



## Mini Solenoid Engine

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### ABSTRACT:

SOLENOID engine basically works on the electromagnetic attraction. It is an electromagnetic device which moves the plunger as per the coil magnetism and no pollution into the atmosphere. Whenever electric current is supplied to conductor a surrounding magnetic field is set up at its surface and it works as electromagnet. The electromagnetic force is depends upon the current flowing through coil and number of turns that wound on coil. As the current passes from coil is works as electromagnet and the basic idea is about to run the engine on magnetic field solenoid engines are nothing but engines run on electrical energy instead of chemical energy. Like conventional engines this system also has cylinder piston, connecting rod, crank shaft. There is no inlet & exhaust valve or ports & no spark-plug also. Important part is the piston which should be made of magnetic materials but rest parts of this system have to be made with non-ferrous. They are also great educational tools for the understanding of basic concepts of electromagnetism, mechanics, reciprocating motion, timing, etc. the idea is very simple: it is a “similar-to-combustion-engine” but powered by electricity instead of fuel. They can be made out of any number of “cylinders” (solenoids) like wise and kind of combustion engine.

### 1.INTRODUCTION:

The first solenoid was made in western countries around 1900. In Japan, solenoids used were started to be used for some special broadcasting equipment in 1950. For the simple structure and low price, they soon became widely used components. With the rapid growth of economics, the market expanded further for various applications from consumer products to industrial, like audio, information, optics, medicals services, air conditioning, vending machines, entertainment, automobiles and housing. With the continued research and development, new solenoids with higher performance have been always newly developed. Solenoids applications will further expand in future achieving advanced requirements including automation and cost savings.

### 2.WORKING:

- Apply Current.
- Magnetic field gets generated.
- Stop & plunger become attracting Magnets.
- Magnetic force Derived plunger to stop.

#### Applying current

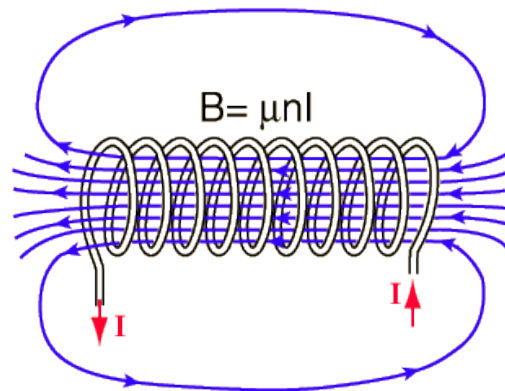
This solenoid engine is working with 12V which comes from step down transformer ( 12 – 0 – 12 ).Then diodes converts 12V AC from transformer to DC.Then Capacitor is used in the circuit to store the energy and maintain the 12V his solenoid engine is working with 12V which comes from step down transformer ( 12 – 0 – 12 ).Then diodes converts 12V AC from transformer to DC.

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### Magnetic field generation

When a lazy charge sits on its couch, doing nothing, it is surrounded by an electric field. This makes sense, because it's an electric charge, after all. But once that charge gets some motivation and goes for a run around the block, suddenly it produces a magnetic field. This might strike you as odd, and you wouldn't be alone! As physicists figured out later, both fields are part of the same force of nature: electromagnetism.

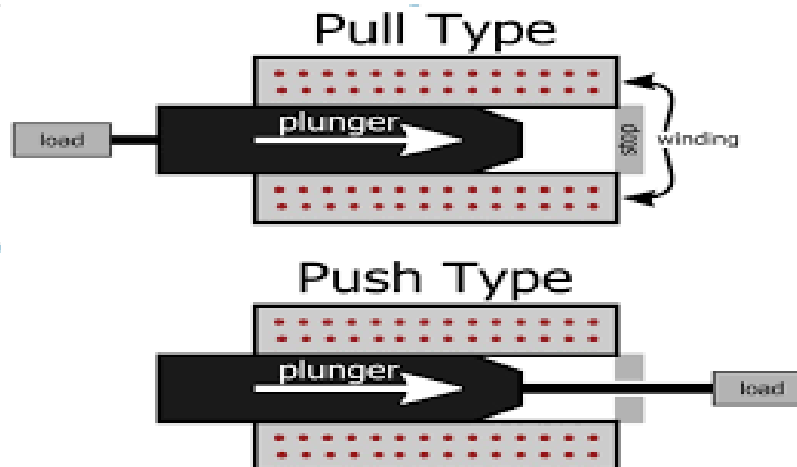
Because of this, we can create a magnet by simply running a current through a wire. When we run a current through a solenoid, however, we get a super strong magnet because the magnetic field is concentrated inside the coil. This can be incredibly useful in our everyday live.



**FIG. 1**

The magnetic field is concentrated into a nearly uniformly field in the center of a long solenoid. The field outside is weak and divergent.

### Stop & plunger become attracting Magnets



### Magnetic force Derived plunger to stop:

The system consists of a permanent neodymium iron-boron magnet which was adhered to the top surface of piston. During reciprocating motion magnets travelled along with the piston. The magnets were fixed in such a way that the pole orientation was in the same direction. For e.g., if the south poles of both the magnets were fixed to piston surface then the north poles were exposed to the atmosphere. A solenoid is an electromagnet which creates a dipole at the two end faces when the current is passed through it resulting in the formation of North and South Pole.

### 3.COMPONENT AND MATERIAL USED:

- 30 SWG ENAMIL COATED COPPER WIRE
- BOBBIN - 12mm ( PLASTIC )
- FLY WHEEL
- STANDS
- CRANK
- 12 VOLTS STEP DOWN TRANSFORMER
- 2 RECTIFIERS
- 1 CONDENSER
- BASE ( WOOD )
- SCREWS
- AC CORD
- CONTACT SWITCH (CARBON OR ELECTRICAL )

### 4.CONCLUSION:

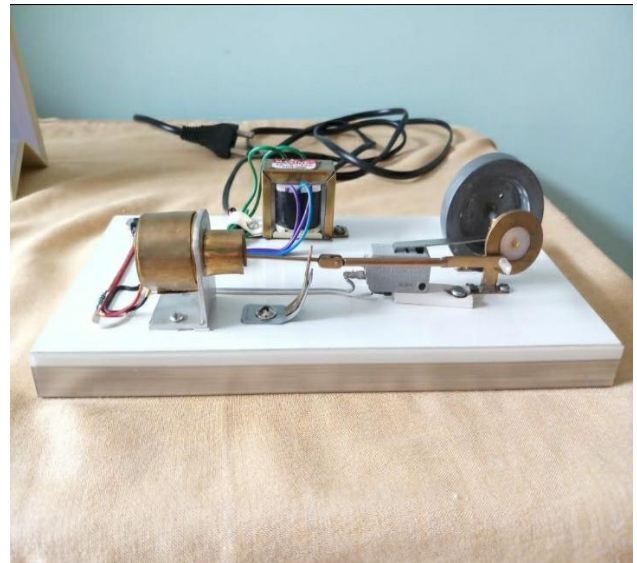
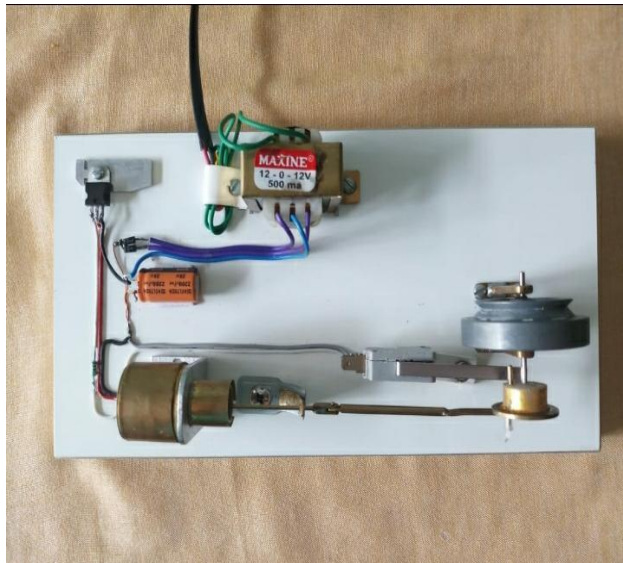
Thus, we modeled a Mini Solenoid Engine by using brass etc. When tested for its working it is proven to work efficiently. We can conclude that, it can be used to convert electrical energy to mechanical work.

One advantage of this engine is that it produces no emissions so it can be used indoors. Even though it looks like a fossil fuel combustion engine, it uses a magnetic field to retract the pistons moving the crankshaft. This engine is a good demonstration and learning aid.

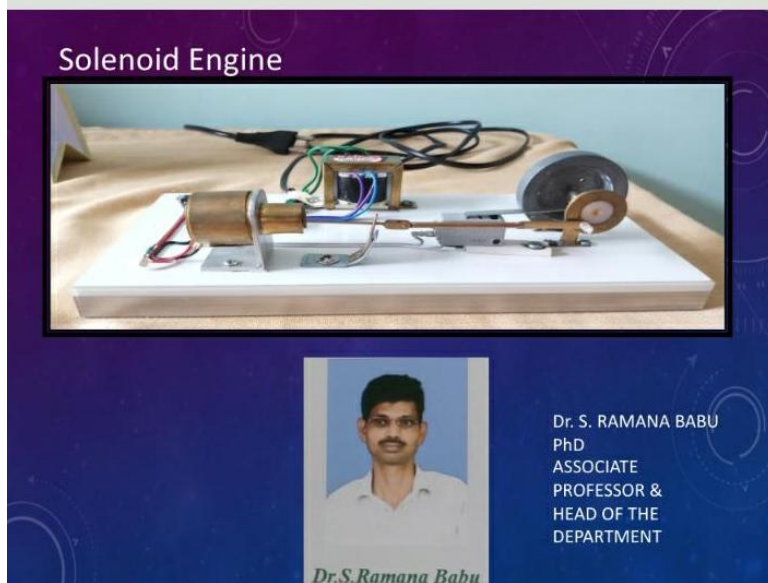
With repeated handling, the windings of the electromagnet got loosened up which increases the gaps between the windings. This causes a drop in the potential energy from the power source and prevents the effective generation of magnetic flux. It is also noticed that the energy of the permanent magnet is higher than that of electromagnet. The design of the engine is to be done with materials having low density. This sector needs accurate manufacturing and utmost care. The MRPE has various advantages over an internal combustion engine. The most important advantage is that it is environmentally friendly. It does not use any fossil fuels, does not deplete natural resources, and does not pollute, no heat generation within the system. Though the electromagnet heats up with continuous operation, but the temperatures are very low as compared to IC engines. It rules out the need of a cooling system, a fuel injector, valves, etc. The operating noise levels are low. Proper development of this engine with materials like aluminum can reduce the weight significantly, and increase the efficiency. The important significance is that its development can decrease the dependence on depleting resources, which is a very important requirement today. With further research and development, it can be proved to be a boon in the Automobile sector.

The electromagnetic engine has various advantages. The main advantage is, no fuel is being used in the engine. This results into no pollution which is very need in the present day situation. As there is no any type of combustion taking place inside the cylinder there is only very little heat generation by the coils. Less noise is produce during working. The disadvantage of this engine is its high initial cost. The electromagnet and permanent magnet can be costly. Also the power of the permanent magnet will decrease during time and the permanent magnet has to be replaced during limited periods. The engine is not as flexible as the internal combustion engine. The engine power source is battery. The number of batteries will vary according to the requirement. In high power engines, the number of batteries will increase which maybe increase the total weight of vehicle and consume a lot of space. Also the batteries needs to be charged regularly which is difficult and time consuming. So the engine is not dependable the prototype is an idea which uses the property of an electromagnet by property of which it changes the polarity of its poles whenever the direction of current is changed.

### 5.PROTOTYPE:



## 6.ANNEXURES:



## 7.References:

- 1) <https://www.slideshare.net/machamadaganapathi/electromagnetic-engine-49492966>
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- 4) [www.informationvine.com/Engine+Solenoid](http://www.informationvine.com/Engine+Solenoid)
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