BATTERY RECHARGING USING SHOCK ABSORBER

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Abstract: Lot of energy is dissipated during operation of any automobile in form of vibration and dynamic forces. Utilizing these energies can develop considerable amount of power. Power generation is done by using chain and freewheel arrangement attached to shock absorbers. This set up will not affect the vehicle's overall performance in any form since it just utilizes the vibrational energy. The linear movement of shock absorbers is converted into rotation using chain and freewheel arrangement. The control mechanism carries the chain and freewheel, shock absorber, DC generator, battery and led light. The non-conventional type of energy system using shock absorber no need of fuel input to generate the output of electrical power. The objective of this project is to generate the electric power through the fabrication of shock absorber with freewheel arrangement.

KEY WORDS: shock absorber, chain and freewheel setup, DC generator

1. Introduction

A shock absorber in common parlance (or damper in technical use) is a mechanical device designed to smooth out or damp shock impulse, and dissipate kinetic energy. It is analogous to a resistor in an electric RLC circuit. Energy is the ability to do work. While energy surrounds us in all aspects of life, the ability to harness it and use it for constructive ends as economically as possible is the challenge before mankind. Alternative energy refers to energy sources which are not based on the burning of fossil fuels or the splitting of atoms. The renewed interest in this field of study comes from the undesirable effects of pollution (as witnessed today) both from burning fossil fuels and from nuclear waste by-products'. Fortunately there are many means of harnessing energy which have less damaging impacts on our environment.

1.1 Alternative energy

1.1.1 Solar energy

Solar power is the conversion of energy from sunlight into electricity, either directly using photovoltaics (PV), or indirectly using concentrated solar power.

1.1.2 Wind Power

Wind energy is a form of solar energy. Wind energy (or wind power) describes the process by which wind is used to generate electricity. Wind turbines convert the kinetic energy in the wind into mechanical power. A generator can convert mechanical power into electricity.

1.1.3 Geothermal energy

Geothermal energy is the heat from the Earth. It's clean and sustainable. Resources of geothermal energy range from the shallow ground to hot water and hot rock found a few miles beneath the Earth's surface, and down

even deeper to the extremely high temperatures of molten rock called magma.

1.1.4 Hydroelectric energy

Flowing water creates energy that can be captured and turned into electricity. This is called hydroelectric power or hydropower. The most common type of hydroelectric power plant uses a dam on a river to store water in a reservoir.

1.1.5 Tidal energy

Tidal power or tidal energy is a form of hydropower that converts the energy obtained from tides into useful forms of power, mainly electricity. Although not yet widely used, tidal power has potential for future electricity generation. Tides are more predictable than wind energy and solar power.

In addition to these we have developed a new methodology of generating power using human energy and the name of this alternative is a shock absorber power generation.

1.2 SHOCK ABSORBER:

A shock absorber in common parlance (or damper in technical use) is a mechanical device designed to smooth out or damp shock impulse, and dissipate kinetic energy. It is analogous to a resistor in an electric RLC circuit.

1.3 WORKING PRINCIPLE OF SHOCK ABSORBER

Shock absorbers must absorb or dissipate energy. One design consideration, when designing or choosing a shock absorber is where that energy will go. In most dashpots, energy is converted to heat inside the viscous fluid. In hydraulic cylinders, the hydraulic fluid will heat up, while in air cylinders, the hot air is usually exhausted to the atmosphere. In other types of dashpots, such as electromagnetic ones, the dissipated energy can be stored and used later.

Fig 1.1 Shock absorber

1.4 DESCRIPTION

Pneumatic and hydraulic shock absorbers commonly take the form of a cylinder with a sliding piston inside. The cylinder is filled with a fluid (such as hydraulic fluid) or air. This fluid filled piston/cylinder combination is a dashpot.

1.5 APPLICATIONS

Shock absorbers are an important part of automobile and motorcycle suspensions, aircraft landing gear, and the supports for many industrial machines. Large shock absorbers have also been used in structural engineering to reduce the susceptibility of structures to earthquake damage and resonance.

1.6 VEHICLE SUSPENSION

In a vehicle, it reduces the effect of traveling over rough ground, leading to improved ride quality. Without shock absorbers, the vehicle would have a bouncing ride, as energy is stored in the spring and then released to the vehicle, possibly exceeding the allowed range of suspension movement. Control of excessive suspension movement without shock absorption requires stiffer (higher rate) springs, which would in turn give a harsh ride. Shock absorbers allow the use of soft (lower rate) springs while controlling the rate of suspension movement in response to bumps. They also, along with hysteresis in the tire itself, damp the motion of the unspring weight up and down on the springiness of the tire. Since the tire is not as soft as the springs, effective wheel bounce damping may require stiffer shocks than would be ideal for the vehicle motion alone. Spring-based shock absorbers commonly use coil springs or leaf springs, though torsion bars can be used in tensional shocks as well. Ideal springs alone, however, are not shock absorbers as springs

only store and do not dissipate or absorb energy. Vehicles typically employ springs or torsion bars as well as hydraulic shock absorbers. In this combination, "shock absorber" is reserved specifically for the hydraulic piston that absorbs and dissipates vibration.

1.7 STRUCTURES

Applied to a structure such as a building or bridge it may be part of a seismic retrofit or as part of new, earthquake resistant construction. In this application it allows yet restrains motion and absorbs resonant energy, which can cause excessive motion and eventual structural failure.

1.8 TYPES OF SHOCK ABSORBERS

There are several commonly-used approaches to shock absorption:

1.8.1 Hysteresis

Hysteresis is like the "memory" of the material, if you press down rubber disks, they tend to return to their normal uncompressed state, as the pressure is relieved of structural material, for example the compression of rubber disks, stretching of rubber bands and cords, bending of steel springs, or twisting of torsion bars. Hysteresis is the tendency for otherwise elastic materials to rebound with less force than was required to deform them. Simple vehicles with no separate shock absorbers are damped, to some extent, by the hysteresis of their springs and frames.

1.8.2 Dry friction

Dry friction as used in wheel brakes, by using disks (classically made of leather) at the pivot of a lever, with friction forced by springs. Used in early automobiles such as the Ford Model T, up through some British cars of the 1940s. Although now considered obsolete, an advantage of this system is its mechanical simplicity; the degree of damping can be easily adjusted by tightening or loosening the screw clamping the disks, and it can be easily rebuilt with simple hand tools. A disadvantage is that the damping force tends not to increase with the speed of the vertical motion.

1.8.3 Solid state

Solid state tapered chain shock absorbers, using one or more tapered, axial alignment(s) of granular spheres, typically made of metals such as nitinol, in a casing.

1.8.4 Fluid friction

Fluid friction, for example the flow of fluid through a narrow orifice (hydraulics), constitutes the vast majority of automotive shock absorbers. An advantage of this type is that using special internal valving the absorber may be made relatively soft to compression (allowing a soft response to a bump) and relatively stiff to extension, controlling "jounce", which is the vehicle response to energy stored in the springs; similarly, a series of valves controlled by springs can change the degree of stiffness according to the velocity of the impact or rebound. Specialized shock absorbers for racing purposes may allow the front end of a dragster to rise with minimal resistance under acceleration, then strongly resist letting it settle, thereby maintaining a desirable rearward weight distribution for enhanced traction. Some shock absorbers allow tuning of the ride via control of the valve by a manual adjustment provided at the shock absorber. In more expensive vehicles the valves may be remotely adjustable, offering the driver control of the ride at will while the vehicle is operated. The ultimate control is provided by dynamic valve control via computer in response to sensors, giving both a smooth ride and a firm suspension when needed. Many shock absorbers contain compressed nitrogen, to reduce the tendency for the oil to foam under heavy use. Foaming temporarily reduces the damping ability of the unit. In very heavy duty units used for racing and/or off-road use, there may even be a secondary cylinder connected to the shock

absorber to act as a reservoir for the oil and pressurized gas. Another variation is the Magneto rheological damper which changes its fluid characteristics through an electromagnet.

1.8.4 Compression of a gas

Compression of gas, for example pneumatic shock absorbers, which can act like springs as the air pressure is building to resist the force on it. Once the air pressure reaches the necessary maximum, air dashpots will act like hydraulic dashpots. In aircraft landing gear air dashpots may be combined with hydraulic damping to reduce bounce. Such struts are called oleo struts (combining oil and air).

1.8.5 Magnetic effects

Magnetic effects, Eddy current dampers are dashpots that are constructed out of a large magnet inside of a non-magnetic, electrically conductive tube.

1.8.6 Inertial resistance to acceleration

Inertial resistance to acceleration, for example prior to the Citroën 2CV had shock absorbers that damp wheel bounce with no external moving parts. These consisted of a spring-mounted 3.5 kg (7.75 lb) iron weight inside a vertical cylinder and are similar to, yet much smaller than versions of the tuned mass dampers used on tall buildings Composite hydro pneumatic devices which combine in a single device spring action, shock absorption, and often also ride-height control, as in some models of the Citroën automobile.

1.8.7 Conventional shock absorbers

It is combined with composite pneumatic springs with which allow ride height adjustment or even ride height control, seen in some large trucks and luxury sedans such as certain Lincoln and most Land Rover automobiles. Ride height control is especially desirable in highway vehicles intended for occasional rough road use, as a means of improving handling and reducing aerodynamic drag by lowering the vehicle when operating on improved high speed roads.

The effect of a shock absorber at high (sound) frequencies is usually limited by using a compressible gas as the working fluid and/or mounting it with rubber bushings.

1.9 ULTIMATE AIM:

The ultimate aim of this project is to develop much cleaner cost effective way of power generation method, which in turns helps to bring down the global warming as well as reduce the power shortages.

4.1 MACHINE COMPONENTS

The shock absorber power generation machine consists of the following components to full fill the requirements of complete operations of a machine.

1. Shock absorber

2. Free wheel

3. Dynamo

4. Chain

5. Battery

4.2 DESIGN

Design specification

Freewheel specification

Number of teeth = 18mm

Pitch = 12mm

Major diameter = 35mm

Minor diameter = 34mm

Frame

Thickness = 3mm

Frame length = 300 mm

Shock absorber spring

Length of the spring = 200 mm

Thickness of the coil = 8mm

Number of coil = 18

Freewheel shaft

Length of the shaft =150 mm

Outer Diameter of the shaft =12mm

Inner diameter of the shaft =8mm

Thickness of shaft =4mm

5. CONSTRUCTION

5.1 CONSTRUCTION

The setup consist of shock absorber, freewheel and chain arrangement, d.c. generator, battery, LED light. Here, chain and freewheel is fitted to the bottom end of the shock absorber, freewheel is attached with the shaft which is directly coupled with d.c. generator shaft.

Further the battery is connected with d.c. generator From that LED light is connected to it. The construction of the setup is shown. The setup generates electricity by non-conventional method because there is no need of fuel for power generation.

5.2 WORKING PRINCIPLE

The concept is used to generate the power form shock absorber. Without shock absorbers, the vehicle would have a bouncing ride, as energy is stored in the spring and then released to the vehicle, possibly exceeding the allowed range of suspension movement. Using this movement we arrange the setup of chain and freewheel drive through the shock absorber.

A dynamo is coupled to the pinion arrangement, so when the dynamo is rotated and generates the electrical power. The generated voltage is given to battery through the charging wire.

The stored DC voltage is used to different application. Through this way electric energy is generated. The stored energy can be used for some purpose, but here to demonstrate a LED light has been connected with the battery.

5.3 MERITS AND DEMERITS

MERITS:

- No need of fuel input.
- Non-conventional system.
- Generated power is stored in battery.

DEMERITS:

- Moving part is high.
- Initial cost is high.
- Rust may occur on the steel bodies.

5.4 APPLICATIONS

This project is applied to

- Two wheelers
- Truck
- Cars
- Tippers
- And other automobile vehicles.

6. LIST OF MATERIALS

6.1 FACTORS DETERMINING THE CHOICE OF MATERIALS

The various factors which determine the choice of material are discussed below.

6.1.1. Properties:

The material selected must possess the necessary properties for the proposed application. The various requirements to be satisfied Can be weight, surface finish, rigidity, ability to withstand environmental attack from chemicals, service life, reliability etc.

The following four types of principle properties of materials decisively affect their selection

a. Physical

b. Mechanical

c. From manufacturing point of view

d. Chemical

6.1.2. Manufacturing case:

Sometimes the demand for lowest possible manufacturing cost or surface qualities obtainable by the application of suitable coating substances may demand the use of special materials.

The various properties concerned from the manufacturing point of view are,

- Cast ability
- Weld ability
- Surface properties
- Shrinkage
- Deep drawing etc.

6.1.3. Quality Required:

This generally affects the manufacturing process and ultimately the material. For example, it would never be desirable to go casting of a less number of components which can be fabricated much more economically by welding or hand forging the steel.

6.1.4. Availability of Material:

Some materials may be scarce or in short supply. it then becomes obligatory for the designer to use some other material which though may not be a perfect substitute for the material designed. The delivery of materials and the delivery date of product should also be kept in mind.

COST ESTIMATION

Table 7.1 Cost estimation

S.NO	COMPONENTS	AMOUNT
1.	MATERIAL COST	3700
2.	MANUFACTURING COST	2000
3.	LABOUR COST	1000
4.	COST FOR WASTAGE	400
5.	COST FOR DESIGN	900
6.	OTHER COST	500
7.	TOTAL	8500

CONCLUSION

Thus by using battery recharging using shock absorber 6 voltage of current is generated and it is stored via battery. This activity goes on while driving the vehicle where unevenness is found on the road. This project will be very efficient in Indian roads. This project is made with pre planning, that it provides flexibility in operation as well as Smoother and noiseless operation. This innovation has made the more desirable. This project is designed with the hope that it is very much economical and helpful to many industries and workshops. This project has also reduced the cost involved in the concern. Project has been designed to perform the entire requirement task which has also been provided. Thus we have completed the project successfully.

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