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DESIGN AND FABRICATION OF MAGNETIC REPEL FORCE ENGINE

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ABSTRACT

In present-day science and technology, there is an ever growing demand of petroleum products. These days' researchers are searching for alternative fuels. This project is one of the primary power sources for the automobile engines. This project is to describe the construction and design of an engine using the magnetic repelling force. This system is entirely different from normal IC engine mechanism. It works with electromagnetic impact and repulsion of magnetic force instead of fossil fuels. It comprises of, two permanent magnets and two electromagnets. Electromagnets are mounted on the cylinder head and the permanent magnets are mounted on the piston head. Here we are not utilizing the sparkle fitting and valve arrangement. Electromagnet contains copper windings. Electromagnets are getting power supply from the battery by reasonable voltage. The piston contains permanent magnet moves from TDC to BDC and BDC to TDC which will come about, change over reciprocating motion into rotary motion of the crankshaft. Power supply from the battery to the electromagnets are controlled by a microcontroller with help of power splitter, timer and relay switch course of action.

Keywords- Crank Shaft, Electromagnet, Mechanism, Permanent Magnet, Reciprocating

I.INTRODUCTION

Fossil fuels are found in 96% of the items we use each day. One major use of these products is like fuel, gasoline for cars, jet fuel, heating oil and natural gas used to generate electricity. Not only does the oil and natural gas industry supply a massive number of jobs, the taxes and royalties generated from revenue the industry directly fund schools, roads, emergency services and more. The products produced by fossil fuels are essential to our daily lives, creating materials like plastics, medicine computers and life-saving devices like MRI scanners. But unfortunately, these are limited in our environment [1]. These are depleting at a very fast rate. Moreover, they are not renewable. So it is need of an hour to save them for our survival and use them in an appropriate amount. Use of fossil fuels is found in almost everywhere to extract energy required to complete the work done. In engines also, they are widely used. So, here comes the need of an electromagnet engine where we cannot fully but reduce the number of fossil fuels for the same amount of energy we get from IC engines. An electromagnet engine makes the use of magnets to give required work done. 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 attracts or repels the magnet, thus pushing then piston downwards or upwards thereby rotating the crankshaft.

By designing and fabrication of this type of engine can really help us to save the use of fossil fuels and save our environment.

The electromagnetic engine consists of a cylinder and a piston, each made of a magnetic material, inner wall of the cylinder made of cylinder electromagnet that can be magnetized to one magnetic pole at a time, pole may be either "N" or may be "S", piston arrangement consist of permanent magnet fixed on a base end side of piston so that S pole side can be directed to the base end surface of the piston and N pole can be directed towards connecting portion, a magnetization unit used for increasing the magnitude of pole and hence called booster coil. By creating a magnetic attractive and repulsive force between the cylinder and the piston by exciting the cylinder electromagnet; and the piston, reciprocal movement of the piston can be obtained that can be transferred through connecting rod [2].

II. WORKING

2.1 Definition

An engine powering device with magnetic components that aid in the operation of piston propelled engines by attaching the device individually to the pistons, causing the pistons to perform the up and down thrusts. Without the use of fuel thereby mobilizing the engine, eliminating the necessity of fuel and preventing pollution exhausting into the atmosphere. This engine has magnetic shielding safety component to protect people and other electronic devices from strong rare earth magnets and electromagnets [3].

2.2 Working Principle

It based on the principle of magnetism i.e. a physical phenomenon that includes force exerted by a magnet on other magnets. By this principle when the like pole of a magnet is brought together they repel away from each other and when unlike poles are brought near each other they attract [4]. This is same for the case of the electromagnet and 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 electromagnet engine is based on attraction and repulsive force of the magnet.

2.3 Case of a Two-Stroke

The engine greatly resembles the working of a two-stroke engine. To start, let us begin with the situation when a 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 inside of the large power Neodymium Iron Boron magnets, the piston moved upper and lower the flywheel connected through the piston link the copper coil energized the piston move upward and copper coil is de-energized the piston moves downward. With the help of relay and control unit. The continuous process through piston is moved to (up and down) with also rotated the flywheel [5].

2.3.1 Working on Two-Stroke

Basically, the working of this engine greatly resembles that of a two-stroke IC engine where there is one power stroke for every two strokes/reciprocation of the piston or one full revolution of the flywheel. The movement of the piston is achieved with the help of the magnetic attraction between the Neodymium Iron Boron (NdFeB) Magnet (Permanent magnet) and the energized electromagnet. When the piston is at the top of the cylinder, the

electromagnet is de-energized by default. When the engine is started (Power supply is given), the electromagnet gets the electric power and hence gets energized becoming a magnet. This now attracts the permanent magnet which in turn draws the piston downwards [6]. The electric supply is provided using a battery set and is controlled by an Arduino Uno chipset which is used to set the frequencies for the pulse to go high and low. When the pulse is high, the power is supplied and when it goes low, the supply gets cut-off. Now, as the piston reaches the bottom and the power is cut-off, the energy stored in the flywheel makes the piston go back to its original position that is to the top, thereby completing the two strokes. The power is generated during the first stroke when the piston is pulled down by the magnetic force. This process is repeated and thus the energy produced is transferred to the flywheel which stores it for further applications. The permanent magnet is fixed on the head of the piston using strong adhesives. The electromagnet is made of Copper coils. When the supply is given, the coil gets energized and hence gets converted into an electromagnet. The power supply to the coil is regulated with the help of a relay. The relay gets power every time the frequency of the chipset goes high thereby completing the circuit and energizing the electromagnet.

2.4 Case of Four-Stroke

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 this magnet will repel and for opposite polarities, they will attract, thus causing them to and fro movement of the piston. So when the cylinder 1& 4 of the four-stroke engine experience attraction of magnet due to which the piston moves upward, repulsion takes place inside the cylinders 2 & 3 in which the piston moves downward and then during the next stroke vice-versa occurs[7]. The to and fro movement of the piston is converted into a rotary motion by the crankshaft, which in turn is coupled to the wheels which causes the wheel 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.

III.EFFECT OF TEMPERATURES ON MAGNETS

Magnetic material has a wide range of working temperatures. The following chart lists the various materials and their maximum working temperature. NdFeB material comes in many different heat tolerances but as the heat tolerance increases the maximum available flux density decreases.

MATERIAL	MAXIMUM WORKING TEMPERATURE	MAXIMUM WORKING TEMPERATURE
	Degree Celsius	Degree Fahrenheit
Ceramic	400	752
Alnico	540	1004
SmCo 1,5	260	500
NdFeB N	80	176
NdFeB M	100	212
NdFeB H	120	248
NdFeB SH	150	302

Table 1. Effect of temperature on magnets

3.1 Variation of strength with temperature

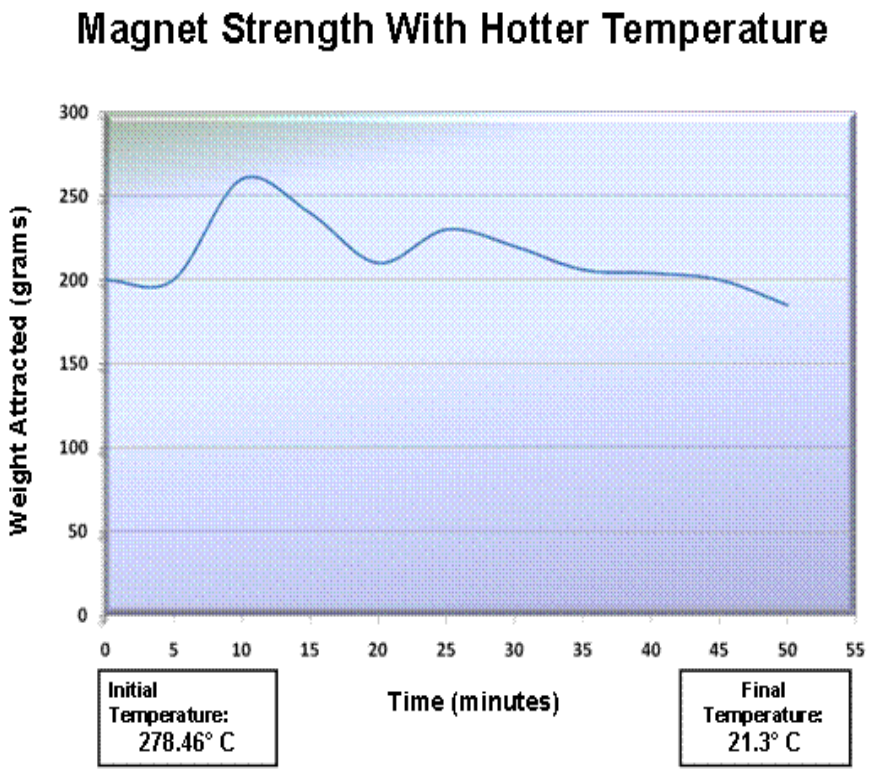

Fig. 1: Magnet Strength with Hotter Temperature

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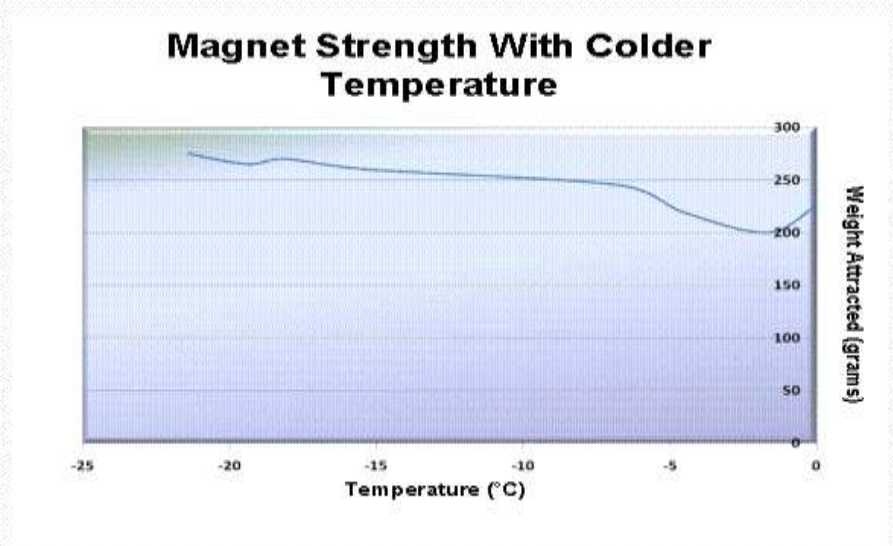

Fig. 2: Magnet Strength with Colder Temperature

IV. INDENTATIONS AND EQUATIONS

DESIGN

Input voltage = 36 V

Input current = 1 A Input Power = Voltage × Current = 36 × 1 = 36W

Max. Force exerted by electromagnet on piston

F1 = (N2I2KA)/2G

Where, N = number of turns = 1000 I = Current flowing through coil = 1 A

K = Permeability of free space = 4π×10-7

A = Cross-sectional area of electromagnet (radius r = 0.0175 m)

G = Least distance between electromagnet and permanent magnet = 0.005 m

On substitution, we get Max. Force

F1 = 24.18 N

Force exerted by permanent magnet Force

F2 = (B2A)/2μ0

Where, B = Flux density (T)

A = Cross-sectional area of magnet (radius r = 0.0125 m)

μ0= Permeability of free space = 4π×10-7

Now flux density

B = Br/2 × [(D + z)/ (R2 + (D + z) 2)0.5 – z/ (R2 + z2)0.5]

Where, Br = Remanence field = 1.21 T

z = distance from a pole face = 0.005 m

D = thickness of magnet = 0.012 m

R = semi-diameter of the magnet = 0.0125 m

On substitution we get flux density,

B = 0.2547 T

Now substituting B in the equation of force,

F2 = 12.67 N Since, force F1 and F2 are repulsive,

Total force F = F1 + F2

F = 36.85 N

Torque T = F × r

Where F = total force on piston, r = crank radius = 0.01m

Torque T = 0.3685 N-m

Mass of Fly wheel $\omega = (2\pi N)/60$,

Where N = speed = 200rpm

Therefore $\omega = 20.94$ rad/s

Energy stored on flywheel

$E = T \times \theta$

Where T = torque

θ = Angle of rotation = 180o = π radians

On substitution we get energy stored E = 1.157 J

Also

Output power $E = 0.5 \times I \times \omega 2$

Where, I = moment of inertia of flywheel

ω = angular velocity

On substitution we get moment of inertia,

I = 5.277 × 10-7 Kg-m2

Moment of inertia,

$I = 0.5 \times m \times r2$

Where, m = mass of fly wheel

r = radius of fly wheel = 0.07 m

On substitution, we get

m = 2.154 Kg

$P = (2\pi NT)/60$

Where, N = speed = 200 rpm

T = Torque = 0.3685 N-m

On substitution, we get

Output power P = 7.718 W

Efficiency = (Output/Input) × 100 = (7.718/36) × 100

Therefore, Efficiency = 21.44 %

V. FIGURES

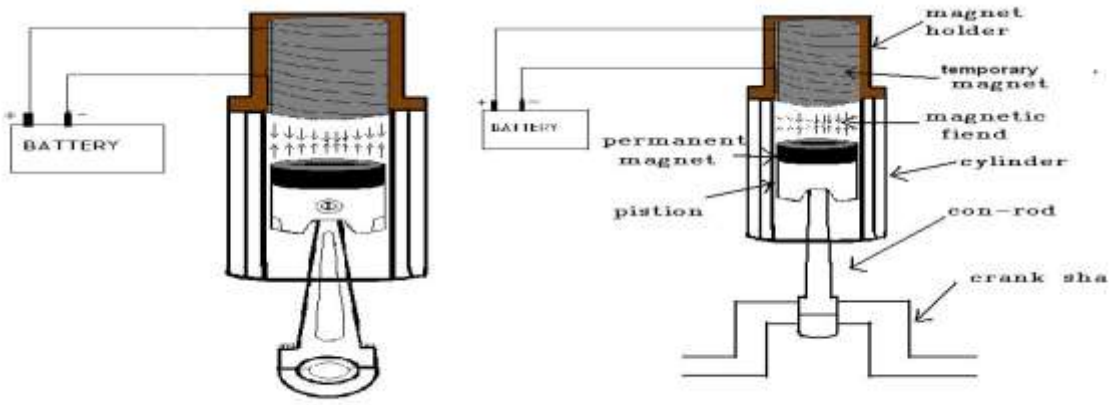

Fig. 3: Diagram of Magnetic Repel Force Engine

V1. CONCLUSION

Outline and working of an electromagnetic engine are different from other engines. The Principle of Operation of Electromagnetic Engine is Different than that of Internal Combustion Engine [8]. The electromagnetic engine has different favourable circumstances over the internal combustion engine. The primarily preferred standpoint is, no fuel is being used in the engine. This outcome is no pollution which is extremely desirable in the present day circumstance. As there is no burning occurring inside the cylinder there is only very little heat generation it is more economical and free from air pollution. A magnet is one of the prime power source utilized for some application. By the request of non-renewable energy sources expecting that electromagnet is primary alternative fuel and it is especially helpful for coming generation. Energy to be created at a shaft of the engine is much more than the ability to be consumed by the electromagnet to repulse permanent magnet. In this manner, the electromagnetic engine gives Green energy, as no harmful result is radiated in Surrounding Atmosphere. This is the eventual fate of Automobile Industries.

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