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ELECTRICITY GENERATION USING PROPELLER SHAFT

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ABSTRACT

A vehicle can generate electricity for operating a hybrid engine or recharging batteries by use of an electricity generating driveshaft. The electricity generating driveshaft is comprised of a magnetized driveshaft which acts as a rotor, and a series of copper wire coils surrounding the magnetized driveshaft which acts as a stator in an electrical generator. As the magnetized driveshaft spins as a result of power from the hybrid engine, an electrical field is created which is captured by the copper wire coils and used to power the hybrid engine or recharge a super capacitor. This rotational movement creates a magnetic field and generates EMF into the coil as defined by Faraday's law of electromagnetic inductions.

Keywords: *Faraday's Law, Magnets, Propeller Shaft, Motor, Capacitor, Belt, Pulley.*

1. INTRODUCTION

In this article we are mentioning the methods for generating electricity from the rotating driveshaft of a motor vehicle and using the driveshaft to slow the vehicle to a stop. Vehicles have been powered by a variety of sources over the years. Before the invention of the internal combustion engine, vehicles were powered by animals, wind, and manpower. Since the abuse of the internal combustion engine, vehicles have been fuelled by gasoline, diesel oil, natural gas, ethanol and combinations of ethanol and gasoline. These fuels are expensive to use, difficult to obtain and transport and are becoming increasingly scarce. In response to these problems with the so called "fossil fuels, vehicles are being powered by all electric motors or hybrid combinations of electric/gasoline or electric/diesel fuel engines. Electric engines receive energy from batteries. However, the batteries are heavy decreasing the efficiency of the electric motor. The batteries also have limited storage capacity thereby decreasing the range of the vehicle driven by an electric motor. Moreover, stations to recharge the batteries are few limiting the usefulness of electric vehicles.

So, a solution is made for these types of problems where an electricity generating driveshaft is used. This typically comprises a magnetized driveshaft which acts as a rotor, and a series of copper wire coils surrounding the magnetized driveshaft which acts as a stator in the electrical generator. The general definition of a generator is a device that converts mechanical energy into electrical energy. This is possible due to principle of electromagnetism.

As this electrical energy is produced, the generator will cause electric current to flow through an external circuit. Typically, generators are made up of an arrangement of magnets, copper winding and a rotor, which ultimately produce electricity from mechanical power. This mechanical energy provided to the generator is eventually converted into electrical power based on the principle of electromagnetic induction

One of the main components of this research is the propeller shaft which is also known as the driving shaft. The purpose is to transmit power via rotation which may lead to various types of stresses such as torsional or shear stresses. To transmit more power the propeller shaft must be strong enough so it can withstand such stress so the design concern is also taken into consideration so the transmission must be smooth.

1.1 Problem Statement

As we know that the automobile sector is turning towards the electrification of vehicles in which charging of batteries is a time-consuming process. Also, after the charging, it is limited to a certain interval of time as per the usage of the vehicle after which it needs to be charged again. So, if some rotary components present in the machine are converted into electrification with minimal losses, we can generate electricity from them, and it can also charge a battery and be used for further applications. To overcome such problems, we have designed this model by using a chain and belt mechanism where we can use rotary energy of the propeller shaft with nano coils and magnets to generate electrical energy.

In current vehicles following are the concern, By using chain and belt mechanisms with the alternator with engine these are the problems

- Loss of power
- More friction
- Wastage of energy

- Less quantity of fuel on earth

2. CONSTRUCTION

Electrical generators have been in use for many years in different applications. The general definition of a generator is a device that converts mechanical energy into electrical energy. This is possible due to the principle of electromagnetism. As this electrical energy is produced, the generator will cause electric current to flow through an external circuit. Typically, generators are made up of an arrangement of magnets, copper winding and a rotor, which ultimately produces electricity from mechanical power. The electric generator consists of two main components, a rotor and a stator. Typically, a stator is composed of one or more magnets and copper winding, and the rotor is a metal loop or shaft that rotates within the stator. When the rotor revolves within the stator, an electric current is generated because the magnetic field in relation to the electron's changes. With every complete turn of the rotor within the stator, the magnetic field is changed, creating electricity which travels to an external electrical circuit through a coil or the copper winding.

Table -1: Parts Used

PARTS	MATERIAL
Frame	Mild Steel
Wooden Sheet	Wood
Shaft	Steel
Coil	Copper Coils
Battery	STD
Bearings P204	STD
Motor	STD
Disc Magnets	Neodymium
Screw Nut Bolt M6	STD
Pulley	Mild Steel
Belt	STD

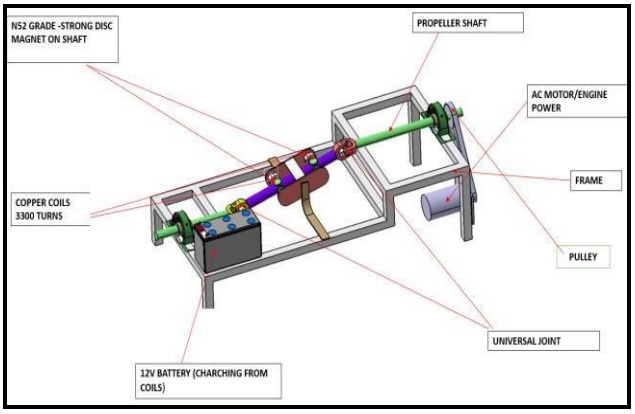

FIG 1: Construction diagram

3. DESIGN CALCULATIONS

1. Design of Motor

The purpose of a motor, regardless of the application, is to change electrical power to mechanical power in order to provide rotational movement. According to our project design we need a variable speed motor, so as per manufacturer's catalogues, we have studied the rpm factor and as per our costing we have selected 1 motor.

Calculations :

Speed=N= 1440 rpm

Torque = 20 Kg-cm =20*9.81*10^-2

=1.962 N-m

Angular Velocity=ω=(2*π*N)/(60)

= (2*π*1440)/(60)

=150.796 rad/sec

Power =P = T*ω =1.962*150.796

=295.862 watt

2. Design of Shaft

When designing our attachment, the following considerations were taken into account.

1. The device should be suitable for local manufacturing capabilities.
2. The attachment should employ low-cost materials and manufacturing methods.
3. It should be accessible and affordable by low-income groups and should fulfill their basic need for mechanical power.
4. It should be simple to manufacture, operate, maintain, and repair.
5. Excessive weight should be avoided, as durability is a primeconsideration.

Calculations :

Material-Mild Steel (M.S.)

Syt=Yield Strength=170MPa

Sut=Ultimate tensile strength=290MPa

Torque=20Kg.cm=20*9.81*10=1962 N.mm

Speed=100rpm

Weight of 8 magnets=1kg

(maximum weight value, weight considered as peravailable magnets with supplier of magnets. i.e.

18mm dia and thick 3mm) Consider Self- Weight of Shaft=5kg

Total weight=W=6kg=6*9.81=58.86N

As per design data book considering the standard size of theshaft is 20 mm. And assuming factor of safety 1.5.

3. Selection of Bearings

From Suppliers catalogs

Dimensions: 18mm Dia x 3mm thick

Magnetic Face; 18mm diameter

Magnets Type; Neodymium

Material: NdFeB,

Grade: N52

Plating /Coating: Ni-Cu-Ni (Nickel)

Magnetization Direction: Axial/radial

Max Operating Temp: 176ºF (80ºC)

Quantity: 08 pcs

4. WORKING

1. When the propeller shaft is rotating at high speeds, the disc magnets also rotates with its axis when the magnet spins, the magnetic field around the top and bottom of the coil constantly changes between a north and a south pole.
2. This rotational movement of the magnetic field results in an alternating EMF being induced into the coil as defined by Faraday's law of electromagnetic inductions.
3. Copper coils generates 10 to 30 AC Volt, by using AC to DC Converter circuit, we can convert it to Dc and charge the batteries.
4. Further By using the power we run the vehicle in hybrid vehicles or electric vehicles.

5. APPLICATIONS

1. In hybrid vehicles like Trucks, busses, low duty commercial vehicles for charging battery.
2. To power Ac on vehicles batteries are used to charge these batteries
3. Power a hybrid engine or recharging a super capacitor
4. Other sources in automobile.

6. CONCLUSION

The presented work aims to reduce the fuel consumption of the automobile in the particular or any machine, which employs drive shafts, in general it is achieved by using light weight composites. The battery is charged with the help of the vehicle's alternator, but due to the alternating current being in direct contact with the engine with a transmission, the engine will experience a certain degree of resistance. Therefore, to reduce this resistance and improve the efficiency of the engine, we modified the design of the drive shaft so that while transmitting the driving force from the engine to the differential, it also generates electrical energy to charge the battery, so it will not utilize engine power. Therefore, increasing the efficiency of the engine.

7. ACTUAL EXPERIMENTATION

Table 2: RPM vs Volts

RPM	VOLTS
710	14.2
1040	19.7
1470	23.2
1880	30.8
2320	38.7
2520	40.7
2770	46

Here we get 14.2 volt at 710 rpm and 46volt at 2770rpm.

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