EXPLORING THE USE OF MULTIPHASE ELECTRO – MAGNETIC ENGINES

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Abstract: The paper tries to address the constant and never dying need for alternative fuels. Instead of searching for alternative fuels or alternative sources of energy, the paper discusses how we have optimized the existing technology of engines used in electric/hybrid engines for generation of better torque and thus higher power output. This we have done by changing the way in which electric engines work, a switching circuit which is connected to coils that are present in stator part of a normal electric motor was provided and the windings were changed to independent, individual configuration. The result that was calculated was a higher power output than conventional electric engines
Key words: engines, alternatives, electro – magnetic fields, optimization

I. INTRODUCTION

Multi-phase is used here to emphasize the absence of 3 phase windings in a traditional electric engine and presence of windings which give us more phase and thus a stronger electro – magnetic field. This paper begins by explaining various components of our assembly and design. Once each and every component is described, the way in which all the components connect with each other is explained. The paper then moves on to describing the way in which all these components work together and reach to the result of producing higher torque than present engines. It concludes by once again reflecting on salient features and commenting on the usefulness of this innovation. The principle of this design is based on a new application of Fleming's Right hand rule. Stator part of the engine will have current running in the opposite side as the current running in the main central – rotor part. Since, the polarity induced is a direct consequence of electricity's direction according to the rule, the rotor will have opposite polarity as the stator. Hence, both of the parts will be attracted to one another and because stator is fixed, rotor will rotate.

II. COMPONENTS

A. STATOR PART

This here is just a reference to the grounded body which will provide the rotating magnetic field and will incorporate all the coils into it. There are 10 hollow sections provided in our design which will house 10 coils with 10 independent windings. Each of them going in and coming out from each section as you can see in the figure. All these coils will be connected to the output from a microprocessor from one end and grounded to the chassis from another.

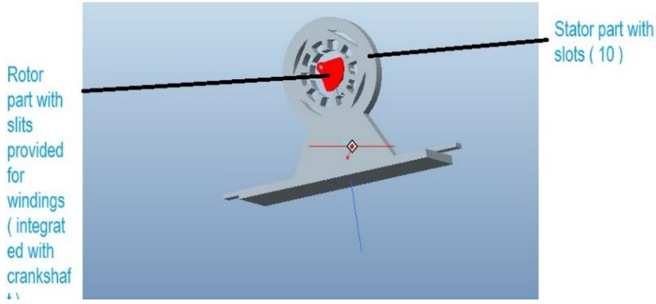

Figure – 1: Schematic diagram of our design

B. Rotor Part

The crankshaft is integrated with the rotor. A vane like projection has been provided on the crankshaft that usually comes out from engine. Though in this design there is no need for an engine. The vane like projection will be as you can see closest to the stator part. Now, this emphasizes the fact that another coil is necessary which will just produce another static magnetic field around this projection whose polarity will be inverse of the polarity of the magnetic field in the stator part so for this purpose, there are three slits provided in the lobe like projection of vane like surface made around the traditional crankshaft. A support structure will pass through the central slit. From the upper slit, the wire will be going in one direction and from third slit, the wire will be coming back. The direction of winding will be perpendicular to the stator windings and hence, both magnetic fields will be perpendicular and in inverse polarity.

C. Microprocessor relays and acceleration

A microprocessor is provided in the car which handles the basic process of rotation of magnetic field. A constant D.C current is provided by microprocessor through one pin at a time on its output end. This output voltage actuates the relay which is connected to the 48 volt battery from its other end.
The microprocessor is provided with an adjustable clock function with an interrupt switch integrated to it. This interrupt switch resets the microprocessor to its original state after every 2 cycles of running down the output from 6 voltage battery to each and every output pin. The basic setup is that a 12 voltage battery is connected to a setup that steps down the voltage to 6 volts so that relays and microprocessors work fine. This powers up microprocessor which has been coded to run output of 6 voltage at a certain interval of time. This interval of time comes from clock which is adjustable and connected directly to accelerator via a sensor. This adjustable clock is the basic process by which we can speed up or speed down the car. Each and every output pin is connected to a separate output relay. This relay

has its other end fixed to the 48 volt battery.

D. Arduino Uno

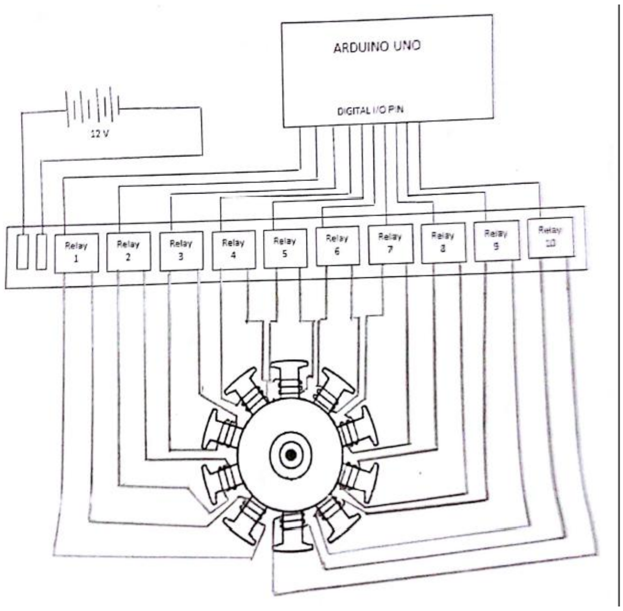

Figure 2: Electrical circuit

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode.

The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

Each of the 14 digital pins on the Uno can be used as an input or output, using pin Mode(), digital Write(), and digital Read() functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 kΩ.

E. Relay power distribution board

The relay board needs a power input of 5 volt for operation. The board has 10 SPDT relays with JQC-3F/T73. The contact types are Normal Opened (NO) and Normal closed (NC). The operational voltage of the board is 12 volts. Green LED connected to each relay shows the status of the relay. The switching of the relays can be very fast and controlled by the digital pins of the Arduino board. Each relay uses fly-back diodes which can eliminate fly-back, which is the sudden voltage spike seen across an inductive load when its supply voltage is suddenly reduced or removed.

III. WORKING

The process begins by starting the battery supply. As soon as the process begins, the current starts flowing through the components and the clock determines the position of the acceleration paddle. According to the acceleration paddle, the clock adjusts the time in which the current changes its flow from one coil to another. Since relays work in nanoseconds, they switch current on as soon as current comes to them from microprocessor. Thus, the switch through which 48 volt is flowing gets closed down and thus current starts flowing from that coil. The coils here are made of tarnished copper wire which generate magnetic field almost immediately. And as soon as the car was switched on, the current started flowing from each and every component thus it means the current even started flowing through the coil which is wounded in the rotor part with three slits and lobe like projection. As discussed previously, the polarity and nature of both the fields generated will be inverse in nature and hence, the lobe like projection will be attracted to its reverse. Now, when microprocessor will constantly switch the current through the ten coils present, the rotor will be attracted to it and thus will rotate hence rotating the crankshaft.

IV. LIMITATIONS

This design is far from being perfect but yet it is much better than nothing. It is a stepping stone towards better performing vehicles with higher outputs of energy. The main limitations we can encounter in our design are:

Eddy currents being generated inside the cavities is also an issue. It is heavily dependent on sensors and microprocessor. If any of the sensors or microprocessor's health is depleted, there is a chance of system failure. Heating is also an issue which can be faced by this system severely.

REFERENCES

[1] http://www.instructables.com/id/Intro-to-Arduino/step2/Arduino-Uno-Features/
[2] datasheets.chipdb.org/Intel/x86/Pentium/.../INITCONF.PDF
[3] http://electronics.stackexchange.com/questions/126939/eddy-current-in-transformer-and-its-minimization.
[4] http://iopscience.iop.org/1367-2630/5/1/357
[5] http://iopscience.iop.org/0143-0807/22/5/302
[6] http://arxiv.org/abs/cond-mat/0608492
[7] http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=1282018&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxpls%2Fabs_all.jsp%3Farnumber%3D1282018
[8] http://www.academia.edu/5642187/Arduino_based_pulse_width_modulated_output_voltage_control_of_a_dc-dc_boost_converter_using_Proportional_Integral_and_Derivative_control_strategy

