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A Novel Design and Fabrication of Electromagnetic Internal Combustion Engines

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ABSTRACT
This paper reports an investigation that was carried out in a magnetic engine is according to the concept appears to be a so-called "perpetual motion machine". Here you will find its images, patent, and also you will learn information from his production and testing. The Black pointer on the disk indicates the position of piston. It is evident that with the closed shutter the piston is located stably in the upper position, and shutter renders the valuable screening of magnets, fulfilling the functions described by me. Further, with the discovery of shutter piston accomplishes reciprocating motion. The stored energy of flywheel continues to move piston to the upper position. Work: the displacements of the shutter = of 0,444 the displacement of piston = 1,251.
Keywords: *Magnetic Engines, Lead Acid Battery, IC555 Timers, Time and Control Unit and Pin Configuration.*

1. INTRODUCTION

Magnetic engine, in housing of which are placed the permanent magnets, the first of which is established with the guarantee of a possibility of the accomplishment of reciprocating motion under the action of the forces of magnetic field, in the housing is also established the shaft, connected with the first magnet with the aid of the means, which makes it possible to convert the reciprocating motion of the first magnet into the rotation of shaft, that is characterized by the fact that the second magnet is securely fastened on the housing opposition first, both magnets are oriented by poles counter, magnetic engine is supplied with the ferromagnetic screen, made with the guarantee of a possibility of its displacement in the clearance between the magnets perpendicular to the line of forces of magnetic field, ferromagnetic screen is supplied with the means, which ensures its displacement under the action of the rotation of shaft, ferromagnetic screen is also supplied with the means, which ensures its recurrent displacement.

Magnetic engine on position 1, which is characterized by the fact that the mentioned means, which ensures the reciprocating displacement of magnet, is executed in the form of crank gear. Magnetic engine on position 1 or position 2, which is characterized by the fact that the mentioned means of the displacement of ferromagnetic screen contains the rotating lever interacting with the ferromagnetic screen and the cam gear, whose kulachek is fixed on the shaft, and the pusher, which interacts with the fist, is fixed in line with rotating lever.

Magnetic engine on any of pp. 1-3, that is characterized by the fact that the shaft is supplied with the storage battery of mechanical energy, made, for example, in the form of flywheel.

The aim is to design and develop a control system based on electro-magnetic system of an intelligent controlled automotive engine system. Based on this model, control strategies such as an 'antilock braking system' (ABS) and improved maneuverability via individual wheel braking are to be developed and evaluated.

2. ENGINE AND ITS OPERATION

A. Construction

In this research we use SPARK IGNITION engine of the type two stroke single cylinder of Cubic capacity 75 cc. Engine has a piston that moves up and down in cylinder. A cylinder is a long round air pocket somewhat like a tin can with a bottom cut out. Cylinder has a piston which is slightly smaller in size than the cylinder the piston is a metal plug that slides up and down in the cylinder Bore diameter and stroke length of the engine are 50mm and 49mm respectively.

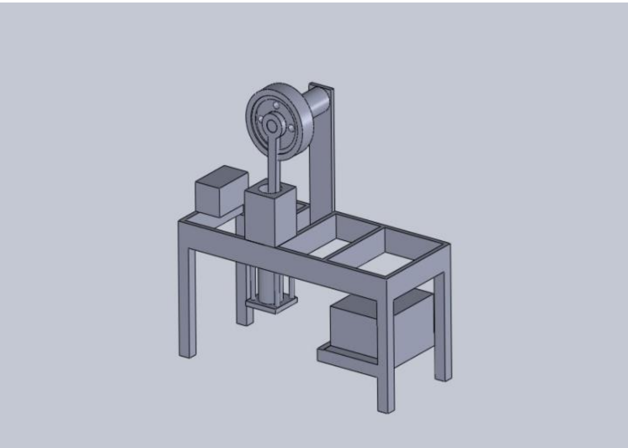

Figure 1: Design of Electromagnetic Engine

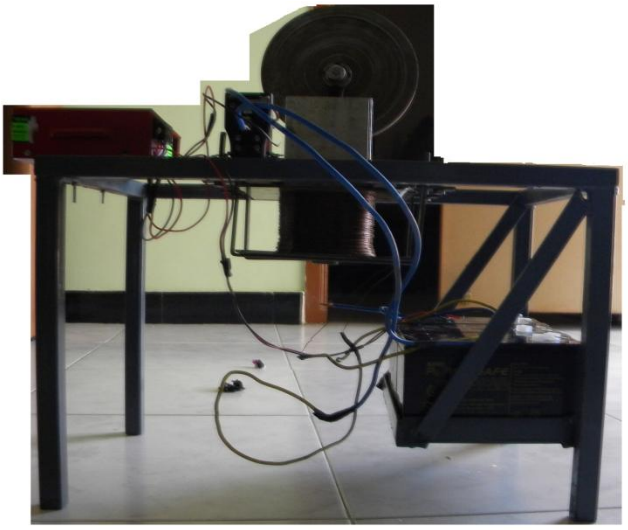

Figure 2: Fabrication of Electromagnetic Engine

B. I.C Engine

Internal combustion engines are those heat engines that burn their fuel inside the engine cylinder. In internal combustion engine the chemical energy stored in their operation. The heat energy is converted in to mechanical energy by the expansion of gases against the piston attached to the crankshaft that can rotate.

C. Petrol Engine

The engine which gives power to propel the automobile vehicle is a petrol burning internal combustion engine. Petrol is a liquid fuel and is called by the name gasoline in America.

The ability of petrol to furnish power rests on the two basic principles:

- Burning or combustions always accomplished by the production of heat.
- When a gas is heated, it expands. If the volume remains constant, the pressure rises according to Charlie's law.

C. Working

There are only two strokes involved namely the compression stroke and the power stroke; they are usually called as upward stroke and downward stroke respectively.

D. Upward Stroke

During this stroke, the piston moves from bottom dead center to top dead center, compressing the charge-air petrol mixture in combustion chamber of the cylinder. At the time the inlet port is uncovered and the exhaust, transfer ports are covered. The compressed charge is ignited in the combustion chamber by a spark given by spark plug.

E. Downward Stroke

The charge is ignited the hot gases compress the piston moves downwards, during this stroke the inlet port is covered by the piston and the new charge is compressed in the crankcase, further downward movement of the piston uncovers first exhaust port and then transfer port and hence the exhaust starts through the exhaust port. As soon as the transfer port open the charge through it is forced in to the cylinder, the cycle is then repeated.

F. Nomenclature

Bore

This is the diameter of the engine cylinder.

***G.* Stroke**

Distance traveled by the piston in moving from TDC to the BDC is called stroke.

***H.* Engine Capacity**

This is a total piston displacement or the swept volume of all the cylinders.

***I.* Power**

It is the work done in a given period of time.

***J.* Compression Ratio**

It is a ratio of volume when the piston is at the bottom dead center to the volume when the piston is at top dead center.

Compression ratio = Maximum cylinder volume / Minimum cylinder volume.

***K.* Indicated Power**

The power developed within the engine cylinders is called indicated power. This is calculated from the area of the engine indicator diagram. It is usually expressed in kilowatts (kW).

I.P = B.P + F.P

F.P is calculated from graph by negative horse power method.

***L.* Brake Power**

This is the actual power delivered at the crankshaft. It is obtained by deducting various power losses in the engine from the indicated power. It is measured with a dynamometer and is expressed in kilowatts (kW). It is always less than the indicated power, due to frictional and pumping losses in the cylinders and the reciprocating mechanism.

B.P = V * I / 1000 * EFFICIENCY OF ALTERNATOR

***M.* Engine Torque**

It is the force of rotation acting about the crankshaft axis at any given instant of time.

T = 2* 3.14 * N / 60

***N.* Function**

The spark ignition engine uses a highly volatile fuel, which easily vaporizes. The fuel is mixed with air before it enters the engine cylinders in the carburetor. This mixture then enters the cylinders and is compressed. Next an electric spark is produced by ignition system ignites the compressed air fuel mixture.

3. Components and Description

The **Electro-magnetic engine** consists of the following components to fulfill the requirements of complete operation of the machine.

1) BATTERY
2) FRAME STAND

3.1 Battery

3.1.1 Introduction

In isolated systems away from the grid, batteries are used for storage of electrical energy in the form of chemical energy.

The only exceptions are isolated sunshine load such as irrigation pumps or drinking water supplies for storage. In fact for small units with output less than one kilowatt. Batteries seem to be the only technically and economically available storage means. Since both the photo-voltaic system and batteries are high in capital costs. It is necessary that the overall system be optimized with respect to available energy and local demand pattern. To be economically attractive the storage of solar electricity requires a battery with a particular combination of properties:

(1) Low cost
(2) Long life
(3) High reliability
(4) High overall efficiency
(5) Low discharge
(6) Minimum maintenance
(7) Ampere hour efficiency
(8) Watt hour efficiency

We use lead acid battery for storing the electrical energy from the solar panel for lighting the street and so about the lead acid cells are explained below.

4. Lead-acid wet Cell

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 200A to 400A. One cell has a nominal output of 2.0V, but lead-acid cells are often used in a series combination of three for a 6-V battery and six for a 12-V battery.

The lead acid cell type is a secondary cell or storage cell, which can be recharged. The charge and discharge cycle can be repeated many times to restore the output voltage, as long as the cell is in good physical condition. However, heat with excessive charge and discharge currents shortens the useful life to about 3 to 5 years for an automobile battery. Of the different types of secondary cells, the lead-acid type has the highest output voltage, which allows fewer cells for a specified battery voltage.

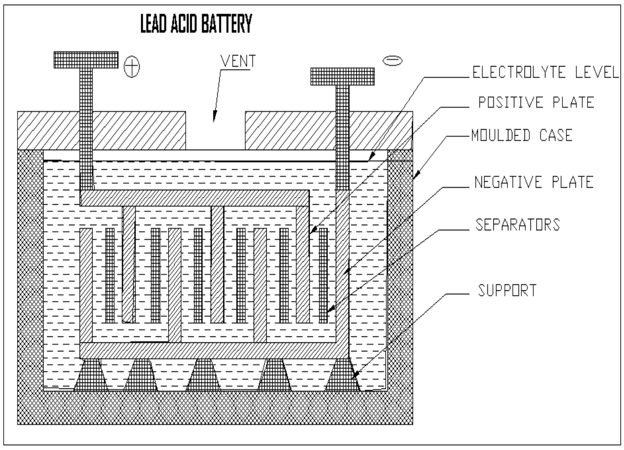

Figure 3: Lead Acid wet Battery

5. CONSTRUCTION

Inside a lead-acid battery, the positive and negative electrodes consist of a group of plates welded to a connecting strap. The plates are immersed in the electrolyte, consisting of 8 parts of water to 3 parts of concentrated sulfuric acid. Each plate is a grid or framework, made of a lead-antimony alloy. This construction enables the active material, which is lead oxide, to be pasted into the grid. In manufacture of the cell, a forming charge produces the positive and negative electrodes. In the forming process, the active material in the positive plate is changed to lead peroxide (pbo_2). The negative electrode is spongy lead (pb). Automobile batteries are usually shipped dry from the manufacturer. The electrolyte is put in at the time of installation, and then the battery is charged to from the plates.

With maintenance-free batteries, little or no water need be added in normal service. Some types are sealed, except for a pressure vent, without provision for adding water.

The construction parts of battery are shown in Figure 3.

5.1 Chemical Reaction

Sulfuric acid is a combination of hydrogen and sulfate ions. When the cell discharges, lead peroxide from the positive electrode combines with hydrogen ions to form water and with sulfate ions to form lead sulfate. Combining lead on the negative plate with sulfate ions also produces he sulfate. Therefore, the net result of discharge is to produce more water, which dilutes the electrolyte, and to form lead sulfate on the plates.

As the discharge continues, the sulfate fills the pores of the grids, retarding circulation of acid in the active material. Lead sulfate is the powder often seen on the outside terminals of old batteries. When the combination of weak electrolyte and sulfating on the plate lowers the output of the battery, charging is necessary. On charge, the external D.C. source reverses the current in the battery. The reversed direction of ions flows in the electrolyte result in a reversal of the chemical reactions.

Now the lead sulfates on the positive plate reactive with the water and sulfate ions to produce lead peroxide and sulfuric acid. This action re-forms the positive plates and makes the electrolyte stronger by adding sulfuric acid.

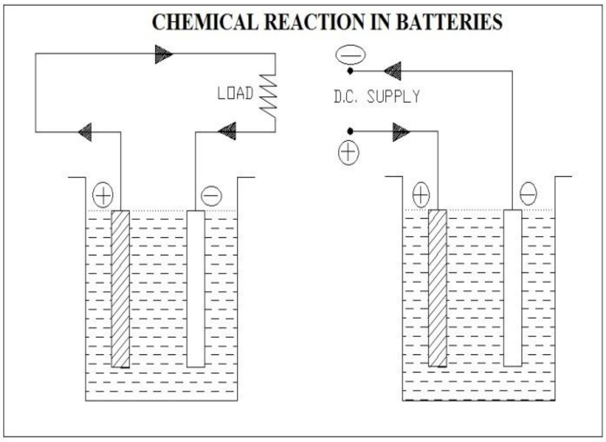

Figure 4: Chemical reaction of Lead Acid wet Battery

At the same time, charging enables the lead sulfate on the negative plate to react with hydrogen ions; this also forms sulfuric acid while reforming lead on the negative plate to react with hydrogen ions; this also forms currents can restore the cell to full output, with lead peroxide on the positive plates, spongy lead on the negative plate, and the required concentration of sulfuric acid in the electrolyte.

The chemical reaction equation for the lead-acid cell is

Charge.

$$Pb + pbO_2 + 2H_2SO_4 \rightleftharpoons 2pbSO_4 + 2H_2O$$

Discharge

On discharge, the (Pb) and (pbo_2) combine with the (SO_4) ions at the left side of the equation to form lead sulphate ($pbSO_4$) and water (H_2O) at the right side of the equation.

One battery consists of 6 cells, each have an output voltage of 2.0V, which are connected in series to get a voltage of 12V and the same 12V battery is connected in series, to get a 24 V battery. They are placed in the water proof iron casing box.

5.2 Caring for Lead-acid Batteries

Always use extreme caution when handling batteries and electrolyte. Wear gloves, goggles and old clothes. "Battery acid" will burn skin and eyes and destroy cotton and wool clothing.

The quickest way of ruin lead-acid batteries is to discharge them deeply and leave them stand "dead" for an extended period of time. When they discharge, there is a chemical change in the positive plates of the battery. They change from lead oxide when charge out lead sulfate when discharged. If they remain in the lead Sulfate State for a few days, some part of the plate dose not returns to lead oxide when the battery is recharged. If the battery remains discharge longer, a greater amount of the positive plate will remain lead sulfate. The parts of the plates that become "sulfate" no longer store energy. Batteries that are deeply discharged, and then charged partially on a regular basis can fail in less than one year.

Check your batteries on a regular basis to be sure they are getting charged. Use a hydrometer to check the specific gravity of your lead acid batteries. If batteries are cycled very deeply and then recharged quickly, the specific gravity reading will be lower than it should because the electrolyte at the top of the battery may not have mixed with the "charged" electrolyte.

Check the electrolyte level in the wet-cell batteries at the least four times a year and top each cell of with distilled water. Do not add water to discharged batteries. Electrolyte is absorbed when batteries are much discharged. If you add water at this time, and then recharge the battery, electrolyte will overflow and make a mess.

Keep the top of your batteries clean and check that cables are tight. Do not tighten or remove cables while charging or discharging. Any spark around batteries can cause a hydrogen explosion inside, and ruin one of the cells, and you. On charge, with reverse current through the electrolyte, the chemical reaction is reversed. Then the (pb) ions from the lead sulfate on the right side of the equation re-form the lead and lead peroxide electrodes. Also the (SO_4) ions combine with (H_2) ions from the water to produce more sulfuric acid at the left side of the equation.

5.3 Current ratings

Lead-acid batteries are generally rated in terms of how much discharge currents they can supply for a specified period of time; the output voltage must be maintained above a minimum level, which is 1.5V to 1.8V per cell. A common rating is ampere-hours (A.H.) based on a specific discharge time, which is often 8 hours. Typical values for automobile batteries are 100 A.H to 300 A.H.

As an example, a 200 A.H battery can supply a load current of 200 A.H /8 hour or 25A, used on 8 hour discharge. The battery can supply less current for a longer time or more current for a shorter time. Automobile batteries may be rated for "cold cranking power", which is related to the job of starting the engine. A typical rating is 450A for 30seconds at a temperature of 0 degree F.

Note that the ampere-hour unit specifies coulombs of charge. For instance, 200 A.H. corresponds to 200 A*3600seconds (1hour=3600seconds). The equals 720,000 A.S, or coulombs. One ampere-second is equal to one coulomb. Then the charge equals 720,000 or 7.2*10^5°C. To put this much charge back into the battery would require 20 hours with a charging current of 10A. The ratings for lead-acid batteries are given for a temperature range of 77 to 80°F. Higher temperature increase the chemical reaction, but operation above 110°F shortens the battery life.

Low temperatures reduce the current capacity and voltage output. The ampere-hour capacity is reduced approximately 0.75% for each decreases of 1° F below normal temperature rating. At 0°F the available output is only 60 % of the ampere-hour battery rating.

In cold weather, therefore, it is very important to have an automobile battery unto full charge. In addition, the electrolyte freezes more easily when diluted by water in the discharged condition.

5.4 Specific Gravity

Measuring the specific gravity of the electrolyte generally checks the state of discharge for a lead-acid cell. Specific gravity is a ratio comparing the weight of a substance with the weight of a substance with the weight of water. For instance, concentrated sulfuric acid is 1.835 times as heavy as water for the same volume. Therefore, its specific gravity equals 1.835. The specific gravity of water is 1, since it is the reference. In a fully charged automotive cell, mixture of sulfuric acid and water results in a specific gravity of 1.280 at room temperatures of 70°F to 80°F. As the cell discharges, more water is formed, lowering the specific gravity. When it is down to about 1.150, the cell is completely discharged.

Specific-gravity readings are taken with a battery hydrometer, such as one in FIGURE 3. Note that the calibrated float with the specific gravity marks will rest higher in an electrolyte of higher specific gravity. The decimal point is often omitted for convenience. For example, the value of 1.220 in figure (7) is simply read "twelve twenty". A hydrometer reading of 1260 to 1280 indicates full charge, approximately 12.50 are half charge, and 1150 to 1200 indicates complete discharge.

The importance of the specific gravity can be seen from the fact that the open-circuit voltage of the lead-acid cell is approximately equal to

$$V = \text{Specific gravity} + 0.84$$

For the specific gravity of 1.280, the voltage is 1.280 + 0.84 = 2.12V, as an example. These values are for a fully charged battery.

5.5 Charging the Lead-Acid Battery

The requirements are illustrated in figure. An external D.C. voltage source is necessary to produce current in one direction. Also, the charging voltage must be more than the battery e.m.f. Approximately 2.5 per cell are enough to over the cell e.m.f. so that the charging voltage can produce current opposite to the direction of discharge current.

Note that the reversal of current is obtained just by connecting the battery (VB) and charging source (VG) with positive to positive and negative to negative, as shown in FIGURE 3. The charging current is reversed because the battery effectively becomes a load resistance for (VG) when it higher than (VB). In this example, the net voltage available to produce charging currents is 15V-12V=3V.

A commercial charger for automobile batteries is essentially a D.C. power supply, rectifying input from the AC power line to provide D.C. output for charging batteries. Float charging refers to a method in which the charger and the battery are always connected to each other for supplying current to the load. In figure the charger provides current for the load and the current necessary to keep the battery fully charged. The battery here is an auxiliary source for D.C. power.

It may be of interest to note that an automobile battery is in a floating-charge circuit. The battery charger is an AC generator or alternator with rectifier diodes, driver by a belt from the engine. When you start the car, the battery supplies the cranking power. Once the engine is running, the alternator charges the battery. It is not necessary for the car to be moving. A voltage regulator is used in this system to maintain the output at approximately 13V to 15 V. The constant voltage of 24V comes from the solar panel controlled by the charge controller so for storing this energy we need a 24V battery so two 12V battery are connected in series. It is a good idea to do an equalizing charge when some cells show a variation of 0.05specific gravity from each other. This is a long steady overcharge, bringing the battery to a gassing or bubbling state. Do not equalize sealed or gel type batteries.

5.6 Timer and Control Unit

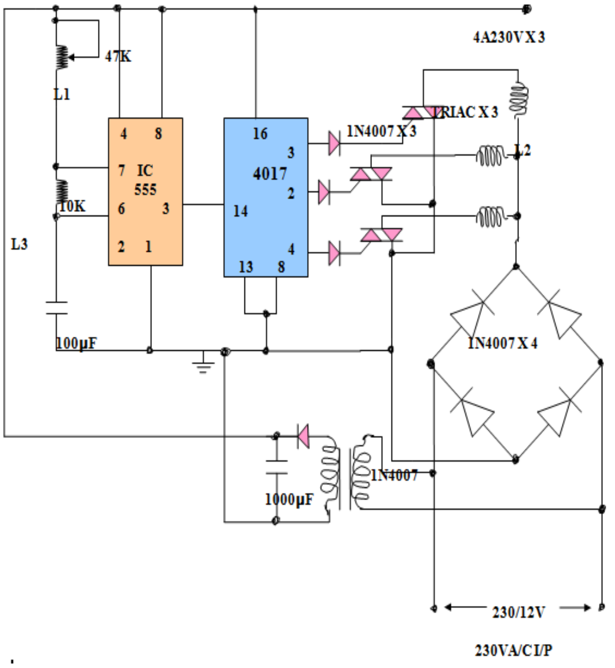

Figure 5: Block Diagram of IC 555

Here the 555 timer IC has been used as a multi vibrator. The output of IC 555 is fed to the input pin (pin no 14) of CD 4017 continues counting. The output of the IC becomes available at pin Nos. 3, 2 and 4. The output pulse of any one of output pin triggers (Puts ON) the Triac and current starts flowing across the load connected. This process continues on other pins at different time intervals and the cycle continues. The frequency interval (Time) of the cycle can be adjusted by the pre-set look connected to pin 6 of 555 Timer IC.

5.7 IC 555 Timers

The IC NE555 timer monolithic circuit is a highly stable controller capable of producing accurate time delays or oscillations. Additional terminals are provided for triggering or resetting if desired. In the timing operations, the time is precisely controlled by one external resistor and a capacitor, by the operation as an oscillator, the free running frequency and the duty cycle are both accurately contributed with the external RC constants.

6. PIN DIAGRAM

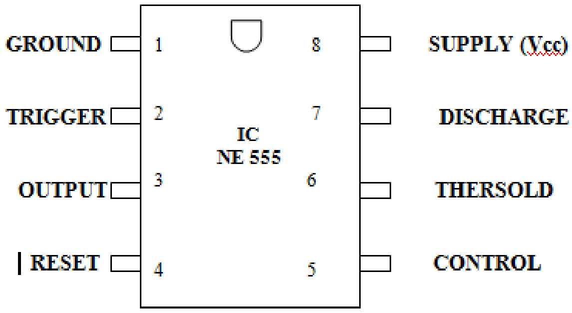

Figure 6: Pin Diagram of IC 555

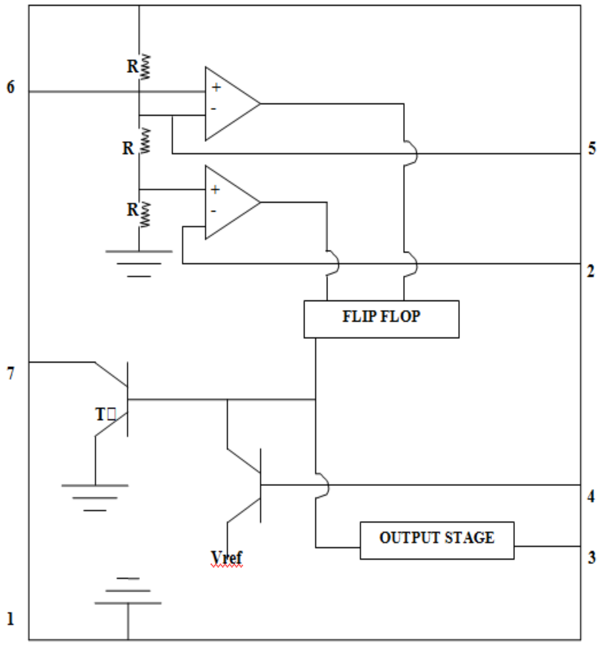

Figure 7: Circuit Diagram of IC 555

7. PIN CONFIGURATION

PIN NO: 1

It is ground terminal.

PIN NO: 2

The trigger voltage to the lower comparator is applied. It has constant voltage that is at least one third of the supply voltage, when trigger voltage falls below this level the flip-flop changes its state and output becomes high.

PIN NO: 3

It is the output terminal, in low state output is equal to zero and when at higher state output is equal to Vcc.

PIN NO: 4

It controls the flip flop directly. It turns the device to its original position when reset pin is connected to ground the output is approximately equal to zero. When reset is not used it is connected to Vcc.

PIN NO: 5

It is the control voltage terminal. It is connected to ground through a capacitor of 0.01 μF. Any external voltage at pin: 5 will change both the threshold voltage and the trigger voltage reference level.

PIN NO: 6

Threshold voltage of upper comparator is applied from this terminal. The resistor (Rt) connected to Vcc and pin: 6 is grounded by an external capacitor. The output is high capacitor charges by resistor (Rt). When the capacitor changes to the threshold level, the output becomes low.

PIN NO: 7

It is the discharge pin for external capacitor. Usually pin: 7 is connected with pin: 6 directly to by a resistor. When the output becomes low then the external capacitor discharges by internal discharge transistor remains at cut-off and the external capacitor charges to Vcc.

PIN NO: 8

It is the positive supply terminal. A Dc voltage from +5 to + 15 can be applied.

8. Wave forms for IC NE555 Timer

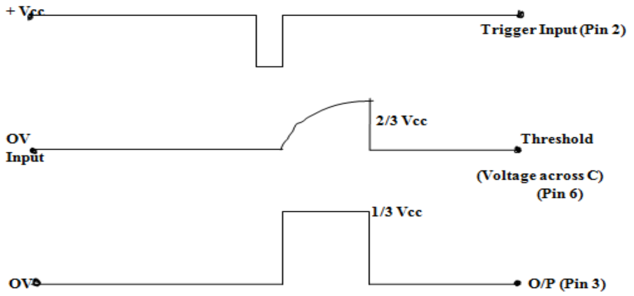

Figure 8: Wave forms for IC NE555 Timer

As we know the IC 555 is available in 8-pin and 14-pin dual-in-line packages or in a circular to-99 metal can with eight loads.

The device consists of two comparators to control the transistor. The circuit consists of flip flop and a buffered output stage. The reference voltage for the two comparators inside the IC 555 is developed across a voltage divider consisting of two equal resistors of 5 K ohms each. The threshold comparators is referenced at 1/3 Vcc. The two comparators control the stages of internal transistor (T1) is conducting that represent a sort circuit across timing capacitors (Cr) the level of the terminal is low.

In most practically circuit the voltage on pin 2 is held by above Triggering point by a resistor connected to Vcc.

The negative going trigger pulse is applied to pin 2. Potential at this point to fall below ½ Vcc, the trigger comparator switches the flip flop cutting of (T1) and forcing the output level high to a value slightly below Vcc. Capacitor now starts to charge and the voltage across it rises exponentially until it reaches the flip flop and the output returns to its low state just slightly above ground. Now transistor (T1) is turned ON discharged Capacitor so that it can read for its next timing period. Once the triggered the circuit responds to additional triggering until the time interval is elapsed.

The delay periods is 1.1 Re Cr. The important features of IC555 can be summarized as follows.

1. Timing range from microseconds to hours.
2. Mono-stable and a stable operation are possible through IC555.
3. The duty cycle can be adjusted according to our necessity.
4. It has the ability to operate from a wide range of supply Voltage.
5. The output of 555 is compatible with CMOS, DTL and TTL, logic. But when used with a 5V supply.
6. Triggering and reset inputs are logically compatible.
7. Output can be operated as normal ON and normal OFF.
8. High temperature stability.
9. Unlike RC timers, 555 provide a time intervals that is virtually independence of supply voltage Vcc. This because that, the charge rate of capacitor (Cr) and the reference voltage to the threshold

comparator are all directly proportional to the supply voltage.

IC 555 SPECIFICATIONS

Supply Voltage (Vcc) = 4.5 to 15V
Supply Current (Vcc=5V/2) = 3 to 6mA
Supply Current (Vcc=25V/2) = 10 to 15mA
Output Current = 200mA (maximum)
Power dissipation = 600mw
Operating temperature = 0-70 degree Celsius.

9. MAGNETIC-ENGINES

A magnetic engine is an engine that runs solely by magnetic force, using no fuel, no electricity, no other source of power, and emitting no pollution of any kind. There are lots of myths about these, much centering around the buzzwords "perpetual motion" that tends to make people shy away from the idea that we can get

To clear up some of the mythology, a magnetic engine isn't something for nothing. As anyone who has handled more than one magnet at a time knows, there is a real magnetic force to deal with. Being able to use it is much the same as using one to stick your child's crayon work to the refrigerator. You don't doubt that, and if you have a decent "fridge magnet", you are reasonably sure that it won't fall off. So having a magnet holding little Jimmy or Jennie's art to your refrigerator is not a lot different than using that same work to turn a flywheel that in turn runs a household fan, or a car or a boat or a municipal power generator. It's just a different way of using that same energy. You can use compressed LPG to shoot a nail, or to blow up a dam, or to run a generator at the river to produce electricity for your house. Those are all just different ways of using the force. Nobody finds anything very magical about those. And there is nothing magic about using the force of magnetism for turning that same generator, or your car's drive shaft. It only requires different equipment to translate that force from a linear one to a rotary one. That's what my magnetic engine is designed to do.

Also, everyone knows that there have been hundreds of outright frauds in the field of magnetic, promising vast riches to investors, and leaving the scene with broke investors and pockets full of money for the frauds. I'm not looking for "investors". If you indeed wish to invest, you'll have to wait until I have released the first working, commercially viable engine. Until then, consider sending me a small bit to help develop the thing.

9.1 Design of Piston

We know diameter of the piston which is equal to 50 mm.

9.2 Thickness of piston

The thickness of the piston head is calculated from flat-plate theory. Where,

t=D (3/16 x P/f) ½

Here,

P-Maximum combustion pressure =100 bar

F-Permissible stress in tension=34.66 N/mm²

Piston material is aluminum alloy.

∴t=0.050 (3/16 x 100/34.66 x $10^6/10^5$)½ x 1000 =12 mm

9.3 Electromagnetic coil Design

The inductance of single-layer air-cored cylindrical coils can be calculated to a reasonable degree of accuracy with the simplified formula

$$\mu\text{H} = \frac{R^2 N^2}{9R + 10L}$$

Where Henry [µH] (micro henries) are units of inductance, *R* is the coil radius (measured in inches to the center of the conductor), *N* is the number of turns, and *L* is the length of the coil in inches. In case you need to input coil dimensions in mm, you can multiply the formula result with 1/25.4. The online Coil Inductance Calculator calculates the inductance of any coil using this formula. Higher accuracy estimates of coil inductance require calculations of considerably greater complexity.

Where

Turns -2000 windings

Wire-2 kg, 20swg (standard measurement).

9.4 Length of the piston

Length of the piston = 1.625 x D
Length of the piston = 81.25 mm

9.5 Other parameter

The distance from the bottom of the piston to the Centre of the piston pin = .5 x D + 1
= .5 x 65 + 1
= 33.5 mm

Thickness of the piston walls at open ends

= .5 x t

= .5 x 12

= 6 mm

10. WORKING PRINCIPLE

The working of the magnetic engine greatly resembles the working of a two-stroke engine. To start, let us begin from the situation, when piston is located in the bottom dead center position, the IC 555 timer circuit gets actuated which in turn actuates the electromagnet which is kept above the top dead centre which attracts the piston in the bottom dead centre to the top dead centre. During this process the excess energy is stored in the flywheel

As soon as the piston reaches the top dead centre the current flow to the coil of the electromagnet is cutoff, the magnet gets demagnetized so the piston again moves to the bottom dead centre.

The kinetic energy of piston begins to accumulate by the flywheel of the shaft (it is not depicted on the sketches). The piston gains speed. With the approximation of piston to bottom dead center the IC 555 timer circuit allows the current to flow again and the above procedure is repeated.

Table 3: List of Materials

S. No	Parts	Quantity
1	Battery	3
2	Fly wheel	1
3	Engine arrangement	1
4	Connecting rod	1
5	Cam wheel	1
6	Piston &Permanent Magnet	1
7	Stand (frame)	1
8	Electromagnetic coil	1

Table 3: List of Material Cost

Sl. No	PARTS	Quantity	Amount (Rs)
1	Battery	3	4500
2	Fly Wheel	1	2000
3	Engine block	1	3500
4	Connecting rod	1	1200
5	Cam wheel	1	1500
6	Piston&permanent magnet	1	1500
7	Stand (Frame)	1	1000
8	Electromagnetic coil	1	1250

10.1 Labour Cost

Lathe, Drilling, Welding, Grinding, Power Hacksaw, Gas Cutting:

Cost = 2000.00

10.2 Overhead Charges

The overhead charges are arrived by "Manufacturing cost"

Manufacturing Cost=Material Cost + Labor cost

=16050.00+2000.00

=18050.00

Overhead Charges =20% of the manufacturing cost

=3610.00

10.3 Total Cost

Total cost=Material Cost + Labor cost + Overhead Charges

= 16050.00+2000.00+3610.00

= 21660.00

Total cost for this project=21660.00

11. CONCLUSION

This research work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, purchasing, assembling and machining while doing this project work. We feel that the project work is a good solution to bridge the gates between institution and industries.

We are proud that we have completed the work with the limited time successfully. The DESIGN AND FABRICATION OF ELECTRO-MAGNETIC ENGINE is working with satisfactory conditions. We are able to understand the difficulties in maintaining the tolerances and also quality. We have done to our ability and skill making maximum use of available facilities.

In conclusion remarks of our research work, let us add a few more lines about our impression project work. Thus we have developed a "DESIGN AND FABRICATION OF ELECTRO-MAGNETIC ENGINE" which helps to produce eco friendly vehicles. The application of Solenoid electro-magnetic coil produces smooth operation. By using more techniques, they can be modified and developed according to the applications.

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