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ELECTROMAGNETIC ENGINE WITH RESERVED POWER ENERGY

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Abstract

The main objective of our project to design and construct an electrically operated engine i.e. Electromagnetic Engine. Our engine is totally different from ordinary IC Engine, because of the inventory advancement in operating principles. We have changed the operating principle of IC Engine by using electromagnetic effect instead of combustion of fossil fuels. This engine works on the principle of magnetic repulsion between two magnets. This electromagnetic engine consists of two magnets, one of them is an Electromagnet and other one is a Permanent Magnet. Permanent Magnet acts as piston and Electromagnet is located at the top of the cylinder instead of spark plug and valve arrangement in IC Engines. In this way this engine does not contain any spark plug and fuel injection system. The Electromagnet is energized by a battery source of suitable voltage and the polarities of electromagnet are set in such a way that it will repel the permanent magnet i.e. piston from TDC to BDC, which will result in the rotary motion of crank shaft. When the piston is at BDC the supply of Electromagnet is discontinued, the permanent magnet which was repelled to BDC will come back to its initial position i.e. TDC. This procedure completes one revolution of crank shaft i.e. our output work. The total power supplied by battery will be just to fulfill the copper losses of winding and power required to magnetize the windings. One the other hand main disadvantage of Electric Vehicle is the lack of capability of storing sufficient energy to run the vehicle for a long time. A method of storing solar energy in the battery using solar panels on the roof of car is undertaken so that energy stored is used as reserve power source.

Index Terms: *Electromagnet, Polarities, Repulsion.*

1. INTRODUCTION

Over the last century numerous changes were brought to the internal combustion engines. Numerous researches are carried out in hopes of improving the engine characteristics. Engine is the main power source of Automobiles, where combustion takes place & produces heat which converts into mechanical energy. We know IC-Engines are used in Automobiles; Aeroplane etc. But the incomplete combustion produces some harmful gasses, which is one main cause of air pollution. Modern Science & Technology has been taken many positive steps for emission control. Like, using CNGs & LPGs instead of petrol & diesel. So the main objective of our project to design and construct an electrically operated engine i.e. Electromagnetic Engine. Our engine is totally different from ordinary IC Engine, because of the inventory advancement in operating principles. We have changed the operating principle of IC Engine by using electromagnetic effect instead of combustion of fossil fuels and charging to batteries in emergency by solar panels.

2. CONCEPT OF ELECTROMAGNET

In electromagnetic engine electromagnet is a type of magnet in which the magnetic field is produced by the flow of electric current. The magnetic field disappears when the current is turned off. Electromagnets are

widely used as components of other electrical devices, such as motors, generators, relays, loudspeakers, hard disks, MRI machines, scientific instruments, and magnetic separation equipment, as well as being employed as industrial lifting electromagnets for picking up and moving heavy iron objects like scrap iron. A simple electromagnet consisting of a coil of insulated wire wrapped around an iron core. The strength of magnetic field generated is proportional to the amount of current. Current (I) through a wire produces a magnetic field (B). The field is oriented according to the right-hand rule.

An electric current flowing in a wire creates a magnetic field around the wire (see drawing below). To concentrate the magnetic field, in an electromagnet the wire is wound into a coil with many turns of wire lying side by side. The magnetic field of all the turns of wire passes through the center of the coil, creating a strong magnetic field there. A coil forming the shape of a straight tube (a helix) is called a solenoid; a solenoid that is bent into a donut shape so that the ends meet is called a toroid. Much stronger magnetic fields can be produced if a "core" of ferromagnetic material, such as soft iron, is placed inside the coil. The ferromagnetic core increases the magnetic field to thousands of times the strength of the field of the coil alone, due to the high magnetic

permeability μ of the ferromagnetic material. This is called a ferromagnetic-core or iron-core electromagnet.

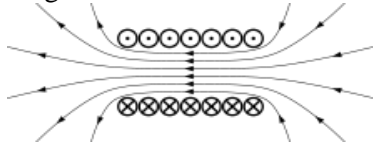


Fig-2.2: A Cross Section Through The Center Of The Coil

Magnetic field produced by a solenoid (coil of wire). This drawing shows a cross section through the center of the coil. The crosses are wires in which current is moving into the page; the dots are wires in which current is moving up out of the page.

3. COMPONENTS

3.1 Cylinder

Electromagnetic engine uses only magnets for its operation. The cylinder must take care of unwanted magnetic field and other losses further cylinder material itself should not get attracted to the magnet and resist the movement of the piston. To take care of above issues, the cylinder must be only made up of non-magnetic materials such as stainless steel, titanium or similar materials of high resistivity and low electrical conductivity. The cylinder of an electromagnetic engine is a simple rectangular block with a blind hole in it. The temperature within the electromagnetic engine cylinder is very low and so no fins are needed for heat transfer. This makes the cylinder easily manufactured, also the cylinder is made of aluminium, a non-magnetic material which limits the magnetic field within the boundaries of cylinder periphery. Usage of aluminium material makes the engine lighter unlike the cast-iron cylinder used in internal combustion engine.

3.2 Piston

The hollow piston casing is made up of non-magnetic stainless steel, titanium or similar materials of high resistivity and low electrical conductivity. Alternatively, piston casing can also be made up of non-metallic, thermal resistant materials as well or can be made by integrating both non-magnetic and non-metallic materials. One end of the hollow case is fitted with a powerful permanent magnet made of neodymium iron-boron (NdFeB), samarium-cobalt (SmCo) or similar high field strength magnetic materials. The permanent magnet acts as the core of the piston. The flat surface (which is also the pole of the magnet) of the piston that is nearer to the pole of the electromagnet is called the magnetic head of the piston or piston head. The flat surface of the piston head may be completely exposed or it may be covered by a thin layer of non-magnetic material of sufficient thickness. The other end of the piston case connects to the piston rod that connects to the crankshaft. The crankshaft and the piston rod convert the

linear reciprocating movement of the piston to the circular movement.

3.3 Connecting Rod

In a reciprocating engine, the connecting rod is used to connect the piston to the crankshaft. This converts the linear motion or reciprocating motion of the piston to the circular motion of the crankshaft. The material of the connecting rod is cast iron and the magnetic fields are contained inside the cylinder and the connecting rod will not be affected much. So, the connecting rod is same as that of an Internal combustion engine. Hence, no modification is required.



Fig-3.1: Connecting Rod

3.4 Fly Wheel

Flywheel is made up of mild steel. It regulates the engine's rotation and making it operate at a steady speed. So, that flywheels have a significant moment of inertia and thus resist changes in rotational speed and the amount of energy stored in a flywheel is proportional to the square of its rotational speed and energy is transferred to the flywheel by applying torque and it is used to store the rotational kinetic energy.

3.5 Electromagnet

An electromagnetic coil is formed when an insulated solid copper wire is wound around a core or form to create an inductor or electromagnet. When electricity is passed through a coil, it generates a magnetic field. One loop of wire is usually referred to as a turn or a winding and a coil consists of one or more turns. For use in an electronic circuit, electrical connection terminals called taps are often connected to a coil. Coils are often coated with varnish or wrapped with insulating tape to provide additional insulation and secure them in place. A completed coil assembly with one or more sets of coils and taps is often called the windings.

3.6 Permanent Magnet

A neodymium magnet (also known as NdFeB, NIB or Neo magnet), the most widely used type of rare-earth magnet, is a permanent magnet made from an alloy of neodymium, iron and boron to form the Nd₂Fe₁₄B tetragonal crystalline structure.

3.7 Battery

Where high values of load current are necessary, the lead-acid cell is the type most commonly used. The electrolyte is a dilute solution of sulphuric acid (H₂SO₄).

3.8 Solar Panel

A photovoltaic module is a packaged, connect assembly of typically 6×10 photovoltaic solar cells. Photovoltaic modules constitute the photovoltaic array of a photovoltaic system that generates and supplies solar electricity in commercial and residential application. Each module is rated by its DC output power under standard test conditions and typically ranges from 100 to 365 Watts. A single solar module can produce only a limited amount of power; most installation contains multiple modules.



Fig-3.6: Solar Panels On Car Roof

3.9 Inverter

An inverter is an electric apparatus that changes DC to AC. It is not the same thing as an alternator, which converts mechanical energy into alternating current. Direct current is created by devices such as batteries and solar panels. When connected, an inverter allows these devices to provide electric power for small household devices. Inverter does this through a complicated electrical adjustment. From this process, AC electric power is produced.

4. FABRICATION & WORKING

The working of the electromagnetic engine is based on the principle of magnetism. A magnet has two poles, a north pole and a south pole. Magnetism is a class of physical phenomenon that includes forces exerted by magnets on other magnets. By principle of magnetism, when like poles of a magnet are brought together they repel away from each other. When unlike poles are brought near each other they attract. This is the same for the case of an electromagnet and a permanent magnet too. So the idea is to modify the piston head and cylinder head into magnets so that force can be generated between them. This working of the electromagnetic engine is based on attraction & repulsive force of the magnet. The engine greatly resembles the working of a two-stroke engine.

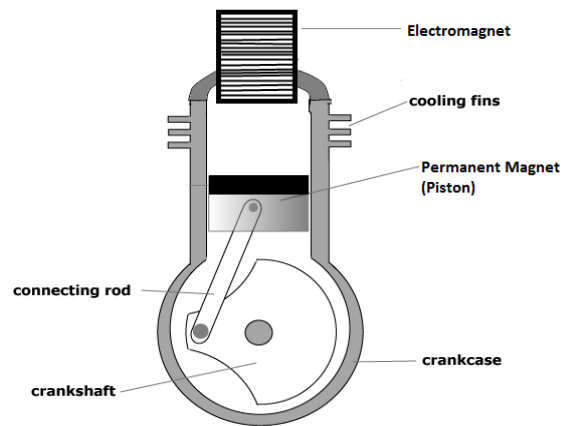


fig. Schematic Diagram of Electromagnetic Engine

Fig-4.1: Schematic Dia Of Electromagnetic Engine

To start, let us begin from the situation, when the piston is located in the lower position. The coil is connected through the battery, the copper coil is energized to produce the magnetic field. The piston is in the side of the large power Neodymium Iron Boron magnets, the piston moves up and down. The flywheel connected through the piston link. The copper coil energized the piston moves upward and the copper coil is de-energized the piston moves downward. With the help of relay and control unit. The continuous process through the piston is move to (up and down) with also rotated the flywheel. The arrangement has shown in the Electromagnetic engines working are based on the principle of interaction between the magnetic field. The permanent magnet is fixed in the piston and iron material is connected to the copper coil. So that the iron material is converted into an electromagnet when the power supply is given to it. When the piston is located in the lower position, the coil is connected through the battery. The copper coil is energized to produce the magnetic field. When the copper coil is energized the piston moves upward and the copper coil is de-energized the piston moves downward, with the help of relay and control unit. The continuous process through the piston is move to (up and down) with also rotated the flywheel.

The main disadvantage of such an electrical vehicle is that when after moving some distance the battery gets discharged. So the batteries need to be charged regularly, which is difficult and time-consuming. So the engine is not dependable, so to overcome this difficulty a new technology is introduced that is to charge the battery by solar panels. As solar energy is renewable, so it is easily available and free of cost. Charging the battery by AC supply is quite difficult to find in emergency. Solar panels are made from silicon and convert solar energy to electrical energy. Initially, solar panels are mounted on the roof of a car so that sunlight falls on the solar panel. Now this solar panel is connected to a solar controller which controls the charging of the battery and prevents it

from overcharging. It also prevents the reverse flow of current during the night when no charging takes place. Now connect this charge controller to the battery and the battery will start charging in the presence of sunlight if it is not fully charged, the charging process stops automatically and it restarts again when the indicator detects the battery is charged. Solar panels collect the energy from the sun and convert it to DC electricity. A battery or series of batteries that stores the electricity is produced. An inverter that converts DC current to AC is connected to the battery. Now we will switch to this reserved battery. And further the working of the electromagnetic engine is same as discussed above.

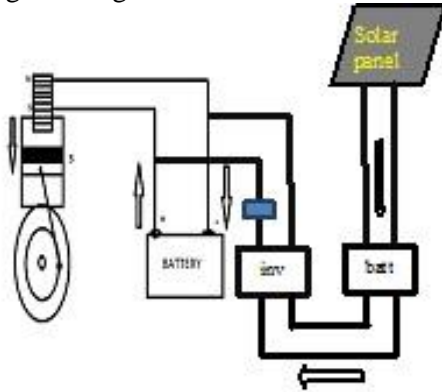


Fig-4.4: Electromagnetic Engine Connected To Reserve Power Source

Solar panels collect the energy from the sun and convert it to DC electricity. A battery or series of batteries that stores the electricity produced. An inverter that converts DC current to AC is connected to the battery. Now we will switch to this reserved battery. And further the working of the electromagnetic engine is same as discussed above.

5. ADVANTAGES

1. Serves as a promising alternative to the fossil fuels.
2. Less maintenance is only required.
3. Lighter than an internal combustion engines
4. It has less running cost than an IC Engine
5. It can produce much more power & running capacity than electric car & bikes.

6. DISADVANTAGES

1. Residual magnetism
2. Complicated engine design
3. Controlling the engine is difficult.
4. It cannot produces power like an IC Engine.

7. CONCLUSIONS

Conventional IC engine are introduced first which uses petrol and diesel to produce power in which oil is depleting gradually and also causes "Pollution". Next Electrical vehicles came it have very less load carrying capacity & not suitable for long run.

Therefore we need an alternative mechanism which should avoid pollution, emission also zero consumption of fuel which are the main features of an

"*Electromagnetic Engine*" And also we can provide reserved storage like IC engine in the electromagnetic engine.

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