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Generation of Compressed Air using Vehicle Suspension System

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Abstract: Pneumatic energy is the readily available and low cost energy. Non-conventional energy system is very essential at this time to our nation. So the pneumatic energy is considered for our project. In this project compressed air can be produced with the help of to and fro motion of suspension. Then this compressed air is stored in air tank and further utilized in other application the vehicle, such as pneumatic jacks, dense air in air conditions and carburetor with the help of battery operated solenoid valve. Compressed air production using vehicle suspension needs no extra fuel input power to generate the compressed air. This air operated four wheeler is the new innovative concept to run vehicle accessories by using the compressed air system within the vehicle itself. Begins with an introduction to pneumatic it's various applications and units and briefly explains a few devices capable of utilizing air effectively and their relative merits, we have taken a solenoid valve for showing the pneumatic jack application in prototype. The pneumatic operated vehicle is very useful for drive the four wheel drives suspension. Air is the working substance of our project. The aim of our project is to gives smooth operation and smooth movement for vehicle's integral part of application. Our project model consists of air tank, suspension, Pneumatic Actuator, solenoid valve and total prototype model.

Keywords: Compressor Air operation, Actuator, Renewable, Solenoid valve.

1. INTRODUCTION

India's road network is gigantic and said to be only after the United States of America. But one of the major facts is the condition of the roads. Since roads indirectly contribute to the economic growth of the country it is extremely essential that the roads are well laid out and strong. India is home to several bad roads be it the metropolitans, the cities or the villages. Bad road conditions are nothing new to India and the problem is being addressed since the last 30 years. If road were perfectly flat, with no irregularities, suspension wouldn't be necessary. But roads are far from flat. Even freshly paved highways have subtle imperfection that can interact with the wheels of car. It's these imperfections that apply forces to wheels. According to Newton's laws of motion, all forces have both magnitude and direction. A bump in the road causes the wheel to move up and down perpendicular to the road surface. The magnitude of course, depends on whether the wheel is striking a giant bump or tiny specks. Either way, the car wheel experiences a vertical acceleration as it passes over an imperfection. The study of the forces at work on moving car is called vehicle dynamics, and you need to understand some of these concept in order to appreciate why a suspension is necessary in the first place.

The general road system in India is such a way that any vehicle suffers from a lot of jerks and shocks. The impact of these jerks and shocks firstly affect on wheel and chaises. The stress contact motion between the wheel tire and road is concentrated on the suspension. The main function of the suspension is to reduce the jerk and shocks vibration and to keep the vehicle at less vibration. This vibration motion concentrated on the suspension tend to compress the spring of the suspension and reciprocating motion in damper. More the shocks absorb by the suspension more is the processes of compression of spring and reciprocating action of damper generated .The passengers experiences the shocks by the forward moment of the vehicle and jerks due to uneven road conditions. Even under good road condition the passenger are also subjected to bounce and roll when cornering and pitch

2. PROBLEM STATEMENT

When the suspension system of a vehicle comes into work some kinetic energy is generated. This kinetic energy is normally wasted as there is no system which can make use of this energy. In this project we try to convert this kinetic energy into compressed air and further try to work in various application of car on this air. Energy generated by shocks and vibration in the vehicle due to rough roads conditions is considered as a waste energy source. Our project is based on the suspension throwback energy that is compressed air to be kept in the consideration of valuable energy source in the vehicle for multiple applications in the vehicle itself.

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3. OBJECTIVE

i) To recover the waste energy of suspension system.
ii) To save fuel which is, burnt for working of A.C.
iii) To run A.C. on waste energy of suspension system.
iv) To increase the mileage of vehicle.
v) To use the linear motion of suspension system for electricity generation.
vi) To study and analysis of different types of shock absorbers in cars.
vii) Literature review on converting shock absorber energy into compressed air.
viii) Developing a prototype.
ix) Experimental analysis of the designed set up.

4. WORKING PRINCIPLE

The working of this project is very simple and also it is compact. This working model is a made of air cylinder, storage tank, non-return valve and frame. In our project suspension Springs are used to store mechanical energy. Below the springs there is a pneumatic single acting cylinder which is produced due to pushing of springs. This pushing power is supplied to the pneumatic piston-cylinder, working medium adopted is compressed air. The compressed air is transmitted through tubes to pneumatic cylinder where power is converted into reciprocating motion. The reciprocating motion is obtained by using an electrically controlled solenoid valve. The input to the solenoid valve giving through the control unit. The reciprocating motion transmitted through the piston which moves on the cylinder. The jack is mounted on the bottom side of the vehicle chassis. If the vehicle has to be lifted, the solenoid valve will be accurate. The load plate will be moved towards the ground. As piston rod keeps on extending the vehicle will be lifted. Thus using pneumatic jack the vehicle can be lifted with ease in operation.

5. COMPONENTS OF SYSTEM

5.1 Non return valve:

Non return valve (one way)-A non-return valve or one-way valve is a valve that normally allows fluid liquid or gas to flow through it in only one direction

5.2 Compressed air storage:

Compressed air energy storage is a way to store energy generated at one time for use at another time using compressed air.

5.3 Pressure gauge:

Instruments used to measure pressure are called pressure gauges or vacuum gauges

5.4 Control Valve:

The air is controlled by control valve .The control valve consist of regulating knob with adjusting bolt.

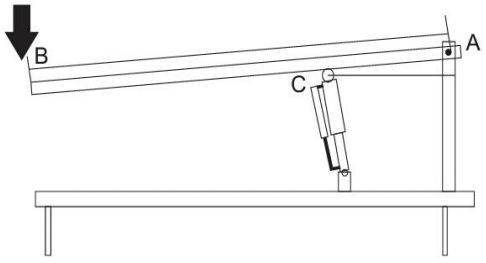
5.5 Pneumatic actuator-:

A pneumatic actuator converts energy typically in the form of compressed air into mechanical motion.

5.6 Single spring and damper suspension:

A shock absorber is a mechanical or hydraulic device designed to absorb and damp shock impulses

6. SCHEMATIC DIAGRAM



Schematic Diagram Of Experimental Set Up

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7. CONCLUSIONS

1) This project has been designed with a vision of saving energy to its maximum level and develops an economical and helpful system. Problem statement depicts that various applications can be run on kinetic energy generated by suspension system.

2) System uses the linear motion of suspension system for compressed air generation. We can recover the waste energy of suspension system by using pneumatic cylinders and display it using pressure gauge.

3) This paper also presented the design and development of prototype for generation of compressed air using vehicle suspension. Previously the vehicle escapes out this compressed air but our assembly helps to utilize in various applications within the vehicle.

4) This whole assembly is easy to mount on any vehicle. Considering different types of road conditions , it is able to bear different fluctuating loads.

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