

Design and Development of Automated Braking System

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Abstract - The technology of pneumatics has gained tremendous importance in the field of workplace rationalization and automation from old-fashioned timber works and coal mines to modern machine shops and space robots. It is therefore important that technicians and engineers should have a good knowledge of pneumatic system, air operated valves and accessories. The aim is to design and develop a control system based on an intelligent electronically controlled automotive bumper activation system is called "AUTOMATIC PNEUMATIC BUMPER". This system consists of IR transmitter and Receiver circuit, Control Unit, Pneumatic bumper system. The IR sensor is used to detect the obstacle. There is any obstacle closer to the vehicle (within 4 feet), the control signal is given to the bumper activation system. This bumper activation system is only activated the vehicle speed above 40-50 km per hour. This vehicle speed is sensed by the proximity sensor and this signal is given to the control unit and pneumatic bumper activation system.

Key Words: IR transmitter, Bumper, Solenoid Valve, Pneumatic Cylinder, Receiver circuit, PVC Pipes.

1. INTRODUCTION:

AUTOMATIC PNEUMATIC BUMPER which is fully equipped by IR sensors circuit and Pneumatic bumper activation circuit. It is a genuine project which is fully equipped and designed for Automobile vehicles. This forms an integral part of best quality. This product underwent strenuous test in our Automobile vehicles and it is good. Today India is the most important under developed country in the world. India is the largest country in the use of various types of vehicles. As the available resources to run these vehicles like quality of roads, and unavailability of new technologies in vehicles are causes for accidents. The number of peoples which are dead during the vehicle accidents is also very large as compared to the other causes of death. Though there are different causes for these accidents but proper technology of braking system and technology to reduce the damage during accident are mainly affects on the accident rates. So today implementation of proper braking system to prevent the accidents and pneumatic bumper system to reduce the damage is must for vehicles. To achieve this system modification goal, design this "Automatic Pneumatic Bumper system. We have pleasure in introducing our new project "Automatic Bumper System for Four Wheelers", which is fully equipped by IR sensors circuit and Pneumatic bumper activation circuit. It is a genuine project which is fully equipped and designed for Automobile vehicles.

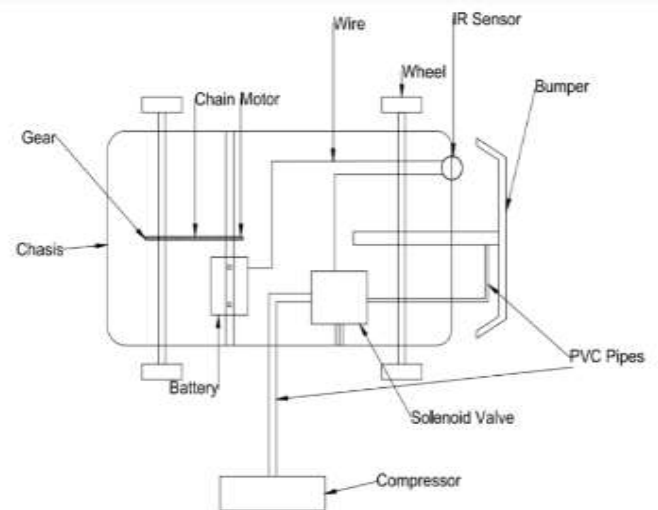


Fig -1: Automated Braking System

2. CONSTRUCTION:

2.1. IR Sensor: A sensor is a transducer used to make a measurement of a physical variable. Any sensor requires calibration in order to be useful as a measuring device. Calibration is the procedure by which the relationship between the measured variable and the converted output signal is established. Care should be taken in the choice of sensory devices for particular tasks. Different sensors can be used in different ways to sense same conditions and the same sensors can be used in different ways to sense different conditions. In our project IR transmitter and IR receiver are used to detect the obstacle. These sensors are fitted at the front side of the vehicle.



Fig -2: IR Sensor

2.2.Solenoid Valve: A solenoid valve is an electro mechanically operated valve. Solenoid valves differ in the characteristics of the electric current they use, the strength of the magnetic field they generate, the mechanism they use to regulate the fluid, and the type and characteristics of fluid they control. The mechanism varies from linear action, plunger-type actuators to pivoted-armature actuators and

rocker actuators. The valve can use a two-port design to regulate a flow or use a three or more port design to switch flows between ports. Multiple solenoid valves can be placed together on a manifold. Solenoid valves are the most frequently used control elements in fluidics. Their tasks are to shut off, release, dose, distribute or mix fluids. They are found in many application areas. Solenoids offer fast and safe switching, high reliability, long service life, good medium compatibility of the materials used, low control power and compact design. [1]



Fig -3: Solenoid Valve

2.3. PNEUMATIC 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. 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.



Fig -4: Pneumatic Cylinder

2.4. Bumper: A bumper is a structure attached to or integrated with the front and rear ends of a motor vehicle, to absorb impact in a minor collision, ideally minimizing repair costs. Stiff metal bumpers appeared on automobiles as early as 1904 that had a mainly ornamental function. Numerous developments, improvements in materials and technologies, as well as greater focus on functionality for protecting vehicle components and improving safety have changed bumpers over the years. Bumpers ideally minimize height mismatches between vehicles and protect pedestrians from injury. Regulatory measures have been enacted to reduce vehicle repair costs and, more recently, impact on pedestrians. [2]

2.5. Battery: A battery is a device consisting of one or more electrochemical cells with external connections for powering electrical devices such as flashlights, mobile phones, and electric cars. When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode.^[2] The terminal marked negative is the source of electrons that will flow through an external electric circuit to the positive terminal. When a battery is connected to an external electric load, a redox reaction converts high-energy reactants to lower-energy products, and the free-energy difference is delivered to the external circuit as electrical energy. [3]



Fig -5: Battery

2.6. Air Compressor: An air compressor is a device that converts power (using an electric motor, diesel or gasoline engine, etc.) into potential energy stored in pressurized air (i.e., compressed air). By one of several methods, an air compressor forces more and more air into a storage tank, increasing the pressure. When the tank's pressure reaches its engineered upper limit, the air compressor shuts off. The compressed air, then, is held in the tank until called into use. The energy contained in the compressed air can be used for a variety of applications, utilizing the kinetic energy of the air as it is released and the tank depressurizes. When tank pressure reaches its lower limit, the air compressor turns on again and re-pressurizes the tank. An air compressor must be differentiated from a pump because it works for any gas/air, while pumps work on a liquid. [4]

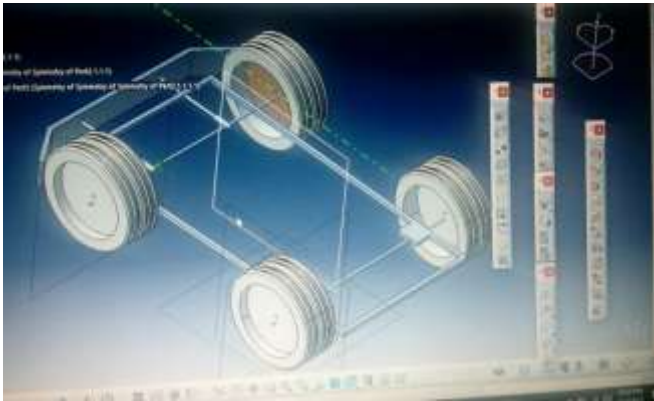


Fig -6: CAD Design of Automated Braking System

3. WORKING PRINCIPLE:

The working of model is much simpler that when driver applies brake more than its maximum braking limit it closes the limit switch contact points and generates output signal then it sends signal to direction control valve and it gets actuated. The solenoid direction control valve is used in this system. When it gets signal and opens the pneumatic valve as a result it pushes the piston forward along with flexible bumper. There by due to compressible properties it absorbs the sudden shocks on vehicle chassis and releases when obstacle rare. The compressed air from the compressor at the pressure of 5 to 7 bar 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.

4. ADVANTAGES:

1. Free from wear adjustment.
2. It gives simplified operation.
3. Installation is simplified very much.
4. This type of mechanism eliminates the accident chances.

5. DISADVANTAGES:

1. This mechanism is not for the rear side.
2. Additional cost is required to install this arrangement in the vehicle.

6. APPLICATIONS:

1. This types of cars may be easily taken through traffic jam.
2. Industrial application.

7. FUTURE SCOPE:

1. This mechanism can be used in Cars, Trucks.
2. This mechanism can be used in Industries.

8. REFERENCES:

1. https://en.wikipedia.org/wiki/Solenoid_valve
2. [https://en.wikipedia.org/wiki/Bumper_\(car\)](https://en.wikipedia.org/wiki/Bumper_(car))
3. https://en.wikipedia.org/wiki/Electric_battery.
4. https://en.wikipedia.org/wiki/Air_compressor