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A PATH FOR HORIZING YOUR INNOVATIVE WORK

DEVELOPMENT OF MECHANISM FOR RECOVERY OF ENERGY OF SUSPENSION SYSTEM.

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Abstract: This project is divided in two systems. First is Air-conditioning working and second is Electricity generation. Vehicle air-conditioning can significantly impact fuel economy and tailpipe emissions of conventional and hybrid electric vehicles (HEV) and reduce electric vehicle (EV) range. There is lot of fuel burn only for working of A.C. while driving the car. If A.C. will run on other system rather than fuel then there will lot of fuel save in car. Efficiency of car will also increase. In industries as well as in our economic life in general significance of compressor shows a steadily increase productivity in most important industrial fields such as mining, metallurgical, civil engineering, architecture and in all types of machine construction etc. This is specially planned to design and fabricate the conversion unit for utilizing the available unconventional energy source. That is available energy in low intensity with ample quantity can be utilized. This machine converts linear motion in to rotary motion. The rotational power generates electricity.

Keywords: Electricity Generation, Energy, Suspension, Shock Absorbers

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INTRODUCTION

Energy is necessary for daily survival. Future development crucially depends on its long-term availability in increasing quantities from sources that are dependable, safe, and environmentally sound. At present, no single source or mix of sources is at hand to meet this future need. [4]

Concern about a dependable future for energy is only natural since energy provides 'essential services' for human life - heat for warmth, cooking, and manufacturing, or power for transport and mechanical work. At present, the energy to provide these services comes from fuels - oil, gas, coal, nuclear, wood, and other primary sources (solar, wind, or water power) - that are all useless until they are converted into the energy services needed, by machines or other kinds of end-use equipment, such as stoves, turbines, or motors. In many countries worldwide, a lot of primary energy is wasted because of the inefficient design or running of the equipment used to convert it into the services required; though there is an encouraging growth in awareness of energy conservation and efficiency.

As the world is going fast the gear in the product to more is its sale and the efficient the same is move car it be marketed and have the problem statement assigned for the project work was to develop an auxiliary electricity generation system for four wheeler.

It was described to develop electricity using the real-time motion of parts in a form of wheeler. After careful analysis of various such parts it was decided to generated electricity using relational motion available in a suspension system of a vehicle. The conventional vehicle suspension dissipates the mechanical vibration energy in the form of heat which waste considerable energy. [5]

In the new age of the electric vehicle, everything has to be rethought. After one hundred years, people will laugh at today's hybrid and pure electric vehicles rather in the way we laugh at motor vehicles from 1880 that looked like something dragged along by a horse because that was the starting point. Inside and out, today's electric vehicles look almost the same as what went before.

However, until we figure out how to make elasticized vehicle bodies we shall need shock absorbers, so they might as well generate electricity. Only 10-16% of fuel energy is used to drive a car. Hybrid vehicles recapture some of the energy usually lost in braking but the dissipation of vibration energy by shock absorbers in the vehicle suspension remains untapped.

In the past, we pay little attention to energy loss of vehicle

suspension. However, how much energy is dissipated by the shock absorbers of vehicle suspension? According to reference [6], only 10-20% the fuel energy is used for vehicle mobility.

This is realized by in-vehicle energy recovery from conversion into electricity of the kinetic energy present during driving resulting from the movements of the suspension of the vehicle wheels. The amount of the energy produced automatically by the vehicle with the methods of this invention is fully sufficient for the energy consumption of the vehicle, so that car battery of relatively modest capacity will recharge. The electric car thus has unlimited range and no operating costs, which is a sensational innovation and an ideal selling point.

Linear motion of suspension system is also use for compress the air by using piston-cylinder arrangement. By using this compress air we can run A.C. system in the car and save fuel.

“Energy in motion when it is suddenly applied with a sort of obstacle means according to Newton’s law for every action there is an equal and opposite reaction. Utilization of this reaction is the basic reason behind the selection of this project work.”

Objective of paper

a. Recover waste energy of suspension system.

b. Save fuel which is burn for working of A.C.

c. Run A.C. on waste energy of suspension system.

d. To increase the mileage of vehicle.

e. Use the linear motion of suspension system for electricity generation.

WORKING PRINCIPLE

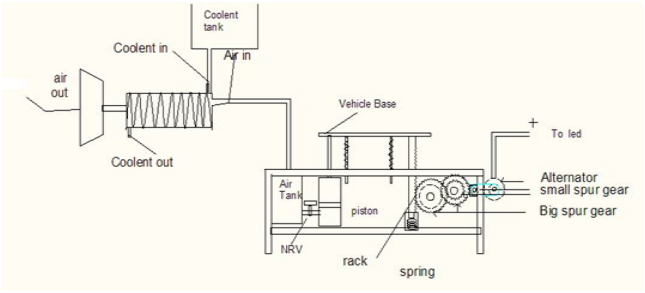

Fig 1. Working diagram of suspension recovery system.

When vehicle is run on bumpy road then suspension spring continuously move up and down. We attach piston to the vehicle frame because of linear motion of piston, high pressure air comes out from cylinder. This high pressure air provide to air tank. In air tank high pressurized air is stored and when we want to turn on A.C. system this high pressurized air send to the heat exchanger by using knob. Low temperature coolant pass through the heat exchanger & also high pressurized air pass through it. Here heat exchange occurs and air temperature becomes 15^0 C to 30^0 C which is further send at the required place which is to be cooled.

Main components and its working

1. Spring: - When vehicle is running on bumpy roads, then shocks and vibrations transmitted to persons, which is very uncomfortable that's why we use shock absorber to absorb shocks and vibrations to become comfort. Shock absorber is nothing but a spring.

2. Rack and pinion: - It is used for converting linear motion into the rotary motion. Rack and pinion used in electricity generation system.

3. Gear trains: - It is used to increase the gear ratio. When suspension spring comes down pinion rotates one revolution but it is not sufficient speed for electricity generation that's why we use gear train for increase the speed or RPM to generate electricity.

4. Alternator: - An alternator is an electromechanical device that converts mechanical energy to electrical energy in the form of alternating current.

5. Piston cylinder arrangement: - It is use for compress the air to generate pressurized air.

6. Air tank: - Air tank is made of Mild steel. A hole is drilled at the upper side & threading is done to keep the pressure gauge and then fix two ends using welding & make an input & output air connection. All pressurize air come in tank from various cylinders through the pipe connection. Use: - To store pressurize compressed air & supply this pressurize air for various use when required.

7. Heat exchanger: - It is used to exchange the heat between two medium in which heat transfer is takes place from high temperature to low level temperature and maintain the temperature at mean temperature.

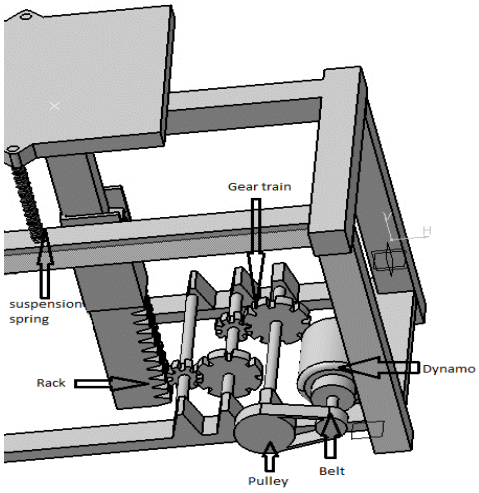

Fig 2 Arrangement of electricity generation System (Catiav5-R20)

When coolant comes out from heat exchanger its temperature is increased by few Celsius, then this coolant is send through radiator and its temperature become low and then it will again send to the heat exchanger. For better performance we can use nitrogen liquid as a coolant. This is all about working of the A.C. system.

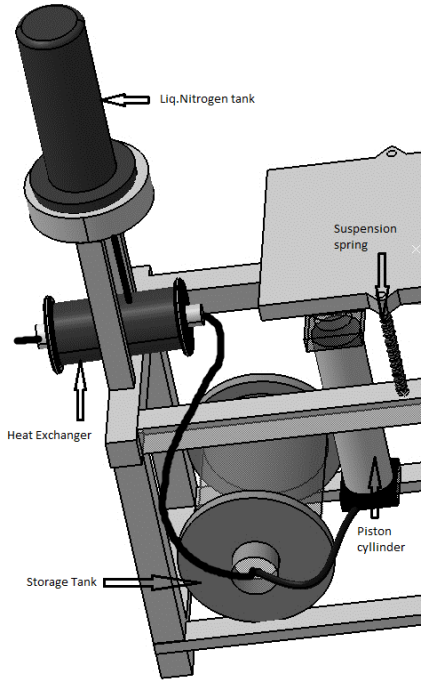

Fig 3Arrangement of Refrigeration System (Catiav5-R20)

When vehicle is run on bumpy road then suspension spring continuously move up and down. Rack is attached to the vehicle frame which is continuously moved up and down. Pinion is mesh with rack. As rack moves up and down pinion rotates clockwise and anticlockwise. Gear train is attached to the pinion which is useful for generating high R.P.M. to generate electricity. Ratchet is used there for one way rotation of gear. D.C. generator is attached to the high speed gear train in which mechanical energy is converted into the electricity which stored in battery and used for glowing lamp.

Design of gear train.

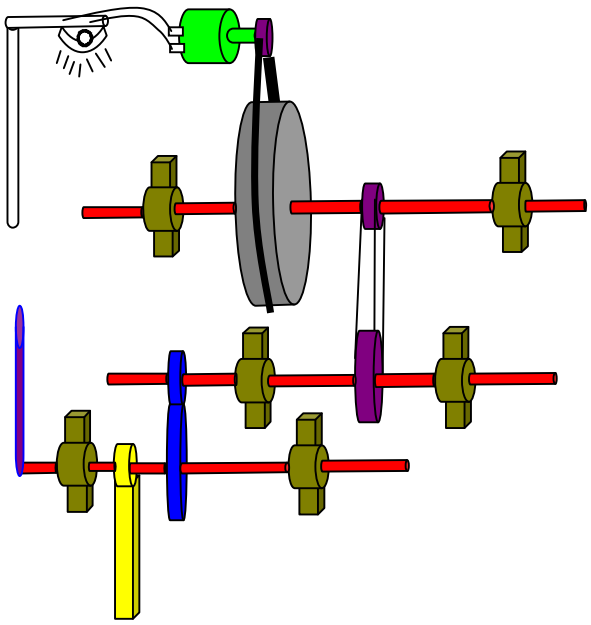

Fig 4 design of gear train

As in our project in suspension of vehicle & input rpm of pinion gear is 20 rpm minimum. This rotation is transmitted to big gear.

We select all gears and rack for obtaining 50 rpm output. Following are the details.

1. Rack length= 300mm.

2. Pitch of the rack= 8mm.

3. No. of teeth on rack =300/8=37.5 38.

4. Dia. of pinion 1= 30mm.

5. Pitch of pinion =8mm.

6. No. of teeth=11.78 12.

7. Dia. of gear 2= 90mm.

8. No. of teeth on gear 2= 56

9. Dia. of gear 3= 40mm.

10. No. of teeth on gear 3= 25

11. Dia. of gear 4= 90mm.

12. No. of teeth on gear 4= 56

13. Dia. of gear 5= 40mm.

14. No. of teeth on gear 5= 25

The big gear2 (Dia. 90 mm) is connected with small gear 3 (Dia. 40 mm). Now we calculate number of rotation of small pinion3

As we know,

$$\frac{\text{Big gear 2 rotation}}{\text{Small gear 3 rotation}} = \frac{\text{Dia. small gear 3}}{\text{Dia. big gear 2}}$$

$$\frac{20}{x} = \frac{40}{90}$$

$$x = \frac{90 \times 20}{40}$$

$$x = 45$$

Small gear3 rotation = 45 rpm.

The same rotation of small gear 3 is transmitted to big gear4 as it is mounted on same shaft.

The rotation of small gear5 on flywheel shaft is calculated as,

$$\frac{\text{Big gear 4 rotation}}{\text{Small gear 5 rotation}} = \frac{\text{Dia. small gear 5}}{\text{Dia. big gear 4}}$$

$$\frac{45}{x} = \frac{40}{90}$$

$$x = \frac{90 \times 45}{40}$$

$$x = 101.25$$

Small gear5 rotation = 101.25 rpm.

The same rotation of small gear5 is transmitted to flywheel as it is mounted on same shaft.

we calculate rpm of dynamo pulley & check whether it is suitable to our system or not.

As we know

$$\frac{N_{flywheel}}{N_{dynamo}} = \frac{D_{dynamo}}{D_{flywheel}}$$

$$\frac{101.25}{x} = \frac{40}{125}$$

$$x = \frac{101.25 \times 125}{40}$$

x = 316.40 rpm

RPM of dynamo = 317rpm

But we required only 50 rpm output for dynamo to generate electricity.

As output rpm of system is sufficient to develop electricity from dynamo so our transmission design is safe & efficient. And any in worst condition (very few bumps on road, min. spring compression) electricity will generate.

CONCLUSIONS

This paper is focused on energy saving mechanisms form suspension system. Analysis for better energy management strategies are carried out via simulation studies by using the simulation tools developed by the Ls-dyna. This project can be very much useful for Indian conditions when we say Indian condition that is not only because of good as well as bad roads available over here but of also the variety of Indian geographical sits when it comes to northern area there are hilly regions when it comes to south it is plane costal area thus the requirement of a versatile vehicle is naturally is demand in Indian context of view.

Taking into consideration other manmade sites like road it is a well known fact that we has one of the best as well as worst road conditions available. So this kind of project is well worthing regarding Indian context of view.

The paper thus worked out displays result as expected.

The project work constructed exhibits the expected results there by making it practically successful project for standalone version model.

After few further modifications suggested in the relevant chapter and after detection of the disadvantages permits this project model seems to have great potential to be implemented across variety of electric motors.

Thus the paper further seems promising. This concept will sure be polite one and can be used everywhere if cost of the device is kept within everybody's reach.

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