



INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Electromagnetic Engine

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Abstract—This paper presents the idea of electromagnetic engine. It is the modification of conventional internal combustion engine. With the increase in consumption and reducing supply, fossil fuels are on the verge of extinction. The paper proposes to use electromagnetic principle for running the engine. The concept is to use electromagnetic force to drive the piston and produce power. As the magnetic field is produced by supplying current to the solenoid, the piston reciprocates. The reciprocating motion is converted into rotational motion and power is stored in the flywheel.

Key Words—Electromagnet, Permanent Magnet, Piston, Reciprocating

1. Introduction

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. A copper winding is also wound to the cylinder block to get additional power to the piston to reciprocate. This winding is connected to a battery to create a magnetic field inside the cylinder and reciprocate permanent magnet piston on basis of repulsion forces created by winding. The total power supplied by battery will be just to fulfil the copper losses of winding and power required to magnetize the windings. The present project relates to an electromagnetic piston engine adapted to produce driving power by the electromagnetic force created by a reciprocal movement of a piston in a cylinder. In their cent years, the development of electric vehicles is exploding. Such electric vehicles use an electric drive motor as a power source. Conventional electric drive motors are designed to pick up rotational energy of a rotor as a power by directly rotating the rotor by electromagnetic force. The electric drive motors of such a type, however, lead naturally to an increase in the weight of a rotor in order to pick up greater outputs and, as a consequence, suffer from the disadvantages that the weight of the portion corresponding to a rotary assembly section becomes heavy. Then such electric drive motors require a power transmission mechanism for transmitting the driving power from a power source to the wheels to be designed to be adapted to the features of the electric drive motors. Power transmission mechanisms for internal combustion piston engines, which have been generally used for conventional vehicles, cannot always be applied to electric vehicles as they are. These problems impose greater burdens upon the designing of electric vehicles.

The main objective of this project is to develop pollution free engine which fulfill the fuel requirement. The working principle of electromagnetic engine is based on magnetic attraction and repulsion phenomenon i.e. magnetic repulsion between same pole and attraction between different poles. This principle moves piston Top dead center to Bottom dead center and vice versa. The Electromagnetic Reciprocating Engine uses Magnetic Energy to turn a crankshaft. The Magnetic Energy is used to move the Magnetic Chamber in a linear motion, that motion is converted into a rotating motion by crankshaft. That crankshaft converts that motion into horsepower and torque with efficiency by using haft strokes. The crankshaft is used to turn an alternator which produces the electricity for the electromagnets in the Magnetic Chamber. The Magnetic Energy is produced by the electromagnets which are powered by electricity from an attached battery. The crankshaft can be connected to a transmission for vehicles.

2. EXPERIMENTAL DETAILS

(1) Cylinder

Electromagnetic engine uses only magnets for its operation. The cylinder prevents unwanted magnetic field and other losses. Further cylinder material itself should not have the properties of attraction and repulsion hence it should not disturb the movement of the piston. As a solution to the above issues, the cylinder must be only made up of nonmagnetic materials such as stainless-steel, fiber, titanium or similar materials of high resistivity and low electrical conductivity. The cylinder of an electromagnetic engine is a simple cylindrical 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 a product to manufacture. Also the cylinder is made of aluminum, a non-magnetic material which limits the magnetic field within the boundaries of cylinder periphery. Usage of aluminum material makes the engine lighter unlike the cast-iron cylinder used in internal combustion engine.

(2) Piston:

The hollow piston casing is made up of non-magnetic stainless steel, titanium or similar materials which are of high resistivity and low electrical conductivity. Alternatively, piston casing can also be made up of non-metallic, thermal resistant materials can be made by integrating both non-magnetic and non-metallic materials. One end of the hollow case is fitted with 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 which in turn connects to the crankshaft. The crankshaft and the piston rod convert the linear reciprocating movement of the piston to the circular movement. When rotated one-half revolution the stress in the fibers originally above the neutral axis of the specimen are reversed from compression to tension for equal intensity. Upon completing the revolution, the stresses are again reversed, so that during one complete revolution the test specimen passes through a complete cycle flexural stress.

(3) Connecting Rod:

In a reciprocating engine, the connecting rod is used to connect the piston to the crankshaft. It converts the linear motion or reciprocating motion of the piston to the circular motion of the crankshaft. The connecting roused in this engine is M10 bolt. The material of the connecting rod is cast iron. As the magnetic fields are contained inside the cylinder, the connecting rod will not be affected much. The connecting rod is same as that of an Internal Combustion engine.

(4) Flywheel:

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

(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 referred to as a turn or a winding, and coil consists of one or more turns. For use in an electronic circuit, electrical connection terminals called taps are often connected to a coil. This 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 set of coils and taps is often called the windings.

(6) 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 sulfuric acid (H_2SO_4). In the application of battery power to start the engine in an auto mobile, for example, the load current to the starter motor is typically 200 to 400A. One cell has a nominal output of 12V. lead acid cells are being used in a series combination of one battery of 12-V each.

(3) WORKING PRINCIPLE:

The electromagnetic engine according to the present invention in one aspect comprises a cylinder and a piston, each made of a non-magnetic material, cylinder is surrounded by a copper winding which is wound in a several layers at a length with which the piston reciprocates. Piston which reciprocates inside the cylinder must be made of nonmagnetic material and fixed with a strong permanent magnet at its top. When D.C current is supplied to the coil, it gets magnetized and two poles are created at the two ends of the coil. The magnetic field is strong enough to attract and repel the permanent magnet fixed at the piston top. So, magnetized coil attracts piston up, when it reaches the TDC, we change the direction of the current through the controller circuit, with this poles are exchanged, repulsion occurs and piston moves downwards to BDC. In this way we get reciprocating motion for the Piston. Piston is connected to flywheel with the help of connecting rod. The electromagnetic engine according to the present invention in a still further aspect is constructed by arranging a combination of the cylinder with the piston in -the aspect described above as a one assembly, arranging the one assembly in plural numbers and operating the plural assemblies in a parallel way, and converting a reciprocal movement of the piston in each of the plural assemblies into a rotary movement of a single crank shaft by crank mechanism so that more can be produce for propelling any heavy vehicle.

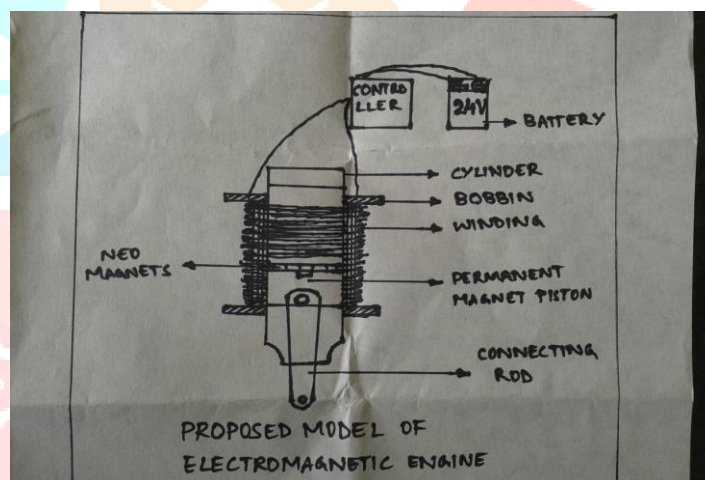
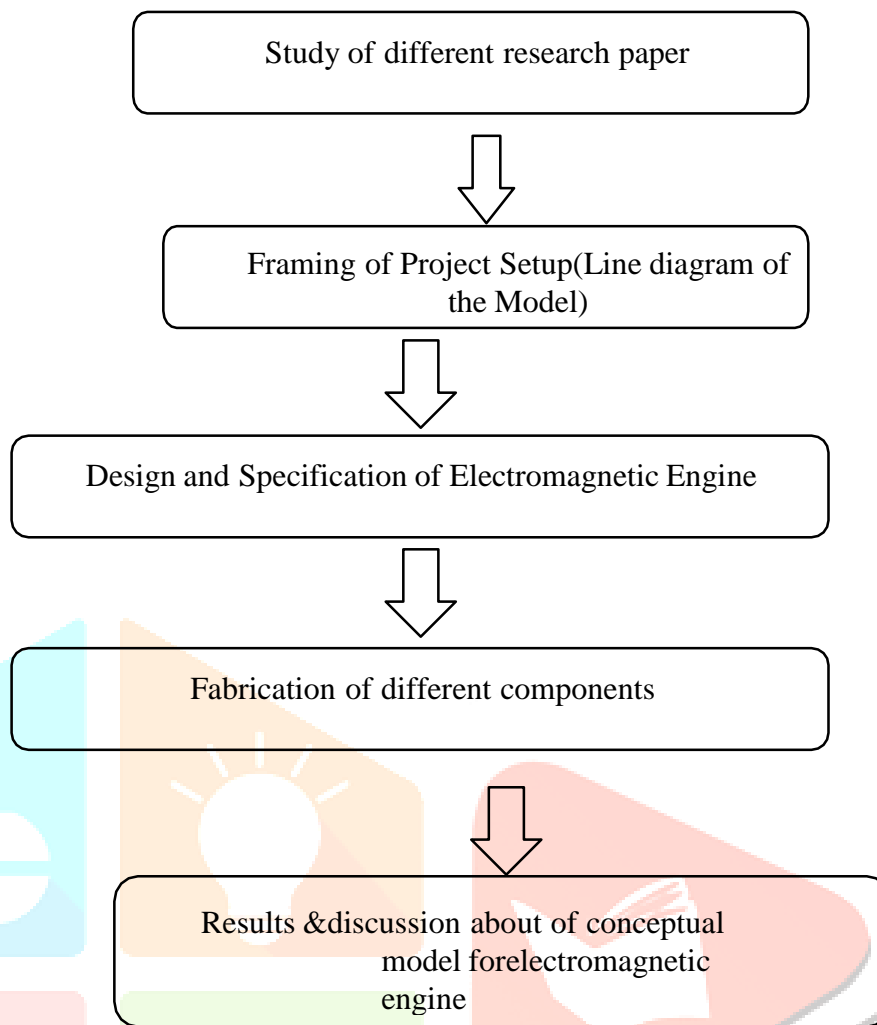
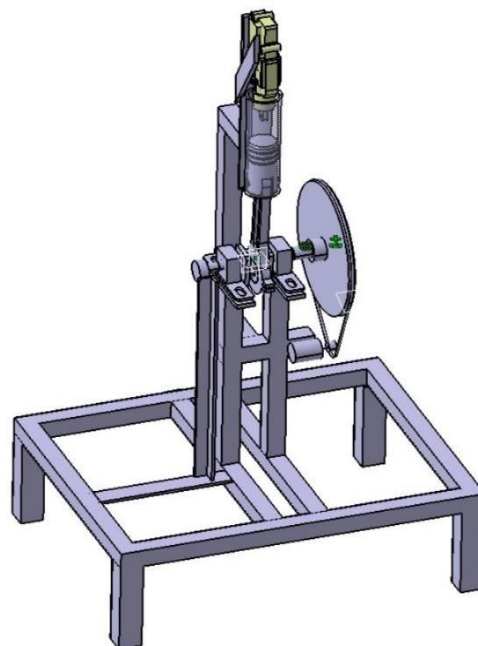
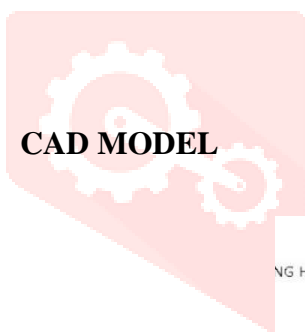


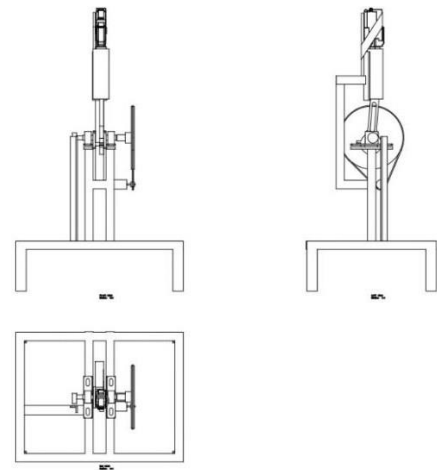
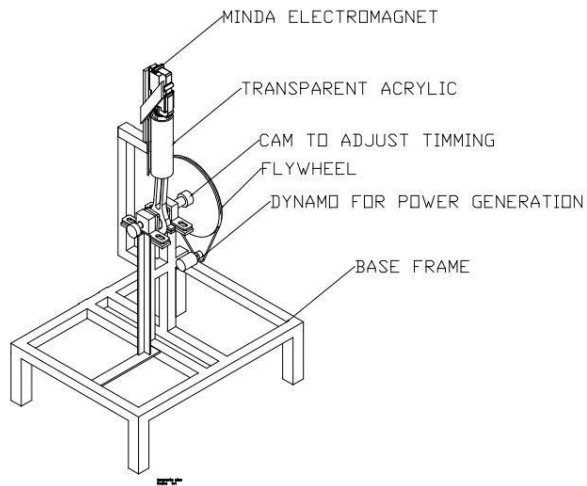
Fig. Proposed Model of Electromagnetic Engine

Methodology of working process



(4) **CAD MODEL**



(5) DRAWING**(6) CONCLUSION**

We have designed an engine which need not be separately manufactured, but existing engines can be easily modified to work this way. The proposed engine is as simple and an excellent technique to run the electric vehicle in a highly efficient manner. The torque that was achieved in this model was almost equal to the torque obtained by the original IC engine. By slight modification in design and by the use of better hands the engine can be modified to generate more power, thereby increasing its efficiency.

The electromagnetic engine has various advantages over the internal combustion engines. The main advantage is, no fuel is being used in the engine. This results in no pollution which is very desirable in the present day situation. As there is no combustion taking place inside the cylinder there is only very little heat generation. This eliminates the need for a cooling system. Also by the use of materials like Aluminums, titanium etc. we can reduce the weight of the engine. Less noise is produce during working. The disadvantage of the electromagnetic engine is its high initial cost. The engine is not as flexible as the internal combustion engine. The power source is battery. The number of batteries will vary according to the requirement. In high power engines, the number of batteries will increase which may increase the total weight of vehicle and consume a lot of space. The batteries needs to be charged regularly which is difficult and time consuming. So the engine is not dependable. The prototype is an idea which uses the property of an electromagnet by virtue of which it changes the polarity of its poles whenever the direction of current is changed. This variation in polarity is utilized to attract or repel the permanent magnet attached to the piston.

(7) FUTURE ENHANCEMENT

Our model uses an existing engine which has aluminum piston heads, cast iron cam, etc which in turn increases the weight of the engine and increasing the load of the engine. Thus to attain maximum power and higher efficiency the piston head and cam are to be designed specifically for an electromagnetic engine using different materials such as various fibers and resins to reduce the weight of the engine.

The usage of relay and timer will limit the output of the engine. By using an ECU in the engine instead, power can be obtained on each stroke which will result in an increased output. Also, by inserting more permanent magnets in series on the piston will enhance the output of the engine.

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