Fabrication of Power Generating Shock Absorber

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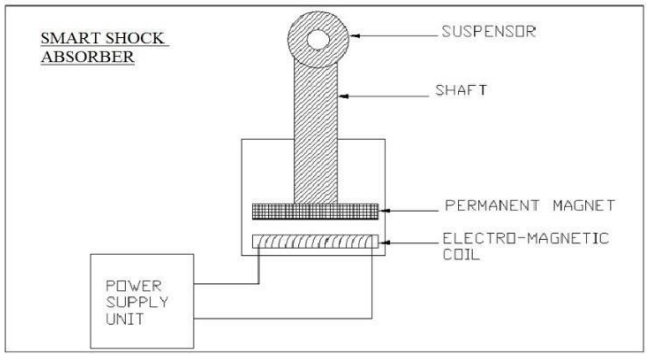
Abstract: -An electromagnetic linear generator and regenerative electromagnetic shock absorber is disclosed which converts variable frequency, repetitive intermittent linear displacement motion to useful electrical power. The innovative device provides for superposition of radial components of the magnetic flux density within a coil winding array. Due to the vector superposition of the magnetic field and magnetic flux from a plurality of magnets, a nearly four-fold increase in magnetic flux density is achieved over conventional electromagnetic generator designs with a potential sixteen-fold increase in power generating capacity.



INTRODUCTION

The transportation counts for 70% of fuel consumption in the United States and over three quarters of which is for road vehicles. Vehicles exhaust causes more air pollution than anything else. Considering only 10-16% of fuel energy is used to actually drive vehicles - to overcome the resistance from road friction and air drag, the improvement of the fuel efficiency is always an important issue. Recently research also indicates that vehicle suspensions have substantial influence on the fuel efficiency. Through modeling and road tests, Zuo and Zhang estimated that 100-400 Watts of energy harvesting potential exist in the suspension of a typical passenger vehicles traveling at 60 miles per hours on the good and average roads, and more energy is available for the trucks or on the rough roads.

LITRATURE REVIEW

DESIGN AND STATIC MAGNETIC ANALYSIS OF ELECTROMAGNETIC REGENERATIVE SHOCK ABSORBER

- This paper presents design and finite element analysis of an electromagnetic energy regenerative shock absorber which can efficiently recover the vibration energy wasted in vehicle suspension system.
- In this paper, design process of electromagnetic energy regenerative shock absorber is explained with due consideration to space limitations in commercial vehicle. A static magnetic analysis is used to analyze magnetic field distribution and to obtain optimum design
- The overall conclusion of this research work is that it is possible to harvest energy from vehicle vibrations travelling on a bumpy road.

REGENERATIVE SHOCK ABSORBER FOR HYBRID CARS

The objective of this project is to design a regenerative shock absorber which can harness the energy. In the present work, a regenerative shock absorber is modeled and analysed for emf generated using Ansoft Maxwell and a physical model was built to validate the model.

- From the above simulation and validation study it is evident that recovering energy from the kinetic energy of shock absorber is very well possible.
- The simulation results show that by using NdFeB magnets as core material can yield a voltage of 12 V AC
- But the voltage being generated with the technology demonstrator is very limited to 2 V AC. The reason for this could be using steel as core material.

COMPONENTS

The components that are used in the project **POWER GENERATING FROM SHOCK ABSORBER** are as follows,

- Electromagnetic coil,
- Permanent magnet
- Frame Stand,
- Shock absorber,
- Spring,
- Bearing with bearing cap,
- Shaft,
- Battery,
- Booster circuit.

WORKING

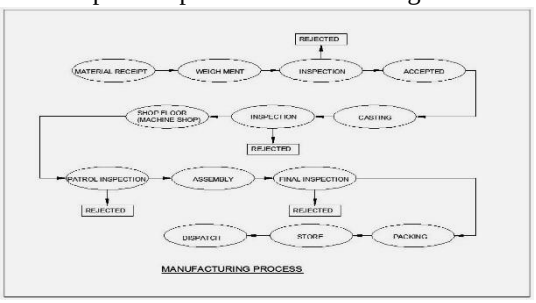
- Our Project has main part of electrical armature suspensor because these armatures through

mechanical motion convert into electrical energy. This electrical armature output voltage 12v – 1amp dc. It supply connect with rechargeable battery 12v-100 ah.

- When vehicle shock absorber pus pull then permanent magnet also follow this mechanical movement between armature coils. Then armature coil and magnet between magnetic repulsion force convert into electrical voltage.
- These current will be stored in a battery to provide an additional power supply to the system

MANUFACTURING PROCESS

Manufacturing processes are the steps through which raw materials are transformed into a final product. The manufacturing process begins with the creation of the materials from which the design is made. These materials are then modified through manufacturing processes to become the required part. Manufacturing processes can include treating (such as heat treating or coating), machining, or reshaping the material. The manufacturing process also includes tests and checks for quality assurance during or after the manufacturing, and planning the productionprocess prior to manufacturing.



ELECTRO-MAGNETIC COIL

An electromagnetic coil is an electrical conductor such as a wire in the shape of a coil, spiral or helix. Electromagnetic coils are used in electrical engineering, in applications where electric currents interact with magnetic fields, in devices such as inductors, electro- magnets, transformers, and sensor coils.

Either an electric current is passed through the wire of the coil to generate a magnetic field, or conversely an external time-varying magnetic field through the interior of the coil generates an EMF (voltage) in the conductor.

NEODYMIUM PERMANENT MAGNETS:-

Neodymium magnets are a rare earth magnet, and known for their strength of power. When handled improperly, they can pose serious dangers. Often referred to as neo magnet, NIB or NdFEB, neodymium rare earth magnets are permanent magnets composed of an alloy of neodymium, boron and iron.Of late, this magnet holds the title for being the strongest type of permanent magnet.

It also has a metallic appearance. The A current through any conductor creates a circular magnetic field around the conductor due to Ampere's law. The advantage of using the coil shape is that it increases the strength of magnetic field produced by a given current. The magnetic fields generated by the separate turns of wire all pass through the center of the coil and add (superpose) to produce a strong field there. The more turns of wire, the stronger the field produced. Conversely, a changing external magnetic flux induces a voltage in a conductor such as a wire, due to Faraday's law of induction. The induced voltage can be increased by winding the wire into a coil, because the field lines intersect the circuit multipletimes.
applications of neodymium are many. They are used in several industrial areas, medicines and health, educational, and as handy tools.When it comes to magnetic applications, neodymium is used to make magnetic separators, magnetic filters,and magnetic ionizers.

This material is currently the strongest type of permanent magnet. The tetragonal $Nd_2Fe_{14}B$ crystal structure has exceptionally high uniaxial magneto crystalline anisotropy (HA~7 Tesla). This gives the compound the potential to have high coercivity (i.e., resistance to being demagnetized). The compound also has a high saturation magnetization (Js ~1.6 T or 16 Kg).

Therefore, as the maximum energy density is proportional to Js2 this magnetic phase has the potential for storing large amounts of magnetic energy (BHmax ~ 512 kJ/m3 or 64 MGOe), considerably more than samarium cobalt (SmCo) magnets, which were the first type of rare earth magnet to be commercialized. In practice, the magnetic properties of Neodymium magnets depend on the alloy composition, microstructure, and manufacturing technique employed.

SPRING

A spring is an elastic object used to store mechanical energy. Springs are usually made out of spring steel. There are a large number of spring designs; in everyday usage the term often refers to coil springs.

Small springs can be wound from pre- hardened stock, while larger ones are made from annealed steel

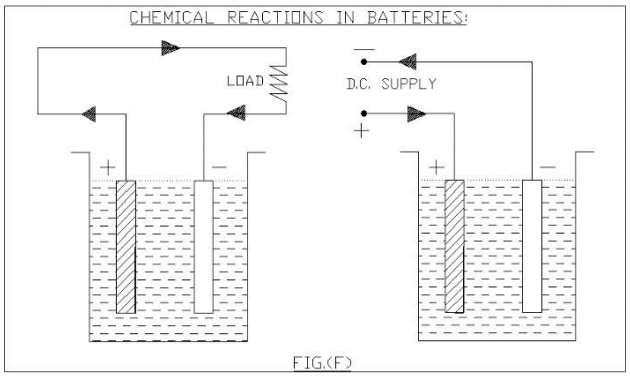
and hardened after fabrication. Some non-ferrous metals are also used including phosphor bronze and titanium for parts requiring corrosion resistance and beryllium copper for springs carrying electrical current (because of its low electrical resistance). When a coil spring is compressed or stretched slightly from rest, the force it exerts is approximately proportional to its change in length (this approximation breaks down for larger deflections).

The rate or spring constant of a spring is the change in the force it exerts, divided by the change in deflection of the spring. That is, it is the gradient of the force versus deflection curve. An extension or compression spring has units of force divided by distance, for example lbf/in or N/m. Torsion springs have units of torque divided by angle, such asN·m/rad or ft·lbf/degree. The inverse of spring rate is compliance, that is: if a spring has a rate of 10 N/mm, it has a compliance of 0.1 mm/N. The stiffness (or rate) of springs in parallel is additive, as is the compliance of springs in series. Depending on the design and required operating environment, any material can be used to construct a spring, so long as the material has the required combination of rigidity and elasticity: technically, a wooden bow is a form of spring.

LEAD-ACID WET CELL:

Where high values of load current are necessary, the lead-acid cell is the type most commonly used. The electrolyte is a dilute solution of sulfuric acid (H_2SO_4). In the application of battery power to start the engine in an auto mobile, for example, the load current to the starter motor is typically 200 to 400A. One cell has a nominal output of 2.1V, but lead-acid cells are often used in a series combination of three for a 6-V battery and six for a 12-V battery.

The lead acid cell type is a secondary cell or storage cell, which can be recharged. The charge and discharge cycle can be repeated many times to restore the output voltage, as long as the cell is in good physical condition. However, heat with excessive charge and discharge currents shortens the useful life to about 3 to 5 years for an automobile battery.



BASIC PRINCIPLE

Principles of Electromagnetic Induction Faraday's Law of Electromagnetic induction is the process in which an electromotive force (emf) is induced in a closed circuit due to changes in the magnetic field around the circuit.

FABRICATED PROJECT CONCLUSION

This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, purchasing, assembling and machining while doing this project work. We feel that the project work is a good solution to bridge the gates between the institutionand the industries.

We are proud that we have completed the work with the limited time successfully. The **"FABRICATION OF POWER GENERATING FROM SHOCK ABSORBER"** system is working with satisfactory conditions. We can able to understand the difficulties in maintaining the tolerances and also the quality. We have done to our ability and skill making maximum use of available facilities.

Thus we have developed an **"POWER GENERATING FROM SHOCK ABSORBER"** which helps to achieve the motion rectification of the shock with the production of the electric energy. By using more techniques, they can be modified and developed according to theapplications.

REFERENCE

[1] Faculty of Mechanical Engineering, PSG Tech., "Design Data", DPV Printers, Coimbatore, 1998.
[2] K. Balasundaram, "Industrial management", Parthian Publishers, Coimbatore-12, 1999, pp.116
[3] "TVS 50 XL Service Manual".
[4] Automotive Electrical, pp.32-94
[5] G.B.S. Narang, "Automobile Engineering", Khanna Publishers, Delhi, 1991, pp 671.
[6] William H. Crowse, "Automobile Engineering".
[7] Donald. L. Anglin, "Automobile Engineering".
[8] The Hindu Daily, "SCIENCE / TECHNOLOGY"