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Design and Prototype of the Electromagnetic Engine

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ABSTRACT: Making of electromagnetic engine is process of removing conventional parts in IC engine. electromagnetic engine produces driving power from reciprocating motion of the piston in the cylinder caused by electromagnetic force. The weight of engine is reduced because as these prototype model consists of only one piston and only one pole of magnet is used for running the engine. As you can see now current world trade going towards electronics and magnetic trade. It has been seeing to end its dependency on oil. Electromagnetic engine is absolute alternate for conventional fuel engine. The current effort lightning on development of electromagnetic engine and creating magnetic field in between magnet holder and permanent magnet. Number of expectations were carried out in developing an electromagnetic engine and output bring out by the engine were calculated.

KEYWORDS: Electromagnetic Engine, magnetic field, Conventional Parts, IC Engine

I. INTRODUCTION

Over a couple of decades, various researchers brought up several changes to the internal combustion engine. They focused mainly on improving efficiency & simultaneously reducing exhaust gases produced by the engine.

Most piston-powered engines are having a four-stroke cycle. A stroke is one complete down or one complete up movement of the piston. There are two downstrokes & two upstrokes for the IC engine of this design. There are four steps in one cycle which are Intake, compression, power, and exhaust. The piston is moved up and down on each stroke by the crankshaft. The crankshaft must turn twice for the four strokes mentioned above.

There is a shortage of fossil fuel in today's day & age, so this research paper is about an alternative to the traditional IC engine. An Electromagnetic Engine uses the power of electromagnets & causes no type of pollution also they are the dominant force when this world faces a huge crisis due to inadequate fossil fuels. Magnetism is the basic principle of working for an electromagnetic engine. In this engine, the cylinder head is an electromagnet & the piston head is attached with a permanent magnet.

The components of an electromagnetic engine include a cylinder block, piston, connecting rod, crankshaft, an electromagnetic coil, bearings, piston pin, flywheel, and power source.

II. RELATED WORK

1. For doing any work or research first of all we need to gather or collect information regarding the work. before going towards Electromagnetic Engine we must have sufficient knowledge about IC engine.
2. We collect the information and after doing some study on that information we understand the concept of electromagnetic field And properties of magnets which is really essential for our work.
3. For study, we come in contact with various journals and research work about the IC engine.
4. All the material that we need for our prototype is received from market.



III. METHODOLOGY

The electro-magnetic engine work on the principle of magnetic attraction. when unlike or different poles of two magnet come in contact with each other they will attract each other with equal and opposite force. This type of phenomena of attraction is used in this system to create linear motion.

It consists of a coil connected to a DC Supply which is placed on the top of the cylinder and is responsible for producing the linear / Reciprocating motion of the piston. A cylinder plunger is fixed on the piston head. The piston rotates the crankshaft while using connecting rod.

The system is designed in such a way that when piston at Bottom Dead Centre (BDC), the switches in turned on and if when the piston at Top Dead Centre (TDC) the switches is turned off and supply is turned off. when the piston at BDC the supply is turned on & this causes coil get energized which attract the block fixed on the piston head and it turn causes the piston move upwards direction and reaches Top Dead Centre (TDC).

At this point, the supply is turned off the piston move back towards the Bottom Dead Centre (BDC) due to the gravity and the energy stored in the flywheel.

This electro-magnetic engine produces more torque it's required lower energy Compare to electric motor.

3.1 Design of piston-

The piston along with the gudgeon pin that was purchased by us is the piston used in the engine of a Hero Honda Splendor which uses a 4-stroke petrol engine. Mean Effective Pressure is the average pressure exerted by the gases on piston head during the combustion process in the engine. The value of MEP for a 4-stroke petrol engine was obtained from the IC Engine Date book by S.V. Kale. Using the MEP and the area of the piston head, we found the average force exerted on the piston is:

Avg. Force = M.E.P. × Area of the piston head

$$= 1.4 \times \pi \times 25$$

$$= 2748.9\text{N}$$

Piston Material	Aluminium
Piston Diameter	49.5 mm

The ideal maximum force exerted on the piston head in our model is equal to 168.82N. Since the force exerted on the piston head in our model is much less than average force exerted on the piston purchased by us, therefore it is safe to use it for our application.

3.2 Design of Connecting Rod-

Material of the connecting rod is Aluminium

Yield Strength of Aluminium (σ_{yt}) = 245 MPa = 245 N/mm²

Ultimate Strength of Aluminium (σ_{ut}) = 300 MPa = 300 N/mm²

Taking Factor of Safety (FOS) as 5

Finding the maximum allowable stress [τ]

$$[\tau]=0.5 \sigma_{yt}/ \text{FOS}$$

We get [τ]= 49 N/m



Finding the shear stress in the connecting rod.

2.2.1 Shear Failure of the Small End of the Connecting Rod

where,

$$F = 170.82 \text{ N}$$

$$A = 2 \times 11.5 \times 15 = 345 \text{ mm}^2$$

$$\text{We get } \sigma = 0.4951 \text{ N/mm}^2$$

Therefore, we have $\sigma <$

Thus we conclude that the connecting rod is safe against shear forces

2.2.2 Tensile Failure of the Connecting Rod

Where,

$$F = 170.82 \text{ N}$$

$$A = 798.53 \text{ mm}^2$$

$$\text{We get } \sigma = 0.2104 \text{ N/mm}^2$$

Maximum Tensile Stress is given by

$$\text{We get } [\sigma] = 62.25 \text{ N/mm}^2$$

Thus we conclude that $\sigma < \sigma_t$

Hence it is safe against tensile failure

Considering shear failure in the big end

2.2.3 Shear failure of the big end of the Connecting Rod

Where,

$$A = 2 \times 16.4 \times 17.15 = 562.52 \text{ N/mm}^2$$

$$\text{We get } \sigma = 0.303 \text{ N/mm}^2$$

Maximum shear strength permissible in the big end of the connecting rod is

Where,

$$FOS = 5 \text{ We get}$$

Therefore, we have $\sigma <$

Thus we conclude that the big end of the connecting rod is safe against shear forces

Electromagnet-

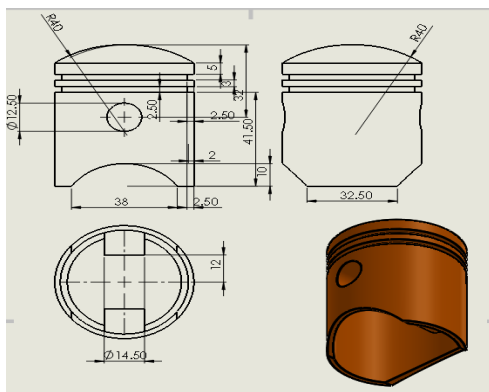
Electromagnet is device used for generating temporary magnetic field by using electric current. It consists a coil which is wound around a core. When current supplied to coil with help of external sources it produces magnetic field around the coil and this magnetic field is highly localized. But when the current supply is turned OFF, then the coil loses their magnetism.

In this experiment **Electromagnetic coil** is used for attracting and repelling the piston.

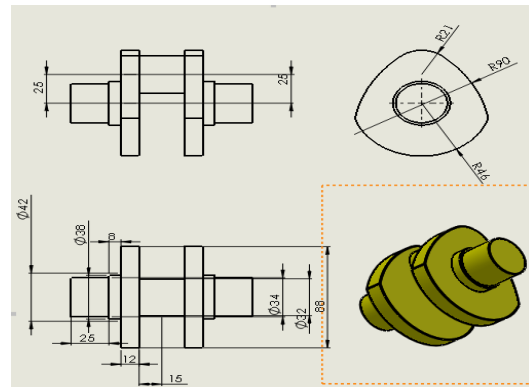
Material	Gauge	No. of turns	Diameter of coil	Height of coil
Copper	SWG 18	340	34mm	78mm

CAD DESIGN OF ELECTROMAGNETIC ENGINE PARTS

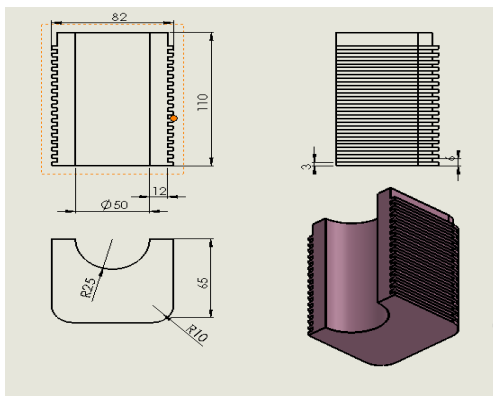
Figures shows the outcomes results of CAD design.



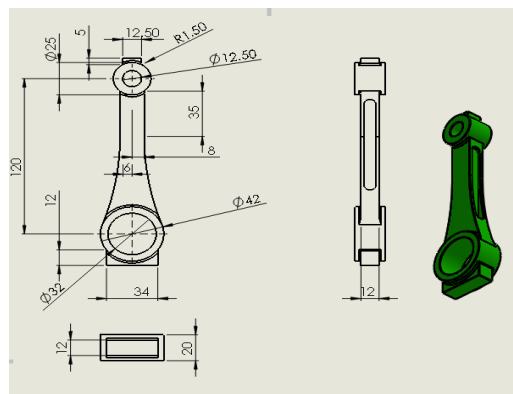
(a) CAD Model of Piston
(b)



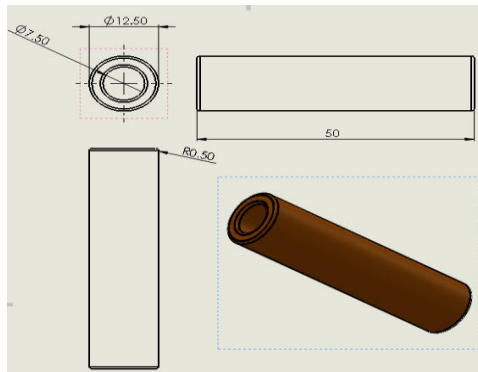
(b)CAD Model of Camshaft



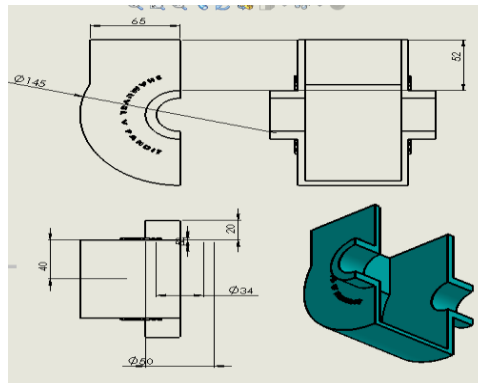
(c) CAD Model of Upper Case



(d) CAD Model of Crank Rod



(e) CAD Model of Gudgeon Pin



(f) CAD Model of Lower Case

(Design fig. of Piston,Camshaft,Upper case,Crank Rod, Gudgeon Pin and Lower Case Shows actual dimensions of partswith two dimensional and three dimensional CAD design.)

IV. CONCLUSION

The electromagnetic engine can be good replacement over commercial IC Engine. As there no fuel is being used in the engine,there will be no pollution which is very desirable in the today's situation.The only power consumed is the power consumed by electromagnet, which is used here is to repel the permanent magnet. Also, there is no combustion taking place inside the cylinder therefore there is very less generation of heat Therefore, the need for cooling system is eliminated. This system also eliminates the use of air filter, fuel tank, supply system, fuel filter, fuel injector, fuel pump, valves etc. making the system simple and with very less voice generation.

REFERENCES

- [1] Patent: Electromagnetic Engine with Plural Reciprocating Members, Angelo Pecci(Appl. No.: 165228)
- [2] Patent: Magnetically propelled engine that does not require fuel (12/624,352)
- [3] Patent: Electro-Magnetic Reciprocating Engine (108,220)
- [4] Patent: Induction Motor Regenerative Braking System (Appl. No.: US3675099 A)
- [5] Patent: Electromagnetic piston engine (Appl. No.: US 6049146 A).
- [6] Patent: Electromagnetic engine (Appl. No.: US 4317058)
- [7] Dr. Antal Penninger, Internal Combustion Engines, Technical University of Budapest.
- [8] AmarnathJayaprakash, Balaji, G., Bala Subramanian, S. and Naveen, N., 2014, "Studies on ElectromagneticEngine," International Journal of Development Research Vol. 4, Issue 3, pp. 519-524.
- [9] Abil Joseph Eapen, Aby EshowVarughese, Arun T.P, Athul T.N, 2014, "Electromagnetic engine," International Journal of Research in Engineering and Technology Volume: 03, Issue: 06, eISSN: 2319-1163.



[10] Vishal Abasaheb Misal, Umesh Dattatray Hajare and Arshad Ashak Atar. Electromagnetic Engine. International Journal on Theoretical and Applied Research in Mechanical Engineering (IJTARME). ISSN: 2319 – 3182, Volume-2, Issue-4, 2013.

[11] V. Ganesan; Tata McGraw-Hill Education; Internal Combustion Engines

[12] http://www.consumerenergycenter.org/transportation/consumer_tips/vehicle_energy_losses.html

[13] <https://www.fueleconomy.gov/feg/atv.shtml>

[14] <https://news.softpedia.com/news/How-Electromagnets-Work-86413.shtml>

[15] <https://cse.ssl.berkeley.edu>



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