International Journal of Emerging Technology in Computer Science & Electronics (IJETCSE)
ISSN: 0976-1353 Volume 22 Issue 1 – MAY 2016.

IMPROVING THE TRAVELING DISTANCE OF SATELLITE BY REPLACING HYDRAZINE THRUSTER INTO MAGNETIC THRUSTER

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***Abstract*— During the exploration of space, the satellite and spacecraft undergo such problems like insufficient of fuel, disconnect with signal and collided with meteorites. Where this paper deals with the problem-solving of fuel deficiency in a satellite which is used to explore space. That can be made by replacing the normal thrusters into Magnetic thrusters. According to the principle of Heike Kammerlingh Onnes and Meissner's effect, the Superconductive materials can be used to generate the Magnetic field. With the help of this principle, the satellite can move faster than now at zero gravity. By this change in thrusters, the speed of satellite increase and a lifetime of exploration reduced.**

Keyword- Magnetic, thrusters, Superconductive, fuel, gravity.

I. INTRODUCTION

One of the major objectives of this paper was to make interstellar exploration mission easier. Countries like US, UK, Russia, Canada, China, Japan, and India are involved in the space exploration. Where space exploration is mainly carried out in two-way. First, one is examining the space through a telescope, exploration takes place only from the lab where the telescope present, the problem in this was it just an assumption the result may vary from place to place and person to person. Second, one carried out by probes which means direct examining the place by the astronauts or satellites. Where exploring through probes may cost high and undergoes lot of problems like insufficient of fuel, disconnect with signal and collided with meteorites. To conclude this problem with the solution is to be hard anyhow we can alter the thrusters into magnetic one which can give high efficiency and speed up our exploration mission. However when the satellites enter the zero gravity zone, it required of thrust force for a further movement to reach the destination. Otherwise, it may stand in one particular places due to zero gravity.

Already existing interstellar research satellites was Voyager satellites, which is used to examine the interstellar space to know about the limits, to examine energy resources and aliens which available around the world. Where this concept is used to give some of the advanced updates in the field of Space research.

The superconductive material is used to produce the magnetic field, According to the principle of Heike Kammerlingh Onnes and Meissner's effect a superconductive material can reject the magnetic lines at zero electrical resistance and holds the object at aloft, which tends to produce the repulsive force on the zero gravity. Where the field which going to work were purely independent of magnetic and gravitational field. There are no other forces like a drag, and normal force going to act on the system while on the outer force. Only the weight and thrust force will act on the outer space.

On the account of consideration force came to know that will magnetic field will act on the zero gravity. Hence, there was no problem in introducing of the magnetic field in the zero gravity. The slight force on the object will make to move the object faster to long distance, where hence continuous force on the object will make to move very faster to long distance in short time in zero gravity.

II. SUPERCONDUCTIVE MATERIALS

Superconductivity is a phenomenon of exactly zero electrical resistance and expulsion of magnetic fields occurring in certain materials when cooled below a characteristic critical temperature. It was discovered by Dutch physicist Heike Kamerlingh Onnes on April 8, 1911

Most of the physical properties of superconductors vary from material to material, such as the heat capacity and the critical temperature, critical field, and critical density at which superconductivity is destroyed.

On the other hand, there is a class of properties that are independent of the underlying material. For instance, all superconductors have exactly zero resistivity to low applied current when there is no magnetic field present or if the applied field does not exceed a critical value. The existence of these universal properties implies that superconductivity is a thermodynamic phase, and thus possesses certain

distinguishing properties which are largely independent of microscopic details. It can be observed on several metals and ceramic materials.

Electrical resistance in metals arises because electrons moving through the metal are scattered due to deviations from translational symmetry. These are produced either by impurities, giving rise to a temperature-independent contribution to the resistance, or by the vibrations of the lattice in the metal.

In a superconductor below its critical temperature, there is no resistance because these scattering mechanisms are unable to impede the motion of the current carriers. As a negatively-charged electron moves through the space between two rows of positively-charged atoms, it pulls inward on the atoms of the lattice. This distortion attracts a second electron to move in behind it. The two electrons from a weak attraction, travel together in a pair and encounter less resistance overall. In a superconductor, electron pairs are constantly forming, breaking and reforming, but the overall effect is that electrons flow with little or no resistance. The current is carried then by electrons moving in pairs called Cooper pairs.

The superconductive materials are broadly classified into two types they are 1) Type 1 2) Type 2.

Type 1:

superconductor is pure metals which exhibit zero resistivity at low temperature and have the property of excluding magnetic fields from the interior of the superconductor (Meissner effect). The identifying characteristics are zero electrical resistivity below a critical temperature, zero internal magnetic fields (Meissner effect), and a critical magnetic field above which superconductivity ceases. It's modeled well by the BCS theory.remarkably, the best conductors at room temperature (gold, silver, and copper) do not become superconducting at all. They have the smallest lattice vibrations, so their behavior correlates well with the BCS Theory.

Type 2:

superconductors are being harder then type 1 superconductors, they exhibit mush higher critical magnetic fields. Type 2 superconductors such as niobium-titanium(NbTi) are used in the construction of high-field superconducting magnets. It usually exists in a mixed state of normal and superconducting regions. This is sometimes called a vortex state because vortices of superconducting currents surround filaments or cores of normal material.

Examples of superconductors are mainly given as several metals and ceramic materials, some examples are explained.

Mercury superconducting transition was historically the first to show superconductivity, and it is an example of a type 1 superconductor. Its practical usefulness is limited by the fact that it's critical magnetic field is only 1.119 T, so the amount of electric current it can carry is also limited.

Niobium tin superconductor was first observed by measuring the inductance of a coil which was wrapped around the sample. At the superconducting transition, the magnetic field is expelled by the Meissner effect and the inductance drops. This measurement was made by immersing the coil in liquid hydrogen and measuring the inductance as a function of temperature.

Lanthanum-barium-copperoxide superconductor is ceramic material was the first of new class of high-temperature superconductor. It's made by randomly substituting some barium atoms into the lattice of lanthanum-copper-oxide in what is termed a solid solution.

Yttrium-barium-copper oxide is ceramic material was the first high-temperature superconductors to make the phase change at a temperature above the liquid nitrogen temperature (77 K). This disc of YBaCuO certainly doesn't look or feel like an electrical conductor. It is a hard, brittle ceramic material. It looks like something you would make a grinding wheel out of - the fact that it can become a perfect conductor is hard to believe. But when a small rare earth magnet is placed on it and liquid nitrogen is poured around it, the magnet levitates, showing the Miessner effect characteristic of the zero resistance state. In the illustration, the black YBaCuO disc is held in a brass mount to facilitate cooling and holding it at liquid nitrogen temperature.

As from the above study clearly get the idea of superconductor, Yttrium-barium-copper oxide is the ceramic material of critical temperature of 77K. It’s strong, high-temperature superconductors and less weight. So it was strongly recommended use as magnetic thrusters.

III. MAGNETIZATION PRINCIPLE

The superconducting material can use as magnetic material according to the principle of Meissner's effect. That can be achieved by the object is cooled to the critical temperature where that material would cancel all another field around the material, at zero electrical resistance.

When the electrical flux is allowed to pass through the superconducting material, that material is kept at a critical temperature, then it acts as the material with the magnetic properties. It's known as Meissner's effect.

One of the notable properties of the Meissner's effect was a material start to “rotate” when it attains a critical temperature of the superconducting material. This property is very useful for improvement in the thrust force, it's used to increase the speed and used to overcome all the opposing force against the object.

The Meissner effect was given a phenomenological explanation by

$$\nabla^2 \mathbf{H} = \lambda^{-2} \mathbf{H}$$

where H is the magnetic field and λ is the London penetration depth.

Where this equation gives the function of the superconducting material in the electrical field and converts to magnetic field wat explained from this formula.

IV. REPULSIVE FORCE

Repulsive force (magnetism) between magnets of opposite orientation. A compressed material repelling bodies on both sides, e.g. according to Hooke's law.

The object is magnetized, now it's the process to produce the repulsive force between the object in space. It's highly possible to produce the repulsive force in space because space fully covered with magnetic field according to the concentration of gravitational force. So as that the magnetic field can also exist in space.

At the same time, the existing magnetic field will not affect the object anyway because its move way from the then magnetic field due to repulsive.

V. MODEL DESIGN

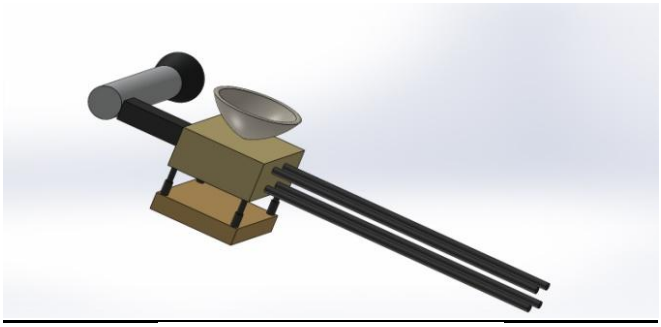

Fig.1, satellite with magnetic thruster.

Fig.1, This model was generated based on the Voyager satellite, Its used to explain about the prototype of this project. It resembles as Voyager satellite, but some modification is made in the thruster which is replaced by the Magnetic thruster.

As adjustable jacket was present at the four corners of the satellites which connected with the superconductive material, because that should not escape beyond the limit, due to the force acting on the satellite.

VI. OPERATING PRINCIPLE

It is work on the principle of Newton's third law, as it says "Every action has the equal and opposite forces" which not only applicable for the field with gravity, It can applicable for the field with zero gravity.

In space, there is the only acting of two forces weight and thrust. Thrust is the force create to move the object forward. In that, we had modified that into the superconducting material to produce the magnetic force. It tends to move the object forward. Electric energy is passed to a superconducting material, which gets energized and its converted to have the material with the magnetic properties. It tends to produce the repulsive force with each material. That create forward motion of the object to words the destination.

According to Meissner effect when the object is get energized and attain the critical temperature, then object tends to rotate about the axis of the forward motion. This makes the object speed up towards the destination.

It will not go to activate all the time, some sensing unit will present inside the satellite which is used to analysis the speed periodically. When it goes down below certain limits then superconductive material get energized and convert it into the material with magnetic properties. Ones it energized and produce the thrust then it should get offed by sensing unit. This is a cyclic process which gets on off by the sensing unit.

Then energy consuming is less when it's compared with normal thrust, where its should on further long time for producing the long range of thrust. But in this case, short time operation of the thrust can able to travel for the very long distance where the energy can be saved this that that of the normal thruster.

VII.SIMILAR PRINCIPLES

Some of the present day application of the Superconductivity materials are listed as Superconducting magnets, Josephson devices, SQUID Magnetometer, Power transmission, Fault current limiters, Electric motors, Maglev trains, and MRI images are exist already in consumer usage.

Further feature development in this field was lifting the satellites to outer orbit with the help Superconducting magnets, magnetic thrusters, and can replace car wheels also hence it has the wide range of use in the feature.

VIII.CONCLUSION

As discussed in the above theory, It explains about the Superconductive materials and principle involved and construction and working of the Magnetic thruster which going to replace the normal thrust. Viewed on the principle that converts the superconductive material into the magnetized material.

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