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Electromagnetic Engine controlled using IR Sensor

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Abstract: ***The base idea of this paper is to control the electromagnetic engine to enhance a smooth rotation by measuring distance of the piston using an IR sensor. This electromagnetic engine consists of an electromagnet, permanent magnet, Infrared Sensor, powerful microcontroller and power supply. The permanent magnet acts as a piston in this electromagnetic engine, it has magnetic field energy for a proper function. The position of permanent magnet has to be noted for electromagnets energisation in order to reduce power consumption by electromagnet. The infrared sensor mounted with electromagnet set and pointed towards permanent magnet, whenever the permanent magnet moves towards electromagnet, sensor reads the change in magnetic piston position. The electromagnet is energized on the reach of permanent magnet near electromagnet. Control of electromagnets power supply is depends on the signal provided by IR sensor, this sensor is mainly makes timing control of power drive circuit through the microcontroller. This makes engine to run continuously and reducing its power consumption by providing a pulse to electromagnet.***

Keywords: Electromagnet, Permanent Magnet, Sensor, Engine.

1. INTRODUCTION

With the diminishing fossil fuel resources and unabated increase in energy cost and environmental concerns, engines using alternate energy sources such as bio-fuel, solar power, wind power, electric power, stored power, etc. are being developed around the world. Hence in the absence of a viable alternative, until now, switching to new technology by changing from traditional Internal Combustion engines has been a challenge.

Magnetism is the basic principle of working for an electromagnetic engine. The general property of magnet is attraction and repulsion forces is converted into mechanical work. This principle is being used in the electromagnetic engine.

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In this engine, the cylinder head is an electromagnet and a permanent magnet is attached to the piston head. When the electromagnet is charged, it repels the magnet, thus the pushing the piston downwards thereby rotating the crankshaft. The power of the engine is controlled by the strength of the field and the strength of the field is controlled by the amount of winding and the current through it [1].

The power flow through the electromagnet is turned on and off by the Infrared sensor signal to the microcontroller. This make control of electromagnet with respect to the position of the piston. Whenever the piston reaches TDC the IR sensor gives signal high and turn on the electromagnet power supply. The On time of the electromagnet is controlled through manually to achieve a speed control. More the on time more will be the electromagnet power created a high force of repulsion.

Working Principle

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 is brought together they repel away from each other. When unlike poles are brought near each other they attract. This is same for the case of an electromagnet and a permanent magnet too [1].

The engine resemble the working of a two-stroke engine. Permanent magnet is fixed in the piston and electromagnet is at the cylinder head. When the sensor locates the piston at the BDC position it de-energies the electromagnet. To start the engine the sensor first reads piston position and make the electromagnet to attract the piston towards the TDC position. After piston reaches the TDC the sensor turns on the electromagnet with an ON delay set by the user. When the engine starts to revolve the sensor starts to control the engine to create the repulsion force of the magnets.

Desing and Development

A. **Elecromagnetic engine**

An electromagnetic engine is the one which works with electrical energy, here the energy is converted into magnetic energy with the help of an electromagnet. The working principle of this engine is similar to an internal combustion engine. The piston of an electromagnetic engine is made up of permanent magnet which makes the energy conversion in the engine.

B. **IR Sensor**

An IR sensor is an Infrared sensor, used is to determine the distance of piston in the engine. This sensor is mounted in parallel to the electromagnet in order to achieve the position of piston towards electromagnet. Then the signal from the sensor is sent to the controller where the softwired operation takes place. This forms a control on the electromagnetic engine. The sensor has a transmitter Tx and receiver Rx with an preamplifier [5].

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C. Cylinder Head

To implement the IR sensor a small provision has to be made in the cylinder head, this helps to mount the Tx and Rx to be mounted on the right place on the head. The change in cylinder doesn't increase the cost and decrease the performance of the engine. [1]

D. Switching Time

Turning ON and OFF the electromagnet plays a vital role in the power consumption, speed and torque parameters. In order to achieve this an atmega328 microcontroller is used to perform the operation which the user defines. By varying the duty cycle of trigger, output power is controlled. This output power interns control the speed and torque of the engine. Figure 1 shows the graphical representation of switching [4].

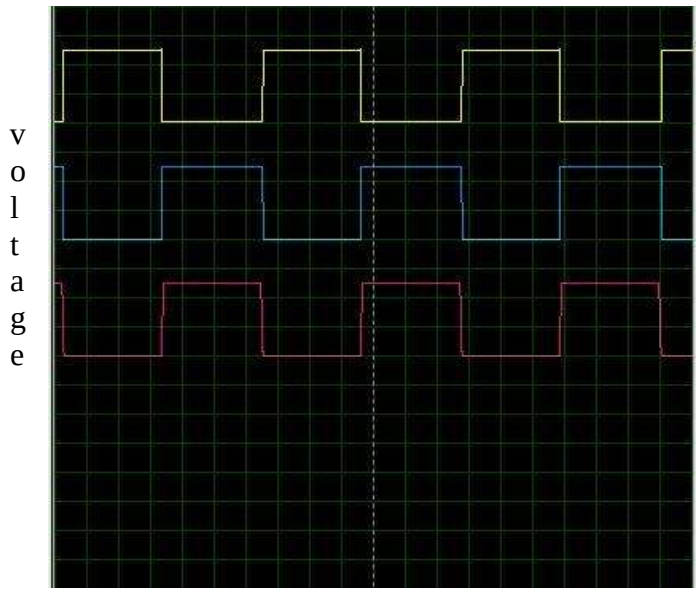

Figure 1 Switching time

Output signal
Gate signal
Sensor Signal

E. Sensor Arrangement

The sensor arranged on the engine is shown in figure 2. The sensor is electrically wired and connected to the controller, this sensor signal is the primary source for switching the engine power supply.

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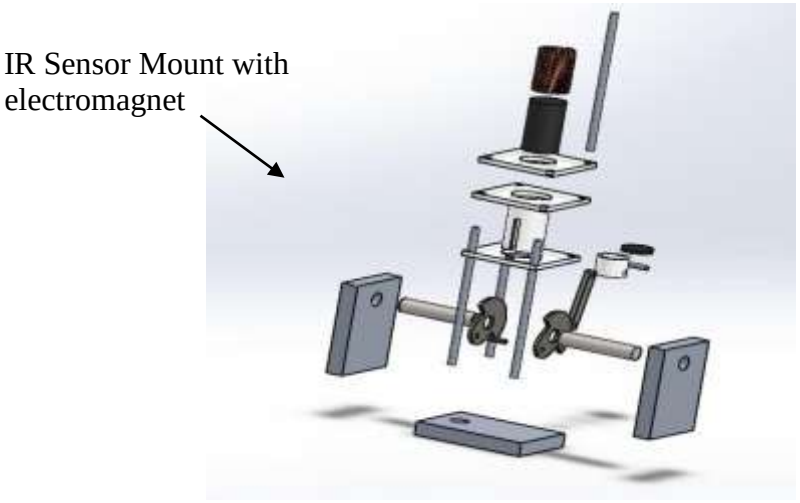

Figure 2 Assemble parts of engine

2. RESULTS AND DISCUSSION

The electromagnetic engine with IR sensor has good switching time than the conventional switching method. Since the losses and time taken to switching the engine is high [3]. In the proposed system the switching is carried out in milliseconds so the engine has the ability to bring very high speed and the losses were minimized by soft switching.

3. CONCLUSION

The engine has overcome the switching losses to least value of 30% from the conventional type electromagnetic engine. The speed torque characteristic of the engine is improved which is under a detail study going on. It also replaced the cam value and hard switches which creates spark while switching.

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