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Electric Vehicle with Zero-fuel Electromagnetic Automobile Engine

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Abstract

The main aim of the project is to design an electromagnetically reciprocating automobile engine. A four-stroke engine is used in the vehicle. The design involves the replacement of the spark plugs and valves by conductors and strong electromagnetic material. The piston is a movable permanent magnet and while an air core electromagnet is fixed at the top of the cylinder. When the electromagnet is excited by A.C. (Square Wave) supply, for same polarities these magnets will repel and for opposite polarities they will attract, thus causing the to and fro movement of the piston. So when the cylinders 1 &4 of the four-stroke engine experience attraction of magnets due to which the piston moves upwards, repulsion takes place inside cylinders 2 & 3 in which the piston moves downwards and then during the next stroke vice-versa occurs . The to and fro movement of the piston is converted into a rotary motion by the crank shaft, which in turn is coupled to the wheels which causes the wheels to rotate. So with the help of the electromagnets and permanent magnets, the to and fro movement of the piston is obtained using the alternating attractive and repulsive force of the magnets, which is responsible for the movement of the vehicle. Thus we can run the electric vehicle without a motor and the energy is extracted in a clean way as it does not require fuels reducing the air pollution.

Keywords: IC engine, electric vehicle, electromagnetic, 4 stroke, zero fuel.

1. Introduction

Necessity is the mother of invention. The need for locomotion has been growing exponentially and the number of automobiles manufactured is growing equally to meet the demand. The emission of toxic pollutants from automobiles therefore has caused serious concern and highlights the need for green vehicle technologies. This is why electric vehicles entered the picture. Moreover, the cost and demand of fossil fuels has been increasing over the past and this has made man to look for better alternatives in the automobiles sector, and electric vehicles exactly fit in. The use of electric vehicles reduces vehicular emissions by a large extent, thus reducing global warming. This paper is proposed to modify the present day engine in such a way that the electric vehicle operates without a motor, and requires no fuel to run.

2. Existing Scenario & Problems

The present day electric vehicle is efficient than petrol/diesel vehicles. They are 97% cleaner than gas-powered cars. The maintenance cost of electric cars is optimum. The main problems faced by electric vehicles are its inability to run long distances before being charged again and the high initial cost of the electric vehicles. Most production electric cars about to hit the market can only go about 100 miles (160.9kms). Also there is need for installation of charging stations as the energy densities of normal batteries is less for vehicles to travel over long distances and getting a full charge takes around eight hours.

3. Components Used in the Proposed Model

3.1 IC Engine

The internal combustion engine is an engine in which the combustion of a fuel (normally fossil fuel) occurs with an oxidizer (usually air) in a combustion chamber. The expansion of the high-temperature and high-pressure gases produced by combustion apply direct force to the piston. Here we replace the spark plugs by electromagnet and a permanent magnet is mounted on the piston. The piston moves to and fro due to attractive and repulsive forces, when the electromagnet is energized. We can use a 4-stroke IC engine for the vehicle.

3.2 Electromagnet

When a current carrying conductor is wound on a magnetic material (ferrite), it acts as a magnet till the conductor is live. An air core electromagnet that acts as a solenoid is used here. Since it has an air core, the core losses are eliminated.

3.3 Permanent magnet

A permanent magnet is a piece of magnetic material that retains its magnetism even after being removed from an external magnetic field. The permanent magnets which

have produced the largest magnetic flux with the smallest mass are the rare earth magnets based on samarium and neodymium. So n32 grade magnets can be used.

3.4 DC Battery

We use a 48V dc battery to supply power to the whole system. Lithium ion batteries can be used as they can have efficiencies of around 99%.

3.5 H-bridge inverter

A device that converts dc power into ac power at desired output voltage and frequency is called an inverter. The dc power input is obtained from the dc battery used here. Since half bridge inverters require 3-wire dc supply, we use a single phase full bridge voltage source inverter to convert the dc supply into AC (square) wave. The output voltage is therefore doubled and the output power is increased by four times. MOSFETs are used as switching elements since self commutation with base or gate drive signals can be employed for their turn-on and turn-off.

3.6 Hall effect sensor

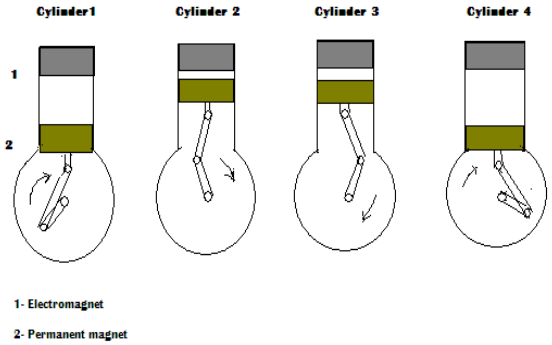
We use hall effect sensors to trigger the MOSFETs. Hall effect sensor is a transducer that varies it's output voltage in response to changes in magnetic field. With a known magnetic field, its distance from the Hall plate can be determined. Using groups of sensors, the relative position of the magnet can be deduced.

4. Working

The main idea behind the project is to modify the existing IC engine into an electromagnetically reciprocating engine by replacing the spark plugs by strong electromagnets and conductors. It consists of four cylinders. A stack of permanent magnets is mounted on the piston head with its north/south pole always facing the fixed electromagnet. If a magnetic material is wound by a current carrying conductor, then it will act as a magnet whose field strength depends on the amount of current flowing through the conductor. When the electromagnet on top of the cylinder is excited by an ac supply (square wave), it acquires positive and negative charges for each half of the supply. For instance, the electromagnet will act as a North pole for positive supply and South pole for the other or vice versa. This leads to the attraction and repulsion of the permanent magnet on the piston head due to which the piston moves to and fro. So when the magnets of cylinders1 & 4 experience attraction causing the piston moves upwards, the magnets inside cylinders 2 & 3 experience attraction making the piston move upwards. This to and fro motion of the piston inside the cylinder rotates the crankshaft which makes the wheels to rotate. This causes the motion of the vehicle.

Engine Model

The current necessary to excite the electromagnet is obtained after the conversion of the dc supply from the battery into ac supply by the H-bridge inverter. The hall sensor senses a pole (North/South) and gives a high/low output. Thus the MOSFETs are triggered to get an ac supply. The output of the hall sensor remains constant till it encounters another pole after which the other set of MOSFETs are triggered to change the polarity of the supply.



5. Features

This innovative technique allows extraction of energy in a clean way which reduces the emissions due to which pollution is minimized to a large extent. So health disorders arising due to pollution can be eradicated to some extent. The salient feature of this engine is that it does not require fossil fuels to run. Also, it does not need motor for operation. The starting torque of the engine is high. The life of the battery source is increased since the battery is charged simultaneously while the engine is running. The greatest advantage is that these engines need not be specially manufactured, as existing engines can be easily modified to work this way. The weight of the vehicle is reduced, thus improving the efficiency of the vehicle. The maintenance cost is optimum.

6. Conclusion

In this paper, we have depicted a revolutionary engine which need not be separately manufactured, but existing engines can be easily modified to work this way. The proposed engine is a simple and excellent technique to run the electric vehicle in a highly efficient manner.

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