: cond-mat/9501133
From: ioffe@physics.rutgers.edu (Lev Ioffe)
Date: Mon, 30 Jan 95 08:59:22 EST
Title: On the spin density wave transition in a two dimensional spin liquid.
Authors: B. L. Altshuler, L. B. Ioffe, A. I. Larkin, A. J. Millis.
Strongly correlated two dimensional electrons are believed to form a spin liquid in some regimes of density and temperature. As the density is varied, one expects a transition from this spin liquid state to a spin density wave antiferromagnetic state. In this paper we show that it is self-consistent to assume that this transition is second order and, on this assumption, determine the critical behavior of the 2p_F susceptibility, the NMR rates T1 and T2 and the uniform susceptibility. We compare our results to data on high Tc materials.

Paper: gr-qc/9502041
From: Barry Haddow
Date: Fri, 24 Feb 1995 18:59:15 (GMT)
Title: Purely Magnetic Spacetimes
Author: Barry Haddow (Trinity College, Dublin, Ireland)
Purely magnetic spacetimes, in which the Riemann tensor satisfies R_{abcd}u^bu^d=0 for some unit timelike vector u^a, are studied. The algebraic consequences for the Weyl and Ricci tensors are examined in detail and consideration given to the uniqueness of u^a. Some remarks concerning the nature of the congruence associated with u^a are made.

Paper: cond-mat/9502103
From: deb@rri.ernet.in (Debnarayan Jana)
Date: Fri, 24 Feb 95 11:23:21+050
Title: Universal Diamagnetism of Charged Scalar Fields
Authors: Debnarayan Jana
We show that charged scalar fields are always diamagnetic, even in

the presence of interactions and at finite temperatures. This generalises earlier work on the diamagnetism of charged spinless bosons to the case of infinite degrees of freedom.

"CP Violation and Antigravity Revisited", G. Chardin, Nuclear Physics, Jun 7 1993, Vol 558

"Equivalence Principal Violation, Antigravity and Anyons Induced by Gravitational Chern-Simons Couplings", S. Deser, Classical and Quantum Gravity, 1992, Vol 9 Supp

"The Arguments Against Antigravity and the Gravitational Acceleration of Anti-Matter", Michael Martin, Physics Reports, Jul 1 1991, Vol 205

"Empirical Limits to Antigravity", Ericson & Richter, Europhysics Letters, Feb 15 1990, Vol 11 no 4

"Chern-Simons Quantizations of (2+1) Anti-de Sitter Gravity on a Torus", K. Ezawa, Classical and Quantum Gravity, Feb 1 1995 Vol 12 No 2

"Green's Function for Anti-de Sitter Space Gravity", Gary Kleppe, Physical Review d: Particles, Fields, Gravity; Dec 15 1994 Vol 50 No 12

"Lowest Eigenvalues of the Energy Operator for Totally Anti Symmetric Massless Fields of the N-Dimensional Anti-de Sitter Group", R.R. Metsaev, Classical and Quantum Gravity, Nov 1 1994, Vol 11 No 11

"The Positivity of Energy for Asymptotically Anti-de Sitter Spacetimes", E. Woolgar, Classical and Quantum Gravity, Jul 1 1994, Vol 11 No 7

"Vacuum Polarization Near Asymptotically Anti-de Sitter Black Holes in Odd Dimensions", Shiraishi & Maki, Classical and Quantum Gravity, Jul 1 1994, Vol 11 No 7

"Strong Anti Gravity: Life in the Shock Wave", Fabbrichesi & Roland, Nuclear Physics B, Dec 21 1992, Vol 388 No 2

"Global Solutions of Yang-Mills Equations on Anti-de Sitter Spacetime", Choquet-Bruhat, Classical and Quantum Gravity, Dec 1 1989, Vol 6 No 12

"The Scalar Wave Equation on Static de Sitter and Anti-de Sitter Spacetimes", D. Polarski, Classical and Quantum Gravity, Jun 1 1989

"Lehman Representation of the Spinor Two-Point Function in Anti-de Sitter Space", E. Gath, Classical and Quantum Gravity, May 1 1989, Vol 6 no 5

Dr. Bernhard Haisch has modeled inertial mass as deriving from an accelerated body's interaction with the zero point field (ZPF), consonant with a large body of refereed physics literature.

Haisch in Feb 1994 Phys. Rev. A
Science vol 263 p 612
Scientific American vol 270, p 30
New Scientist 25 Feb 1995 p 30

"Gravity as a Zero-Point-Fluctuation Force," H.E. Puthoff, Physical Review A: General Physics. Mar 1 1989, Vol39 No 5

The 4 February 1994 issue of Science magazine has an article about a new theory of inertia. A recent paper by Bernhard Haisch, Alfonso Rueda and Hal Puthoff in the 1 Feb 1994 issue of Physical Review A, based on earlier work by Andrei Sakharov, derives inertia from quantum electromagnetic vacuum fluctuations. The idea is that if inertia is due to some strange quantum EM effects, it might be understood and controlled, and even neutralized.

Haisch is at the Lockheed Palo Alto laboratories, Rueda, at Cal. State. Long Beach, and Puthoff at the Institute for Advanced Studies in Austin Texas. Needless to say, this new theory is serious, but very controversial physics. A test is planned later this year at the SLAC linear accelerator by exposing a high energy electron beam to terawatt laser. Keep tuned!
-- John H. Chalmers Jr

A recent controversial theory of Austin Institute for Advanced Study physicist Hal Puthoff and his collaborators Haisch and Rueda appears to explain gravity as not an intrinsic property of matter but as an indirect consequence of Maxwellian electromagnetic radiation, namely that (as earlier suggested by the late Russian dissenter Sakharov) gravity is a "shadow effect" similar to the Casimir Effect of quantum electrodynamics. Bass points out that if the Haisch-Puthoff-Rueda theory is correct then Hodowanec's idea of tapping the earth's gravity field in some electromagnetic way not hitherto suggested is conceivable.
- Joel McClain

Puthoff and his collaborators have gone so far as to use SED (Stochastic Electro-Dynamics) to _explain_ both gravitational & inertial mass and

to show their equivalence, and to derive Newton's F = Ma, and to derive Mach's principle (without which Einstein admitted that no theory of gravity could claim to be complete), and to derive Dirac's "cosmological numerical coincidences" as inevitabilities, and to derive Newtonian gravity, and to derive the Newton-Cavendish parameter G!!!
-- Robert Bass

It is an amazing coincidence that the total Newtonian gravitational potential energy of any object due to all masses in the universe is equal in magnitude to its total energy, at least to within a small factor, considering that this involves an expression involving multiple factors of the order of 10 to the 40th power.
This was pointed out by Dirac in his Large Numbers Hypothesis, and used as part of a beautiful illustrative theory by Dennis Sciama [1], in which he constructs a theory of gravity closely analogous to the classical theory of electromagnetism, and shows that inertia can be directly attributed to the gravitational effect of accelerating relative to the gravitational potential sources of the whole universe (or indeed of accelerating the whole universe relative to the object, because in Sciama's theory, the two points of view are equivalent). This theory is obviously consistent with Mach's Principle (which is effectively that inertial motion is in some sense relative to the rest of universe). Sciama's theory is only a simplified approximation, but it is so neat that it seems likely that some similar principle must apply also within General Relativity. However, one of its most basic implications is that the gravitational "constant" G would depend on the distribution of matter in the universe, which seems to be in direct conflict with GR. I personally think GR is probably not quite right.
-- Jonathan Scott

[1] D.W.Sciama, "On the Origin of Inertia", M.N.R.A.S. Vol. 113, p34, 1953.

GENERAL RELATIVITY & QUANTUM COSMOLOGY, ABSTRACT GR-QC/9412012
From: "Haret Rosu"
Date: 3 Dec 94 19:36:00 CST
Classical and quantum inertia: a heuristic introduction,
Author(s): Haret C. Rosu
Report: IFUG-27/94,
Comments: 20 pages, LaTex 11pt, no figures.
A non-technical discussion of the problem of inertia is provided both in classical physics and in the quantum world. After briefly reviewing the classical formulations (WEP, EEP, and SEP), I pass to a presentation of the equivalence statements for quantum vacuum

states. One can also find a number of related comments and suggestions.

Krech, Michael.
The Casimir effect in critical systems / Michael Krech. Singapore ; River Edge, NJ : World Scientific, c1994. x, 253 p. : ill. ; 23 cm.
LC CALL NUMBER: QC173.4.C74 K74 1994
SUBJECTS: Critical phenomena. Casimir effect.
ISBN: 9810218451

Cavity quantum electrodynamics/edited by Paul R. Berman.
Boston : Academic Press, c1994. xvi, 464 p. : ill. ; 24 cm.
LC CALL NUMBER: QC446.2 .C38 1994
SUBJECTS: Quantum optics. Quantum electrodynamics. Casimir effect.
ISBN: 0120922452 (alk. paper)

Long-range Casimir forces : theory and recent experiments on atomic systems
Edited by Frank S. Levin and David A. Micha. New York : Plenum Press, c1993.
LC CALL NUMBER: QC680 .L63 1993
SUBJECTS: Casimir effect.
ISBN: 0306443856

Physics in the making : essays on developments in 20th century physics: in honour of H.B.G. Casimir on the occasion of his 80th birthday/ edited by A. Sarlemijn and M.J. Sparnaay. Amsterdam : North-Holland; New York, N.Y., U.S.A. : Sole distributors for the U.S.A. and Canada, Elsevier Science Pub. Co., 1989. xiv, 361 p. : ill. ; 23 cm.
LC CALL NUMBER: QC7 .P48 1989
SUBJECTS: Casimir, H. B. G. (Hendrik Brugt Gerhard), 1909-
Casimir, H. B. G. (Hendrik Brugt Gerhard), 1909-
Sarlemijn, Andries, 1936-
Sparnaay, M. J. (Marcus Johannes)
ISBN: 0444881212

Edwards-Casimir Quantum Vacuum Drive --
A hypothetical drive exploiting the peculiarities of quantum mechanics by restricting allowed wavelengths of virtual photons on one side of the drive (the bow of the ship); the pressure generated from the unrestricted virtual photons toward the aft generates a net force and propels the drive.

CONDENSED MATTER, ABSTRACT COND-MAT/9505108
From: moraes@guinness.ias.edu (Fernando Moraes)

Date: Tue, 23 May 95 17:12:35 EDT
Enhancement of the magnetic moment of the electron due to
a topological defect
Author(s): Fernando Moraes (Institute for Advanced Study, Princeton)
In the framework of the theory of defects/three-dimensional gravitation, it is obtained a positive correction to the magnetic moment of the electron bound to a disclination in a dielectric solid. With the disclination modelled as a parallel plate casimir effect.

HIGH ENERGY PHYSICS - THEORY, ABSTRACT HEP-TH/9212077
From: milton@phyast.nhn.uoknor.edu (Kim Milton)
Date: Fri, 11 Dec 92 16:13:13 CST
MAXWELL-CHERN-SIMONS CASIMIR EFFECT, KIMBALL A. MILTON,
DEPARTMENT OF PHYSICS AND ASTRONOMY, UNIVERSITY OF OKLAHOMA
In odd-dimensional spaces, gauge invariance permits a Chern-Simons mass term for the gauge fields in addition to the usual Maxwell-Yang-Mills kinetic energy term. We study the Casimir effect in such a (2+1)-dimensional Abelian theory. For the case of parallel conducting lines the result is the same as for a scalar field. For the case of circular boundary conditions the results are completely different, with even the sign of the effect being opposite for Maxwell-Chern-Simons fields and scalar fields. We further examine the effect of finite temperature. The Casimir stress is found to be attractive at both low and high temperature. Possibilities of observing this effect in the laboratory are discussed.

GENERAL RELATIVITY & QUANTUM COSMOLOGY, ABSTRACT GR-QC/9303038
PHYS. REV. D 48, 776 (1993)
FROM: LFORD@PEARL.TUFTS.EDU
Date: Wed, 31 Mar 1993 17:47 EDT
MOTION OF INERTIAL OBSERVERS THROUGH NEGATIVE ENERGY, BY L.H. FORD AND
THOMAS A. ROMAN,
Recent research has indicated that negative energy fluxes due to quantum coherence effects obey uncertainty principle-type inequalities of the form $|\Delta E|\,{\Delta \tau} \lprox 1\,$. Here $|\Delta E|$ is the magnitude of the negative energy which is transmitted on a timescale $\Delta \tau$. Our main focus in this paper is on negative energy fluxes which are produced by the motion of observers through static negative energy regions. We find that although a quantum inequality appears to be satisfied for radially moving geodesic observers in two and four-dimensional black hole spacetimes, an observer orbiting close to a black hole will see a constant negative energy flux. In addition, we show that inertial observers moving slowly through the Casimir vacuum can achieve

arbitrarily large violations of the inequality. It seems likely
that, in general, these types of negative energy fluxes are not
constrained by inequalities on the magnitude and duration of the
flux. We construct a model of a non-gravitational stress-energy
detector, which is rapidly switched on and off, and discuss the
strengths and weaknesses of such a detector.

GENERAL RELATIVITY & QUANTUM COSMOLOGY, ABSTRACT GR-QC/9304008
PHYS. REV. D 47, 4510 (1993).
FROM: LFORD@PEARL.TUFTS.EDU
Date: Tue, 6 Apr 1993 12:56 EDT
SEMICLASSICAL GRAVITY THEORY AND QUANTUM FLUCTUATIONS, BY CHUNG-I KUO AND
L. H. FORD.

We discuss the limits of validity of the semiclassical theory of
gravity in which a classical metric is coupled to the expectation
value of the stress tensor. It is argued that this theory is a good
approximation only when the fluctuations in the stress tensor are
small. We calculate a dimensionless measure of these fluctuations
for a scalar field on a flat background in particular cases,
including squeezed states and the Casimir vacuum state. It is found
that the fluctuations are small for states which are close to a
coherent state, which describes classical behavior, but tend to be
large otherwise. We find in all cases studied that the energy
density fluctuations are large whenever the local energy density is
negative. This is taken to mean that the gravitational field of a
system with negative energy density, such as the Casimir vacuum, is
not described by a fixed classical metric but is undergoing large
metric fluctuations. We propose an operational scheme by which one
can describe a fluctuating gravitational field in terms of the
statistical behavior of test particles. For this purpose we obtain
an equation of the form of the Langevin equation used to describe
Brownian motion.

HIGH ENERGY PHYSICS - PHENOMENOLOGY, ABSTRACT HEP-PH/9307258
From: langfeld@ptsun1.tphys.physik.uni-tuebingen.de (Kurt Langfeld)
Date: Tue, 13 Jul 93 08:04:30 +0200
CASIMIR EFFECT OF STRONGLY INTERACTING SCALAR FIELDS, BY K. LANGFELD, F. SCHMUSER, AND H. REINHARDT

Non-trivial $\phi ^{4}$-theory is studied in a renormalisation group
invariant approach inside a box consisting of rectangular plates and
where the scalar modes satisfy periodic boundary conditions at the
plates. It is found that the Casimir energy exponentially approaches
the infinite volume limit, the decay rate given by the scalar
condensate. It therefore essentially differs from the power law of a
free theory. This might provide experimental access to properties of

the non-trivial vacuum. At small interplate distances the system can no longer tolerate a scalar condensate, and a first order phase transition to the perturbative phase occurs. The dependence of the vacuum energy density and the scalar condensate on the box dimensions are presented.

GENERAL RELATIVITY & QUANTUM COSMOLOGY, ABSTRACT GR-QC 9310007
PHYSICA SCRIPTA 48, 649 (1993)
FROM: harald@nordita.dk (Harald H. Soleng)
Date: Mon, 4 Oct 93
INVERSE SQUARE LAW OF GRAVITATION IN (2+1)-DIMENSIONAL SPACE-TIME AS A
CONSEQUENCE OF CASIMIR ENERGY, H. H. SOLENG,

The gravitational effect of vacuum polarization in space exterior to a particle in (2+1)-dimensional Einstein theory is investigated. In the weak field limit this gravitational field corresponds to an inverse square law of gravitational attraction, even though the gravitational mass of the quantum vacuum is negative. The paradox is resolved by considering a particle of finite extension and taking into account the vacuum polarization in its interior.

HIGH ENERGY PHYSICS - THEORY, ABSTRACT HEP-TH/9312069
From: segui@cc.unizar.es
Date: Thu, 9 DEC 93 13:50 GMT
A MODIFIED SCHWINGER'S FORMULA FOR THE CASIMIR EFFECT, M.V. COUGO-PINTO, C.
FARINA AND ANTONIO J. SEGUI-SANTONJA

After briefly reviewing how the (proper-time) Schwinger's formula works for computing the Casimir energy in the case of "scalar electrodynamics" where the boundary conditions are dictated by two perfectly conducting parallel plates with separation "a" in the Z-axis, we propose a slightly modification in the previous approach based on an analytical continuation method. As we will see, for the case at hand our formula does not need the use of Poisson summation to get a (renormalized) finite result.

HIGH ENERGY PHYSICS - THEORY, ABSTRACT HEP-TH/9401123
From: segui@cc.unizar.es
Date: Tue, 25 JAN 94 21:47 GMT
SCHWINGER'S METHOD FOR THE MASSIVE CASIMIR EFFECT, BY M.V. COUGO-PINTO, C.
FARINA AND A.J. SEGUI-SANTONJA

We apply to the massive scalar field a method recently proposed by Schwinger to calculate the Casimir effect. The method is applied with two different regularization schemes: the Schwinger original one by means of Poisson formula and another one by means of

analytical continuation.

HIGH ENERGY PHYSICS - THEORY, ABSTRACT HEP-TH/9405060
From: Shtykov Nikolay
Date: Tue, 10 May 94 17:40:50 JST
THE FINITE VACUUM ENERGY FOR SPINOR, SCALAR AND VECTOR FIELDS, N.SHTYKOV

We compute the one-loop potential (the Casimir energy) for scalar, spinor and vectors fields on the spaces $\,R^{m+1}\, \times\,Y$ with $\,Y=\,S^N\,,CP^2$. As a physical model we consider spinor electrodynamics on four-dimensional product manifolds. We examine the cancelation of a divergent part of the Casimir energy on even-dimensional spaces by means of including the parameter $\,M$ in original action. For some models we compare our results with those found in the literature.

HIGH ENERGY PHYSICS - THEORY, ABSTRACT HEP-TH/9408172
From: LFORD@PEARL.TUFTS.EDU
Date: Tue, 30 Aug 1994 16:45:05 -0400 (EDT)
DECOHERENCE AND VACUUM FLUCTUATIONS, L.H. FORD, TUFTS UNIVERSITY

The interference pattern of coherent electrons is effected by coupling to the quantized electromagnetic field. The amplitudes of the interference maxima are changed by a factor which depends upon a double line integral of the photon two-point function around the closed path of the electrons. The interference pattern is sensitive to shifts in the vacuum fluctuations in regions from which the electrons are excluded. Thus this effect combines aspects of both the Casimir and the Aharonov-Bohm effects. The coupling to the quantized electromagnetic field tends to decrease the amplitude of the interference oscillations, and hence is a form of decoherence. The contributions due to photon emission and to vacuum fluctuations may be separately identified. It is to be expected that photon emission leads to decoherence, as it can reveal which path an electron takes. It is less obvious that vacuum fluctuations also can cause decoherence. What is directly observable is a shift in the fluctuations due, for example, to the presence of a conducting plate. In the case of electrons moving parallel to conducting boundaries, the dominant decohering influence is that of the vacuum fluctuations. The shift in the interference amplitudes can be of the order of a few percent, so experimental verification of this effect may be possible. The possibility of using this effect to probe the interior of matter, e.g., to determine the electrical conductivity of a rod by means of electrons encircling it is discussed.
(Presented at the Conference on Fundamental Problems in Quantum Theory, University of Maryland, Baltimore County, June 18-22, 1994.)

GENERAL RELATIVITY & QUANTUM COSMOLOGY, ABSTRACT GR-QC/9410043
PHYS. REV. D 51, 4277(1995).
FROM: FORD@TUHEP.PHY.TUFTS.EDU
Date: Fri, 28 Oct 1994 20:33 EST
AVERAGED ENERGY CONDITIONS AND QUANTUM INEQUALITIES, L.H. FORD AND THOMAS A. ROMAN

Connections are uncovered between the averaged weak (AWEC) and averaged null (ANEC) energy conditions, and quantum inequality restrictions on negative energy for free massless scalar fields. In a two-dimensional compactified Minkowski universe, we derive a covariant quantum inequality-type bound on the difference of the expectation values of the energy density in an arbitrary quantum state and in the Casimir vacuum state. From this bound, it is shown that the difference of expectation values also obeys AWEC and ANEC-type integral conditions. In contrast, it is well-known that the stress tensor in the Casimir vacuum state alone satisfies neither quantum inequalities nor averaged energy conditions. Such difference inequalities represent limits on the degree of energy condition violation that is allowed over and above any violation due to negative energy densities in a background vacuum state. In our simple two-dimensional model, they provide physically interesting examples of new constraints on negative energy which hold even when the usual AWEC, ANEC, and quantum inequality restrictions fail. In the limit when the size of the space is allowed to go to infinity, we derive quantum inequalities for timelike and null geodesics which, in appropriate limits, reduce to AWEC and ANEC in ordinary two-dimensional Minkowski spacetime. We also derive a quantum inequality bound on the energy density seen by an inertial observer in four-dimensional Minkowski spacetime. The bound implies that any inertial observer in flat spacetime cannot see an arbitrarily large negative energy density which lasts for an arbitrarily long period of time.

GENERAL RELATIVITY & QUANTUM COSMOLOGY, ABSTRACT GR-QC/9411053
From: "Haret Rosu"
Date: 20 Nov 94 21:15:00 CST
On the assignment of frequency spectra to quantum vacuum effects,
Author: Haret C. Rosu, Report: IFUG-25/94,

I discuss in an introductory manner, i.e., in the form of comments on available references, the problem of assigning frequency spectra to such fundamental effects like Casimir, Hawking, Unruh, and squeezing effects. This may help to clarify their differences as well as their similarities.

GENERAL RELATIVITY & QUANTUM COSMOLOGY, ABSTRACT GR-QC/9411056
From: ulvi@tapir.Caltech.EDU (Ulvi Yurtsever)

Date: Mon, 21 Nov 94 15:56:11 -0800
The averaged null energy condition and difference inequalities in quantum field theory, by: Ulvi Yurtsever

Recently, Larry Ford and Tom Roman have discovered that in a flat cylindrical space, although the stress-energy tensor itself fails to satisfy the averaged null energy condition (ANEC) along the (non-achronal) null geodesics, when the ``Casimir-vacuum'' contribution is subtracted from the stress-energy the resulting tensor does satisfy the ANEC inequality. Ford and Roman name this class of constraints on the quantum stress-energy tensor ``difference inequalities.'' Here I give a proof of the difference inequality for a minimally coupled massless scalar field in an arbitrary two-dimensional spacetime, using the same techniques as those we relied on to prove ANEC in an earlier paper with Robert Wald. I begin with an overview of averaged energy conditions in quantum field theory.

QUANTUM PHYSICS, ABSTRACT QUANT-PH/9502024
From: MANKO@napoli.infn.it
Date: Mon, 27 Feb 1995 16:32:21 +0200 (CET)
Deformation of Partical Distribution Functions due to Q-nonlinearity and Nonstationary Casimir Effect, Author: V. I. Man'ko

The geometrical phase is shown to be integral of motion. Deformation of particle distribution function corresponding to nonstationary Casimir effect is expressed in terms of multivariable Hermite polynomials. Correction to Planck distribution due to q--nonlinearity is discussed.

QUANTUM PHYSICS, ABSTRACT QUANT-PH/9503001
From: onofrio%38619.hepnet@Csa4.LBL.Gov
Date: Wed, 1 Mar 95 08:23:43 PST
Detecting Casimir Forces through a Tunneling Electromechanical Transducer
Authors: Roberto Onofrio , Giovanni Carugno

We propose the use of a tunneling electromechanical transducer to dinamically detect Casimir forces between two conducting surfaces. The maximum distance for which Casimir forces should be detectable with our method is around 1μm, while the lower limit is given by the ability to approach the surfaces. This technique should permit to study gravitational forces on the same range of distances, as well as the vacuum friction provided that very low dissipation mechanical resonators are used.

CONDENSED MATTER THEORY, ABSTRACT COND-MAT/9505023
From: moraes@guinness.ias.edu (Fernando Moraes)
Date: Fri, 5 May 95 09:35:57 EDT
Casimir effect around disclinations

Author: Fernando Moraes (Institute for Advanced Study, Princeton)
This communication concerns the structure of the electromagnetic quantum vacuum in a disclinated insulator. It is shown that a nonzero vacuum energy density appears when the rotational symmetry of a continuous insulating elastic medium is broken by a disclination. An explicit expression is given for this Casimir energy density in terms of the parameter describing the disclination.

CONDENSED MATTER THEORY, ABSTRACT COND-MAT/9505108
From: moraes@guinness.ias.edu (Fernando Moraes)
Date: Tue, 23 May 95 17:12:35 EDT
Enhancement of the magnetic moment of the electron due to a topological defect
Author: Fernando Moraes (Institute for Advanced Study, Princeton)
In the framework of the theory of defects/three-dimensional gravitation, it is obtained a positive correction to the magnetic moment of the electron bound to a disclination in a dielectric solid.

QUANTUM PHYSICS, ABSTRACT QUANT-PH/9506005
From: JAEKEL Marc
Date: Wed, 7 Jun 1995 16:30:40 +0200
Mechanical Effects of Radiation Pressure Quantum Fluctuations
Authors: Marc-Thierry Jaekel (Laboratoire de Physique Th\'eorique de l'Ecole Normale Sup\'erieure) , Serge Reynaud (Laboratoire Kastler-Brossel)
As revealed by space-time probing, mechanics and field theory come out as complementary descriptions for motions in space-time. In particular, quantum fields exert a radiation pressure on scatterers which results in mechanical effects that persist in vacuum. They include mean forces due to quantum field fluctuations, like Casimir forces, but also fluctuations of these forces and additional forces linked to motion. As in classical electron theory, a moving scatterer is submitted to a radiation reaction force which modifies its motional response to an applied force. We briefly survey the mechanical effects of quantum field fluctuations and discuss the consequences for stability of motion in vacuum and for position fluctuations.

QUANTUM PHYSICS, ABSTRACT QUANT-PH/9506006
From: JAEKEL Marc
Date: Wed, 7 Jun 1995 16:58:17 +0200
Quantum Fluctuations and Inertia
Authors: Marc-Thierry Jaekel (Laboratoire de Physique Th\'eorique de l'Ecole Normale Sup\'erieure) , Serge Reynaud (Laboratoire Kastler-Brossel)
Vacuum field fluctuations exert a radiation pressure which induces mechanical effects on scatterers. The question naturally arises

whether the energy of vacuum fluctuations gives rise to inertia and gravitation in agreement with the general principles of mechanics. As a new approach to this question, we discuss the mechanical effects of quantum field fluctuations on two mirrors building a Fabry-Perot cavity. We first put into evidence that the energy related to Casimir forces is an energy stored on field fluctuations as a result of scattering time delays. We then discuss the forces felt by the mirrors when they move within vacuum field fluctuations, and show that energy stored on vacuum fluctuations contributes to inertia in conformity with the law of inertia of energy. As a further consequence, inertial masses exhibit quantum fluctuations with characteristic spectra in vacuum.

QUANTUM PHYSICS, ABSTRACT QUANT-PH/9506023
From: claudia@cromwell.physics.uiuc.edu (Claudia C Eberlein)
Date: Thu, 15 Jun 95 11:13:57 -0500
Sonoluminescence as quantum vacuum radiation
Author: Claudia Eberlein (Dept of Physics, UIUC, Urbana, IL)
Sonoluminescence is explained in terms of quantum radiation by moving interfaces between media of different polarizability. It can be considered as a dynamic Casimir effect, in the sense that it is a consequence of the imbalance of the zero-point fluctuations of the electromagnetic field during the non-inertial motion of a boundary. The transition amplitude from the vacuum into a two-photon state is calculated in a Hamiltonian formalism and turns out to be governed by the transition matrix-element of the radiation pressure. Expressions for the spectral density and the total radiated energy are given.

HIGH ENERGY PHYSICS - THEORY, ABSTRACT HEP-TH/9508086
From: eli@ecm.ub.es (Emili Elizalde)
Date: Fri, 18 Aug 1995 10:14:50 +0200
A precise definition of the Casimir energy, Authors: K. Kirsten , E. Elizalde
The somehow arbitrary definition of the Casimir energy corresponding to a quantum system in a d-dimensional ultrastatic spacetime ---profusely used in the last years--- which has been critized sometimes for adopting without a sound argument the minimal subtraction scheme, is shown to be completely equivalent to the definition steming naturally from the concept of functional determinant through the zeta-function prescription. This is done by considering the theory at finite temperature and by defining then the Casimir energy as its energy in the limit $T\to 0$. The ambiguity in the coefficient $C_{d/2}$ is understood to be a result of the necessary renormalization of the free energy of the system. As an example, the Casimir energy corresponding to a general $(1+2)$-dimensional toroidal spacetime with flat spatial geometry,

parametrized by the corresponding Teichm\"uller parameters, and its precise dependence on these parameters is obtained under the form of an analytic function.

Ernest G. Cullwick. In his book "Electromagnetism and Relativity", published in 1957, was one of the first to provide an analysis of the probable coupling between EM and inertial fields. Cullwick realized that Maxwell's equations and most existing theories of electrodynamics assume that the mass of an electron is zero. At Maxwell's time this was a reasonable assumption. But it is well known today that electrons have mass, and therefore an inertial momemtum is always associated with an electric current. Cullwick suggested in his analysis that coupling terms between EM and inertia may be very small, but would likely appear sometime in the future as we go to higher current densities. And he was one of the first scientists to predict some of the odd effects which can now seen with superconductors. Cullwick was also one of the first to identify and attempt an analysis of the relativistic paradoxes and unusual effects which occur in a rotating EM field. His work still stands today as one of the only existing efforts to consider the problem of a rotating EM field.

AUTHOR: Cullwick, E. G. (Ernest Geoffrey), 1903-
TITLE: Electromagnetism and relativity : with particular reference to moving media and electromagnetic induction / by E. G. Cullwick.
EDITION 2d ed.
PUBL.: New York : J. Wiley,
DATE: 1959 (2nd Edition)
SUBJECT: Electromagnetic theory, Relativity (Physics)

AUTHOR: Cullwick, E. G. (Ernest Geoffrey), 1903-
TITLE: The fundamentals of electro-magnetism by E.G. Cullwick.
EDITION 3rd ed.
PUBL.: London, Cambridge U.P.,
DATE: 1966 (3rd Edition)
SUBJECT: Electromagnetism

AUTHOR: Cullwick, E. G. (Ernest Geoffrey), 1903-
TITLE: The fundamentals of electro-magnetism; a restatement for engineering students and others of physical and theoretical principles in accordance with modern scientific thought, by E. Geoffrey Cullwick ... With an appendix and numerous examples on the recently adopted M.K.S. system of practical units ...

PUBL.: New York, The Macmillan company; Cambridge, Eng., The University press,
DATE: 1939
SUBJECT: Electromagnetism

If you work out the metric for EM waves circulating in a cavity you get some strange results. There is a preliminary discussion of this effect in the article by Houshang Ardavan, 'Gravitational Waves from Electromagnetic Waves' in the book "Classical General Relativity," edited by W.B. Bonner, I.N. Islam and M.A.H. MacCollum (Cambridge Univ. Press, 1984).
It is something I have seen done. At the point in an annular cavity where the phase velocity goes from less than c to greater than c, a term shows up in the derived metric of the system that looks like a source term. On the other hand you have assumed that the metric is source free in the EM region of the cavity. So you get a solution which contradicts the hypothesis that went into building the solution. You get something which is possibly unphysical. Now Einstein's equation and the associated geometry is pretty tricky and it is easy to get unphysical solutions.
The final arbitors of whether a solution is satisfactory or not is physical reasonability and self consistancy (these are almost the same thing). The cavity problem seems very physically reasonable initially, but ends with a self-consistancy problem which appears to be unphysical.
Also, Cauchy's theorem does not apply to this case since it becomes a mixed type problem (elliptic and hyperbolic PDEs), so the Hawking singularity theorems don't a priori apply. It is something very interesting, but to publish it with out being scoffed at would take a lot of work and possibly inventing some new math.
-- Jim McClune, University of Missouri

ROTATING FIELDS IN GENERAL RELATIVITY, by Islam, J.N.
Begins with a short introduction to the relevant aspects of general relativity. This is followed by a detailed derivation of the Wehl-Lewis-Papapetrou form of the stationary axially symmetric metric. The Kerr and Tomimatsu-Sato forms of the rotating interior and exterior solutions of the Einstein equations are then considered.
Subject: physics
1985 6 X 9 122 pp. 4 diagrams
Hardback 0-521-26082-5 $47.95 (£7.99)

>If an EM field is somehow rotated extremely fast, shouldn't all
>matter be repelled from its center? -kgo.

How fast do you want it rotated? It's fairly simple to construct a system to produce rotating EM waves at whatever rotational velocity you wish by feeding a pair of broadside dipole arrays with quatrature phased waves. It is quite simple to construct a system that would have a rotational velocity of C within the uniform field area. It might also be fairly easy to do this with a Hemholtz coil arangement as well, but the broadside array will be much easier to do at easily engineerable frequencies.
Some really interesting paradoxes come about when the rotational frequency is high enough so that the rotational velocity exceeds C within the uniform field area of the arrays or within the hemholtz coils.
-- Robert Shannon

Ehrenfest Paradox (Ehrenfest, 1909) --
The special relativistic "paradox" involving a rapidly rotating disc. Since any radial segment of the disc is perpendicular to the direction of motion, there should be no length contraction of the radius; however, since the circumference of the disc is parallel to the direction of motion, it should contract.

Question -- by Kung Lo (October 1995):
Take a rigid disk of radius R and spin it up to angular velocity . As seen by an observer S that is at rest in the center of the disk, the radius is still R, but the circumference is contracted by the Lorentz effect. How is this possible?
More physically, if a fixed ring is just outside the spinning disk and placed with equally spaced markers on the rim of the disk and on the fixed ring, I know by symmetry that, when one marker on the disk is aligned with a marker on the ring, all pairs of markers must be aligned. This contradicts the fact that, for observer S, the distance between successive markers on the disk is reduced by the Lorentz factor.

Answer -- provided by David Djajaputra (November 1995):
It seems that the rotating disk paradox (it turned out to be Ehrenfest's paradox) has been extensively analyzed by many people (including Einstein himself, who developed general relativity to answer this problem, as one author speculates...). This I found from a nice paper :

O. Gron, "Relativistic description of a rotating disk"
Am. J. Phys. V43, 869 (1975), and all the references therein.

The key sentence in Gron's paper is at the end of Section IV:
"By definition a Born rigid motion of a body leaves lenghts unchanged, when measured in the body's proper frame . (...) A Born rigid motion is not a material property of the body, but the result of a specific

> program of forces designed to set the body in motion without
> introducing stresses. (...) A transition of the disk from rest to
> rotational motion, while it satisfies Born's definition of rigidity,
> is a kinematic impossibility"

With this kinematics the radius is R and the circumference is as measured by observer S (lab frame), but an observer riding on the disk will measure a distance R to the center and a distance around the circumference (he can do this measurement by slowly walking around the spinning disk with a meter tape). This is consistent with the usual Lorentz contraction . The point is that this is NOT a Born rigid motion. There is much more in Gron's paper.
-- Vittorio Celli

Several key pharases keep popping up regarding rotating fields, powerful magnetic pulsed fields, and 90 degree cross-field phase shifts.
For example, Preston Nicholes describes a device known as a Delta T antenna in the Montauk series of books. The Delta T antenna is described as a pyramidal structure, but lets just take two square loops, placed at 90 degrees to each other, and feed these two loops with an RF signal, also with a 90 degree phase shift, we will produce a rotating magnetic field within the loops (these loops share a common center point, and each loop is in a plane 90 degrees from the other)
The speed of rotation of this magnetic field is a direct function of the frequancy of the applied RF signal. At the center of the antenna, the rotational velocity is zero, but as you move out from the center, and rotational velocity increases. At some distance from center would reach the speed of light, dependant of the frequancy used.
One could imagine that the rotational velocity of this rotating magnetic field could reach the speed of light within the antenna structure itself if a way could be found to make the antenna much larger than a normaly resonant antenna would be for that same frequancy. At several hundred megahertz, a two meter per side square loop would have a rotational velocity well in excess of the speed of light within the antenna structure itself.
What effect would there be at the boundry where the rotational velocity reached, and then exceeded the speed of light. How could the magnetic field even propogate to the center of the antenna structure if it would have to move faster than light to reach that space? If hemholtz coils were used instead of loops, the magnetic field strength would be uniform inside the structure, how could the field strenght be uniform if there is not sufficient time for the field to propogate through the space inside the structure itself?
Could such an effect actually generate a wormhole like phenomena, at energy levels far below that of neutron stars and such? As the causal mechanism,

the magnetic field, is in roation, would this describe a traversable worm hole as has been postulated in relationship to rotating black holes?
-- Robert Shannon

Aono, Osamu, 1937-
Rotation of a magnetic field / Osamu Aono and Ryo Sugihara. Nagoya, Japan : Institute of Plasma Physics, Nagoya University, 1986. 6 p. ; 30 cm.
LC CALL NUMBER: QC717.6 .N35 no. 792 (ALTERNATE CLASS QC754.2.M3)
SUBJECTS: Magnetic fields. Electrodynamics.
Research report (Nagoya Daigaku. Purazumu Kenkyujo) ; IPPJ-792.

Let me clear this up a bit, the two coils are acting as antenne already, producing the rotating field by vector sumnation of the radiated quatrature phased EM waves. The loops would be operating as the driven elements of a cubical antenne, not as coils as such.
If you prefer, substitute the two loop antenne with a pair of crossed dipoles at 90 degrees, this will also produce the rotating field, but the center will be occupied by the dipoles rather than be open as with loop antenne of by using sets of broadside arrays. Note that this is not the same as the rotational speed reaching c inside the "uniform field" area, as described earlier. It's simple a tool to understsand the generation of the rotating field and the relationship between applied frequency and the resultant roational speed.
Rather than loop elements, in practice you might use a phased array of dipole elements that produces a constant phase plane wave, not unlike a pair of hemholtz coils produced a uniform field within the coil sets. Four of these "broadside arrays" would from the four sides of a cube, inside of which you could induce the fast rotating fields from the radiated EM waves.
In all cases, the driven elements are lauching EM waves a c. Only the vector sum of the two (of four) quatrature fields is in rotation, which leads us back the the question of what happens as the rotational velocity of the sum of these EM fields reaches c within the field generator, and there is not sufficient time for the fields to propogate accross the Vr=c boundry?
This is the point where two different physists have tried to lead me dowm the garden path of "red shifted magnetic fields". I'm not sure I'm ready to buy that concept just yet.
-- Robert Shannon

GENERAL RELATIVITY & QUANTUM COSMOLOGY, ABSTRACT GR-QC/9601034
From: Tevian Dray
Date: Mon, 22 Jan 1996 10:57:03 PST
The Rotating Quantum Vacuum

Author(s): Paul C. W. Davies , Tevian Dray , Corinne A. Manogue
Report-no: ADP 95-43/M36 (University of Adelaide)
We derive conditions for rotating particle detectors to respond in a variety of bounded spacetimes and compare the results with the folklore that particle detectors do not respond in the vacuum state appropriate to their motion. Applications involving possible violations of the second law of thermodynamics are briefly addressed.

I'm also saying that a pair of crossed coils will start behaving differently when the driving frequency is so high that the field lines near them try to exceed the speed of light. At low frequencies the coils create a rotating magnetic field. At high frequencies they send out radio waves having a rotating field vector (circularly polarized waves, in other words.) WITHIN the volume of the coils the fields still rotate, at least until the frequency is raised so high that the coils are many wavelengths across. At these frequencies the fields in the center of the crossed coils would be of complex shape, maybe some kind of contracting spiral. (Which is interesting, because at very high frequencies there would be a "hot spot" at the exact center of the crossed coils.)
-- Robert Shannon

On similar topic: anyone ever heard of the "CFA antenna" flap in the UK? CFA is for "crossed-field antenna." There were a bunch of articles and letters to the editor in EWW, "Electronics and Wireless World," the British engineering mag. The CFA-believers though they had discovered a way to make 1-foot antennas which were efficient at 100-meter wavelengths. The key to the CFA was to create the e- and b-fields separately: feed both a coil-loop and a pair of capacitor-spheres with separate high-current and high-voltage signals respectively, orient them 90deg to produce a broadside wave, shift the phases with L/C networks to form the proper EM wave (90? zero?), and then obtain a powerful EM emission from a tiny antenna. There was a great quantity of argument and name-calling over this, all done in slow-motion over many months of letters in the letters-to-the-editor column. Then it just died away. Either the pro-CFA side couldn't prove that it worked, or nobody believed the proof they did find.
-- William Beaty

And some comments about rotating EM fields by Dr Dennis Cravens in a report titled "Electric Propulsion Study", done for the Astronautics Laboratory at Edwards AFB. August 1990. Dennis Cravens was formerly with SAIC Corp, and is now working with CETI in development of cold

fusion. Anyway, here's some things he says in the electric propulsion report about the "peculiarities" of a rotating magnet:

ROTATION OF MAGNETS - There is a continuing debate in physics as to the reality of the magnetic field. The prime question is whether the axial magnetic field of a bar magnet rotates with the magnet or is stationary. The Faraday homopolar generator dates back to the 1830s. DePalma, Tewari, and others have attempted to utilize the Faraday generator to produce more power than needed to run it. Most objective reviews of the work have, however, failed to see such effects.

It is doubtful that these claims will be independently validated and even more doubtful that they will lead directly to a propulsive system. However, the work on homopolar generators as high current devices is reasonable and may be useful for ground uses. The angular momentum complications seem to rule the system out for any practical space applications.

SEARL EFFECT - The Searl Effect is a separate issue from homopolar generator above. Searl has claimed to produce disk levitation by rapidly rotating magnets. There have been claims of anti-gravity, high electric fields, perpetual motion, inertial loss, and gas ionization. All these claims come from Searl or those supportive of his work and no outside witnesses are available. Searl has not supplied any technical data or specifics of the operation in any easily referenced source. It is not recommended that his work be experimentally followed by the USAF. It is worth noting however, that a rotating magnet does have some definite theorectical peculiarities.

Through the years there have been many interesting developments concerning the Faraday Homopolar generator. DePalma has claimed to get more energy out than is supplied to the the generator. None of the claims seem to withstand careful examination and no machine has ever been made self driving. The underlying reason that such claims continue to surface is that rotating magnetic fields are extremely difficult to handle within existing theories. This is because for a rotating frame there is a distance (removed from the axis) which is travelling at velocities greater than c. Although the distance is not withing any real physical object, it's existence within the mathematical development greatly complicates any calculations.

DePalma B.E., "Electro-Mechanical Device for the Amplification of Electrical Power", The New Age Science Magazine, No 7, 1980

Tewari P., "Generation of Electrical Power from Absolute Vacuum
by High Speed Rotation of Conducting Magnetic Cylinder", Tech. Rep.
Dept. of Atomic Energy, Bombay India, 1985

Searl, J.R.R., British provisional patent specification #57578, 1970

These articles are indicative of studies of EM waves and rotating
bodies. It appears that when EM waves pass through rotating
dielectrics some unusual effects are predicted. This may lead
to some interesting future technology.
-- Dr Dennis Cravens

"Some Remarks on Scattering by a Rotating Dielectric Cylinder",
D. Schreiber, Journal of EM Waves and Applications, Vol 2 No2 1988

"Rotating Bodies and Electrodynamics in a Rotating Reference Frame",
I.B. Zeldovich and L.V. Rozhavskii, Radiofizka Vol 29 No 9, 1986

Here's an interesting news brief from Infinite Energy magazine,
July/Aug 1995, Dr Eugene Mallove - editor. (603)-228-4516

A bombshell paper has just been published in the American Journal
of Physics, Vol 63 No 8, August 1995, pages 694-705, "Maxwell's
Equations in a Rotating Medium: Is There a Problem?" by Gerald
N. Pellegrini and Arthur R. Swift (the latter of the Dept of
Physics and Astronomy, University of Massachusetts, Amherst MA)"

The paper is a direct challenge to Special Relativity. It proves
one of two things about a classic 1913 experiment of Wilson and
Wilson that was used to verify the prediction of relativity that
"a moving magnetic dipole develops an electric dipole moment.'
The conclusion of the paper is that Special Relativity does NOT
agree with this experiment -- and no one has ever challenged the
quality of the experiment.

Peregrinni told Infinite Energy that he thinks that all of
relativity as well as Maxwell's equations as descriptors of
EM radiation are now called into question.

The origin of the Montauk Project dates back to 1943 when radar
invisibility was being researched aboard the USS Eldridge. As the
Eldridge was stationed at the Philadelphia Navy Yard, the events
concerning the ship have commonly been referred to as the "Philadelphia
Experiment." The objective of this experiment was to make the ship

undetectable to radar and while that was achieved, there was a totally unexpected and drastic side effect. The ship became invisible to the naked eye and was removed from time and space as we know it. It went into 10-dimensional hyper-space. For further info into this, read the book called "Hyperspace" by Dr. Michio Kaku.
A movie called "The Philadelphia Experiment" was made, but delayed for two years as the Pentagon was able to halt its release.
After the war, research continued under the tutelage of Dr. John Von Neumann who had directed the technical aspects of the Phily Experiment.
A massive human factor study was also begun at Brookhaven National Labs on Long Island, New York -- known as the Phoenix Project.
The Montauk Project culminated on August 12, 1983. A full blown time portal was fully functioning, but things were out of control and the project was crashed. An unauthorized video has been widely distributed regarding this story and several lectures has been given on the Montauk Project. One science reported for the New York times started the project but tacked off when he discovered to his own surprise that the Montauk Project was indeed real.
Three books have been released by Preston Nichols, who was involved in the Project, and Peter Moon. They are
1) The Montauk Project: Experiments in Time - 1992
2) Montauk Revisited: Adventures in Synchronicity - 1994
3) Pyramids of Montauk Explorations in Consciousness-1995
This coming year, 1996, the next book will be out and the title will be "Montauk Reconciled"
-- Richard Frager

HIGH ENERGY PHYSICS - PHENOMENOLOGY, ABSTRACT HEP-PH/9412234
From: Michael Martin Nieto 505-667-6127
Date: Mon, 5 Dec 94 09:52:27 -0700
THEORETICAL MOTIVATION FOR GRAVITATION EXPERIMENTS ON ULTRA-LOW ENERGY
ANTIPROTONS AND ANTIHYDROGEN
Authors: Michael Martin Nieto , T. Goldman , John D. Anderson , Eunice L. Lau, J. Perez-Mercader
Comments: Written version of invited contribution to LEAP'94: Third Biennial Conference on Low-Energy Antiproton Physics.

We know that the generally accepted theories of gravity and quantum mechanics are fundamentally incompatible. Thus, when we try to combine these theories, we must beware of physical pitfalls. Modern theories of quantum gravity are trying to overcome these problems. Any ideas must confront the present agreement with general relativity, but yet be free to wonder about not understood phenomena, such as the dark matter problem and the anomalous spacecraft data which we announce here. This all has led some

``intrepid'' theorists to consider a new gravitational regime, that of antimatter. Even more ``daring'' experimentalists are attempting, or considering attempting, the measurement of the gravitational force on antimatter, including low-energy antiprotons and, perhaps most enticing, antihydrogen.

HIGH ENERGY PHYSICS - EXPERIMENT, ABSTRACT HEP-EX/9412018
From: PHILLIPS@hep.phy.duke.edu
Date: Fri, 30 Dec 1994 16:03:31 -0500 (EST)
A Technique for Directly Measuring the Gravitational Acceleration of Antihydrogen, By: Thomas J. Phillips, Duke University Durham
Comments: Written version of invited contribution to LEAP'94: Third Biennial Conference on Low-Energy Antiproton Physics.

The gravitational force on antimatter has never been directly measured. A method is suggested for measuring the acceleration of antimatter $(\overline g)$ by measuring the deflection of a beam of neutral antihydrogen atoms in the Earth's gravitational field. While a simple position measurement of the beam could be used, a more efficient measurement can be made using a transmission interferometer. A 1\% measurement of $\overline g$ should be possible from a beam of about 100,000 atoms, with the ultimate accuracy being determined largely by the number of antihydrogen atoms that can be produced. A method is suggested for producing an antihydrogen beam appropriate for this experiment.

HIGH ENERGY PHYSICS - PHENOMENOLOGY, ABSTRACT HEP-PH/9509336
From: Michael Martin Nieto 505-667-6127
Date: Tue, 19 Sep 95 14:08:11 -0600
Antimatter Gravity and Antihydrogen Production
Authors: Michael H. Holzscheiter , T. Goldman , Michael Martin Nieto

Certain modern theories of gravity predict that antimatter will fall differently than matter in the Earth's gravitational field. However, no experimental tests of gravity on antimatter exist and all conclusions drawn from experiments on matter depend, at some level, on a specific model. We have proposed a direct measurement that would compare the gravitational acceleration of antiprotons to that of negatively charged hydrogen ions. Substantial progress towards the development of this experiment has been achieved. Based on our work a number of alternative proposals for measuring ``g'' on both charged and neutral antimatter have been made. We summarize the present status of our experiment and also discuss the steps that would be necessary to produce antihydrogen in an environment suitable for gravity measurements.

Hi Robert, I have one reference for you. The book is called

"Suppressed Inventions and other Discoveries". It's an anthology edited by Jonathon Eisen. Authors include: Dr. Brian O'Leary, Christopher Bird, Jeanne Manning, Barry Lynes, and others. As well as Townsend Brown, the inventers/doctors (as well as inventions the book also covers various cancer treatments which have had research suppressed) who are discussed include Naessons, RifeHoxsey, Gerson, Tesla, Brown, Reich and others.

The book covers free energy, various "unfree" though different motive technologies, cancer cures which have worked but not seen approval by the AMA, Roswell, the Mars face, and as a delight to conspiracy buffs, there are also chapters on how various Government bodies have suppressed these technologies, as well as how the AMA came to be all powerful in the field of suppressing alternate treatments.

The book is published by:
Auckland Institute of Technology Press
Private Bag 92006
Auckland, New Zealand

ISBN No. 0-9583334-7-5

For further research, consult the following sources:

Fer-de-Lance by T.E. Beardon
Tesla Book Company
P.O. Box 121873
Chula Vista, CA 91912 USA

Leading Edge Research Group
(Leading Edge Journal #77 12/94)
P.O. Box 7530 Ste 58
Yelm, Washington 98597 USA

Nexus Magazine
P.O. Box 66
8400 AB Gorredijk
The Netherlands
Tel/Fax: 31-(0)5133-5567

The information on the electrogravitics reference list which is of particular interest to me are the Laithwaite and Wallace references. I think my work (Electrical-Dipole Theory of Gravitation) explains what they were observing and why. Here are some additional references.
-- Ralph Sansbury

Fischbach, Sudarsky, Szafer, Talmadge, and Aronson in
"Reanalysis of the Eotvos Experiment" (Phys Rev Let vol 56 p3 6/1/86)

J.H. Pratt and G.B. Airy 1855 Phil Trans v145

Fredrich Zollner, Explanation of Universal Gravitation through
the Static Action of Electricity and the General Importance
of Weber's Laws, 1882

Immanuel Velikovsky, Cosmos without Gravitation, 1964

V. A. Bailey In the May 14 , 1960 issue of Nature

P.M.S. Blackett In the May 17, 1947 issue of Nature

T. Gold in a later issue (April 2, 1949) of Nature

Henry Wallace US patent number 3 626 605

P.S. Wesson Phys Rev D v23 p1730 (1981)

Sansbury R.N. Electrical Engineering Times (12/28/87)

Sansbury R.N. US patent number 4,355,195

Sansbury R.N. Rev. Sci. Instr. (3/85)

Bartlett D.F. Rev.Sci. Instr. (10/90)

Peter Graneau, Nature v295 1982 p311

Weiskopf M.C., Carrico, Gould, Lipworth and Stein, Physical
Review Letters 1968, vol21 p1645

Coles and Good, Physical Review 1946 p979

Kaufmann W. p502 in World of the Atom by H. Bourse and L. Motz

W.J. Duffin, Electricity and Magnetism Wiley 1973

R.A. Tricker, Early Electrodynamics Pergamon Oxford 1965

Paper: gr-qc/9410019
From: Peter Marzlin

Date: Mon, 17 Oct 94 12:50:28 +0100
THE DIPOLE COUPLING OF ATOMS AND LIGHT IN GRAVITATIONAL FIELDS,
Karl-Peter Marzlin, 10 pages, LaTeX

The dipole coupling term between a system of N particles with total charge zero and the electromagnetic field is derived in the presence of a weak gravitational field. It is shown that the form of the coupling remains the same as in flat space-time if it is written with respect to the proper time of the observer and to the measurable field components. Some remarks concerning the connection between the minimal and the dipole coupling are given.

The level of difficulty in the above paper is well beyond my grasp. But what is clear is that it presents an analysis which strongly suggests that the textbook wavefunctions for electrons within atomic matter can be best described by the dipole coupling rather than the coulomb gauge. The paper also relates the dipole coupling to a weak gravitational field. The last paragraph of the paper provides substance to the idea that gravity is at least in part, an electric dipole phenomena. Here is the last paragraph:

"It is interesting to make a comparison of the present results with the well known formal equivalence between the Maxwell field in curved space and in a dielectric medium (23). In this approach one defines a formal dielectric displacement vector to describe the influence of gravity on the Maxwell field. In the absence of particles, i.e. for vanishing polarisation P, the formal electric displacement agrees with the vector delta defined above. Also the coupling of the Poynting vector to the rotation occurs in the energy of the formal Maxwell field."

The paper referenced (23) is:

A.M. Volkov, A.A. Izmest'ev, and G.V. Skrotskii,
Soviet Physics JETP 32, page 686, (1971)

Note: There are a variety of other theories and experiments which attempt to show that a static gravitational field is identical to that which results from electric dipole moments -- a polarisation of the vacuum. And conversely, it is well know that if you accelerate a dielectric material, or in "equivalence" subject a dielectric material to a gravitational field or other mechanical force -- an electric field due to dipole moment (polarisation P) will be generated within the material. This effect is especially prevalent in structured crystal dielectrics (piezoelectric materials), which are used as transducers in accelerometer sensors. You can also find piezoelectric material, and conversion of mechanical force to a high voltage electric field, in push-button spark igniters used on gas grills and cigarette lighters.

Here's a thought. To enlighten those folks who continue to stubbornly try to debunk the evident relationship between gravitation and electromagnetics -- insert one of these spark igniters in a neuro-sensitive body cavity, and click it as many times as necessary.

One issue with the electrostatic dipole hypothesis is that once the magnetic effects of spin etc have been considered there is no evidence of such dipoles inside atomic nuclei and electrons. However if magnetic properties of nuclei and electrons can be represented in terms of electrostatic dipoles as recent experiments and theoretical discussion seem to indicate then this objection is avoided. The dipole can be produced by a negatively oriented particle orbiting a positive central particle so that the combination has a net positve charge (see Rev Sci Instr Mar 1985 and Geomagnetism: Gravity Measured by Magnetic Materials, ICP Press, Box 492 NY NY 10185 $25US 1994 by R Sansbury) An added benefit: the observed quadrapole in nuclei and electrons makes more sense in a physically real Taylor expansion by the inclusion of an observed dipole term as well; that is the dipole term is not observed because its effects are wrongly attributed to another cause, magnetism; thus magnetism is properly regarded as a derived apparently separate force like the Coriolis sideways force on bodies moved radially on a rotating platform.
-- Ralph Sansbury

About electric dipole precession. The article "Electricity" in Britannica includes a resonance equation for dipole precession in dielectrics. It was identical in form to the one used in magnetic resonance, except for the obvious differences in units. Dielectric precession (resonance) frequencies were in the optical range.
Brown didn't use resonance; but he did use a steady frequency. His frequency, too, would damp out if it were discontinued. Greater results than Brown's could probably be achieved with lasers. But I doubt you'll find a better description of dielectric dipole resonance. The Britannica article gives the mathematics.

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van der Waals force (J.D. van der Waals) --
Forces responsible for the non-ideal behavior of gases, and for the lattice energy of molecular crystals. There are three causes: dipole-dipole interaction; dipole-induced dipole

moments; and dispersion forces arising because of small instantaneous dipoles in atoms.

"The Electric Dipole Moment of the Electron", Bernreuther & Suzuki, Reviews of Modern Physics, April 1991 vol 63 no 2

-- An electron or any other elementary particle can possess an electric moment (EDM) only by virtue of an interaction that violates parity and time-reversal invariance. The question of whether an electron EDM exists is thus related directly to the unsolved problem of CP violation. According to the standard model, in which CP violation is accounted for in terms of the Kobayashi-Maskawa matrix, the electron EDM is predicted to be far too small to be observed experimentally. However, a number of alternative teoretical models of CP violation predict larger values of the electron EDM. These models are of special interest now, when experimental limits on the electron EDM are improving substantially.

"The Electron Electric Dipole Moment for a CP-violating Neutral Higgs Sector", J.F. Gunion, Physics Letters: Part 8, Nov 8 1990

"New Experimental Limit on the Electron Electric Dipole Moment", Abdullah & Commins, Physical Review Letters, Nov 5 1990

"The Standard Model Prediction for the Electric Dipole Moment of the Electron", F. Hoogeveen, Nuclear Physics B, Sep 10 1990

"Electric Dipole Moment of the Electron and the Neutron", S.M Barr, Physical Review Letters, July 2 1990, Vol 65 No 1

"Effective Hamiltonian for the Electric Dipole Moment of the Neutron", Boyd, Gupta & Trivedi, Physics Letters: Part 8, May 24 1990

"A search for the Electric Dipole Moment of the Neutron", K.F. Smith, Physics Letters: Part 8, Jan 4 1990, Vol 234 No 1/2

"Interpretation of the Neutron Electric Dipole Moment: Possible Relationship to Epsilon", Booth, Briere & Sachs, Physical Review D Jan 1 1990, Vol 41 No 1

"Inclusion of the Toroidal-Moment Contribution in the Probability of the Electric Dipole Transition", R.G. Nazmitidinov, Soviet Journal of Nuclear Physics, Sep 1 1990, Vol 53 No 2

But what is the thing in atomic nuclei that collectively
produces the gravitational field of the Earth etc. and which
causes individual nuclei to react in the prescribed manner?
The hypothesis proposed is that atomic nuclei contain small
electrostatic dipoles (10^-37C.-m.) with radial and longitudinal
components transverse to the west to east spinning direction of
the Earth etc. Such dipoles explain the nuclear magnetic moment
and electrostatic quadrapole moment inferred from the hyperfine
spectra emitted by some excited atoms and the deflection of molecules
such as orthohydrogen in a magnetic field (but not parahydrogen
because the magnetic moments are anti parallel in pairs and cancel)

The Cavendish measurement of the horizontal gravitational
force between two lead spheres instead of being attributed to
the small masses of each can be attributed to the small
horizontal component of the radial force, directed to the center
of the Earth, due to the mass of the Earth on each of the small
masses. That is gravity is not a property of mass per se but
only of spinning mass.

The atomic nuclei of all elements, except iron, cobalt, and
nickel primarily, tend to line up in the direction of the
surrounding atomic nuclei when the bulk object of which they are
a part is moved but in the case of the magnetic elements the
bulk material must also move to complete the required alignment,
hence the north south and downward movement of a magnetized
steel compass needle. Hence the Wilson-Blackett proportionality
between the angular momentum of planets, stars etc and their
magnetic moment where the constant of proportionality is the
square root of the gravitational constant divided by the speed
of light. For more information see Science News Aug 6 '94 p82.
- Ralph Sansbury

Edward Teller, "Electromagnetism and Gravitation", Proceeds of the
National Academy of Science, Vol 74 No 4, Pages 2664-2666.

In this paper Dr Teller suggests some clues about the coupling
between electromagnetism and gravitation. In the first part of his
paper Teller describes how an electric field due to polarization
can be induced in a dielectric material which is subject to angular
or linear acceleration, or if subject to a gravitational field. In
the second part of the paper Teller describes, using purely dimenensional
analysis, how a magnetic field might be produced by a spinning mass.
He also comments that the magnitude of this magnetic field might be
exceedingly small, and notes that a "numerical" factor could exist

which might act to increase the magnitude of the field.

(Note: It is speculated by others that alignment of microscopic
particles with the macroscopic spin axis of the earth, could result
in a large "numerical" factor. Fact is, the earth does have a fairly
large measurable magnetic field, about which there are a variety of
theories as to the origin.)

Paper: hep-th/9506049
From: HORIE@dipmza.physik.Uni-Mainz.DE
Date: Thu, 08 Jun 1995 11:23:23 +0100
Title: New Insight into the Relation between Torsion and Electromagnetism
Author: Kenichi Horie (Mainz Univ.)
Report-no: MZ/TH 95-16
In several unified field theories the torsion trace is set equal to
the electromagnetic potential. Using fibre bundle techniques we show
that this is no leading principle but a formal consequence of
another geometric relation between space-time and electromagentism.

HIGH ENERGY PHYSICS - THEORY, ABSTRACT HEP-TH/9409018
From: HORIE@VIPMZw.physik.Uni-Mainz.DE
Date: Sat, 03 Sep 1994 10:27:48 +0100
GEOMETRIC INTERPRETATION OF ELECTROMAGNETISM IN A GRAVITATIONAL THEORY WITH
SPACE--TIME TORSION BY KENICHI HORIE, INSTITUT FUR PHYSIK, JOHANNES GUTENBERG--UNIVERSIT"AT MAINZ, D--55099 MAINZ, GERMANY,
A complete geometric unification of gravity and electromagnetism is
proposed by considering two aspects of torsion: its relation to spin
established in Einstein--Cartan theory and the possible
interpretation of the torsion trace as the electromagnetic
potential. Starting with a Lagrangian built of Dirac spinors,
orthonormal tetrads, and a complex rather than a real linear
connection we define an extended spinor derivative by which we
obtain not only a very natural unification, but can also fully
clarify the nontrivial underlying fibre bundle structure. Thereby a
new type of contact interaction between spinors emerges, which
differs from the usual one in Einstein--Cartan theory. The splitting
of the linear connection into a metric and an electromagnetic part
together with a characteristic length scale in the theory strongly
suggest that gravity and electromagnetism have the same geometrical
origin.

"Gauge Invariant Electromagnetic Coupling with Torsion Potential", Richard
T. Hammond, General Relativity and Gravitation, Vol 23 No 11 1991
Electromagnetism is coupled to torsion in a gauge invariant manner

by relaxing minimal coupling and introducting into the Lagrangian a term bilinear the electromagnetic field tensor and its torsion potential. The resulting coupling between electromagnetism and torsion is examined and a solution corresponding to traveling coupled waves is given. Since torsion is usually regarded as resuting from the spin of a body, this might establish a classical relationship between charge and spin. The results suggest that the effect should be looked for in high intensity electric fields of low frequency.

"Detecting Torsion from Massive Electrodynamics", L.C. Garcia de Andrade, and M. Lopes, General Relativity and Gravitation, Vol 25 No 11 1993
A new method of detecting torsion in the case of massive electrodynamics is proposed. Several authors have proposed methods for the detection of torsion in theories of the Einstein-Cartan type, and also in theories where the torsion field propogates. These theories are based on the studies of Dirac test particles, which have spin like the electron, and the gyroscope-like precession of these atomic particles. The interaction energy between the torsion vector Q, and an electric dipole p, is given by (p dot Q).

AUTHOR(s): de Andrade, L.C. Garcia
TITLE(s): Electron gyroscopes to test torsion gravity?
In: Il nuovo cimento delle societa italiana di fisic
OCT 01 1994 v 109 n 10 Page: 1123

AUTHOR: De Sabbata, Venzo.
TITLE: Spin and Torsion in Gravitation
by Venzo de Sabbata, and C. Sivaram.
PUBL.: Singapore ; River Edge, NJ : World Scientific,
FORMAT: xii, 313 p. : ill. ; 23 cm.
DATE: 1994
SUBJECTS: Torsion, Gravitation

AUTHOR: De Sabbata, Venzo.
TITLE: Introduction to Gravitation
by Venzo de Sabbata and Maurizio Gasperini.
PUBL.: Singapore ; Philadelphia : World Scientific,
FORMAT: ix, 346 p. : ill. ; 23 cm.
DATE: 1985
SUBJECTS: General relativity, Torsion, Gravitation

AUTHOR: NATO Advanced Study Institute on Cosmology and Gravitation (1979: Bologna, Italy)
TITLE: Cosmology and Gravitation: Spin, Torsion, Rotation, and Supergravity
Edited by Peter G. Bergmann and Venzo De Sabbata.

PUBL.: New York : Plenum Press : NATO Scientific Affairs Division,
FORMAT: ix, 510 p. : ill. ; 26 cm.
DATE: 1980
SERIES: NATO Advanced Study Institutes Series v 58 Series B Physics
---

CONFERENCE :International Conference on Magnetic and Electric Resonance and Relaxation (1962: Eindhoven)
TITLE :Magnetic and electric resonance and relaxation; proceedings of the XIth Colloque Ampere, Eindhoven, July 2-7, 1962.
PUBLISHED :Amsterdam, New York, North-Holland Pub. Co.; Interscience Publishers, 1963.
DESC :xi,789p. illus.,diagrs.,tables. 24cm.

The Lorentz-Dirac equation is a purely classical expression for the electromagnetic force on a point charge, including the self-force from the particle's own radiation. It's a strange equation, with solutions that are manifestly unphysical under certain circumstances. If you want to know more about it, you might want to look at:

S. Parrott, Relativistic Electrodynamics and Differential Geometry, Springer-Verlag, 1987.

GENERAL RELATIVITY & QUANTUM COSMOLOGY, ABSTRACT GR-QC/9403058
PHYS. REV. D50 (1994 3867) carroll@marie.mit.edu (Sean Carroll)
Tue, 29 Mar 1994 19:57:32 -0500
CONSEQUENCES OF PROPAGATING TORSION IN CONNECTION-DYNAMIC THEORIES OF
GRAVITY, BY SEAN M. CARROLL AND GEORGE B. FIELD, 16 PAGES PLUS ONE FIGURE
(PLAIN TEX), MIT-CTP #2291.
We discuss the possibility of constraining theories of gravity in which the connection is a fundamental variable by searching for observational consequences of the torsion degrees of freedom. In a wide class of models, the only modes of the torsion tensor which interact with matter are either a massive scalar or a massive spin-1 boson. Focusing on the scalar version, we study constraints on the two-dimensional parameter space characterizing the theory. For reasonable choices of these parameters the torsion decays quickly into matter fields, and no long-range fields are generated which could be discovered by ground-based or astrophysical experiments.

GENERAL RELATIVITY & QUANTUM COSMOLOGY, ABSTRACT GR-QC/9304047

From: KUBYSHIN%EBUBECM1.BITNET@FRMOP11.CNUSC.FR
Date: Sun, 02 May 93 12:55:30 BCN
INVARIANT CONNECTIONS WITH TORSION ON GROUP MANIFOLDS AND THEIR APPLICATION
IN KALUZA-KLEIN THEORIES, KUBYSHIN YU.A., MALYSHENKO V.O. AND MARIN RICOY D.

Invariant connections with torsion on simple group manifolds S are studied and an explicit formula describing them is presented. This result is used for the dimensional reduction in a theory of multidimensional gravity with curvature squared terms on M^{4} times S. We calculate the potential of scalar fields, emerging from extra components of the metric and torsion, and analyze the role of the torsion for the stability of spontaneous compactification.

Subject: Antigravity in Jane's
From: "Terry Colvin"

"All those interested in advanced propulsion concepts should check out Jane's Defence Weekly, 10 June 1995. An article discusses anti-gravity schemes and shows drawings of sauceroid vehicles from British Aerospace among others. Area 51 is mentioned, as well as an unclassified paper done for the USAF by Science Applications International Corp. in 1990. The subject was [Electric Propulsion], a[n] euphemism for anti-gravity according to Jane's. Michael Flora"

Anti-Gravity for Real -- Discussed in Jane's Defence Weekly

Jane's Defence Weekly is a most respected journal in the defense industry. Jane's has often been the first to break the news about secret development of radically new technologies and equipment.

Jane's Defence Weekly of 10 June 1995, has an article about advanced aerospace technologies, written by Nick Cook. The idea of anti-gravity is taken seriously and is auspicously present throughout the article -- including three artist renditions of future anti-gravity based craft.

The Jane's article commences with a mention of anti-gravity technology, and also ends with a few paragraphs discussing anti-gravity. In between is the bulk of the article, which consists of discussion of "conventional" subjects, including: Hypersonics, Gas Turbine Inrements, The Super Cockpit, and Stealth.

At the start of the Jane's article there is some information from the Gravity Rand Report on Electrogravitics which was done for the USAF in 1956, and was recently declassified. Here's an excerpt from the beginning of the Jane's article.

> Take this example from a specialist US aviation magazine in 1956. "We're already working with equipment to cancel out gravity," Lawrence D Bell, founder of the company that bears his name was quoted as saying. Bell, apparently, was not the only one working in this field. Others said to be seeking to master this arcane 'science' included the Glenn L Martin Company, Convair, Lear, and Sperry Gyroscope. Within a few years we were assured, aircraft, cars, submarines and power stations would all be driven by this radical new propulsion technology. Sadly it was not to be.

Here's the ending section of the Jane's article.

> BEYOND 2001
> Groom Lake Nevada is the epicentre of classified USAF research into Stealth and other exotic aerospace technologies. Several years after the collapse of the Soviet threat, activity and investment at this remote, highly secret air base (so secret its prescence is, as yet, unacknowledged by the US government) is still on the increase. While research into less sensitive technologies such two-dimensional thrust-vectoring and advanced short take-off and vertical landing (ASTOVL) are pursued in the open at nearby Edwards AFB in California, Groom Lake is set to hang onto its secrets. The USAF's recent confiscation of 1600 acres of public land bordering the facility is consistent with the Pentagon's desire to maintain its lead in quantum leap technologies -- some of which, according to well qualified observers in and around the Nevada area, defy current thinking into the predicted direction of aerospace engineering.
>
> That aerospace ocmpanies continue to look at highly radical alternative air vehicle concepts is evidence of the ongoing quest for breakthrough designs. Glimpses into this world are rare, but provide some insight into likely 21st century research activity. The 1990 unclassified 'Electric Propulsion Study' (a quest for antigravity propulsion system by another name) conducted by the USA's Science Application International Corp (SAIC) on behalf of USAF's then Astronautics Laboratory at Edwards AFB shows that USAF visionaries are still being given free reign. Until recently BAe (British Aerospace) also provided internal resources for its own anti-gravity studies and even

went so far as to outline this thinking with artists' concepts -- a case of Lawrence Bell's vision perhaps being not so wide of the mark after all.

Before he died, Ben Rich, who headed Lockheed's Skunk Works from 1975-1991, was quoted as saying: "We have some new things. We are not stagnating. What we are doing is updating ourselves, without advertising. There are some new programmes, and there are certain things -- some of them 20 to 30 years old -- that are still breakthroughs and appropriate to keep quiet about. Other people don't have them yet.

Thirty years from now, we may still not know the half of what is currently being tested in and around Groom Lake.

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AUTHOR(s): McIntosh, C.B.G. Arianrhod, R. Wade, S.
TITLE(s): Electric and magnetic Weyl tensors: classification and analysis.
In: Classical and quantum gravity.
JUN 01 1994 v 11 n 6 Page 1555

AUTHOR(s): Arianrhod, R. Lun, A.W.-C. McIntosh, C.B.G.
TITLE(s): Magnetic curvatures.
In: Classical and quantum gravity.
SEP 01 1994 v 11 n 9 Page 2331

AUTHOR(s): Arianrhod, R. McInthosh, C.B.G.
TITLE(s): Principle null directions of Petrov type I Weyl spinors: geometry and symmetry.
In: Classical and quantum gravity.
AUG 01 1992 v 9 n 8 Page 1969

AUTHOR(s): Hoenselaers, C. Perjes, Z.
TITLE(s): Multipole moments of axisymmetric electrovacuum spacetimes.
In: Classical and quantum gravity.
OCT 01 1990 v 7 n 10 Page 1819

AUTHOR(s): de Felice, Fernando Yu, Yunqiang Fang, Jing
TITLE(s): Relativistic charged spheres.
In: Monthly notices of the royal astronomical societ

NOV 01 1995 v 277 n 1 Page: L17

AUTHOR(s): de Felice, Fernando
TITLE(s): Dynamics on a rotating disk.
In: Physical review. A, Atomic, molecular, and opt
NOV 01 1995 v 52 n 5 Page 3452

AUTHOR(s): de Felice, Fernando Yu, Yunqiang Coriasco, Sandro
TITLE(s): The Lynden-Bell and Katz Definition of Gravitational Energy: Applications to Singular Solutions.
In: General relativity and gravitation.
AUG 01 1994 v 26 n 8 Page 813

AUTHOR(s): Cavaglia, Marco de Alfaro, Vittorio de Felice, Fernando
TITLE(s): Anisotropic wormhole: Tunneling in time and space.
In: Physical review d: particles, fields, gravitat
JUN 15 1994 v 49 n 12 Page 6493

AUTHOR(s): de Felice, Fernando
TITLE(s): Rotating frames and measurements of forces in general relativity.
In: Monthly notices of the royal astronomical societ
SEP 15 1991 v 252 n 2 Page 197

AUTHOR(s): Hammond, Richard
TITLE(s): Tetrad Formulation of Gravity with a Torsion Potential.
In: General relativity and gravitation.
NOV 01 1994 v 26 n 11 Page 1107

AUTHOR(s): Hammond, Richard
TITLE(s): Spin, Torsion, Forces.
In: General relativity and gravitation.
MAR 01 1994 v 26 n 3 Page 247

AUTHOR(s): Hammond, Richard T.
TITLE(s): Gauge Invariant Electromagnetic Coupling with Torsion Potential.
In: General relativity and gravitation.
NOV 01 1991 v 23 n 11 Page 1195

AUTHOR(s): Hammond, Richard T.
TITLE(s): Magnetic Charge Type Equations from Torsion.
In: General relativity and gravitation.
SEP 01 1991 v 23 n 9 Page 973

AUTHOR(s): Hammond, Richard T.

TITLE(s): Dynamic Torsion from a Linear Langrangian.
In: General relativity and gravitation.
APR 01 1990 v 22 n 4 Page 451

AUTHOR(s): Ringermacher, H.I.
TITLE(s): An electrodynamic connection.
In: Classical and quantum gravity.
SEP 01 1994 v 11 n 9 Page 2383

AUTHOR(s): Anandan,J. Hagen, C.R.
TITLE(s): Neutron acceleration in uniform electromagnetic fields.
In: Physical review. A, Atomic, molecular, and opt
OCT 01 1994 v 50 n 4 Page 2860

AUTHOR(s): Anandan, J.
TITLE(s): Relativistic gravitation and superconductors.
In: Classical and quantum gravity.
JUN 01 1994 v 11 n 6A Page 23

AUTHOR(s): Georgiou, A.
TITLE(s): Rotating Einstein-Mazwell fields: smoothly matched exterior and interior spacetimes with charged dust and surface layer.
In: Classical and quantum gravity.
JAN 01 1994 v 11 n 1 Page 167

AUTHOR(s): Unnikrishnan, C.S.
TITLE(s): Experimental gravitation in India: progress and challenges.
In: Classical and quantum gravity.
JUN 01 1994 v 11 n 6A Page 195

AUTHOR(s): Cowsik, R. Tandon, S.N. Unnikrishnan, C.S.
TITLE(s): Limit on the strength of intermediate-range forces coupling to isospin.
In: Physical review letters.
NOV 07 1988 v 61 n 19 Page 2179

AUTHOR(s): Banerjee, A. Panigrahi, D. Chatterjee, S.
TITLE(s): Evolution of Kaluza-Klein inhomogeneous model with a cosmological constant.
In: Journal of mathematical physics.
JUL 01 1995 v 36 n 7 Page 3619

AUTHOR(s): Chatterjee, S. Panigrahi, D. Banerjee, A.
TITLE(s): Inhomogeneous Kaluza-Klein cosmology.
In: Classical and quantum gravity.

FEB 01 1994 v 11 n 2 Page 371

It might interest antigravity researchers to know (for those not already aware) that Professor ER Laithwaite, a respected British electrical engineer, has been doing work on this very subject for decades, but when he tried to demonstrate the viability of his theories to his peers their closed minds closed ranks and ridiculed his efforts as fantasy. Laithwaite lost cred with the scientific community and had to rely just on one or two close associates in semi-secrecy.

A recent (a year or two ago) series of TV programmes in Britain (on controversial scientific discoveries that have yet to accepted by the scientific establishment as worthy of further research and funding) ran an episode on Laithwaite. He claimed that gyroscopes could transfer mass.

I know of one book he wrote: Transport Without Wheels published by Paul Elek in 1977 ISBN 0236400665 (info from an old note I made) though this is NOT specifically about his antigravity theories (I remember that it concentrated on propulsion via electrical rails) I would be most interested in learning about anything he (or anyone else) might have written specifically on his antigravity work.
- George Szaszvari

"Propulsion by Gyro", Eric Laithwaite, Space, Sep 1989 Vol 5 No 5
In an attempt to reveal the strange, hidden properties of gyroscopes, Professor Eric Laithwaite explains the physics behind the idea that a propulsion system could be built using gyros.

AUTHOR(s): Ljubicic, A. Zovko, N.
TITLE(s): Lorentzian component of the fifth force.
In: Fizika B.
JAN 01 1992 v 1 n 1 Page: 1

AUTHOR(s): Bertotti, B. Sivaram, C.
TITLE(s): Radiation of the <> field.
In: Il Nuovo cimento della Societa italiana di fisic
NOV 01 1991 v 106 n 11 Page: 1299

AUTHOR(s): Fujii, Y.
TITLE(s): The Theoretical Background of the Fifth Force.
In: International journal of modern physics. a, pa
AUG 20 1991 v 6 n 20 Page: 3505

AUTHOR(s): Mannheim, Philip D.

TITLE(s): General Relativity and Fifth Force Experiments.
In: Astrophysics and space science.
JUL 01 1991 v 181 n 1 Page: 55

AUTHOR(s): Cho, Y.M. Park, D.H.
TITLE(s): Fifth Force from Kaluza-Klein Unification.
In: General relativity and gravitation.
JUL 01 1991 v 23 n 7 Page: 741

AUTHOR(s): Fujii, Y.
TITLE(s): Locally varying particle masses due to a scalar fifth-force field.
In: Physics letters: [Part B]
FEB 14 1991 v 255 n 3 Page: 439

AUTHOR(s): Hagiwara, Yukio
TITLE(s): No gravimetric evidence for the fifth force?
Summary: TEXT IN JAPANESE
In: Chigaku zasshi =
1991 v 100 n 3 Page: 429

AUTHOR(s): Cho, Y.M. Park, D.H.
TITLE(s): Higher-dimensional unification and fifth force.
In: Il nuovo cimento delle societa italiana di fisic
AUG 01 1990 v 105 n 8/9 Page: 817

AUTHOR(s): Sardanashvily, G.
TITLE(s): The Gauge Model of the Fifth Force (E,SUM).
In: Acta physica Polonica, B.
AUG 01 1990 v 21 n 8 Page: 583

AUTHOR(s): Schimdt, H.-J.
TITLE(s): Fifth force, dark matter, and fourth-order gravity.
In: Europhysics letters.
AUG 01 1990 v 12 n 7 Page: 667

AUTHOR(s): de Sabbata, Venzo Sivaram, C.
TITLE(s): Fifth Force as a Manifestation of Torsion.
In: International journal of theoretical physics.
JAN 01 1990 v 29 n 1 Page: 1

AUTHOR(s): Timoshenko, E.G. Sardanashvily, G.A.
TITLE(s): Gauge model for the fifth force.
In: Moscow university physics bulletin.
1990 v 45 n 4 Page: 73

AUTHOR(s): Hagiwara, Yukio
TITLE(s): The fifth force-doubt about newton's gravitational law
Summary: TEXT IN JAPANESE
In: Chigaku zasshi =
1990 v 99 n 3 n 904 Page: 263

AUTHOR(s): Gasperini, M.
TITLE(s): Phenomenological consequences of a direct fifth force coupling to photons.
In: Physical review. D, Particles and fields.
NOV 15 1989 v 40 n 10 Page: 3525

AUTHOR(s): Gasperini, M.
TITLE(s): Fifth force and the gravi-magnetic hypothesis..
In: Physics letters: [part A]
OCT 02 1989 v 140 n 6 Page: 271

AUTHOR(s): Fayet, P.
TITLE(s): The fifth force charge as a linear combination of baryonic, leptonic (or B-L) and electric charges.
In: Physics letters: [Part B]
AUG 17 1989 v 227 n 1 Page: 127

AUTHOR(s): Mufti, A. Kwong, N.H. Schaudt, K.J.
TITLE(s): Search for the fifth force using Gauss's law.
In: Physics letters: [part A]
JUL 31 1989 v 139 n 3 / 4 Page: 115

AUTHOR(s): Bizzeti, P.G.
TITLE(s): Search for a Composition-Dependent Fifth Force.
Summary: A differential accelerometer consisting of a solid sphere floating freely inside a stratified saline solution has been used to search for a composition-dependent force, originated by a mountain relief. No evidence of such a force has been obtained.
In: Physical review letters.
JUN 19 1989 v 62 n 25 Page: 2901

AUTHOR(s): T.M. Aliev, Dobroliubov, M.I. Ignatiev, A. Yu.
TITLE(s): Do Kaon decays constrain the fifth force?
In: Physics letters: [Part B]
APR 20 1989 v 221 n 1 Page: 77

AUTHOR(s): Riveros, C. Logiudice, E. A. Vucetich, H.
TITLE(s): On differential fifth force measurements.
In: Physics letters: [part A]

APR 17 1989 v 136 n 7/8 Page: 343

AUTHOR(s): Kuroda, K. Mio, N.
TITLE(s): A Free Fall Interferometer to Search for a Possible Fifth Force.
In: IEEE transactions on instrumentation and measure
APR 01 1989 v 38 n 2 Page: 189

AUTHOR(s): Faller, J. E. Fischbach, E. Fujii, Y.
TITLE(s): Precision Experiments to Search for the Fifth Force.
In: IEEE transactions on instrumentation and measure
APR 01 1989 v 38 n 2 Page: 180

AUTHOR(s): Stubbs, C. W. Adelberger, E. G. Heckel, B. R.
TITLE(s): Gravitation and Astrophysics: Limits on composition-dependent interactions using a laboratory source: Is there a "fifth force" coupled to isospin?
In: Physical review letters.
FEB 06 1989 v 62 n 6 Page: 609

TITLE(s): Alternate source of fifth force challenged.
In: Science news.
OCT 01 1988 v 134 n 14 Page: 214

TITLE(s): The stimulation of the fifth force.
In: Nature.
SEP 29 1988 v 335 n 6189 Page: 393

One of the first "scientific" DOGMAS fed to new physics students is the doctrine about "projectile motion". Students are given several formulas or equations from which they can precisely calculate how high and far a projectile will travel given its initial speed and angle from the ground.
But the results are NOT so absolute as students are led to believe, even if they take into account air resistance and Coriolis effects.
Recent experiments have shown that if the projectile is SPINNING at HIGH SPEED, (at least 27,000 RPM), [axis of spin coinciding with line of projection], the projectile will travel HIGHER and FARTHER than predicted by Newtonian mechanics!
Similarly, experiments with falling gyroscopes have shown that a gyroscope whose enclosed rotor is spinning at high speed (about 27,000 RPM) falls AT A DIFFERENT RATE than when the same gyroscope falls with rotor NOT spinning.
The AMOUNT of DEVIATION might depend on the MATERIAL

COMPOSITION of the projectile or rotor, as suggested in the text of U.S. Patent #3,626,605, "Method and Apparatus for Generating a Secondary Gravitational Force Field", by Henry W. Wallace, Dec. 14, 1971.
These DEVIATIONS are EASILY REPRODUCABLE, and effectively DIS-PROVE the OVER-HYPED "General Theory of Relativity" which states that gravity results from a "warping or distorion of space" caused by the MERE PRESENCE of mass.
- Robert McElwaine

The late Henry W Wallace died april 1994. Fellow researchers at GE were not "happy" with his research regarding gravitational fields. An interesting article was written in The New Scientist circa 1980 about Wallace's work.
-- Ron Kita

Henry Wallace was an engineer at General Electric about 25 years ago, and developed some incredible inventions relating to the underlying physics of the gravitational field. Few people have heard of him or his work.

US Patent #3626605 -- "Method and Apparauts for Generating a Secondary Gravitational Force Field"
Awarded to Henry Wm Wallace of Ardmore PA Dec 14, 1971

US Patent #3626606 -- "Method and Apparatus for Generating a Dynamic Force Field"
Awarded to Henry Wm Wallace of Ardmore PA Dec 14, 1971

US Patent #3823570 -- "Heat Pump" (based on technology similar to the above two inventions)
Awarded to Henry Wm Wallace of Freeport NY July 16, 1973

Wallace discovered that a force field, similar or related to the gravitational field, results from the interaction of relatively moving masses. He built machines which demonstrated that this field could be generated by spinning masses of elemental material having an odd number of nucleotides -- i.e. a nucleus having a multiple half-integral value of h-bar, the quantum of angular momentum. Wallace used bismuth or copper material for his rotating bodies and "kinnemassic" field concentrators.
Aside from the immense benefits to humanity which could result from a better understanding of the physical nature of gravity, and other fundamental forces, Wallace's inventions could have

enormous practical value in countering gravity or converting gravitational force fields into energy for doing useful work. So, why has no one heard of him? One might think that the discoverer of important knowledge such as this would be heralded as a great scientist and nominated for dynamite prizes. Could it be that his invention does not work? Anyone can get the patents. Study them -- Wallace -- General Electric -- detailed descriptions of operations -- measurements of effects -- drawings and models -- it is authentic. If you're handy you can even build it yourself. It does work.

So what is going on?
One explanation I've heard is that Wallace ran up against the politics of science, as dictated in the late 1960's by the power-block at Princeton, who were primarily interested in promoting the ideas of their main man, Einstein, and the gravitation-is-geometry paradigm. Maybe there is some truth to this story. Nowadays, there seems to be a piss-pot full of theoretical physicists working on abstract geometrical theories and other absurdly difficult mental masturbations, while no one seems to have made any effort to provide a theoretical explanation of the physics of a nuts-and-bolts invention which could have enormous practical value. Maybe we can blame it on the Princeton folks, but I'm more inclined to believe that our defense industry black project community has confiscated and suppressed knowledge of Wallace's discoveries. All done of course under the most honorable and sacred banner of national security. Well, it's been 25 years. We ought to be real secure by now. Isn't it way past time for some trickle down benefits to real people?

There are two paragraphs about the Wallace inventions in the Electric Propulsion Study by Dr Dennis Cravens, prepared in 1991. Cravens had this to say about Wallace's work:

> ROTATIONAL ALIGNMENT - Nuclei can also be aligned by rotation. Henry Wallace claimed some unusual effects assigned to electomagnetic and gravitational couplings. This was in three US patents (3823570, 3626605, and 362606). The assertion was that the application of a rotational force on a material of half-integral spin would result in a reorientation of the nuclear structure and could be utilized for "altering its gravitational attraction toward other bodies, separation of isotopes by distinguishing between nuclei according to their nucleon content..." The patents are written in a very believable style which includes part numbers, sources for some

components, and diagrams of data.

Attempts were made to contact Wallace using patent addresses and other sources but he was not located nor is there a trace of what became of his work. However, should the work be real it may furnish a novel experimental approach to experimental design. The concept can be somewhat justified on general relativistic grounds since rotating frames of time varying fields are expected to emit gravitational radiation. Even if the work does not give a direct gravitational coupling it may furnish a new method for nuclear spin alignment.

An article about the Wallace patents appeared in the British magazine "New Scientist" in February 1980. This was written nearly ten years after Wallace was awarded his patents. Here's a paragraph from the article.

> "Although the Wallace patents were initially ignored as cranky, observers believe that his invention is now under serious but secret investigation by the military authorities in the US. The military may now regret that the patents have already been granted and so are available for anyone to read."

I know -- it's a tease. And the rest of the article is the same way. It provides barely enough information to jab your psyche a little, and not nearly enough to get you off your comfortable ass. And who knows who the anonymous party of "observers" are, who believe that a secret investigation is underway by the military -- or whether these observers even exist at all. None the less, the New Scientist has a fairly well established track record for accurate identification of new science trends and issues. And, while the editors of this British journal may be prone to enjoyment of gossip and innuendo, it generally turns out be grounded in truth.

NUCLEAR SPIN SELECTIVITY OF CHEMICAL REACTIONS

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A property of spin selective reactions to sort the nuclei according to their spin and orientation, is discussed. The separation of spin (magnetic) and spinless (nonmagnetic) nuclei forms the basis for the magnetic isotope effect, the separation of nuclei according to their

orientation and creation of nuclear alignment in reaction products is a basis for the chemically induced nuclear polarisation phenomenon. Bibliography - 50 references.
Received 14 February 1995

NUCLEAR THEORY, ABSTRACT NUCL-TH/9601046
From: spevak@TAUPHY.TAU.AC.IL
Date: Tue, 30 Jan 1996 17:18:34 +0200
Collective T- and P- Odd Electromagnetic Moments in Nuclei with Octupole Deformations
Author(s): N. Auerbach , V.V. Flambaum , V. Spevak

Parity and time invariance violating forces produce collective P- and T- odd moments in nuclei with static octupole deformation. Collective Schiff moment, electric octupole and dipole and also magnetic quadrupole appear due to the mixing of rotational levels of opposite parity and can exceed single-particle moments by more than a factor of 100. This enhancement is due to two factors, the collective nature of the intrinsic moments and the small energy separation between members of parity doublets. The above moments induce T- and P- odd effects in atoms and molecules. Experiments with such systems may improve substantially the limits on time reversal violation.

The Hughes-Drever experiment was conducted in 1959-1960 independently by Vernon Hughes and collaborators at Yale University, and by Ron Drever at Glasgow University. In the Glasgow version, the experiment examined the ground state of the lithium-7 nucleus in an external magnetic field. The state has total angular momentum quantum number 3/2, and thus is spolit into four equally spaced levels by the magnetic field. When the nucleus undergoes a transition between a pair of adjacent levels, the photon emitted has the same energy or frequency, no matter which pair of levels was involved. The result is a single narrow spectral line. Any external perturbation of the nucleus that is associated with a preferred direction in space, such as the motion of the Earth relative to the mean rest frame of the universe, will destroy the equality of the energy spacing between the four levels, since the nuclear wave functions of the four levels have different spacial dependencies relative to the magnetic field. Using nuclear magnetic resonance techniques, the experiments set a limit on the separation or spread in frequency of line that corresponded to a limit on anistropy or bidirectional dependence in the energy of the nucleu at the level of one part in 10^23.
-- Clifford Will, Chapt 2 of The New Physics, edited by Paul Davies

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Magnetic resonance in its various forms, NMR, EPR, and EFR, are all applied to relatively small specimens and, with the exception of EFR, are rarely applied to magnetic materials. EFR means Electron Ferromagnetic Resonance, and the best intro to this subject is by Vonsovskii. Curiously, there is no published data on EFR for large ferromagnetic specimens. A literature search at a campus of the University of California revealed nothing. F. Herlach has said that there is an 'open' literature and a 'closed' literature concerning magnetic research.
-- Larry Adams

A body which is spinning within a larger macroscopic body which is also spinning will tend to align the axis of its angular momentum with the angular momentum of the larger body.

For example, a gyroscope located on the earth, unless it is in a frictionless gimbal, with always try to precess due to the rotation of the earth into alignment with the earth's polar axis, at which point it will no longer precess due to earth rotation.
Another example, a cylinder of magnetic material spinning around its longitudinal axis will develop a magnetic field proportional to is angular velocity (Barnett Effect), because the angular momemtum of the electrons in the material will attempt to precess and come into alignment with the macroscopic axis of the spinning cylinder, which also brings into alignment the magnetic moment of the electrons, some of which have unpaired spins (ferromagnetic), resulting in generation of a macroscopic magnetic field. Similarly, it is know that a static magnetic field itself contains angular momentum -- and spinning the source of the static field, whether a magnet or DC current loop, will result in a corresponding increase or decrease in the field strength.

Another example is the inventions of Henry Wallace. Wallace found that if you spin a material which has an odd number of nucleotides, i.e. having an "un-paired" value of angular momentum, resulting in a nucleus with a multiple integer of a one-half value of quantum momentum. The spin in the nucleus will begin to line up with the macroscopic spin axis, and will create an unusual force field related to gravity -- which he call a "kinemassic" field.

Maybe I've missed it, but I've looked seriously, and there seems to be no information in undergraduate or graduate level physics reference books which mentions the relationship between

macroscopic and microscopic angular momentum -- much less
provides any analysis or explanation linking quantum angular
momentum to macroscopic angular momentum. Why not?
How does quantum angular momentum become organized from a
microscopic to a macroscopic level? Has anyone ever published
any work about this? I can't find any.

Date: Sun, 5 Nov 1995
From: James Youlton
To: Robert Stirniman
Re: Angular Momentum and the Barnett Effect

On Wed, 1 Nov 1995, Robert Stirniman wrote:
> Maybe I've missed it, but I've looked seriously, and there seems
> to be no information in undergraduate or graduate level physics
> reference books which mentions the relationship between
> macroscopic and microscopic angular momentum -- much less
> provides any analysis or explanation linking quantum angular
> momentum to macroscopic angular momentum.

You're catching on. The subject of compound angular momentum, or
internal and external angular momentum, or intrinsic and extrinsic
angular momentum has been a repressed subject for about 2 and half
decades. Add to that list, spherical pendulums, Coriolis effect, except
as applied to balistics and meteorology as used by the US military,
and Shafer's pendulum, that neat little device used as the artifical
horizon of aircraft.

> How does quantum angular momentum become organized from a
> microscopic to a macroscopic level? Has anyone ever published
> any work about this? I can't find any.

There isn't any that I know of, though back in the late fifties, there
was a fellow named Edward Condon at the University of Colorado who was
fairly proficient on the subject. So much so that he wrote the rotational
dynamics section, called noninertial dynamics at the time, of the
reference "The Handbook of Physics" which he also co-edited (Chapter 5).
I don't recall offhand who the publisher was (Harcourt/Brace?), though
it was endorsed by the American Institute of Physics.
Later, when Mr Condon was the head of the USAF project 'Blue Book', he
labored to supress his own work when the directive was handed down from
the Navy's Turtle Island project.
-- James Youlton

Condon directed a government UFO project, but was never the head of

Blue Book. That position was held, for most or perhaps all of Blue Book's life, by an Air Force Officer Named Edward Ruppelt. Blue Book was shut down in 1969, shortly after the report of the project Condon directed, "Scientific Study of Unidentified Flying Objects".
-- Jim Giglio

AUTHOR: Cousins, Frank W.
TITLE: The anatomy of the gyroscope : a report in 3 parts comprising a literature and patent survey directed to the gyroscope and its applications / by Frank W. Cousins ; edited by John L. Hollington.
PUBL.: Neuilly-sur-Seine, France : North Atlantic Treaty Organization, Advisory Group for Aerospace Research and Development,
FORMAT: 296 p. (in various pagings) ; 30 cm.
DATE: 1988
SERIES: AGARDograph no. 313

AUTHOR: Leimanis, E. (Eugene)
TITLE: The general problem of the motion of coupled rigid bodies about a fixed point.
PUBL.: Berlin, New York, Springer-Verlag,
FORMAT: xvi, 337 p. illus. 24 cm.
DATE: 1965
SERIES: Springer tracts in natural philosophy. v. 7
SUBJECT Dynamics, Rigid Gyroscopes, Two-body problem, Astrodynamics

AUTHOR(s): de Andrade, L.C. Garcia
TITLE: Electron gyroscopes to test torsion gravity?
In: Il nuovo cimento delle societa italiana di fisic
OCT 01 1994 v 109 n 10 Page 1123

AUTHOR(s): Abe, Hiroshi Yoshida, Tetsuo Turuga, Kikuo
TITLE: Piezoelectric-ceramic cylinder vibratory gyroscope.
In: Japanese journal of applied physics. part 1, r
SEP 01 1992 v 31 n 9B Page 3061

AUTHOR(s): Case, William B. Shay, Michael A.
TITLE: On the interesting behavior of a gimbal-mounted gyroscope.
In: American journal of physics.
JUN 01 1992 v 60 n 6 Page 503

AUTHOR(s): Zhuravlev, V.F.
TITLE: Nutational self-oscillation of a free gyroscope.
In: Mechanics of solids.

1992 v 27 n 6 Page 11

AUTHOR(s): Chang, C.O. Chou, C.S.
TITLE: Partially Filled Nutation Damper for a Freely Processing Gyroscope.
In: Journal of guidance, control, and dynamics.
SEP 01 1991 v 14 n 5 Page 1046

AUTHOR(s): Chang, C.O. Chou, C.S. Liu, L.Z.
TITLE: Stability analysis of a freely precessing gyroscope carrying a mercury ring damper.
In: Journal of sound and vibration.
MAY 08 1991 v 146 n 3 Page 491

AUTHOR(s): Imanishi, Akira Maruyama, Koichi Midorikawa, Shoichi
TITLE: Observation against the Weight Reduction of Spinning Gyroscopes.
In: Journal of the physical society of japan.
APR 01 1991 v 60 n 4 Page 1150

AUTHOR(s): Petry, Walter
TITLE: Angular Momentum and Gyroscope in Flat Space-Time Theory of Gravitation.
In: Astrophysics and space science.
JAN 01 1991 v 175 n 1 Page 1

AUTHOR(s): Zhivkov, A.I.
TITLE: Geometry of invariant manifolds of a gyroscope in the field of a quadratic potential.
In: Mathematics of the USSR: Izvestija.
1991 v 37 n 1 Page 227

AUTHOR(s): Hayashi, Kenji Shirafuji, Takeshi
TITLE: Frame-Dragging Precession of Orbiting Gyroscopes in New General Relativity and Possible Violation of Equivalence Principle.
In: Progress of theoretical physics.
DEC 01 1990 v 84 n 6 Page 1074

AUTHOR(s): El-Sabaa, F.M.
TITLE: On the Periodic Motion of a Gyroscope Supported by Cardan Gimbals.
In: al-Majallah al-Arabiyah lil-ulum wa-al-handasa
JUL 01 1990 v 15 n 3 Page 495

AUTHOR(s): Moffat, J.W. Brownstein, J.R.

TITLE: Spinning test particles and the motion of a gyroscope according to the nonsymmetric gravitation theory.
In: Physical review. D, Particles and fields.
MAY 15 1990 v 41 n 10 Page 3111

AUTHOR(s): Nitschke, J.M. Wilmarth, P.A.
TITLE: Null result for the weight change of a spinning gyroscope.
In: Physical review letters.
APR 30 1990 v 64 n 18 Page 2115

AUTHOR(s): Faller, J. E. Hollander, W. J. Nelson, P. G.
TITLE(s): Gyroscope-weighing experiment with a null result.
In: Physical review letters.
FEB 19 1990 v 64 n 8 Page 825

AUTHOR(s): Rumyantsev, V.V.
TITLE: Stability of permanent rotations of a nonsymmetric liquid-filled gyroscope.
In: Mechanics of solids.
1990 v 25 n 6 Page 1

AUTHOR(s): Panayotounakos, D.E. Theocaris, P.S.
TITLE: On the Decoupling and the Solutions of the Euler Dynamic Equations Governing the Motion of a Gyroscope.
In: Zeitschrift fur angewandte Mathematik und Mechan
1990 v 70 n 11 Page 489

AUTHOR(s): Hayasaka, Hideo Takeulchi, Sakae
TITLE: Gravitation and Astrophysics.
Summary: Anomalous weight reduction on a gyroscope's right rotations around the vertical axis on the Earth.
In: Physical review letters.
DEC 18 1989 v 63 n 25 Page 2701

AUTHOR(s): Laithwaite, Eric
TITLE: Propulsion by Gyro.
Summary: In an attempt to reveal the strange, hidden properties of gyroscopes, Professor Eric Laithwaite explains the physics behind the idea that a propulsion system could be built using gyros.
In: Space. SEP 01 1989 v 5 n 5 Page 36

AUTHOR(s): Vitale, S. Bonaldi, M. Falferi, P.
TITLE: Magnetization by rotation and gyromagnetic gyroscopes.
Summary: We discuss how the general phenomenon of magnetization by rotation may be used probe the angular velocity of the

laboratory with respect to a local frame of inertia. We show that gyroscope with no moving parts based on this pheno-

In: Physical review B: Condensed matter.
JUN 01 1989 v 39 n 16 p B Page 11993

AUTHOR(s): Aspden, H.
TITLE: Anti Gravity Electronics.
Summary: Reinterpretation of Newton's Third Law of Motion suggests that it depends upon and electronic action. Electronic interaction therefore explains the paradoxical anti-gravity properties of the force processed gyroscope.

In: Electronics & Wireless World.
JAN 01, 1989 v 95 n 1635 Page 29

AUTHOR(s): Sachs, Mendel
TITLE: The Precessional Frequency of a Gyroscope in the Quaternionic Formulation of General Relativity.

In: Foundations of physics.
JAN 01 1989 v 19 n 1 Page 105

AUTHOR(s): Medvedev, A.V.
TITLE: Motion of a rapidly run-up gyroscope acted upon by a constant moment in a resistive medium.

In: Mechanics of solids.
1989 v 24 n 2 Page 21

AUTHOR(s): Starzhinskii, V.M.
TITLE: An exceptional case of motion of the Kovalevskaia gyroscope.

In: PMM, Journal of applied mathematics and mechanic
1983 v 47 n 1 Page 134

AUTHOR: Gray, Andrew, 1847-1925.
TITLE: A treatise on gyrostatics and rotational motion; theory and applications.
PUBL.: New York, Dover Publications
FORMAT: 530 p. illus. 22 cm.
DATE: 1959

QA861:P4
Perry, John
SPINNING TOPS AND GYROSCOPIC MOTION. By John Perry. Dover, 1957. 102 pages

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Articles and Books by Kip Thorne:

AUTHOR: Misner, Charles W.
TITLE: Gravitation (by) Charles W. Misner, Kip S. Thorne (and) John Archibald Wheeler.
PUBL.: San Francisco, W. H. Freeman
FORMAT: xxvi, 1279 p. illus. 26 cm. 1973
SUBJECT: Astrophysics, General relativity, Gravitation

GENERAL RELATIVITY & QUANTUM COSMOLOGY, ABSTRACT GR-QC/9308009
THE QUANTUM PROPAGATOR FOR A NONRELATIVISTIC PARTICLE IN THE VICINITY OF
A TIME MACHINE DALIA S. GOLDWIRTH, MALCOLM J. PERRY, TSVI PIRAN AND KIP S.THORNE.

We study the propagator of a non-relativistic, non-interacting particle in any non-relativistic ``time-machine'' spacetime of the type shown in Fig. 1: an external, flat spacetime in which two spatial regions, V- at time t- and V+ at time t+, are connected by two temporal wormholes, one leading from the past side of V- to t the future side of V+ and the other from the past side of V+ to the future side of V-. We express the propagator explicitly in terms of those for ordinary, flat spacetime and for the two wormholes; and from that expression we show that the propagator satisfies completeness and unitarity in the initial and final ``chronal regions'' (regions without closed timelike curves) and its propagation from the initial region to the final region is unitary. However, within the time machine it satisfies neither completeness nor unitarity. We also give an alternative proof of initial-region-to-final-region unitarity based on a conserved current and Gauss's theorem. This proof can be carried over without change to most any non-relativistic time-machine spacetime; it is the non-relativistic version of a theorem by Friedman, Papastamatiou and Simon, which says that for a free scalar field, quantum mechanical unitarity follows from the fact that the classical evolution preserves the Klein-Gordon inner product.

AUTHOR(s): Thorne, Kip S.
TITLE(s): Gravitational-wave bursts with memory: The Christodoulou effect.
In: Physical review. D, Particles and fields.
JAN 15 1992 v 45 n 2 Page 520

AUTHOR(s): Apostolatos, Theocharis A. Thorne, Kip S.
TITLE(s): Rotation halts cylindrical, relativistic gravitational collapse.
In: Physical review. D, Particles and fields.

SEP 15 1992 v 46 n 6 Page 2435

AUTHOR(s): Echeverria, Fernando Klinkhammer, Gunnar Thorne, Kip S.
TITLE(s): Billiard balls in wormhole spacetmes with closed timelike curves: Classical theory.
In: Physical review. D, Particles and fields.
AUG 15 1991 v 44 n 4 Page 1077

AUTHOR(s): Eich, Chris Zimmermann, Mark E. Thorne, Kip S.
TITLE(s): Giant and supergiant stars with degenerate neutron cores.
In: The astrophysical journal.
NOV 01 1989 v 346 n 1 p 1 Page 277

AUTHOR(s): Frolov, Valery P. Thorne, Kip S.
TITLE(s): Renormalized stress-energy tensor near the horizon of a slowly evolving, rotating black hole
Summary: The renormalized expectation value of the stress-energy tensor ren of a quantum field in an arbitrary quantum state near the future horizon of a rotating (Kerr) black hole is derived in two very different ways: One derivation (restricted for simplicity to a massless scalar field) makes use of traditional techniques of quantum field theory in curved spacetime, augmented by a variant of the "ETA formalism " for handling superradiant modes.
In: Physical review. D, Particles and fields.
APR 15 1989 v 39 n 8 Page 2125

AUTHOR(s): Kim, Sung-Won Thorne, Kip S.
TITLE(s): Do vacuum fluctuations prevent the creation of closed timelike curves?
In: Physical review. D, Particles and fields.
JUN 15 1991 v 43 n 12 Page 3929

AUTHOR: Thorne, Kip S.
TITLE: Black holes and time warps : Einstein's outrageous legacy / Kip S. Thorne.
PUBL.: New York : W.W. Norton,
FORMAT: 619 p. : ill. ; 24 cm. 1994
SERIES: Commonwealth Fund Book Program (Series)
SUBJECT: Relativity, Astrophysics, Physics--Philosophy, Black holes

AUTHOR: Harrison, B. Kent.
TITLE: Gravitation theory and gravitational collapse (by) B. Kent Harrison, Kip S. Thorne, Masami Wakano (and) John Archibald Wheeler.
PUBL.: Chicago, University of Chicago Press

FORMAT: xvii, 177 p. illus. 25 cm. 1965
SUBJECT: Astrophysics, Gravitation

AUTHOR: Thorne, Kip S.
TITLE: Gravitational radiation : a new window onto the universe / Kip S. Thorne, William R. Kenan, Jr.
PUBL.: Cambridge, (Cambridgeshire) ; New York : Cambridge University Press,
DATE: 1988
SUBJECT: Gravitational radiation

AUTHOR: Braginskii, V. B. (Vladimir Borisovich
TITLE: Quantum measurement / Vladimir B. Braginsky and Farid Ya. Khalili ; edited by Kip S. Thorne.
PUBL.: Cambridge (England) ; New York, NY, USA : Cambridge University Press,
SUBJECT: Quantum theory, Physical measurements

AUTHOR: Braginskii, V. B. (Vladimir Borisovich)
Sistemy s maloi dissipatsiei. English
TITLE: Systems with small dissipation / V.B. Braginsky, V.P. Mitrofanov, V.I. Panov ; edited by Kip S. Thorne and Cynthia Eller ; translated by Erast Gliner.
PUBL.: Chicago : University of Chicago Press,
FORMAT: xii, 145 p. : ill. ; 24 cm. DATE: 1985
SUBJECT: Harmonic oscillators--Design and construction.
Physical measurements
NOTES: Translation of: Sistemy s maloi dissipatsiei.
Includes index.

Title: Black holes : the membrane paradigm / edited by Kip S. Thorne, Richard H. Price, Douglas A. Macdonald.
Date/Source: New Haven : Yale University Press, 1986.

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E. U. Condon and P. E. Condon, "Effect of Oscillations of the Case on the Rate of a Watch," 16 (1), 14-16 (1948).

G. F. Pake, "Fundamentals of Nuclear Magnetic Resonance Absorption 1," 18 (7), 438-452 (1950); "Fundamentals of Nuclear Magnetic Resonance Absorption II," 18 (8), 473-486 (1950).

J. H. Van Vleck, "Landmarks in the Theory of Magnetism," 18 (8),495-509 (1950).

Herbert Goldstein, "The Classical Motion of a Rigid Charged Body in a Magnetic Field," 19 (2), 100-109 (1951).

J. C. Slater, "The Electron Theory of Solids," 19 (6), 368-374 (1951).

L. I. Schiff, "Quantum Effects in the Radiation from Accelerated Relativistic Electrons," 20 (8), 474-478 (1952).

Kerson Huang, "On the Zitterbewegung of the Dirac Electron," 20 (8), ' 479-484 (1952).

F. Keffer, H. Kaplan, and Y. Yafet, "Spin Waves in Ferromagnetic and Antiferromagnetic Materials," 21 (4), 250-257 (1953).

F.M. Purcell, "Nuclear Magnetism," 22 (1), 1-8 (1954).

H. G. Dehmelt, "Nuclear Quadrupole Resonance," 22(3), 110-120 (1954).

C. Kittel, "The Effective Mass of Electrons in Crystals," 22 (5), 250-252 (1954).

E. J. Zimmerman, "Numerical Coincidences in Microphysics and Cosmology," 23(31), 136-141 (1955).

W. H. Furry, "Lorentz Transformation and the Thomas Precession," 21 (8), 517-525(1955).

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Leon N. Cooper, "Theory of Superconductivity," 28 (2), 91-101 (1960).

R. H. Dicke, "Eotvos Experiment and the Gravitational Red Shift," 28 (4), 344-347 (1960).

Gerald Holton, "On the Origins of the Special Theory of Relativity," 28 (7), 627-636 (1960).

F. Rohrlich, "Self-Energy and the Stability of the Classical Electron," 28 (7), 639-643 (1960).

P. W. Bridgman, "Significance of the Mach Principle," 29 (1), 32-36 (1961).

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T. Gold, "The Arrow of Time," 30 (6), 403-410 (1962).

Robert W. Brehme, "A Geometric Representation of Galilean and Lorentz Transformations," 30 (7), 489-496 (1962).

David H. Frisch and James H. Smith, "Measurement of Relativistic Time Dilation Using u-Mesons," 31 (5), 342-355 (1963).

R. H. Dicke, "Cosmology, Mach's Principle and Relativity," 31 (7), 500-509 (1963).

R. S. Shankland, "Michelson-Morley Experiment," 32 (1), 16-35 (1964).

Philip Morrison, "Less May Be More," 32 (6), 441-457 (1964).

A. L. Schawlow, "Measuring the Wavelength of Light with a Ruler," 33 (11), 922-923 (1965).

Arthur Komar, "Foundations of Special Relativity and the Shape of the Big Dipper," 33 (12), 1024-1027 (1965).

R. H. Romer, "Angular Momentum of Static Electromagnetic Fields," 34 (9), 772-778 (1966); "Electromagnetic Angular Momentum," 35 (5), 445-446(1967).

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N. Bloembergen, "The Concept of Temperature in Magnetism," 41 (3), 325-331 (1973).

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Julian Schwinger, "Spin-Precession -- A Dynamical Discussion," 42 (6), 510-513 (1974).

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Hans C. Ohanian, "What is the principle of equivalence?" 45 (10), 903-909 (1977).

Frederik J. Belinfante, "Can individual elementary particles have individual properties?" 46 (4), 329-336 (1978).

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E. J. Konopioski, "What the electromagnetic vector potential describes," 46 (5), 499-502 (1978).

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and inverse-square orbits," 50 (7), 610-617 (1982).

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Robert C. Hilborn, "Einstein coefficients, cross sections, f values, dipole moments, and all that," 50 (11). 982-986 (1982).

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M. W. P. Strandberg, "Special relativity completed: The source of some 2s in the magnitude of physical phenomena," 54 (4), 321-331 (1986).

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L. Lederman, "Unification, grand unification, and the unity of physics," 54 (7), 594-600 (1986).

E. T. Osypowski and M. G. Olason, "lsynchronous motion in classical mechanics," 55 (8), 720-725 (1987).

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* Henrik Broberg (Stockholm) ^Ö Particle Mass in a Cosmological Perspective
* Toivo Jaakkola (University of Helsinki Observatory) ^Ö Mach s Principle and Properties of Local Structure

Apeiron Number 2 (February 1988)
* Jean-Claude Pecker/Jean-Pierre Vigier (University of Paris) ^Ö A Possible Tired-Light Mechanism

Apeiron Number 3 (August 1988)
* D.F. Roscoe (University of Sheffield) ^Ö Gravitation as an Inertial Process
* Amitabha Ghosh (Indian Institute of Technology, Kanpur) ^Ö Velocity-Dependent Inertial Induction: A Case for Experimental Observation

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* S.V.M. Clube (University of Oxford) ^Ö Lorentzian Gravity and Cosmology

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* Jacques Trempe (Montreal, Quebec) ^Ö Laws of Light Propagation in Galilean Space-Time
* Thomas E. Phipps Jr. (Urbana, Illinois) ^Ö Weber-type Laws of Action-at-a-Distance in Modern Physics

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* S.V.M. Clube (Astrophysics Department, Oxford University) ^Ö Mass Inflation as a Recurring Property of Matter in Astrophysical Situations
* Amitabha Ghosh (Indian Institute of Technology, Kanpur) ^Ö Velocity Dependent Inertial Induction: A Possible Tired-Light Mechanism
* David Roscoe (Department of Applied Mathematics, Sheffield University) ^Ö Gravity out of Inertia
* Henrik Broberg (Djursholm, Sweden) ^Ö Mass, Energy, Space
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* Zaman Akil (Kuwait City) ^Ö On the Constant of Gravitation
* André K.T. Assis (State University of Campinas, Brazil) ^Ö On

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* D.F. Roscoe (University of Sheffield) ^Ö The Equivalence Principle as a Consequence of the Third Law
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* H.E. Wilhelm (University of Utah) ^Ö Explanation of Anomalous Unipolar Induction in Corotating Conductor-Magnet Arrangements by Galilean Electrodynamics

Apeiron Number 14 (September 1992)
* Thomas E. Phipps Jr. (Urbana, Illinois) ^Ö Lorentz Contraction of the Coulomb Field: An Experimental Proposal
* Peter Huber (Germanistisches Seminar, Heidelberg University) ^Ö Does the Velocity of Light Decrease?

Apeiron Number 15 (February 1993)
* H.E. Wilhelm (University of Utah) ^Ö Galilei Covariant Electrodynamics of Moving Media with Applictions to the Experiments of Fizeau and Hoek
* S.X.K. Howusu (University of Jos, Nigeria) ^Ö The Confrontation between Relativity and the Principle of Reciprocal Action
* Henrik Broberg (Norwegian Telecom, Oslo) ^Ö On the Kinetic Origin of Mass

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* C.I. Mocanu (Polytechnical Institute of Bucharest, Romania) ^Ö Is Thomas Rotation a Paradox?
* Zu Shaozhi and Xu Xiangqun (Beijing Control Device Research Institute) ^Ö On the Relativity of Simultaneity
* Martin Kokus (Hopewell, PA) and A.O. Barut, University of Colorado) ^Ö Suggestion for Unifying Two Types of Quantized Redshift of Astronomical Bodies

Apeiron Number 17 (October 1993)
* Thomas E. Phipps Jr. (Urbana, Illinois) ^Ö Ampere Tension and Newton's Laws
* S.X.K. Howusu (University of Jos, Nigeria) ^Ö General Mechanics of a Photon in the Gravitational Field of a Stationary Homogeneous Spherical Body

Apeiron Number 18 (February 1994)

* Toivo Jaakkola (Tuorla Observatory, Turku, Finland) ^Ö Radiative and Dynamical Implications of Electrogravity
* Peter Huber (Heidelberg University) ^Ö The Cosmological Redshift as a Virtual Effect of Gravitation
* H.E. Wilhelm (University of Utah) ^Ö Fitzgerald Contraction, Larmor Dilation, Lorentz Force, Particle Mass and Energy as Invariants of Galilean Electrodynamics
* Adolphe Martin (Longueuil, Quebec) ^Ö Einstein to Galilean Relativity

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* S.H. Kim (University of Texas at Arlington) ^Ö A Non-Lorentzian Force Stronger than the Lorentz Force
* Constantin Antonopoulos (National Technological University of Athens) ^Ö The Semantics of Absolute Space
* P. Graneau (Northeastern University, Arlington) and A.K.T. Assis (University of Campinas, Brazil) ^Ö Kirchhoff on the Motion of Electricity in Conductors
* Peter F. Browne (University of Manchester) ^Ö Newtonian Cosmology with Renormalized Zero-Point Radiation

Apeiron Number 20 (October 1994)

* V.A. Kuligin, G.A. Kuligina and M.V. Korneva (University of Voronezh, Russia) ^Ö Epistemology and Special Relativity
* G. Galeczki (University of Köln) ^Ö Physical Laws and the Theory of Special Relativity
* T. Chang (University of Alabama, Huntsville) ^Ö A Formulation of the Gravitational Equation of Motion

Aperion Volume 2, Number 1 (January 1995)

* Paul Marmet (University of Ottawa) ^Ö Origin of the 3 K Radiation
* Wen-Xiu Li (University of Science and Technology of China) ^Ö On the Relativity of Lengths and Times

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* Amitabha Ghosh (Indian Institute of Technology, Kanpur) ^Ö Dynamical Inertial Induction and the Potential Energy Problem
* Halton C. Arp (Max-Planck-Institut für Astrophysik) ^Ö New Light on Redshift Periodicities

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* P.F. Browne (University of Manchester) ^Ö de Sitter Cosmology Reinterpreted

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AUTHOR(s): Cramer, John G. Forward, Robert L. Landis, Geoffrey A. Visser, M. Benford, G.
TITLE: Natural wormholes as gravitational lenses.
In: Physical Review-D: Particles, Fields, Gravitation Traversable wormholes, energy condition, time machines MAR 15 1995 v 51 n 6 Page 3117

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TITLE: Statite: A Spacecraft That Does Not Orbit.
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AUTHOR(s): Forward, Robert L.
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In: The Journal of the astronautical sciences.
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TITLE: Advanced space propulsion.
In: Aerospace america.
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AUTHOR(s): Forward, Robert L.
TITLE: Grey Solar Sails.
In: The Journal of the astronautical sciences.
APR 01 1990 v 38 n 2 Page 161

AUTHOR(s): Forward, Robert
TITLE: The power of negative matter: Does matter with a negative mass exist somewhere in the cosmos? If it does, it would make the perfect space-drive.
In: New scientist.
MAR 17 1990 v 125 n 1708 Page 54

AUTHOR(s): Forward, R.L.
TITLE: Solar Photon Thruster.
In: Journal of spacecraft and rockets.
JUL 01 1990 v 27 n 4 Page 411

AUTHOR(s): Forward, R.L.
TITLE: Negative matter Propulsion.
In: Journal of propulsion and power.
JAN 01 1990 v 6 n 1 Page 28

AUTHOR(s): Forward, R.L.
TITLE: Space Warps: A Review of One Form of Propulsionless Transport.
In: JBIS; Journal of the British Interplanetary Society
NOV 01 1989 v 42 n 11 Page 533

AUTHOR: Forward, Robert L.
TITLE: Negative Matter Propulsion
In: July 1988 AIAA Joint Propulsion Conference,
Journal of Propulsion and Power Vol 6 no 1 pp 28-37

AUTHOR(S): Robert L. Forward and Joel Davis.
TITLE: Mirror Matter: Pioneering Antimatter Physics
Source: New York : Wiley, 1988.
Series: Wiley science editions

AUTHOR: Forward, Robert L.
TITLE: Spin Drive To The Stars
In: ANALOG, Apr 1981, pp. 64-7O

AUTHOR: Forward, R.L.
TITLE: Far Out Physics
In: Analog Science Fiction/Science Fact
Vol 95, August 1975 pages 147-166

TITLE: Bibliography of interstellar travel and communication: April 1977
AUTHOR: Mallove, Eugene F. and Forward, Robert L.

TITLE: Camelot 30K / 1993
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AUTHOR: Forward, Robert L.

TITLE: Marooned on Eden / 1993
AUTHOR: Forward, Robert L.

TITLE: Martian rainbow / 1991
AUTHOR: Forward, Robert L.

TITLE: Mirror matter : pioneering antimatter physics / 1988
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TITLE: A national space program for interstellar exploration. 1975
AUTHOR: Forward, Robert L.

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TITLE: Timemaster / 1992
AUTHOR: Forward, Robert L.

Dr. Harold Aspden recently retired after serving many years as IBM's patent agent in Europe. He is the discoverer of the "Aspden Effect" or rotational inertia in spinning magnets (NEN, Jan. & Feb. 1995). His Ph.D. thesis involved demonstrations of anomalies in magnetic fields

Books and articles by Harold Aspden:

AUTHOR: Aspden, Harold.
TITLE: Gravitation / by Harold Aspden.
PUBL.: Southampton, Eng. : Sabberton Publications,
FORMAT: 78 p. ; 22 cm.
DATE: 1975
SUBJECT Gravitation

ISBN: 0850560055. 0850560063

AUTHOR: Aspden, Harold.
TITLE: Modern aether science.
PUBL.: Southampton, Eng., Sabberton Publications
FORMAT: 165 p. illus. 22 cm.
DATE: 1972
SUBJECT Ether (Space)
ISBN: 0850560039 0850560047 (pbk)

AUTHOR: Aspden, Harold.
TITLE: The need for a new theory of gravitation, by H. Aspden.
PUBL.: Southampton (Hants.), Sabberton Publications,
FORMAT: (1), 4 p. 22 cm.
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SUBJECT: Gravitation
Relativity (Physics)

AUTHOR: Aspden, Harold.
TITLE: Physics unified / by Harold Aspden.
PUBL.: Southhampton : Sabberton Publications,
FORMAT: xi, 206 p. : ill. ; 22 cm.
DATE: 1980
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AUTHOR: Aspden, Harold.
TITLE: Physics without Einstein.
PUBL.: Southampton, Sabberton Publications,
FORMAT: xiii, 224 p. illus. 23 cm.
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SUBJECT Physics
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AUTHOR(s): Aspden, H.
TITLE(s): Anti Gravity Electronics.
Summary: Reinterpretation of Newton's Third Law of Motion suggests that it depends upon and electronic action. Electronic interaction therefore explains the paradoxical anti-gravity properties of the force processed gyroscope.
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http://www.physics.wustl.edu/~visser/homepage.html

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International Journal of Modern Physics A6 (1991) 5409--5433.

Dirty black holes: Thermodynamics and horizon structure.
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>From wormhole to time machine:
Remarks on Hawking's chronology protection conjecture.
Physical Review D47 (1993) 554--565.

van Vleck determinants:
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With Gerald Gilbert and Eric Raiten
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Lorentzian Wormholes --- from Einstein to Hawking.
Full length technical monograph.
American Institute of Physics Press, July 1995.

Acoustic propagation in fluids:
An unexpected example of Lorentzian geometry.
gr-qc/9311028; gr-qc@xxx.lanl.gov.
Submitted for publication.

Thin-shell wormholes: Linearization stability
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Stick a fork in me. I'm done.

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... The quest for knowledge is eternal. The worship of knowledge is infernal.