

Switching System For Solenoid Engine Using Mico-Controller

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Abstract--Solenoid engine is an engine which uses magnetic field created by energized solenoid to gain reciprocating motion as an output. There are many solenoid engines are available. But they all use 555IC (TimerIC) by which we can only get limited frequency for switching the solenoid coil. Our project is to use Arduino for switching the polarity of the solenoid coil.

Index Terms :--Solenoid Engine, Frequency controlled solenoid engine, Electromagnetic engine, Arduino used electric engine.

I. INTRODUCTION

Non-conventional energy sources also called renewable energy sources that are continuously replenished by natural processes. Most of the renewable energy comes either directly or indirectly from sun and wind and can never be exhausted, and therefore they are called renewable energy sources. Various forms of non-conventional energy are solar energy, wind energy, bio energy, hydro energy, geothermal energy, wave and tidal energy etc. Fossil fuels are often termed as conventional energy sources. and so will in principle 'run out' at some time in the future.

The demand for power is growing rapidly. The problem will be due to fast depletion of fossil fuel deposits, quality of fuels, heavy price to be paid for basic materials plus their transportation cost and the environmental degradation caused by the use of conventional energy sources. Under such conditions, environment friendly and pollution-free, non-conventional and renewable energy sources known as 'clean and green energy' have emerged as an important alternative to conventional energy sources. The renewable energy sources are clean and inexhaustible as they rely on sun, wind, biomass, etc. To solve these problems we have to use renewable energy resources. As a part of making it suitable for more application the key is electromagnetic engine or electromagnetic device which is replacement to many conventional device.

II. WORKING PRINCIPLE

When electric current starts flowing through a conductor wire, it will generate a small circular magnetic field around it, perpendicular to the wire and rotating accordingly to the direction in which the electric current flows.

When two magnets are placed nearer to each other if they are having same poles then repulsive force will act on both the magnets. And if they are having opposite poles then attractive force will act on both the magnets. The reciprocating motion can be gain by applying this simple principle.

III. COMPONENTS

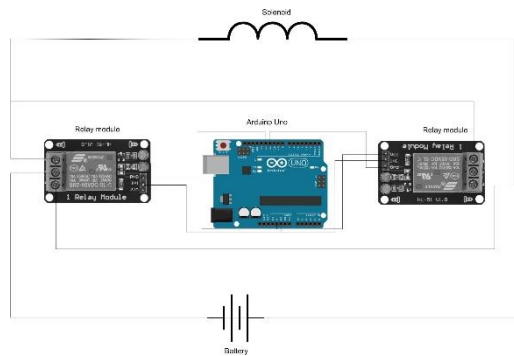
A. Relay Module

Relays work on electromagnetism, When the Relay coil is energized it acts like a magnet and changes the position of a switch. The circuit which powers the coil is completely isolated from the part which switches ON/OFF, This provides electrical isolation. This is the reason we can control a relay using 5V's from an arduino and the other end of it could be running an 230V appliance, the 230V end is completely isolated from the 5V arduino circuitry.

B. Arduino Uno (Microcontroller)

A microcontroller is a small and low-cost computer built for the purpose of dealing with specific tasks, such as displaying information in a microwave LED or receiving information from a television's remote control. Microcontrollers are mainly used in products that require a degree of control to be exerted by the user. The architecture of a microcontroller depends on the application it is built for. For example, some designs include usage of more than one RAM, ROM and I/O functionality integrated into the package.

IV. CIRCUIT DIAGRAM



V. ARDUINO CODE

The arduino code used is basically same of blinking of led with time delay. But switching the polarities we have used relay modules between solenoid and input source of electricity. Here pin-12 & 13 are output pins. We can set time delay according to radius of crank shaft(stroke length/2).

The code is given below:

```
void setup() {
  // initialize digital pin 13 as an output.
  pinMode(12, OUTPUT);
  pinMode(13, OUTPUT);
}
void loop() {
  digitalWrite(12, HIGH);
  digitalWrite(13, HIGH);
  delay(200);
  digitalWrite(12, LOW);
  digitalWrite(13, LOW);
  delay(200);
}
```

VI. EXPLANATION OF CODE

Here pin 12 & 13 are set as a output pins. In the code HIGH means Straight polarity and LOW means Reverse polarity of current. E.g. first when we apply current to this circuit solenoid will be ON for 200 ms. Then 200 ms its polarity changes into reverse direction. By this way we can achieve changing in polarity by using Arduino. Here we can input time delay by deciding frequency(Frequency=1/TimeDelay).It can be achieved by time taken by piston to complete half stroke.

VII. CONCLUSION

The presented work contribute to Solenoid Engine (Electromagnetic Engine). In previous time the builted solenoid engine were based on timer IC. There is a main disadvantage that we can not get all the possible frequency. But by using Microcontroller we can get all the possible frequency. This function is depended only on relay module. If we know the specific frequency and do not want to use relay circuit we can use transistor and diode also by which we can

fix any frequency. But use of that minimize our application for one instrument only. By use of microcontroller and relay we can use one instrument in many ways. E.g. Shaper machine, Drilling machine, Stamping Operation, etc.

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