

Study on Automatic Pneumatic Braking System

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Abstract- Vehicle accidents are ubiquitous in recent years. This is because of heavy increase in population of vehicles, due to its high demand. They pose a serious threat to life and property. A system must be designed to minimize the effects of these accidents. The aim of the present study is to design a device which can successfully scan the surroundings during driving and apply brake to avoid front end collision of the vehicle, along with extension of bumper. The technology of pneumatics plays a major role in the field of automation and modern machine shops and space robots. The aim is to design and develop a control system based intelligent electronically controlled automotive bumper activation and automatic braking system is called automatic bumper system. IR sensor provided on the front end of the vehicle detects the presence of the obstacle. The use of pneumatic system can prove to be useful in automation due to its simplicity and ease of operation. So, the aim is to design and develop a system based on automatic control of vehicle. So, we aim to design "Automatic Pneumatic Braking System".

Keyword — IR transmitter, IR sensor, bumper, and proximity sensor, braking

1. INTRODUCTION

In this fast moving world accidents are becoming proportional to high speed. In this project we are dealing with the speed limit taking into consideration, the wheel speed. A speed limit, the electronic gets closed. This makes the solenoid valve to close, which is placed before the carburetor. The fuel supply is cut off due to the action of a solenoid valve that in turn decreases the speed. As soon as speed decreases the op-amp circuit disables the supply to the solenoid valve, which makes it to open and allows the fuel flow in a regular manner to the engine. The rider while in action may drive in different speeds depending on his needs and his substance of mind. This may lead to negligence of visual indication of the speed that he is driving which in many incidents have proven to be a disaster. In our Automatic braking system the audible alarm is given to the rider against the high speed stop that he is brought to his senses from the deviation, the Automatic braking system enables the control limit and brings the vehicle to the safety limit. Automatic braking is a technology for automobiles to sense an imminent collision with another vehicle, person or obstacle; or a danger such as a high speed approach to a stop sign and to respond with the braking system by either recharging the brakes or by applying the brakes to slow the vehicle without any driver input. Sensors to detect other vehicles or obstacles can include radar, video, infrared, ultrasonic or other technologies. GPS sensors

can detect fixed dangers such as approaching stop signs through a location database. Using such systems to prevent crashes is problematic, so practical systems more often seek only to reduce crash speed in some situations. Every year, we find more and more road accidents due to increased traffic on the roads, and if you see the statistics, you will find that the casualties are more every year than that of 1970 Indo –Pak war. Experts say,

increased motorist population, long working hours, stressful life, are the major cause. The factors are beyond one's control, but if we could alert the driver on the highway, could save the many prestigious lives.

2. LITERATURE REVIEW

The existing approaches in preventing accidents are: Honda's idea of ABS (Anti-lock Braking System) which helps the rider get a hassle free braking experience in muddy and watery surfaces by applying a distributed braking and prevents skidding and wheel locking. Volvo is all set to launch its new XC60 SUV which will sport laser assisted braking which will be capable to sense a collision up to 50 mph and apply brakes automatically.

3. COMPONENTS AND DESCRIPTION

The following are the parts required for the High Speed Indication and Automatic Pneumatic Braking System

- Engine,
- Solenoid valve,
- Speedometer,
- Carburetor,
- OP-AMP IC,
- Indication panel
- Wheel arrangement,
- Power supply

A. Engine Construction

In this project we use spark ignition engine of the type two stroke single cylinder of Cubic capacity 75 cc. The engine has a piston that moves up and down in the cylinder. A cylinder is a long round air pocket somewhat like a tin can with a bottom cut out. Cylinder has a piston which is slightly smaller in size than the cylinder the piston is a metal plug that slides up and down in the cylinder Bore diameter and stroke length of the engine are 50mm and 49mm respectively. Internal combustion engines are those

heat engines that burn their fuel in the engine cylinder. The engine which gives power to propel the automobile vehicle is a petrol burning internal combustion engine. Petrol is a liquid fuel and is called by the name gasoline in America.

B. Solenoid Valve (or) Cut off Valve

Solenoid valves come in a variety of sizes and materials in order to integrate within many fluid management systems. The body of the valve should be made of a material that is compatible with the system media to prevent premature failure of the valve, or contamination of the media. The most important components to consider when selecting a solenoid valve are the seal, coil, and the ports of the valve. The control valve is used to control the flow of fuel to air mixture is called cut off valve or solenoid valve. This solenoid cut off valve is controlled by the electronic control unit which is attached in the control panel itself. Fig.3 show the simple Solenoid valve (cut off valve). Fig 1 Solenoid valve (cut-off valve)

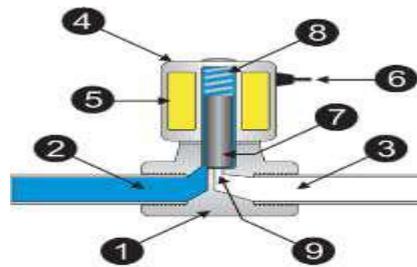


Fig 1. Solenoid valve

- 1. Valve body
 - 2. Inlet port
 - 3. Outlet port
 - 4. Coil/Solenoid
 - 5. Coil windings
 - 6. Lead wires
 - 7. Plunger
 - 8. Spring
 - 9. Orifice
- 1) Types of Solenoid Valve

Solenoid valves generally have two ports: an inlet and an outlet port. There are several types of solenoid valves that include three or more ports.

□□ **Three-way solenoids** are used to operate single-acting actuators, such as diaphragm actuators. They are designed to only send air to one chamber of an actuator. Three way solenoids are used to interrupt or override an instrument signal for double-acting actuators with a pneumatic positioner.

□□ **Four-way solenoids** provide a positive two directional action. They can be used instead of positioners to provide on-off operation of double-acting valves. When the solenoid is de-energized, it sends the full air supply to one side of the actuator and exhausts the other side to the atmosphere.

2) PNEUMATIC SINGLE ACTING CYLINDER:

Pneumatic cylinder consist of A) PISTON B) CYLINDER
The cylinder is a Single acting cylinder one, which means that the air pressure operates forward and spring returns backward. The air from the compressor is passed through the regulator which controls the pressure to required amount by adjusting its knob. A pressure gauge is attached to the regulator for showing the line pressure. Then the compressed air is passed through the single acting 3/2 solenoid valve for supplying the air to one side of the cylinder.



Fig .2 Single Acting Cylinder

3) BRAKES:

Brake is a mechanical device which inhibits motion, slowing or stopping a motion object or preventing its motion. Brake is generally applied to rotating axles or wheels, but may also take other form such as the surface of a moving fluid.

4) IR SENSOR UNIT:

The IR transmitter and IR receiver circuit is used to sense the obstacle.

A) NORMAL CONDITION: The IR transmitter sensor is transmitting the infrared rays with the help of 555 IC timer circuit.

B) OBSTACLE CONDITION: At Obstacle conditions the IR transmitter and IR receiver, the resistance across the Transmitter and receiver is high due to the non-conductivity of the IR waves.

5) WHEEL AND BRAKING ARRANGEMENT: The simple wheel and braking arrangement is fixed to the frame stand.

6) STAND: This is a supporting frame and made up of mild steel.

7) IC 555 TIMER: The IC SE / NE 555 monolithic circuit is a highly stable controller capable of producing accurate time delays or oscillations. Additional terminals are provided for triggering or resetting if desired. both accurately contributed with the external RC constants.

4. WORKING PRINCIPLE

The compressed air from the compressor at the pressure of 5 to 7bar is passed through a pipe connected to the Solenoid valve with one input. The Solenoid Valve is actuated with Control Timing Unit. The Solenoid valve has two outputs and one input. The air entering into the input goes out through the two outputs when the timing control unit is actuated. Due to the high air pressure at the bottom of the piston, the air pressure below the piston is more than the pressure above the piston. So these moves

the piston rod upwards which move up the effort are, which is pivoted by control unit. This force acting is passed on to punch/rivet which also moves downwards. 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.

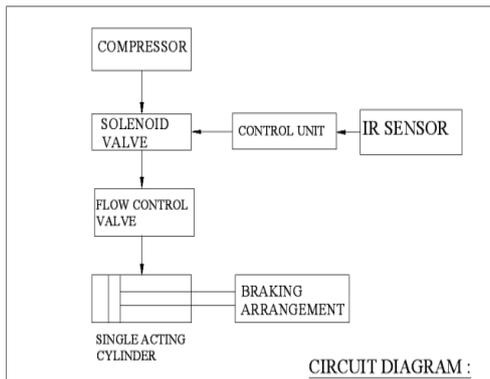


Fig.3 Circuit Diagram

If the solenoid valve is activated, the compressed air passes to the Single Acting Pneumatic Cylinder. The compressed air activates the pneumatic cylinder and moves the piston rod. If the piston moves forward, then the breaking arrangement activated. The breaking arrangement is used to break the wheel gradually or suddenly due to the piston movement. The breaking speed is varied by adjusting the valve is called "Flow Control Valve". In our project, we have to apply this breaking arrangement in one Wheel as a model. The compressed air drawn from the compressor in our project. The compressed air flow through the Polyurethane tube to the flow control valve. The flow control valve is connected to the solenoid valve as mentioned in the circuit diagram.

5. ADVANTAGES AND DISADVANTAGES

Advantages

1. It able to Increase the sureness in braking system.
2. Braking system able to give fast response.
3. System able to increase the pre-crash safety.
4. System able to provide more safety to the passengers.
5. System plays an important role to save human

Disadvantages

Air compressor (bigger load on the engine) bigger possibility to freeze up on you (winter time + humidity), more components involves must/should empty the air reservoir after each day/trip, regular adjustment/lub of the S cam required (do not trust the self-adjustment system if equipped) if ABS, more and touchy, looser feel of the pedal. If you lose the air you are going nowhere, if you have a leak, there is no visible sign only audible

6. APPLICATION

The automatic braking system can be used in both light moving vehicles such as two wheelers as well as in heavy moving vehicles such as buses and trucks etc.

- The automatic braking system is flexible enough to be used in any type of breaking system such as mechanical, hydraulic, vacuum and air brakes.
- The automatic braking system can be implemented in institutional vehicles, taxis, driving school vehicles, etc. Solenoid valves are used in a wide variety of industries. They are used in machinery, devices, and equipment such as refrigerators and automatic faucets

7. CONCLUSION

Automatic brake with pneumatic bumper system is an additional safety to heavy vehicles with passenger car . It is easy to make such a system in heavy air brake vehicles. An emergency switch is provided for emergency uses . This switch avoids the driver to stand from his seat. The system carried out by us made an impressing task in the field of automobile manufacturing industries. It is very useful for the workers work in the lath and small scale industries.

This system will reduce the cost involved in the concern. system can be design to perform the entire requirement task at the shortest time available

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