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HILL STATION BREAKING SYSTEM

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ABSTRACT

The aim of the project is to design and construction of a module used for vehicles in the hill stations. Auto breaking system is used when vehicle is moving upward direction. The project was divided into two phases. The First phase is to demonstrate the application of MEMS. The second phase of the project attempts controlling motors. MEMS sensor is interfaced to micro controller using I2c protocol, microcontroller receives the data from the mems sensor and process it according to the data from the sensor appliances are operated. Application are like refrigerators, microwave ovens, Theaters hospitals etc. I2C protocol is used for interfacing MEMS sensors with micro controller, Micro controller main functionality is to receive signals for sensors and process information by taking desired decision. Applications which use this technology are refrigerators, operation theaters and microwaves. MEMS-based sensors are a class of devices that builds very small electrical and mechanical components on a single chip. MEMS-based sensors are a crucial component in automotive electronics, medical equipment, smart portable electronics such as cell phones, PDAs, and hard disk drives, computer peripherals, and wireless devices. These sensors began in the automotive industry especially for crash detection in airbag systems. Throughout the 1990s to today, the airbag sensor market has proved to be a huge success using MEMS technology. MEMS-based sensors are now becoming pervasive in everything from inkjet cartridges to cell phones. Every major market has now embraced the technology.

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I. INTRODUCTION

In this work the mechanism has been developed to stop the vehicle from rolling backwards when the vehicle is moving in the hill roads. Ratchet and Pawl mechanism has been identified to arrest the motion to the front axle. Anti-Roll Back mechanism has been fabricated and tested on the front axle assembly. The mechanism works well.

Ratchet and pawl mechanism is used in many applications effectively where the one side power transmission is required for example in (i) Giant wheel- It is the large wheel used in the amusement parks to rotate along the horizontal axis to rotate in one direction while carrying the number of passengers. (ii)Clocks- where the hands rotate in clockwise directions only.(iii) Baffle gates- in the entrances of many buildings which rotates about vertical axis in one direction.(iv) Shaping Machines – in the crank and slotted arm. In the hill station, the most common problem to the drivers is to park their cars in the slope and to start up the car. While waiting in the traffic, the cars have to move on step by step very slowly, this situation is a difficult one for the drivers to make their car not to roll back in the slope. So the mechanism has to be developed to stop the vehicle from rolling back and it should not stop the vehicle in accelerating forwards. This function can be achieved by using the ratchet and pawl mechanism. The ratchet and pawl has to be designed and has to be fit in the front drive shaft in case of the front drive vehicles. The Maruti Swift Dzire car is considered and the ratchet and pawl has to be designed for it. In order to design for the worst case the road maximum slope is considered- Zoji pass Road Kashmir which has 21.80 o with gradient 2/5.

- The aim of the project is to design and construction of a module used for vehicles in the hill stations. Auto breaking system is used when vehicle is moving upward direction.
- The project was divided into two phases. The First phase is to demonstrate the application of MEMS. The second phase of the project attempts controlling motors.
- MEMS (micro-electro-mechanical-systems) sensor is interfaced to micro controller using I2c protocol, microcontroller receives the data from the MEMS sensor and process it according to the data from the sensor appliances are operated.

II. PROBLEM STATEMENT

Design and develop a prototype model of showing the concept of automatic hill station braking system which will show the working of application of brakes in emergency conditions while driving on slopes in hill stations road conditions.

Also fabricate the model of the same which will show the working desired by emergency braking on slopes in hill station roads.

A. OBJECTIVES:

1. To Design and develop a prototype model of showing the concept of automatic hill station braking system while driving on slopes in hill stations road conditions.
2. To fabricate the model of the same which will show the working desired by emergency braking on slopes in hill station roads.
3. To provide safety options while driving in hill stations.
4. To test the model under different conditions of speed and slopes.
5. To automate the braking system by means of sensors and actuators.

III. WORKING METHODOLOGY

In this work, Ratchet and Pawl mechanism is identified to arrest the backward motion to the car. The ratchet is placed in the front drive shaft and the Pawl is fitted with the frame. When the vehicle is moved in the hill road, the lever has to make the pawl to touch the ratchet. If the vehicle tends to move backward direction, the pawl would stop the ratchet to move Counter Clock-wise direction with respect to front wheel. As the vehicle is in neutral position, the pawl engaged the ratchet and the vehicle did not move in the IR TRANSMITTER circuit is to transmit the Infra-Red rays. If any obstacle is there in a path, the Infra-Red rays reflected. This reflected Infra-Red rays are received by the receiver circuit is called "IR RECEIVER". The IR receiver circuit receives the reflected IR rays and giving the control signal to the control circuit. The control circuit is used to activate the solenoid valve.

IV. CONSTRUCTION

PNEUMATIC CYLINDER

Pneumatic cylinders impart a force by converting the potential energy of compressed gas into kinetic energy. This is achieved by the compressed gas being able to expand, without external energy input, which itself occurs due to the pressure gradient established by the compressed gas being at a greater pressure than the atmospheric pressure. This air expansion forces a piston to move in the desired direction.

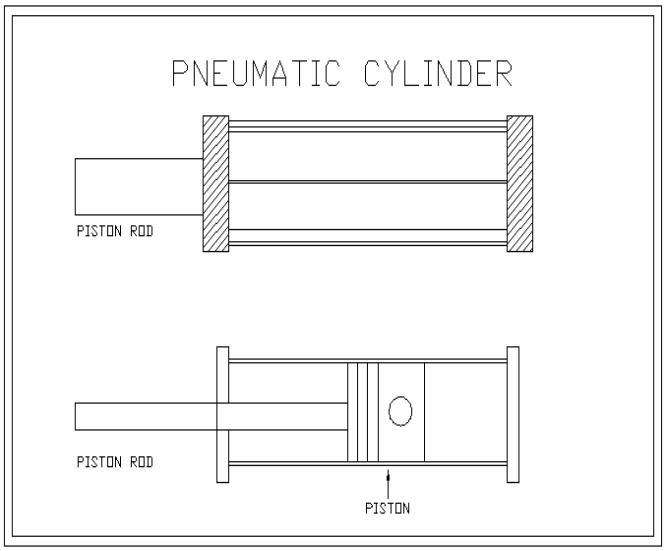


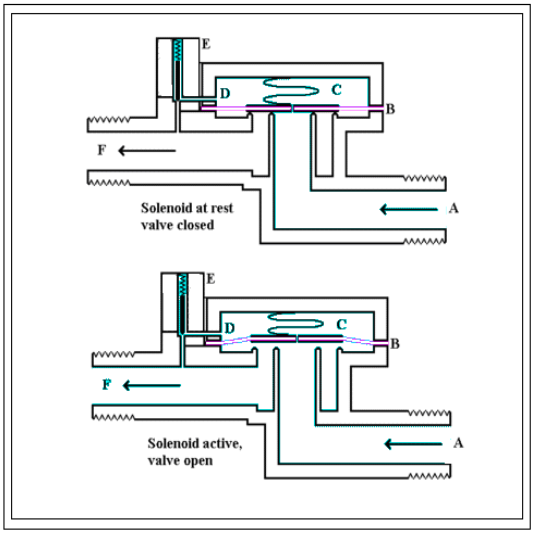
Fig.1 System Architecture

FLOW CONTROL VALVE

A flow control valve regulates the flow or pressure of a fluid. Control valves normally respond to signals generated by independent devices such as flow meters or gauges. Control valves are normally fitted with actuators and petitioners. Pneumatically-actuated globe valves are widely used for control purposes in many industries, Control valves can also work with hydraulic actuators. These types of valves are also known as Automatic Control Valves. The hydraulic actuators will respond to changes of pressure or flow and will open/close the valve.

SOLENOID VALVE

A solenoid valve is an electromechanical valve for use with liquid or gas controlled by running or stopping an electrical current through a solenoid, which is a coil of wire, thus changing the state of the valve. The operation of a solenoid valve is similar to that of a light switch, but typically controls the flow of air or water, whereas a light switch typically controls the flow of electricity. Solenoid valves may have two or more ports: in the case of a two-port valve the flow is switched on or off; in the case of a three-port valve, the outflow is switched between the two outlet ports. Multiple solenoid valves can be placed together on a manifold.



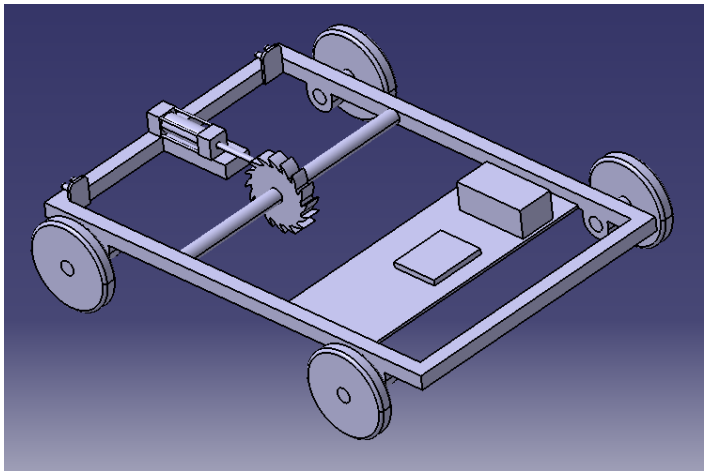
Working of the setup

Air brakes use compressed air to make the brakes work. Air brakes stop large and heavy vehicles. Safely; but the brakes must be maintained and used correctly. Air brakes are three different braking systems: service brake, parking brake and emergency brake systems. The emergency brake system uses parts of the service and parking brake systems to stop the vehicle if the service brake system fails. B. Air brake system parts The air brake system consists of the following parts.

1). Air compressor pumps Air compressor pumps air into the air storage tanks (reservoirs). It is connected to the engine through gears or a vbelt. The compressor may be air cooled or cooled by the engine cooling system. It may have its own oil supply or it may be lubricated by engine oil. If the compressor has its own oil supply, check the oil level during the pre-trip inspection.

2). Air compressor governor Air compressor governor controls when the air compressor pumps air into the air storage tanks. When air tank pressure rises to the cut-out level (around 125 pounds per square inch-psi), the governor stops the compressor from pumping air. When the tank pressure falls to the cut-in pressure (around 100 psi), the governor allows the compressor to start pumping again.

3). Air storage tanks Air storage tanks hold compressed air. The number and size of the tanks vary between vehicles. The tanks will hold enough air to allow the brakes to be used several times even if the compressor stops working. Air tank drains allow you to drain water and compressor oil that may accumulate in the tanks. Water and oil tend to collect in the bottom of the air tank and are bad for the air brake system. The tank must be drained completely to remove all moisture. Otherwise, water can freeze in cold weather and cause brake failure. Each air tank is equipped with a drain valve in the bottom. Fig shows the air storage tank arrested. The same can be achieved if this model is fitted in the car. This will be the case while fitting this mechanism in the drive shaft of the car. When it has been done the car cannot move in reverse direction in the slope as the pawl locks the ratchet.



V. CONCLUSION

Thus the mechanism can stop the vehicle from rolling back in hill roads. This would be more helpful for the drivers to drive their cars comfortably in hilly roads and he can take off the car in the uphill without rolling back the car.

The project SAFETY AUTO BRAKE SYSTEM FOR HILL STATION VEHICLE USING MEMS SENSOR has been successfully designed and tested. It has been developed by integrating features of all the hardware components used. Presence of every component has been reasoned out and placed carefully thus contributing to the best working of the unit. Secondly, using highly advanced IC's and with the help of growing technology the project has been successfully implemented.

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