

Auto Pneumatic Bumper and Braking System to Avoid Accident

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Abstract— In today's world vehicle accident is a major problem. To avoid this we have developed an automatic impact reducing system in our project. The system is based on intelligent electronically control system known as "Automatic pneumatic-bumper system". Automatic pneumatic bumper system uses infrared sensor (IR), which is used to sense the vehicle coming in front of our vehicle which is responsible for an accident. As soon as any object or vehicle is sensed by the sensor the sensor sends feedback signal to engine through the relay control to activate the Solenoid Valve which allows the flow of compressed air to the cylinder. During the working of Automatic Pneumatic Bumper system simultaneously the driver also try to stop the vehicle by applying brake pedal which somewhat slows down the engine. The compressed gas flowing through the solenoid valve will activate the cylinder which in turn activates the Bumper. This system provides pre-crash safety to the vehicle. As well as it improves the response time of vehicle braking to keep safe distance between the vehicles. By using this system we can obtain control over the speed of vehicle in short distance.

Key words: Pneumatic, Bumper, Single Acting Cylinder, Solenoid Valve, IR Sensor

I. INTRODUCTION

It is the project which has been fully equipped and designed for auto vehicles. 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 on intelligent electronically controlled automotive bumper activation system is called "automatic pneumatic bumper and break actuation before collision". The project consists of IR transmitter and Receiver circuit, Control Unit, Pneumatic bumper system. The IR sensor senses the obstacle. There is any obstacle closer to the vehicle (within 1feet), the control signal is given to the bumper and break activation system.

This bumper activation system is activated when the vehicle speed above 40-50 km per hour. The speed is sensed by the proximity sensor and this signal is transfer to the control unit and pneumatic bumper activation system. The word 'pneuma' comes from Greek and means breather wind, for automation. Pneumatic systems operate on a supply of compressed air which must be made available in sufficient quantity and at a pressure to suit the capacity of the system. When the pneumatic system is being adopted for the first time, however it will indeed the necessary to deal with the question of compressed air supply It is the project which has been fully equipped and designed for auto vehicles. 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 on intelligent electronically controlled automotive bumper activation system is called "automatic pneumatic bumper and break actuation before collision". The project consists of IR transmitter and Receiver circuit, Control Unit, Pneumatic

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A. Problem statement

In conventional vehicles there are different mechanism. operated for braking system like hydraulic, pneumatic air, mechanical, etc. But all these braking mechanisms receive the signal or input power directly from the driver.so it totally manual operated. When the driver saw the obstacle or any vehicle in front of his driving vehicle, he was irritated or becomes mazy. Due to this the driver fails to give the proper input to braking system and proper working is not occurs. Also the driver may not able to pay the full attention during night travelling so there are many chances to accidents. After the accident occurs, there is no any provision to minimize the damages of vehicles. In currently used vehicles generally bumpers used are of rigid types. These bumpers have specific capacity and when the range of the accidental force is very high then the bumpers are fails and these force transferred towards the passengers. So this system never reduces the damage of both vehicle and passengers. To overcome these unwanted effects design the Automatic Pneumatic Bumpers is important.

B. Objectives

The objective of this project includes:

- 1) To increase the sureness of braking Application.
- 2) To increase the response time of braking system.
- 3) To improve the pre-crash safety.
- 4) To avoid the percentage of passenger injury by using external vehicle safety.
- 5) To reduce the requirement of internal safety devices like air bags.

II. LITERATURE SURVEY

- 1) The aim is to design and develop a control system based on pneumatic breaking of an intelligent electronically controlled automotive breaking system. Based on this model, control strategies such as and ANTILOCK BRAKING SYSTEM (abs) and improved maneuverability via individual wheel braking are to be developed
- 2) ABS braking systems have been well-known in the automotive industry for many years. At first, they were optional extras for upmarket vehicles, then became

more “democratic” as part of the basic equipment of most vehicles. Several generations of such systems have followed one another and now they are considered perfect by the general public and so need not, or can not, be improved. Yet, a generalized conception (Richalet,1991) or a mechatronics approach (Isermann, 1996), i.e. a reflection on all the principles, components, sensors, actuators, regulation, etc., can lead to important improvements in these fields, as in others. 1.The aim is to design and develop a control system based on pneumatic breaking of an intelligent electronically controlled automotive braking system. Based on this model, control strategies such as an ANTILOCK BRAKING SYSTEM (abs) and improved maneuverability via individual wheel braking are to be developed.

A sensor is a transducer used to make a measurement of a physical variable. Proximity is a sensor which senses the obstacle without any physical contact. Proximity sensor emits an electromagnetic radiation. When the electromagnetic radiation impinge the target The proximity sensor sense that any obstacle comes in the range of vehicle proximity sensor having a very long life because it does not having any physical contact with object therefore there is no chance of damage. Without damage and any physical contact it sense object. Proximity sensor are mostly used in smart phones. The most popular sensor used in remote sensing are the camera, solid state scanner, such as CCD (charged couple vehicle).

III. CONSTRUCTION

A. Pneumatic Double Acting Cylinder Pneumatic Cylinder Consist of

- 1) PISTON
- 2) CYLINDER



Fig. 3.1: Single Acting 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.

One hose take the output of the directional Control (Solenoid) valve and they are attached to one end of the cylinder by means of connectors. One of the outputs from the directional control valve is taken to the flow control valve from taken to the cylinder. The hose is attached to each component of pneumatic system only by connectors.

B. Cylinder Technical Data:

Piston Rod: M.S. hard Chrome plated
Seals: Nitrile (Buna – N) Elastomer
End Covers: Cast iron graded fine grained from 25mm to 300mm
Piston: -Aluminium.
Media:-Air.
Temperature Range:- 0°c to 85°c
Parts of Pneumatic Cylinder

C. Piston:

The piston is a cylindrical member of certain length which reciprocates inside the cylinder. The diameter of the piston is slightly less than that of the cylinder bore diameter and it is fitted to the top of the piston rod. It is one of the important parts which convert the pressure energy into mechanical power.The piston is equipped with a ring suitably proportioned and it is relatively soft rubber which is capable of providing good sealing with low friction at the operating pressure. The purpose of piston is to provide means of conveying the pressure of air inside the cylinder to the piston of the oil cylinder. Generally piston is made up of Aluminum alloy light and medium work. Brass or Bronze or CI heavy duty.

The piston is single acting spring returned type. The piston moves forward when the high-pressure air is turned from the right side of cylinder. The piston moves backward when the solenoid valve is in OFF condition. The piston should be as strong and rigid as possible. The efficiency and economy of the machine primarily depends on the working of the piston. It must operate in the cylinder with a minimum of friction and should be able to withstand the high compressor force developed in the cylinder and also the shock load during operation. The piston should posses the following qualities.

- The movement of the piston not creates much noise.
- It should be frictionless.
- It should withstand high pressure.

D. Piston Rod:

The piston rod is circular in cross section. It connects piston with piston of other cylinder. The piston rod is made of mild steel ground and polished. A high finish is essential on the outer rod surface to minimize wear on the rod seals. The piston rod is connected to the piston by mechanical fastening. The piston and the piston rod can be separated if necessary. One end of the piston rod is connected to the bottom of the piston. The other end of the piston rod is connected to the other piston rod by means of coupling. The piston transmits the working force to the oil cylinder through the piston rod. The piston rod is designed to withstand the high compressive force. It should avoid bending and withstand shock loads caused by the cutting force. The piston moves inside the rod seal fixed in the bottom cover plate of the cylinder. The sealing arrangements prevent the leakage of air from the bottom of the cylinder while the rod reciprocates through it

E. Solenoid Valve with Control Unit:



Fig. 3.2: Solenoid valve

The directional valve is one of the important parts of a pneumatic system. Commonly known as DCV, this valve is used to control the direction of air flow in the pneumatic system. The directional valve does this by changing the position of its internal movable parts.

This valve was selected for speedy operation and to reduce the manual effort and also for the modification of the machine into automatic machine by means of using a solenoid valve. A solenoid is an electrical device that converts electrical energy into straight line motion and force. These are also used to operate a mechanical operation which in turn operates the valve mechanism. Solenoids may be push type or pull type. The push type solenoid is one in which the plunger is pushed when the solenoid is energized electrically. The pull type solenoid is one in which the plunger is pulled when the solenoid is energized.

The name of the parts of the solenoid should be learned so that they can be recognized when called upon to make repairs, to do service work or to install them.

F. Braking System

The foot brake or service brake is always applied by a pedal, while the parking brake is applied by a hand lever. The parking brake is intended chiefly to hold the car in position. The parking brake can be set in the "ON" position by means of a latch while the service brake remains on only as long as the driver presses down on the pedal. The hand brake is normally used only after the driver has stopped the car by using the foot brake. Its other use is as an emergency brake to stop the car if the foot broken system should fail. The hand or parking brakes operates on a PA Ultrasonic of wheels, frequently the rear wheels. When drum type rear brakes are used, the same shoes can be used for both hand and foot control. The drum type of brake may either be a band brake or a shoe brake.

Both band brakes and shoe brakes may be either external or internal. The band brakes generally are external and shoe brakes internal. In drum brakes the drum is attached to the wheel and revolves with it. Friction to slow the drum is applied from inside by the shoes which do not rotate but are mounted on a stationary metal back plate. There are different types of drum brakes such as a two leading shoe arrangement – which gives an augmented response to pedal effort because of its self-applying arrangement. A leading-trailing shoe is a cheaper and better alternative as it is equally effective whether the car is going forward or backwards.

Manufacturers design drum brakes so that rain, snow or ice or grit cannot get inside and decrease braking efficiency for moisture greatly reduces the friction between the linings and the drum. The dissipate quickly the considerable amount of heat generated when braking a fast moving heavy car large brake drums would be required

ultrasonic. Disc brakes do the job more efficiently, for the cooling a ultrasonic can get to the rubbing between each piston and the disc, there is a friction pad held in position by retaining pins, spring plates etc. Passages are drilled in the calliper for the fluid to enter or leave the each housing. These passages are also connected to another one for bleeding. Each cylinder contains a rubber selling ring between the cylinder and the piston. The brakes are applied, hydraulically actuated piston move the friction pads into contact with the disc, applying equal and opposite forces on the later.

On releasing the brakes, the rubber sealing rings act as return springs and retract the pistons and the friction pads away from the disc.

IV. 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. The operating principle of solenoid valve is already.

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.

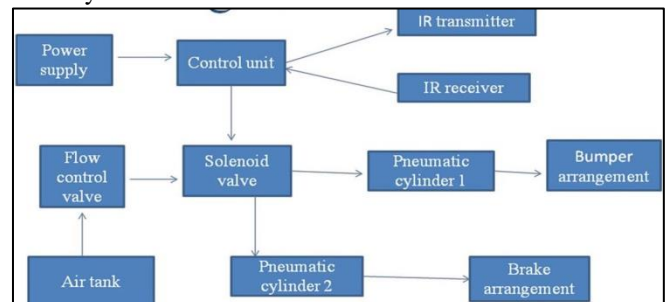


Fig 4.1: Block Diagram Our Project

A. Advantages:

- To Able To Increase The Sureness In Braking System.

- Braking System Able To Give Fast Response.
- System Able To Increase The Pre-Crash Safety.
- System Able To Provide More Safety to the Passengers.
- System Plays An Important Role To Save Human.

B. Disadvantages:

- System has few limitations in densely traffic road.
- System has no provision to prevent and cure the accidents from rear side of vehicle.
- Hard and thick materials cannot be riveted.
- Due to the linkages there will be frictional losses.
- Maintenance will be more due to the number of moving parts.
- Stroke length is fixed.

C. Application:

- 1) This system may be applicable in all types of light vehicles like cars, Rickshaws, Tempos.
- 2) This system also successfully installed in the heavy vehicles like bus, truck etc

V. CONCLUSION

Behind the designing of this system, our main aim is to improve the prevention technique of accidents and also reducing the hazard from accidents like damage of vehicle, injury of humans, etc. We observed that our work is able to achieve all the objectives which are necessary. Initial cost of cars with air bags is always high. Usually air bags are given to high end cars. By implementing this project we can reduce cost of high end cars by giving similar kind of safety. Air bags are helpful to provide internal safety to people sitting in vehicle, whereas in our project we will be giving internal plus external safety to car from damage. Thus we will reduce initial cost of cars and also provide better safety

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