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SOLAR POWERED SOLENOID ENGINE

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Abstract—Electric Vehicle are becoming increasingly attractive alternative to the car with combustion engine, considering the effect on the environment as well as economic factors such as gradual increasing price of fluid fossil fuels, maintenance and others. Due to the fact that these vehicles are widely known for their zero emission and powered by renewable energy sources. The idea of the project is to take another alternative design of EV prime mover to replace existing electric motor. In general, EV are driven and controlled by the integration of electrical, electronics and also mechanical components but the main component that actually moves these vehicles is the electric motor. Electric motor works on principles of the electromagnetic induction by converting electrical energy to kinetic energy. This energy conversion is the main purpose of an electric motor and this actuator are highly popularized in most EV's designs. So a solenoid will be used to replace the electric motor as a prime mover. For this a prototype of a solenoid is designed, built, and tested. The solenoid will be used as kicking device.

Keywords:- Solenoid Engine, Solar powered Vehicle, Electromagnetic force.

1. INTRODUCTION

As earlier studies have investigated a solenoid as shooting mechanism. In one study the solenoid is investigated as most suitable kicking device. The other study designed and optimized a solenoid. In this study a prototype solenoid is designed and tested. [1]

The advancement and production of electric vehicle is gradually increasing from the past few years and continuous research is going on in this department to raise the efficiency and to replace the existing theory. At present electric cars work with electric motors, accumulator is used to store the energy. The main moto of this work is to design a solenoid engine that follows the concept of electromagnetic induction. Solenoid is used as the replacement for the standard pistons that are being used in internal combustion engines. Solenoid engine consists of four/eight solenoids that provides power to the engine. Here the electrical energy is converted into mechanical work. A specific firing order is given to run the engine without any excessive load. Electricity is the best alternative for the petroleum products to stop the emission. We use solar panel to charge the batteries and obtain clean source of free energy to run the engine. [2]

A solenoid is a type of electromagnet when the purpose is to generate a controlled magnetic field. If the purpose of the solenoid is instead to impede changes in the electric current, a solenoid can be more specifically classified as an inductor rather than an electromagnet. In engineering, the term may also refer to a variety of transducer devices that convert energy into linear motion. The term is also often used to refer to a solenoid valve, which is an integrated device containing an electromechanical solenoid which actuates either a pneumatic or hydraulic valve, or a solenoid switch, which is a specific type of relay that internally uses an electromechanical solenoid to operate an electrical switch; for example, an automobile starter solenoid, or a linear solenoid, which is an electromechanical solenoid. Solenoid bolts, a type of electronic-mechanical locking mechanism, also exist. Solenoid is the generic term for a coil of wire used as an electromagnet. It also refers to any device that converts electrical energy to mechanical energy using a solenoid. The device creates a magnetic field from electric current and uses the magnetic field to create linear motion. Common application of solenoids is to power a switch, like the starter in an automobile, or a valve, such as in a sprinkler system. [2]

A solenoid consists of a coil and a moving metal rod, also known as armature or plunger. The operation of solenoids is based on conversion electrical energy into mechanical energy, and therefore solenoids are being considered as electromechanically actuators. Normally, the coil is a copper wire wound a tiny pitch and placed in a metal (iron-based material) case, also known as a C-frame. The C-frame is a supporting structure that also contributes to the magnetic field produced by the coil. Applying an electric current to a solenoid coil generates a magnetic field or flux with intensity proportional to the current. The magnetic field pulls the plunger in. The reason for the plunger attraction is a ferromagnetic material with high magnetic permeability, whereas air which has very low magnetic permeability. Pulling the plunger inside closes the air gap and intensifies the field concentration inside the solenoid. [1]

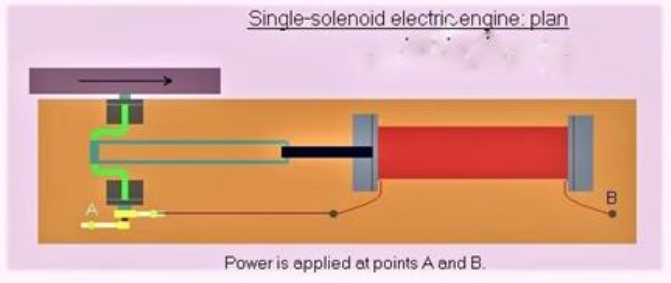

Fig 1 Schematic diagram of solenoid engine [8]

The plunger (armature) of the solenoid can only be attracted by the magnetic field, hence the solenoid can only generate force in one direction. Normally when the solenoid is in the rest the plunger is kept far from the coil using a spring. However, solenoid has been used as servo actuator in engine mount application. [1]

2. LITERATURE SURVEY

The electromagnetic piston engine is a type of reciprocating engine that operates on the electromagnetism principle, which states that like poles attract and unlike poles repel. The piston, connecting rod, cylinder, and crankshaft are all present in the engine, just as they are in a traditional engine. A neodymium magnet is fixed to the top of the piston since it is a very strong magnet. The piston attracts the solenoid from BDC to TDC as the magnet and solenoid have opposite poles. The solenoid repels and moves the piston from TDC to BDC until it switches poles and becomes the same pole as the magnet. This paper's engine is a four- cylinder V4 configuration engine. As a result of this experiment and project, this engine cannot currently be used to lift high-power loads or for significant vehicular applications. [3]

The engine is the primary source of power in a car, and the vast majority of engines today are Internal Combustion (IC) engines that run on either gasoline or diesel. When these fuels are burned in the piston, heat energy is released, which is then converted into mechanical energy. After combustion, these fuels emit toxic gases, polluting the atmosphere and having detrimental effects. Fossil fuels will be depleted in the near future, and Electric Cars are currently the perfect alternative to gasoline-powered vehicles. Electricity is a pollution-free energy source with virtually no emissions. The aim of this project is to create a solenoid engine that operates on the electromagnetism principle. This principle is applied to the conversion of electrical energy to mechanical energy. [4]

In present investigation we have designed a solenoid coil engine based on Induction principle which is alternate option of electric Engine in future due to it high load carrying capacity and low cost as compared to electric engine. Through this work new advanced automobile cum electrical technology is implemented to regenerate a new advance electric engine without using a motor and it is possible to totally remove the motor from car which we name as high torque coil engine. It works like a normal fuel engine but now power source is battery with is totally pollution free and eco-friendly. [5]

In an automobile, the engine is the primary power source, in which fuel is burned and heat energy is emitted, which is then transformed into mechanical energy. When fuel is burned, toxic gases are emitted, resulting in air pollution. Electric vehicles are being built these days. For power generation, we prefer electromagnetic engines. [6]

As we move toward becoming a developed world, the demand for fossil fuels increases. Hence an alternative to fossil fuel is the present requirement. The internal combustion engine pollutes the environment. As a consequence, the electromagnetic field was invented to solve this problem. [7]

3. WORKING PRINCIPLE

A solenoid generates an electromagnetic field around a moveable core known as an armature. When moved by an electromagnetic field, the armature opens and closes valves or switches, converting electrical energy into mechanical motion and force. A solenoid is, at its most basic, a length of wire wrapped around a core. The core is frequently divided into two parts: a stationary core and a moving core, which serves as the armature. Both components are spring-loaded. When an electrical current flows through the wire, it produces a magnetic field that causes the armature to move away from (or toward) the stationary core, depending on the solenoid's purpose and design. When the current stops, the spring puts the armature back into position. This back-and-forth motion classifies this as a linear solenoid, while rotary solenoids are slightly more complicated.

A solenoid must have three components in order to function are Coiling wire, A core that is moveable and Electric supply. These pieces work together in a car's ignition system to drive the armature, completing the circuit that ignites your engine. When you let off of the key and move it away from the "start" position, the solenoid deactivates and the armature returns to its prior position, breaking the circuit. As a result, your car's ignition will no longer attempt to start the engine because it is already running. While a solenoid makes use of electromagnetic, it is not an electromagnet. It only works through electromagnetism. [8]

Applications of solenoid engine:

- The core of the solenoid is used for applying mechanical force to the valve.
- Electromagnets find application indoor locking systems as a secure closure.
- Computer printers and fuel injector gears in cars use solenoids.[9]

Advantages of Solenoid Engine:

- The solenoid engine causes zero atmospheric pollution.
- These engines can be used as an alternative to fossil fuels.
- The engine has more efficiency with lesser torque.
- There is no hazard to the surroundings because solenoid engines cause no atmospheric pollution.
- Serves as a promising alternative to the fossil fuels.
- Better efficiency for operations requiring lesser torque.
- Less maintenance is required.
- Very much lighter than an internal combustion engine.
- The reaction time required for a solenoid engine is very quick.[9]

4. CONCLUSION

The electromagnet's windings became loosened as a result of excessive use, increasing the gaps between the windings. This results in a drop in the power source's potential energy, which hinders the effective creation of magnetic flux. It's also worth noting that the permanent magnet's energy is higher than that

of an electromagnet. Low density materials will be used in the engine's design. It necessitates precise manufacture and meticulous winding maintenance. In comparison to an internal combustion engine, the solenoid engine has several advantages. It is Eco- friendly and also its maintenance and running costs are lesser than Internal Combustion Engine.
The main application of a solenoid engine is to transform electrical energy into mechanical work. A solenoid is typically found in a cylindrical configuration around the engine. The cylinder is comprised of two parts, one of which travels up and down or rotates and is known as an armature. The other component remains stationary within the cylinder, therefore there are no moving parts on it. This component is known as the stator. A magnetic field is produced within this metal rod as current travels through the coil of wire wrapped around it. This magnetized rod then attracts another bar, causing it to move.

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