

DESIGN ON AUTOMATIC REVERSE BRAKING SYSTEM

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Abstract

At present scenarios safety is an important feature in the automotive industry. In a automobiles, braking system plays a major role for the driver and passenger safety. In which our project mainly concentrate on the braking system The intelligent braking system is the next step to automation. Presently cars have the alarm system where when the car gets too close to an object an alarm is triggered which warns the driver about an object close. But this feature has produced lot of problems and are prone to human error. We have enhanced the facility by using the same system but we have altered it so that the car brakes automatically when an obstacle is close to our automobile. This project mainly to design and develop a control system based on intelligent electronically controlled automotive braking system is called "AUTOMATIC REVERSE BRAKING SYSTEM". Sensor Operated Pneumatic Brake consists of IR transmitter and Receiver circuit, Control Unit, Pneumatic breaking system. The IR sensor is used to detect the obstacle. There is any obstacle in the path, the IR sensor senses the obstacle and giving the control signal to the breaking system. The pneumatic breaking system is used to brake the system. So basically here the car brakes on its own by determining the distance from the object.

KEYWORDS : Sensor Operated Pneumatic Brake IR sensor transmitter, Receiver circuit, Control Unit, and Pneumatic breaking system.

I. INTRODUCTION

We have pleasure in introducing our new project "AUTOMATIC BRAKING SYSTEM", which is fully equipped by IR sensors circuit and Pneumatic breaking circuit. It is a genuine project which is fully equipped and designed for Automobile vehicles. This forms an integral part of best quality. The "PNEUMATIC BRAKING CIRCUIT" can stop the vehicle within 2 to 3 seconds running at a speed of 50 KM. The intelligent braking system is a fully automated. This is an era of automation where it is broadly defined as replacement of manual effort by mechanical power in all degrees of automation. The operation remains an essential part of the system although with changing demands on physical input as the degree of mechanization is increased. Degrees of

automation are of two types, viz. Full automation. **Semi automation.**

In semi automation a combination of manual effort and mechanical power is required whereas in full automation human participation is very compacts. Automation can be achieved through computers, hydraulics, pneumatics, robotics, etc., of these sources, pneumatics form an attractive medium for low cost automation. The main advantages of all pneumatic systems are economy and simplicity. Automation plays an important role in mass production.

For mass production of the product, the machining operations decide the sequence of machining. The machines designed for producing a particular product are called transfer machines. The components must be moved automatically from the bins to various machines sequentially and the final component can be placed separately for packaging. Materials can also be repeatedly transferred from the moving conveyors to the work place and vice versa. Nowadays almost all the manufacturing process is being atomized in order to deliver the products at a faster rate. The manufacturing operation is being atomized for the following reasons. To achieve mass production to reduce man power to increase the efficiency of the plant to reduce the work load ,to reduce the production cost to reduce the production time to reduce the material handling to reduce the fatigue of workers to achieve good product quality and Less Maintenance

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.

The IR transmitting circuit is used in many projects. The IR transmitter sends 40 kHz (frequency can be adjusted) carrier under 555 timer control. IR carriers at around 40 kHz carrier frequencies are widely used in TV remote controlling and ICs for receiving these signals are quite easily available.

The transmitted signal reflected by the obstacle and the IR receiver circuit receives the signal and giving control signal to the control unit. The control unit activates the pneumatic breaking system, so that break was applied.

II. LITERATURE SURVEY

The word 'pneuma' comes from Greek and means breather wind. the word pneumatics is the study of air movement and its phenomena is derived from the word pneuma. Today pneumatics is mainly understood to means the application of air as a working medium in industry especially the driving and Controlling of machines and equipment.[1] Pneumatics has for some considerable time between used for carrying out the simplest mechanical tasks in more recent times has played a more important role in the development of pneumatic technology for automation[2]. 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.[3] When the pneumatic system is being adopted for the first time, however it will indeed be necessary to deal with the question of compressed air supply. The key part of any facility for supply of compressed air is by means using reciprocating compressor. A compressor is a machine that takes in air, gas at a certain pressure and delivered the air at a high pressure[5]. Compressor capacity is the actual quantity of air compressed and delivered and the volume expressed is that of the air at intake conditions namely at atmosphere pressure and normal ambient temperature. There have been considerable advances braking systems in recent years. designers have proposed several enhancements range radar system[1] was developed for anti applications where automatic braking is applied in response to detection of a collision risk where a very high probability of detection is accompanied by a very low level of false alarms. A brake strategy for an automatic parking system [2] of vehicle has proposed brake controller which work with the automatic parking system and make the process of parking smooth and stable. Autonomous antilock braking system (ABS) system [3] which can take over the traction control of the vehicle is developed for a four wheel vehicle. ABS is a braking system that maintains control over the directional stability of the vehicle during emergency braking or braking on slippery roads by preventing wheel lock-up. The system includes a novel technology to make vehicles safer and more efficient. The system is probably the most reliable means of detecting human beings and objects and, therefore, invaluable in the prevention of injury or fatal accidents. The aim of this paper is to develop an automatic braking system "Automatic Reverse Braking System" when the vehicle detects an obstacle in its reverse path using Field Programmable Gate Array)which can avoid the accident in reversing the heavy loaded vehicles like trucks, consisting of braking system.. If there is object in reverse path, the sensor senses the object and the break is applied automatically. In this, FPGA is used as a control unit to which the devices and sensors are interfaced. memorial vehicles such as car, emergency services vehicles, trucks and buses. Driver moving in reverse direction REVIEW advances in modern vehicle In automation field , enhancements. A precise short range radar system[1] was developed for anti-collision applications where automatic braking is applied in response to detection of a collision risk where a very high probability of accompanied by a very low level of false alarms. A brake strategy for an automatic parking system [2] of vehicle proposed brake controller which work with the automatic parking system and make the process of parking smooth and lock braking system (ABS) system [3] which can take over the traction control of the vehicle is developed ABS is a braking system that maintains control over the directional stability of the vehicle king.

III. SELECTION OF PNEUMATICS:

Mechanization is broadly defined as the replacement of manual effort by mechanical power. Pneumatics is an attractive medium for low cost mechanization particularly for sequential or repetitive operations. Many factories and plants already have a compressed air system, which is capable of providing both the power or energy requirements and the control system (although equally pneumatic control systems may be economic and can be advantageously applied to other forms of power).

The main advantages of an all-pneumatic system are usually economy and simplicity, the latter reducing maintenance to a low level. It can also have outstanding advantages in terms of safety.

PNEUMATIC COMPONENTS AND ITS DESCRIPTION

The pneumatic bearing press consists of the following components to fulfill the requirements of complete operation of the machine.

- i. Pneumatic Single Acting Cylinder
- ii. Solenoid Valve
- iii. Flow Control Valve
- iv. Ir Sensor Unit
- v. Wheel And Brake Arrangement
- vi. Pu Connector, Reducer, Hose Collar
- vii. Stand
- viii. Single Phase Induction Motor

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.

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.

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

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.

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.

Cylinder Cover Plates

The cylinder should be enclosed to get the applied pressure from the compressor and act on the pinion. The cylinder is thus closed by the cover plates on both the ends such that there is no leakage of air. An inlet port is provided on the top cover plate and an outlet ports on the bottom cover plate. There is also a hole drilled for the movement of the piston.

SOLENOID VALVE WITH CONTROL UNIT

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 repair to do service work or to install them.

IR SENSOR UNIT

The IR transmitter and IR receiver circuit is used to sense the obstacle. It is fixed to the back side of the frame stand with a suitable arrangement. The pneumatic cylinder is controlled by the flow control valve, single acting solenoid valve and control unit.

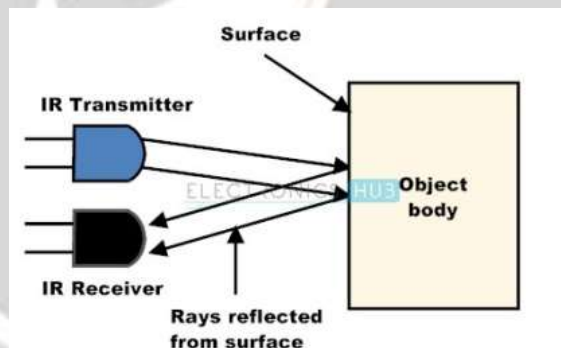


Fig 1. Representation of IR sensor units

AT NORMAL CONDITION

The IR transmitter sensor is transmitting the infrared rays with the help of 555 IC timer circuit. These infrared rays are received by the IR receiver sensor. The Transistor T1, T2 and T3 are used as an amplifier section. At normal condition Transistor T5 is OFF condition. At that time relay is OFF, so that the vehicle running continuously.

AT 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. So the output of transistor T5 goes from OFF condition to ON stage. In that time the relay is ON position. In that time, the solenoid valve is on so that the vehicle stops

WHEEL AND BRAKING ARRANGEMENT

The simple wheel and braking arrangement is fixed to the frame stand. Near the brake drum, the pneumatic cylinder piston is fixed.

CONNECTORS, REDUCER AND HOSECOLLAR

In our pneumatic system there are two types of connectors used; one is the hose connector and the other is the reducer. Hose connectors normally comprise an adapter (connector) hose nipple and cap nut. These types of connectors are made up of brass or Aluminium or hardened steel. Reducers are used to provide inter connection between two pipes or hoses of different sizes. They may be fitted straight, tee, “V” or other configurations. These reducers are made up of gunmetal or other materials like hardened steel etc

SINGLE PHASE INDUCTION MOTOR

It is found to drive the roller shaft which fixed on the end of the frame structure. The free end of the shaft in the motor a large pulley is found around which the belt runs. The other specification about the motor is discussed in design part of the machine.

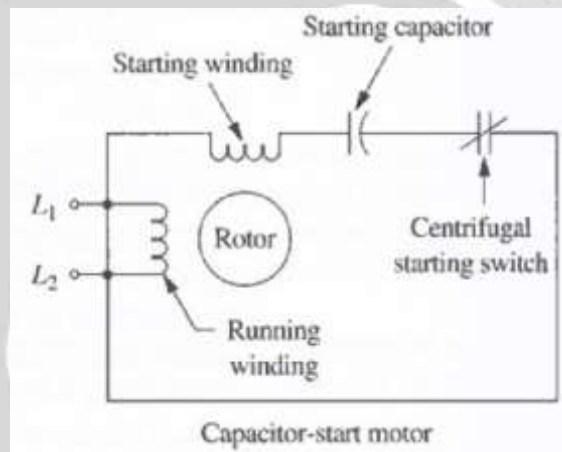


Fig 1.1 Circuit of an capacitor –Start motor

IV. Design and Working Producer

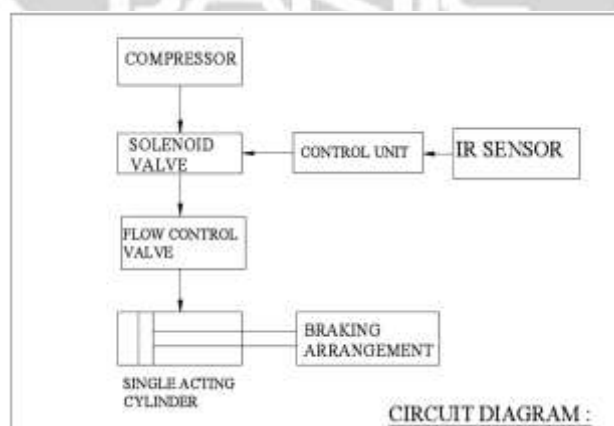


Fig 1.2 Circuit diagram of the system

The important components of our project are,

- IR transmitter
- IR receiver
- Control Unit with Power supply

- Solenoid Valve
- Flow control Valve
- Air Tank (Compressor)

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 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.

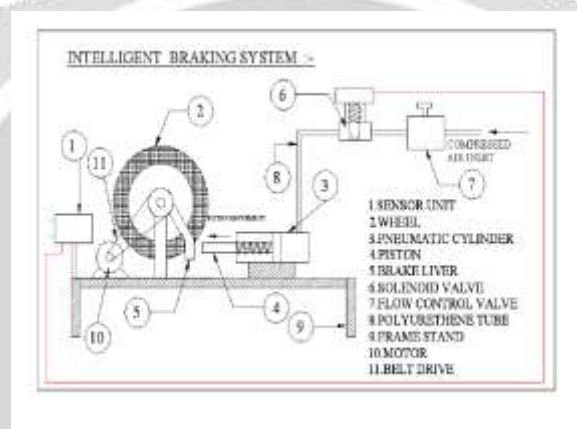


Fig 1.3 Layout of reverse braking system

V.CONCLUSION

This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, purchasing, assembling and machining while doing this project work. We feel that the project work is a good solution to bridge the gap between institution and industries. We are proud that we have completed the work with the limited time successfully. The **INTELLIGENT PNEUMATIC BRAKE** is working with satisfactory conditions. We are able to understand the difficulties in maintaining the tolerances and also quality. We have done to our ability and skill making maximum use of available facilities. In conclusion remarks of our project work, let us add a few more lines about our impression project work. Thus we have developed an “**INTELLIGENT BRAKING SYSTEM**” which helps to know how to achieve low cost automation. The application of pneumatics produces smooth operation. By enhancing this technique, the system can be modified and developed according to the applications.

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