

# RESEARCH PAPER ON MAGNETIC PISTON ENGINE

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**Abstract:** The diminishing fossil fuel resources and unabated increase in energy costs 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. However, such engines have many limitations. Production of bio-fuel takes enormous resources and they still pollute the environment. They do not meet the ever increasing energy demand as well. 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. This is how power is generated in the electromagnetic engine.

**Index Terms – Fossil fuel, bio-fuel, electromagnet, piston, crankshaft.**

## 1.INTRODUCTION:

There is currently some interest in developing engine which is useful to the environment, the present system the fossil fuel sources are fast depleting and their combustion products are causing global environmental problems. Though pollution is controlled in combustion engine Knox gas level is increased which leads to damage in ozone layer and also by using other various technology like Exhaust Gas Recirculation (EGR) valve are used the Knox content is reduced but the co2 content is increased, due to increase of co2 in atmosphere global warming occurs. Since the use of fossil fuel rate is increased day by day at the year of 2050 the existence of fossil fuel decreases and leads to fuel scarcity. Then where we shall go for fuel? In order to reduce this condition we shift towards the use of alternate fuel which do not require any combustion material so we have choose magnetic flux to power the engine and decided to design and construct a magnetic engine.

### 1.1 Problem Statement:

The diminishing fossil fuel resources increase in energy costs and environmental concerns Engines using alternate energy sources such as bio-fuel, solar power, wind power, etc. are being developed around the world. So, we have decided to develop magnetic piston engine, which will be pollution free and will cost low.

### 1.2 Objectives:

1. Propose a magnetic engine that work in unison with magnet and magnetic shielding material.
2. The magnetic shielding to be assembled in high strength polymer piston arrangement to reduce fuel consumption.
3. To increase efficiency of engine.
4. Engine has require low energy for working means it require 90 watt energy for function.

## 2. RESEARCH METHODOLOGY:

The two-stroke internal combustion engine differs from the more common four-stroke engine by completing the same four processes (intake, compression, combustion, exhaust) in only two stroke of the piston rather than four. This allows a power stroke for every revolution of the crank, instead of every second revolution as in a four-stroke engine. For this reason, two-stroke engines provide high specific power, so they are valued for use in portable, lightweight applications such as chainsaws as well as large-scale industrial application like locomotives.

Invention of the two-stroke cycle is attributed to Dugald Clark around 1880 whose engines had a separate charging cylinder. The Crankcase scavenged engine, employing the area below the piston as a charging pump, is generally credited to Joseph Day (and Frederick Cock for the piston controlled inlet port). In case you believe that spaghetti grows on trees, or that the Japanese invented the two stoke engine, here's few facts to set the record straight.

The two-stroke cycle engine was developed by Sir Dugald Clark in 1878. The first patented two-stroke engine was a vertical twin by Alfred Scoff in 1904. Scott also developed a rotary valve engine in 1912. The Schnuerle ported engine was patented in 1925 and featured two by pass ports (loop scavenging method). In 1975 Walter Camden (MZ, E, and Germany) added a third transfer port opposite the exhaust porters Danger defected from to join Suzuki. Reciprocating motors have been and continue to be used in virtually every available mode of transportation and for all types of power supply needs throughout the entire World. Generally, reciprocating motors have a piston slid ably disposed in a cylinder and utilize a driving force to drive the piston in one or both directions inside the cylinder so as to rotate an output shaft, such as a crankshaft. The most commonly utilized reciprocating motor is an internal combustion engine. The typical internal combustion engine comprises a series of cylinders each having a piston reciprocating inside to drive a crankshaft in order to produce motion or power. Air and fuel are combined in the piston chamber, defined inside the cylinder by the top of the piston, and ignited by a spark from a spark plug to provide an explosive driving force that drives the piston downward. The fuel and air are fed into the piston chamber through an intake valve and, after combustion, exhaust air is forced out through an exhaust valve. To obtain proper performance of the fuel/air igniting sequence, the valve activating mechanism must open and close the intake and exhaust valves at the proper times. Due to relatively high engine operating speeds, this process happens at a very fast rate. Due to their extensive use, the internal combustion engine has been the subject of intensive efforts in India and most countries since the beginning of their utilization to improve the engine's operating characteristics. Despite these efforts, internal combustion engines are Well-known

for relatively inefficient utilization of fuel, such as gasoline and other products made from oil, and being significant contributors to the air pollution problems that existing most cities and towns.

**2.1 Engine:**

Here we use Engine of two wheeler named as “Luna

Table No.1: Technical Specification of Kinetic Luna

TECHNICAL SPECIFICATIONS OF KINETIC LUNA SUPER	
BORE	42 mm
STROKE	43 mm
NO. OF CYLINDERS	One
DISPLACEMENT (cc)	59.57 cc
COMPRESSION RATIO	8.8:1(+ 0.2)
a. MAX. ENGINE OUTPUT (KW)	2.2 + 0.1 KW@6000 + 250 rpm
b. MAX. ENGINE OUTPUT (HP)	2.94
MAX. TORQUE (Nm)	4.2 @ 4000 rpm
AIR CLEANER	Wire mesh
OIL SUMP CAPACITY	N.A.
WEIGHT OF ENGINE (Kg.)	12.5
WHEEL BASE ( mm )	1130
OVERALL WIDTH (mm)	660
OVERALL LENGTH (mm)	1805
MAX. GVW (Kg.)	184
MIN. GROUND CLEARANCE	180
<b>TYRE SIZE</b>	
FRONT	2.5” X 16 – 4 ply
REAR	2.5” X 16 – 6 ply
BORE	42 mm
STROKE	43 mm

**2.2 Calculation:**

- **Our project model speed under the loading rpm:**

Speed of engine: 450 rpm

- **Input Power:**

$$P = V \times I$$

$$P = 12 \times 7.5$$

$$P = 90 \text{ W}$$

- **Output power:**

$$P = \frac{2\pi nT}{60}$$

$$T = F \times R$$

$$R = 6 + 4 = 10 \text{ mm} = 0.010 \text{ m}$$

$$T = 15.5 \text{ kg} \times 9.81 \times (0.010)$$

$$= 1.520 \text{ N-m}$$

$$P = \frac{2\pi \times 450 \times 1.520}{60}$$

$$= 71.63 \text{ W}$$

- **Efficiency =  $\frac{\text{OUTPUT}}{\text{INPUT}}$**

$$= \frac{71.63}{90}$$

$$= 0.7958 \times 100$$

$$= 79.58\%$$

2.3 Design of Magnetic Piston Engine:

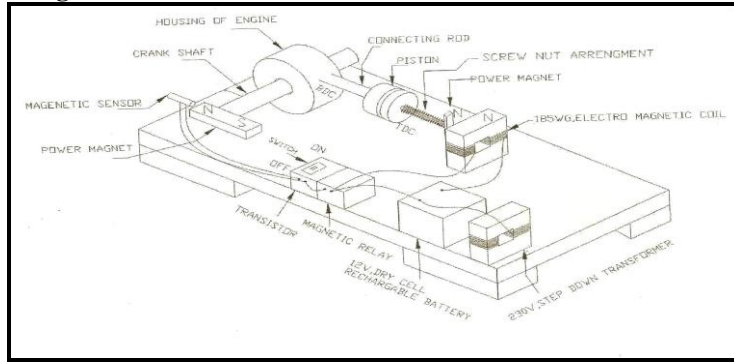


Fig No 1: Design of Magnetic Piston Engine

2.4 Magnetic Field:

Magnetic fields are produced by electric currents, which can be macroscopic currents in wires, or microscopic currents associated with electrons in atomic orbits. The magnetic field  $B$  is defined in terms of force on moving charge in the [Lorentz force law](#). The interaction of magnetic field with charge leads to many [practical applications](#). Magnetic field sources are essentially dipolar in nature, having a north and south magnetic pole.

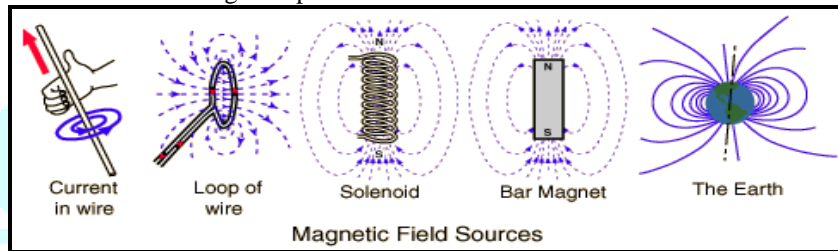


Fig No 2: Magnetic Field Sources

2.5 Lorentz Force Law:

Both the electric field and magnetic field can be defined from the Lorentz force law:

$$\vec{F} = q\vec{E} + q\vec{v} \times \vec{B}$$

Electric force
Magnetic force

The electric force is straightforward, being in the direction of the electric field if the charge  $q$  is positive, but the direction of the magnetic part of the force is given by the right hand rule.

2.6 Flux Leakage:

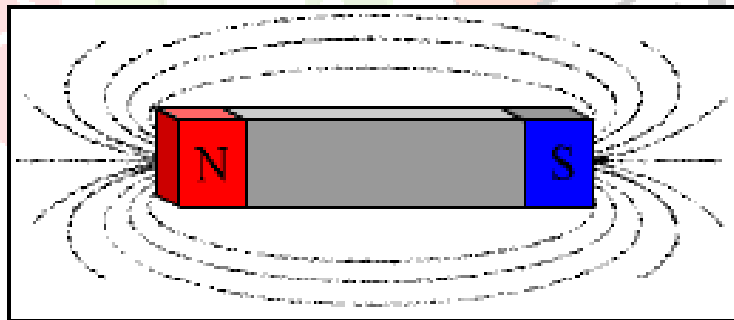
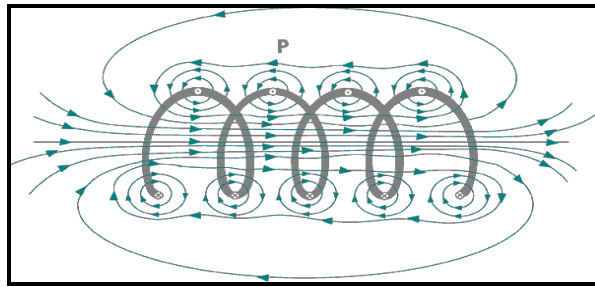


Fig No 3: Flux Leakage

When a bar magnet is broken in the center of its length, two complete bar magnets with magnetic poles on each end of each piece will result. If the magnet is just cracked but not broken completely in two, a north and south pole will form at each edge of the crack. If iron particles are sprinkled on a cracked magnet, the particles will be attracted to and cluster not only at the poles at the ends of the magnet, but also at the poles at the edges of the crack. This cluster of particles is much easier to see than the actual crack and this is the basis for magnetic particle inspection.

2.7 Magnetic Field Produce by a Coil:

When a current carrying conductor is formed into a loop or several loops to form a coil, a magnetic field develops that flows through the centre of the loop or coil along its longitudinal axis and circles back around the outside of the loop or coil. The magnetic field circling each loop of wire combines with the fields from the other loops to produce a concentrated field down the centre of the coil. A loosely wound coil is illustrated below to show the interaction of the magnetic field. The magnetic field is essentially uniform down the length of the coil when it is wound tighter.

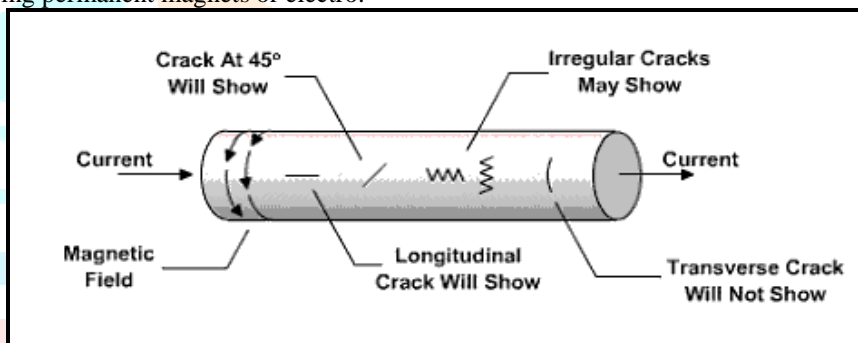


**Fig No 4: Magnetic Field Produce by a Coil**

The strength of a coil's magnetic field increases not only with increasing current but also with each loop that is added to the coil. A long, straight coil of wire is called a solenoid and can be used to generate a nearly uniform magnetic field similar to that of a bar magnet. The concentrated magnetic field inside a coil is very useful in magnetizing ferromagnetic materials for inspection using the magnetic particle testing method.

### 2.8 Magnetic Field Orientation and Flaw Detection:

To properly inspect a component for cracks or other defects, it is important to understand that the orientation between the magnetic lines of force and the flaw is very important. There are two general types of magnetic fields that can be established within a component. A longitudinal magnetic field has magnetic lines of force that run parallel to the long axis of the part. Longitudinal magnetization of a component can be accomplished using the longitudinal field set up by a coil or solenoid. It can also be accomplished using permanent magnets or electro.



**Fig No 5: Magnetic Field Characteristics**

An orientation of 45 to 90 degrees between the magnetic field and the defect is necessary to form an indication. Since defects may occur in various and unknown directions, each part is normally magnetized in two directions at right angles to each other that passing current through the part from end to end will establish a circular magnetic field that will be 90 degrees to the direction of the current. Therefore, defects that have a significant dimension in the direction of the current (longitudinal defects) should be detectable. Alternately, transverse-type defects will not be detectable with circular magnetization.

### 2.9 Magnetic Field In and Around a Bar Magnet:

As discussed previously, a magnetic field is a change in energy within a volume of space. The magnetic field surrounding a bar magnet can be seen in the magnetograph below. A magnetograph can be created by placing a piece of paper over a magnet and sprinkling the paper with iron filings. The particles align themselves with the lines of magnetic force produced by the magnet. It can be seen in the magnetograph that there are poles all along the length of the magnet but that the poles are concentrated at the ends of the magnet. The area where the exit poles are concentrated is called the magnet's North Pole and the area where the entrance poles are concentrated is called the magnet's South Pole. The type of magnetic field established is determined by the method used to magnetize the specimen. Being able to magnetize the part in two directions is important because the best detection of defects occurs when the lines of magnetic force are established at right angles to the longest dimension of the defect. This orientation creates the largest disruption of the magnetic field within the part and the greatest flux leakage at the surface of the part.

### 2.10 General Properties of Magnetic Lines Of Force:

Magnetic lines of force have a number of important properties, which include. They seek the path of least resistance between opposite magnetic poles. In a single bar magnet as shown to the right, they attempt to form closed loops from pole to pole. They never cross one another. They all have the same strength. Their density decreases (they spread out) when they move from an area of higher permeability to an area of lower permeability. Their density decreases with increasing distance from the poles. They are considered to have direction as if flowing, though no actual movement occurs.

### 2.11 Magnetism:

Magnets are very common items in the workplace and household. Uses of magnets range from holding pictures on the refrigerator to causing torque in electric motors. Most people are familiar with the general properties of magnets but are less familiar with the source of magnetism. The traditional concept of magnetism centers around the magnetic field and what is known as a dipole. The term "magnetic field" simply describes a volume of space where there is a change in energy within that volume.

This change in energy can be detected and measured. The location where a magnetic field can be detected exiting or entering a material is called a magnetic pole. Magnetic poles have never been detected in isolation but always occur in pairs, hence the name dipole. Therefore, a dipole is an object that has a magnetic pole on one end and a second, equal but opposite, magnetic pole on the other

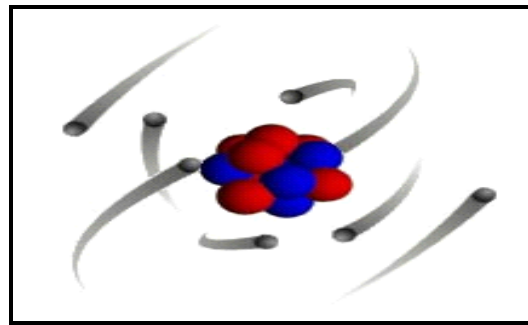


Fig No 6: Magnetism

A bar magnet can be considered a dipole with a north pole at one end and south pole at the other. A magnetic field can be measured leaving the dipole at the north pole and returning the magnet at the south pole. If a magnet is cut in two, two magnets or dipoles are created out of one.

### 2.12 Magnetization of Ferromagnetic Materials:

There are a variety of methods that can be used to establish a magnetic field in a component for evaluation using magnetic particle inspection. It is common to classify the magnetizing methods as either direct or indirect.

### 2.13 Magnetization using Direct Induction (Direct Magnetization)

With direct magnetization, current is passed directly through the component. Recall that whenever current flows, a magnetic field is produced. Using the right-hand rule, which was introduced earlier, it is known that the magnetic lines of flux form normal to the direction of the current and form a circular field in and around the conductor. When using the direct magnetization method, care must be taken to ensure that good electrical contact is established and maintained between the test equipment and the test component.

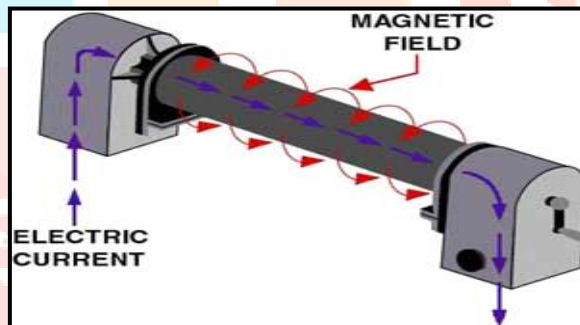


Fig No 7: Magnetization Using Direct Induction

There are several ways that direct magnetization is commonly accomplished. One way involves clamping the component between two electrical contacts in a special piece of equipment. Current is passed through the component and a circular magnetic field is established in and around the component. When the magnetizing current is stopped.

### 2.14 Magnetization Using Indirect Induction (Indirect Magnetization):

Indirect magnetization is accomplished by using a strong external magnetic field to establish a magnetic field within the component. As with direct magnetization, there are several ways that indirect magnetization can be accomplished. The use of permanent magnets is a low cost method of establishing a magnetic field.

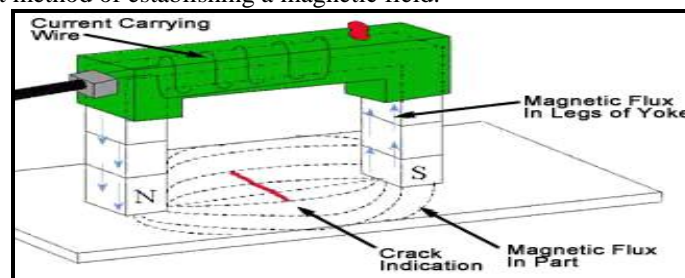


Fig No 8: Magnetization Using Indirect Induction

Electromagnets in the form of an adjustable horseshoe magnet (called a yoke) eliminate the problems associated with permanent magnets and are used extensively in industry. Electromagnets only exhibit a magnetic flux when electric current is flowing around the soft iron core. When the magnet is placed on the component, a magnetic field is established between the north and south poles of the magnet.

2.15 Modern Magnet Materials:

There are four classes of modern commercialized magnets, each based on their material composition. Within each class is a family of grades with their own magnetic properties. These general classes are:

- Neodymium Iron Boron
- Ceramic
- Samarium cobalt
- Alnico

2.16 Magnetization:

Permanent magnet materials are believed to be composed of small regions or "domains" each of which exhibit a net magnetic moment. An magnetized magnet will possess domains that are randomly oriented with respect to each other, providing a net magnetic moment of zero. Thus a magnet when demagnetized is only demagnetized from the observer's point of view. Magnetizing fields serve to align randomly oriented domains to give a net.

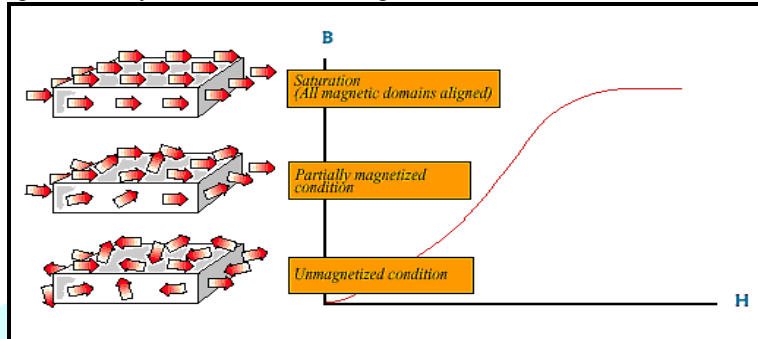


Fig No 9: Objective of Magnetization

3. RESULTS AND DISCUSSION:

When magnet connect to the shaft of rotation piston (crane shaft) is come in front of or near to magnetic switch then due to the magnetic field, magnetic switch (magnetic relay) will switch on automatically. Due to this +ve supply flow from this switch of which is fed to the base of transistor Q1 through resistor R1 therefore transistor Q1 switch ON and -ve current flow from emitter to collector. This is given to the relay coil RL1. Due to which relay RL1 energized. The switching terminal of relay RL1 is connect to the supply terminal of coil L1. This, electromagnetic field will induced in the coil and the magnet connect to the piston is in front of coil. The poles of permanent magnet and poles of electromagnet are same and they came in front of each other. Coil is fixed; therefore, repulsion of magnet with piston will done.

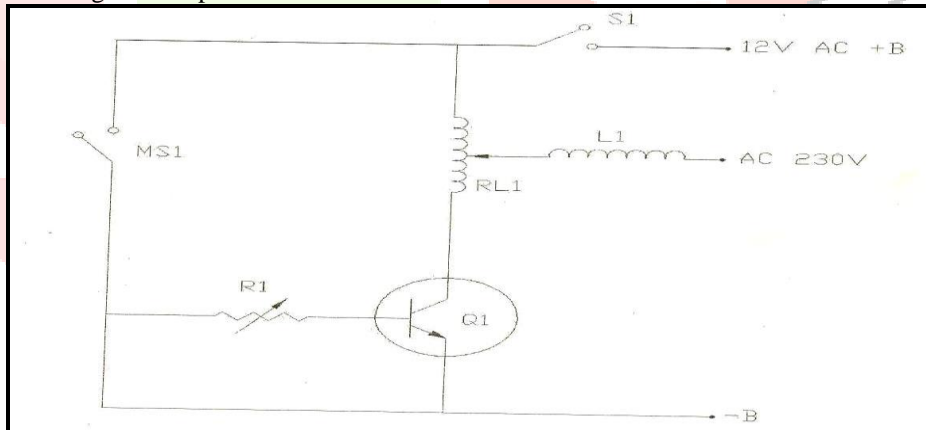


Fig No. 10: Circuit Diagram

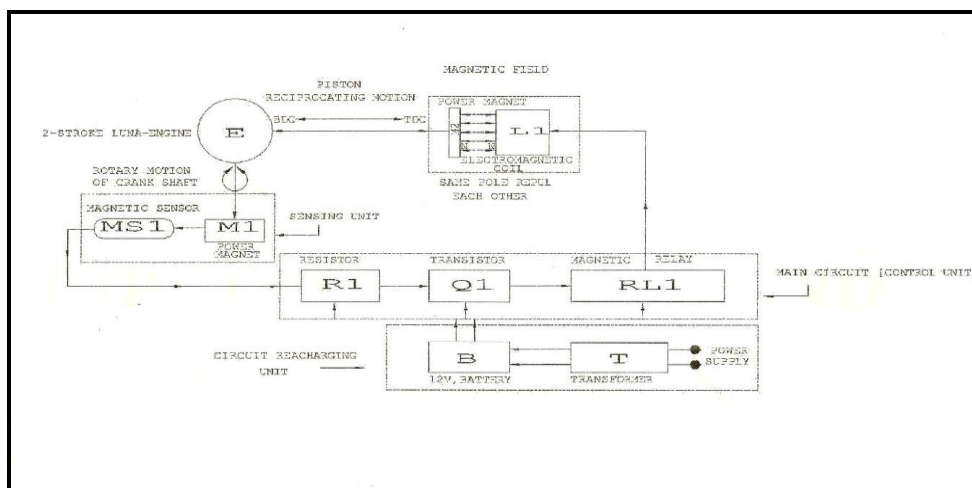
When piston go inner side then distance between magnets (connect in crane shaft) and magnetic switch will increase. Due to this magnetic switch MS1 will OFF. Therefore, transistor Q1 switch OFF. Because there is no +ve current at base of transistor Q1. Therefore supply of coil L1 will disconnected and due to high weight of the shaft of piston came at outer side again transistor Q1 switch ON because magnet of magnetic switch came near to each other thus process.

Construction and Working of Engine:

When head of piston is came near the spark plug then by limit switch the supply produced to the primary coil of Height voltage coils which is generated by the engine with the help of magnet and coil. Due to this bombarding of fuel will do and therefore piston pull of back side? At that time supply break by limit switch which is internally fitted in the engine. The piston came at outer side due to the weight of flywheel and air pressure. This process will done again and again. Piston full back side to the crane shaft.

Here, on the head of piston a permanent magnet is fitted with the help of screw nuts and in front of magnet a coil of 20 SWG is fitted and near that magnet a magnet switch is placed on the metal strip. When we switch ON the supply of battery then this supply is obtain at the electronic circuit. The magnet that fitted on the shaft will cause to switch ON the magnetic switch. Therefore positive supply will obtain at the base of the transistor which flow through resistor due this transistor switch ON and

negative supply flow from emitter to collector. This is given to the relay coil and thus relay will energize. The switching terminal of relay connect to the coil and electromagnetic field induced in the coil.



**Fig No. 11: Construction of Magnetic Piston Engine**

When magnet go at backside then distance between magnet which fitted on the shaft of and magnetic switch will increase then magnetic switch OFF and therefore there will no magnetic field at electromagnet. Due to the weight of magnet on the shaft of the crankshaft the piston came at outside means near the coil. This process will repeat again and again.

#### 4. ADVANTAGES:

There Are Many Advantages Of System Magnetic Piston Made By Some Of The Main Advantages We Explain As Below:

1. It Is An Innovative Idea.
2. It Is Possible To Connect This System To Any Engine.
3. No Need Of Fuel I.E. Saves Conventional Sources.
4. There Is No Complicated Wiring.
5. Engine Has Require Low Energy For Working Means It Require 90 Watt Energy For Function.
6. There Is No Need Of Costly Mechanism For Making This System.
7. It Is Pollution Free.
8. The Battery Is Used For Working Is Rechargeable I.E. Life Of Battery Is More.
9. This Type Of System Saves Foreign Currency.
10. It Is Self Started System I.E. No Need Of Kick.

#### 5. LIMITATIONS:

1. Here Relay Is Used Is Heat More Due To Load And Due To This It Will Stop Working After Some Time.
2. Load Carrying Capacity Is Not Equal To The Petrol Engine.
3. It Cannot Produces Power Like An Engine.
4. It Can Provide Less Uniform Torque At Crank-Shaft Than Engine.
5. It Is Not Applicable For Multi-Cylinder System.

#### 6. FUTURE SCOPE:

1. Here relay is heat due to load and stop working after some time thus we can use heavy or Trial to solve this problem.
2. Here coil required more energy by using Ferro magnetic material with coil it will possible to solve this problem or by the use of special mechanical arrangement.
3. Here we make a demo model of single engine. In future it will possible to connect engine to the vehicle and by which it will possible to convert fuel vehicle into battery operated vehicle.
4. For recharge the dry cell battery, we need electricity thus if we use solar panel for the battery recharging then we can save electricity.
5. After modification this system can applicable for aero plane Engine system.
6. For this model we are using engine of two wheeler by changing mechanical arrangement with circulatory it will possible to drive this system by use of four wheeler engine.

#### 7. ACKNOWLEDGMENT:

We fill quite contended at having completed the project assignment well in time .We have enormous practical experiences on the fulfillment of the manufacturing schedules of the working project model .The co-ordinate planning and endeavor on our part severed a very useful purpose .It helped us to achieve the preplanned target undoubtedly the joint venture has all the merits of the interest and zeal shown by all of us .The credit goes to the healthy co-ordination of our batch colleagues and mainly our project guide in bringing out a resourceful fulfillments of our assignment prescribe by the board. After

making this innovative system we conclude that this system totally operate on magnetic principle. Therefore no requirement of fuel means this type of system is useful to save natural fuel sources as well as foreign currency. Also by the use of this system our two wheeler can be used as an E-bike.

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