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Compressed air production with bumper and power generation using vehicle suspension

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ABSTRACT

As for as Indian road transports scenario is concerned, accidents are the major problem. An attempt has been made in this project to reduce such mishaps. In our project a high speed indication is given and automatic bumper is moved front of the vehicle setup with help of pneumatic system when the setup speed is exceeded. In our project, we have used solenoid valve and a control circuit. This project is necessary to be attached to every vehicle. Mainly it is used for night drive. Pneumatic energy is the readily available and low cost energy. Non-conventional energy system is very essential at this time to our nation. So that the pneumatic type of energy is considered for our project. In this project compressed air can be produced with the help of motion of wheel. Then this compressed air can be used for further applications. Compressed air production using vehicle wheel needs no fuel input power to produce the output of the air. And then waste air produced in power generation.

INTRODUCTION

Man has needed and used energy at an increasing rate for his sustenance and wellbeing ever since he came on the earth a few million years ago. Primitive man required energy primarily in the form of food. He derived this by eating plants or animals, which he hunted. Subsequently he discovered fire and his energy needs increased as he started. To make use of wood and other bio mass to supply the energy needs for cooking as well as for keeping himself warm. With the passage of time, man started to cultivate land for agriculture. With further demand for energy, man began to use the wind for sailing ships and for driving windmills, and the force of falling water to turn water wheels.

The suspension systems are used in vehicle to support weight of vehicle body and to isolate the Vehicle chassis from load disturbance. The dampers are designed to dissipate vibrations energy into heat so as to reduce the vibration transmitted from road excitation it is feasible to harvest this vibration energy from the vehicle suspension system to improve the efficiency of the vehicle. The suspension used for the regeneration of vibration energy is called regenerative suspension system. One of the important loses is the energy dissipation from the vibration suspension system.

Till this time, it would not be wrong to say that the sun was supplying all the energy needs of man either directly or indirectly and that man was using only renewable sources of energy .An automobile's bumper is the front-most or rear-most part, ostensibly designed to allow the car to sustain an impact without damage to the vehicle's safety

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systems. They are not capable of reducing injury to vehicle occupants in high-speed impacts, but are increasingly being designed to mitigate injury to pedestrians struck by cars.

PROBLEM IDENTIFICATION

In India most of the accident happens due to high speed crashes. But there is a fire wall in cars which prevent the driver and passenger from life danger. But this works on a certain speed so when exceeding it becomes use less and put life in danger. As for as Indian transport scenario is concerned, accidents are the major problem. An attempt has been made in this project to reduce such mishaps. Now-a-days someone is following the rules so to protect the peoples and who has been affected by those peoples

LITERATURE SURVEY

This paper deals with the pneumatic system are "Fluid Power Control' it which transmit power through pressized in liquid or gas. This are the main target to there, project to achieve their goal. We go through that gas is compressed above atmospheric pressure to impact energy working fluid in air due to its abundance. This design is simple as minimum hardware to use. And it makes suitable applications like" Robotics, Aerospace, NC Machine, Food Products , Bomb and Fabrications Of The Plastics etc., They ready to do that the single acting cylinder connected to suspension system and compressed air stored in storage tank . Then they concentrate on their reaction . The output air from the pneumatic cylinder is collected through temperature sensor and after they concluded successfully in this project . Car is lot of fuel burnt only for A.C .while driving the car. By used this compressed air they run the air conditioning system in car and save the fuel. [1]

This journal paper deals with the project importance in these present days, Power is more important need of human life due to increase the population, convention energy source are decreases. And they take a step in power generation from suspension system using piezoelectric material .so they were in a small part of their research in vehicle suspension system of shock absorber assembly is mount. Which gets expanded, contraction pressure produce? using this they succeeding this project that when we use pressure we can get the electrical power [2]

They are the member to do research for the project in " Mathematical Modeling And Simulation Of Quarter Car Model Of An Active Suspension " It is deals with automobile suspension have the function of improving passengers comfort by isolating vehicle from external disturbance and ability of vehicle by proving adequate suspension deflection. but it is seen that an active control system with mass flow rate of air as function of relative velocity of spring mass to unspring mass has transmissibility less than 1 for low value of damping and gain equal to 1 in system . So therefore they did that this research in the particular project to develop the model and these two strategies are purpose be used in active air suspension systems and at the last some few commercially available vehicle or car fitted with active suspension system. [3]

This paper deals with the converts wasted energy of suspension system into useful energy and they are describing that in these current days the cost of fuel is increasing. The fossil fuels being consumed in very fast rate. So they have reduce the fuel consumption. So that regenerative suspension system is a type of suspension system that converts wasted energy of suspension system into useful energy, such as electric energy. In these projects they used DC generator is converted in rotary motion because pinion is meshed with rack and the gear train consist of two years which are meshed with each other end and transmit rotary motion to DC generator which tents to generates electric energy. This energy of electrical energy to charge battery and this stored battery is used for more vehicles accessories like music system, power window and light etc.., This energy is applicable in most of vehicles. Battery is connected to DC generator; such a battery will be charge due to suspension system. This was the project that they explain briefly and finished successfully. [4]

In this project, journal paper of their area is in the topic about Compressed air production using vehicle suspension and collecting air cylinder to store energy to the compressor tank as non-

conventional method by driving the vehicle. Non conventional energy system is essential time to our Nation. For this project the conversion of the force energy in to air. The control mechanism carries the air cylinder, quick exhaust valve, non-return valve and spring arrange. For this initial cost of this arrangement is high. [5]

Energy generation by suspension system. The regenerative shock absorbers are a type of suspension system that converts parasitic intermittent linear motion and vibration into useful energy. In this project we used shock absorber, rack &pinion arrangement and dynamo. The pinion is mounted on shaft which is connected to shaft of dynamo and this energy is used to battery and stored energy is used to charge battery and stored energy is used for different vehicle accessories like power window, rights and air conditioner. This energy is applicable is mostly of military vehicle, race automobile and maximum suspension is generate of when shock absorbers will be reciprocated. [6]

Power Generation through the rack &pinion in suspension system for an automobile. Before their research the suspension system are used in vehicle to support weight of vehicle body and to isolate the vehicle chassis from road disturbance, so that in their project work attempts have been made to convert dissipate energy into electrical energy. These idea for the project is design of regenerative suspension system is proposed for improving suspension system is proposed for improving the energy harvesting efficiency. Mechanical motion rectifier is convert oscillators vibration into unidirectional rotation of generator. So, that the mechanical rack and pinion system is used to generate power through regenerative shock absorber and in this system can be used effectively in vehicles for power generation and these project was succeeded successfully. [7]

Design and analysis of a shock absorber. In this journal the problem identification is the shock absorber is a mechanical device designed to smooth out and dissipate kinetic energy. The shock absorbs duty is to absorb the main problem in these days. In a vehicle is reduces the effect of travelling over rough ground, travelling on level roads and wheel strikes a bump, the spring is compressed quickly and the compressed spring will attempt to return to its normal loaded length. So, the design of spring in suspension system is very important. In this project a shock absorber is designed and 3d model is created using Pro/Engineer .So because the model is also changed by changing the thickness of spring. The structural analysis and modal analysis are done on weight. [8]

WORKING PRINCIPLE

When the vehicle runs on the irregular roads then the wheel goes to up and down motion. The cylinder arrangement is attached on the wheel axle. This motion is used to suck the air from the atmosphere. Thus the piston inside the cylinder creates the internal pressure which results in storage of air to the tank at certain pressure. This pressurized air is saved inside the tank. The outlet of tank consists of four valves which are used to supply the air to other pneumatic applications. Here the non-return valve is used to avoid the reversing of air flow to the atmosphere. This air used for emergency time vehicle safety for Pneumatic bumper mechanism. And then tank waste air move the emergency valve. That air used Turbine rotated in power generation system.

Diagram & layout

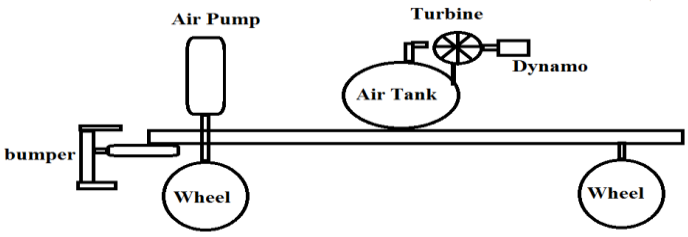


Fig. 1 Layout

Foot pump

A bicycle pump is a type of positive-displacement pump specifically designed for inflating bicycle tires. It has a connection or adapter for use with one or both of the two most common types of valves used on bicycles, Schrader or Presta. A third type of valve called the Woods valve exists, but tubes with these valves can be filled using a Presta pump.

Several basic types are available:

1. Floor models or track pumps
2. Frame mounted
3. Compact or mini
4. Foot operated
5. Double action

In its most basic form, a bicycle pump functions via a hand-operated piston. During the up-stroke, this piston draws air through a one-way valve into the pump from the outside. During the down-stroke, the piston then displaces the air from the pump into the bicycle tire. Most floor pumps, also commonly called track pumps, have a built in pressure gauge to indicate tire pressure.

Caution must be used when using a gas station air pump. Some are designed to cut off before the high pressures used in many bicycle tires are reached. Other operate at such a high pressure that the tire can be burst. There is also a slight difference between the modern standard for Schrader valves on an automobile and that on a bicycle which makes some more recent valves on gas station pumps a poor fit. These pumps are often not specifically designed for bicycle use. They do not generate very high pressures so don't work well for narrow road-bike tires, but are fine for large low-pressure tires as found on mountain bike.

Air tank

A pressure vessel or storage tank is a closed container designed to hold gases or liquids at a pressure different from the ambient pressure. The pressure differential is potentially dangerous and many fatal accidents have occurred in the history of their development and operation. Consequently, their design, manufacture, and operation are regulated by engineering authorities backed up by laws. For these reasons, the definition of a pressure vessel varies from country to country, but involves parameters such as maximum safe operating pressure and temperature.

Zeolites are solid desiccant and that can carry water in crystalline structure. Zeolites have a very high capacity of absorbing moisture more strongly than the silica or clay. Zeolites are most economic desiccants because of its high adsorption capacity at lower relative humidity. It has hygroscopic property that water is absorbed or deabsorbed by the micro capillary until vapor pressure equilibrium is achieved with relative humidity of surrounding air. Channel size of zeolite is 2.5 to 4.3 angstroms in dia. The rotational speed of the rotary desiccant dehumidifier is inversely proportional to sorption time. When the desiccant wheel rotates must faster than the optimum speed, the adsorption and regeneration process will too small which results in poor performance. From the previous study the optimum rotational speed of desiccant wheel is calculated around 25-30 rph. In our project for obtaining this rph a small DC motor of 12v is used and a pulley of dia 3cm is connected to shaft of the motor. The desiccant wheel is of 30cm dia and by using belt drive to drive wheel thereby obtaining necessary speed reduction. Calculation of RPM of desiccant wheel is 5RPM.Thermocouples and subzero is used for measuring the hot and cold temperatures.

Air cylinders

There are only two main kinds of air cylinders: Double acting, and single acting. There are lots of calculations to accurately figure the power of a cylinder, but most haunt pop-up applications can be handled by air cylinders in the range of 3/4" to 1-1/2" bore, and 3" to 8" stroke.

Power measurements primarily take into account the air pressure (the higher the pressure, the more power); and the bore (the larger the bore - the more power). The power ratings are usually only quoted at maximum pressure. So if a cylinder produces180 pounds, it will only deliver that at the maximum pressure (usually 250 psi for commercial cylinders). Haunters should work their props to work and much, much lower pressures. A good goal is not to exceed 60-70psi for working props. Going much higher causes more stress on the prop and all parts in the air system, and make your compressor run more often. Even at lower

pressures, air cylinders can still move very fast and deliver quite a lot push so, always be very careful around pneumatics. Double Acting means the air cylinder rod is 'pushed' out, and 'pushed' in.

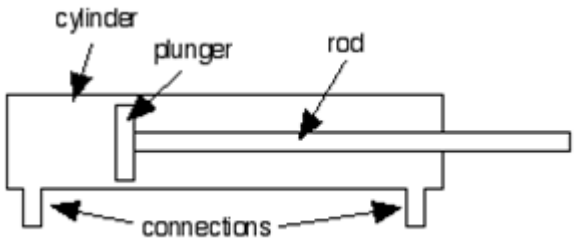
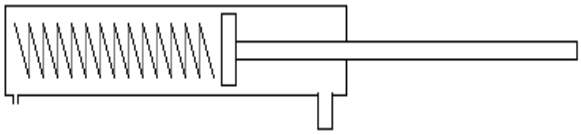


Fig.2 typical double acting air cylinder

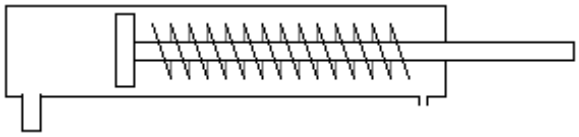
Every double acting air cylinder has these basic parts. A cylinder to hold everything together, a 'plunger' that the air pushes against, two connections to get the air in and out, and a rod that goes in and out. That's it. Here's a simple animation to illustrate the motion.

Single acting cylinder

Single Acting means the air cylinder rod is only pushed in a single direction, either out or in. There is only one connection for air, and a little hole in the other end to let air in and out. A spring is used to push the rod in the opposite direction after air pressure is removed.



Single Acting Air Cylinder, with the rod normally out without pressure



Single Acting Air Cylinder, with the rod normally in without pressure.

Fig. 3 (A) and (B) Single acting cylinder

As air is pushed into the connection, the plunger begins to move and compress the spring. Exhaust air exits out the exhaust hole on the other end. When air is released, it exits out the connection, and air is sucked into the exhaust hole as the spring pushes the plunger back to its resting position. Basically, the spring is 'push' needed to return the plunger and rod back to their starting position.

When selecting a cylinder for an application, remember that a double acting cylinder pushes in both directions, while a single acting cylinder only pushes in one direction.

Dynamo

When a bar magnet is thrust into a coil connected to an electric circuit, a current is caused to flow in the circuit to which the coil is attached. If the magnet is withdrawn, the direction of the current is reversed. Such currents are called induced currents. The size of the current depends on how fast the magnet moves in or out of the coil, and the number of loops in the coil.

The phenomenon of inducing a current by changing the magnetic field in a coil of wire is known as electromagnetic induction. This phenomenon underpins the design of all electric generators.

CONCLUSION

This project is made with pre planning, that it provides flexibility in operation. This innovation has made the more desirable and economical. This project "compressed air production with bumper and power generation using vehicle suspension" is designed with the hope that it is very much economical and helpful to all vehicles to produce the compressed air. This project helped us to know the periodic steps in completing a project work. Thus we have completed the project successfully.

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