

“Automatic Pneumatic Braking Control System”

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ABSTRACT

The aim is to design and develop a control system based on braking system of an AIR controlled safely automotive wheel braking system. The control valve which directs the air to the double acting cylinder for breaking control. This braking action is implemented In our project, we have to apply this braking system in one wheel as a model. Vehicle accidents are increasing in recent years. This is because of heavy increase in population of vehicles, due to its high demand. 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

Keyword: -IR SENSOR ,Pneumatic braking, Cylinder,accident prevention

1. INTRODUCTION

In the present study a model was designed to automatically forecast upcoming collision and take appropriate action and avoid collision by automatic braking and thus reduce the damage by automatic bumper circuit and to decrease response time by using high frequency waves. A safety system was designed to reduce property damage and passenger injury. All the conventional vehicles are equipped with brakes that are operated manually. The consequence of collision depends on driver's reflex to vary the driving environment. Vehicle accidents might be a consequence of rash driving, driving under influence, fatigue etc. Most of these can be mapped down to a single cause, driver's inability to hit the brakes at right time. If this work is replaced by automatic means, most of the collision can be controlled. Automated collision avoidance system is one among such system to avoid the severity of accidents. It is an electrically controlled pneumatic circuitry, which aims to avoid forward collision of the vehicle and improve crashing safety. This is achieved by means of automatic pneumatic circuits

1.1 Collision mitigation braking systems (CMBS)

Sensors detect a potential collision but take no immediate action to avoid it. Once the sensing system has detected that the collision has become inevitable regardless of braking or steering actions then emergency braking is automatically applied (independent of driver action) to reduce the collision speed, and hence injury severity, of the collision. This type of system has lower potential benefits but is lower risk because it will not take control away from the driver until a point very close to a collision where the sensing system is likely to be more reliable. Such a system may also trigger actions related to secondary safety such as the pre-arming or optimization of restraints.

1.2 PNEUMATICS

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1.3 IR SENSOR

The **HC-SR04 Ultrasonic (US) sensor** is a 4 pin module, whose pin names are Vcc, Trigger, Echo and Ground respectively. This sensor is a very popular sensor used in many applications where measuring distance or sensing objects are required. The module has two eyes like projects in the front which forms the Ultrasonic transmitter and Receiver. The sensor works with the simple high school formula that, $\text{Distance} = \text{Speed} \times \text{Time}$. The Ultrasonic transmitter transmits an ultrasonic wave, this wave travels in air and when it gets objected by any material it gets reflected back toward the sensor this reflected wave is observed by the Ultrasonic receiver module.

HC-SR04 Sensor Features

- Operating voltage: +5V
- Theoretical Measuring Distance: 2cm to 450cm
- Practical Measuring Distance: 2cm to 80cm
- Accuracy: 3mm
- Measuring angle covered: $<15^\circ$
- Operating Current: $<15\text{mA}$
- Operating Frequency: 40Hz



FIGURE 1.1 I R SENSOR (ULTRASONIC)

1.4 SOLENOID VALVE

Solenoid valves are electromechanical devices like relays and contractors. A solenoid valve is used to obtain mechanical movement in machinery by utilizing fluid or air pressure. The fluid or air pressure is applied to the cylinder piston through a valve operated by a cylindrical electrical coil. The electrical coil along with its frame and plunger is known as the solenoid and the assembly of solenoid and mechanical valve is known as solenoid valve Single solenoid spring return operating valve.



FIGURE 1.2 SOLENOID VALVE

2. LITERATURE REVIEW

E. Arun Kumar, Vikas Gautam and Shankar C. Subramanian [1] dealing with the brake system is one of the vital systems in an automobile that ensure its safety on the road. Air brake systems are usually used in commercial vehicle such as buses, trucks and tractor-trailers. The brake system should ideally operate with the least effort from the driver and should stop the vehicle within the shortest possible distance. The brake time lag and the brake response time are two important parameters that play a major role in determining the stopping distance.

2.1 OBJECTIVES

- 1) To increase the safety during pre-crash.
- 2) To increase the crashing distance during accident.
- 3) To decrease the level of passenger injury by use of external vehicle safety device.
- 4) To reduce the requirement of internal safety devices like air bags.
- 5) To increase external safety to vehicle body.

3. 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. 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 oneWheel 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.

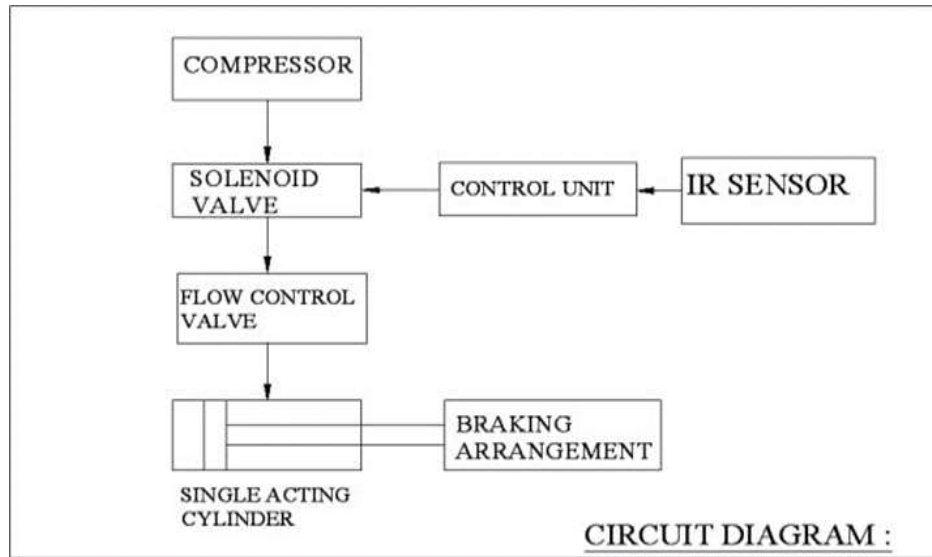


FIGURE 3.1 CIRCUIT DIAGRAM

4. ADVANTAGES

1. Brake cost will be less
2. Free from wear adjustments
3. Less power consumption
4. Less skill technicians is sufficient to operate
5. Installation is simplified very much
6. More room and less weight: fewer components result in savings in terms of space and weight

5. LIMITATIONS

1. Need separate air tank
2. This brake system is costlier one.
3. Addition cost is required to install this system to four wheeler

6. CONCLUSION

1. This project will present the implementation of an automatic pneumatic braking system for forward collision.
2. The speed of vehicle may reduce automatically due to sensing of the obstacles.

7. REFERENCES

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