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# Fabrication of Automatic Air Bag Alternative System

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**ABSTRACT**

As for as Indian road transport scenario is concerned, accidents are the major problem. An attempt has been made in this project to reduce such mishaps. In our project a high vibrate indication is given and automatic seat is moved back of the vehicle setup with help of pneumatic system when the setup is exceeded. In our project, we have used solenoid valve and a control circuit. This project is necessary to be attached to every vehicle. Mainly it is used for night drive.

*Keywords— Pneumatic Cylinder, Compressor, Solenoid valve, Vibration sensor*

## 1. Introduction

As for as Indian road transport scenario is concerned, accidents are the major problem. An attempt has been made in this project to reduce such mishaps. In our project a high vibrate indication is given and automatic seat is moved back of the vehicle setup with help of pneumatic system when the setup is exceeded. In our project, we have used solenoid valve and a control circuit. This project is necessary to be attached to every vehicle. Mainly it is used for night drive. A seat moving is a device for slowing or stopping the motion of a machine or vehicle, or alternatively a device to restrain it from starting to move again. The kinetic energy lost by the moving part is usually translated to heat by friction. Alternatively, in regenerative braking, much of the energy is recovered and stored for later use. As the standard of living people increased together with the human population it resulted in a drastic increase in the number of moving vehicles on the road. This means that the probability of the number of accidents also increase which resulted in heightened need of safety systems in automobiles. Keeping this fact in mind we have developed a unique way of preventing accidents, by sensing the vehicle which is moving in front measure the distance between the two and if the distance is close enough for a contact, the sensor will immediately send signal to the ECU which actuates the pneumatic cylinder to apply brakes. Thereby preventing a possible accident

This project involves controlling accident or defecting due to vehicle. Here an vibration sensor is fixed on the vehicle where if anybody gets close contact with the solenoid valve then the relay circuit will trip off the Pneumatic cylinder. Hence accidents can be prevented which is caused due to carelessness.

## 2. Materials

### *2.1 Pneumatics*

The word ‘pneuma’ comes from Greek and means 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. 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. 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 wills indeed the 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. Compressor capacity is the actual quantity of air compressed and delivered and the volume expressed is that of that of the air at intake conditions namely at atmosphere pressure and normal ambient temperature. The compressibility of the air was first investigated by Robot Boyle in 1962 and that found that the product of pressure and volumes of particular quantity of gas.

The usual written as

$PV = C$ (or) $P1V1 = P_2V_2$

In this equation the pressure is the absolute pressured which for free is about 101352.9 pascal and is of courage capable of maintaining a column of mercury, nearly 7465.2 pascal high in an ordinary barometer. Any gas can be used in pneumatic system but air is the mostly used system now a days.

### *2.2 Selection of Pneumatic*

Mechanization is broadly defined as the replacement of manual effort by mechanical power. Pneumatic 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 the power (or) energy requirements and 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 Economic and simplicity the latter reducing maintenance to a low level. It can have out standing advantages in terms of safety.

### *2.3 Pneumatic Power*

Pneumatic systems use pressurized gases to transmit and control power. Pneumatic systems typically use air as the fluid medium because air is safe, low cost and readily available.

### *2.4 Advantages of Pneumatic*

Air used in pneumatic systems can be directly exhausted back In to the surrounding environment and hence the need of special reservoirs and no-leak system designs are eliminated.

1. Pneumatic systems are simple and economical
2. Control of pneumatic systems is easier

### *2.5 Disadvantages of Pneumatic*

1. Pneumatic systems exhibit spongy characteristics due to compressibility of air.
2. Pneumatic pressures are quite low due to compressor design limitations (less that 1.724 * 102).

## 3. Compressor

Compressor is the air producing machine. They collect the airs from the atmosphere are in the running of machine are engine. Air compressors are utilized to raise the pressure of a volume of air. Air compressors are available in many configurations and will operate over a very wide range of flow rates and pressures. Compressed air was expelled by primitive man to give glowing embers sufficient oxygen to allow them to flare up into a fire. During the compression process, the temperature increases as the pressure increases. This is known as polytypic compression. The amount of compression power also increases as the temperature increases. Compressors are staged thereby reducing the temperature rise and improving the compression efficiency. The temperature of the air leaving each stage is cooled prior to entering the next stage. This cooling process is called intercooling. Volumetric efficiency also increases with multi-stage compression since the pressure ratio over the first stage will be decreased. Selection of the air compressor is only the first step in designing an efficient and reliable compressed air system. The air exiting the compressor is saturated with moisture and will have compressor lubricants (lubricated compressors only). Other chemicals that may have been drawn into the compressor intake may also be present. This contamination is harmful to many processes, pneumatic tools, instruments and equipment. Air purification equipment, filters, air dryers, breathing air purifiers, monitoring equipment, used alone or in combination will remove these contaminants. Selection and purchase of the compressor and necessary purification equipment can be easily done on the Compressed air site. Our application engineers are ready to answer all of your questions and to assist you in placing your order. And it work in the process of rotating the fan and the piston movement with the help of current supply.

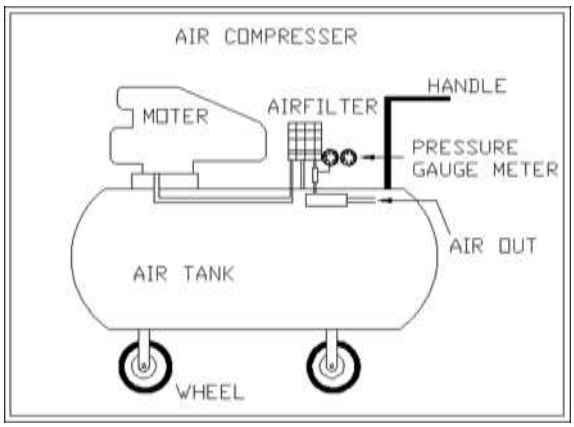


Fig 1. Air Compresser

### *3.1 Pneumatic Cylinder Pneumatic Control Component*

An air cylinder is an operative device in which the state input energy of compressed air i.e. Pneumatic power is converted into mechanical Output power, by reducing the pressure of the air to that of the atmosphere.

#### *a) Single Acting cylinder*

Single acting cylinder is only capable of performing an operating medium in only one direction. Single acting cylinders equipped with one inlet for the operating air pressure, can be production in several fundamentally different designs. Single cylinders Develop power in one direction only. Therefore no heavy control equipment should be attached to them, which requires to be moved on the piston return stroke single action cylinder requires only about half the air volume consumed by a double acting for one operating cycle.

#### *b) Double Acting Cylinder*

A double acting cylinder is employed in control systems with the full pneumatic cushioning and it is essential when the cylinder itself is required to retard heavy messes. This can only be done at the end positions of the piston stroke. In all intermediate position a separate externally mounted cushioning derive most be provided with the damping feature.

The normal escape of air is out off by a cushioning piston before the end of the stroke is required. As a result, the sit in the cushioning chamber is again compressed since it cannot escape but slowly according to the setting made on reverses. The air freely enters the cylinder and the piston strokes in the other direction at full Force and velocity.

## 4. 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. Solenoid is one is 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.

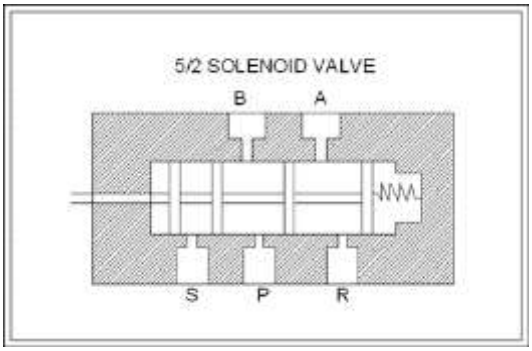


Fig 2. Solenoid Valve

### *4.1 Parts Of Solenoid Valve*

#### *a) Coil*

The solenoid coil is made of copper wire. The layers of wire are separated by insulating layer. The entire solenoid coil is covered with a varnish that is not affected by solvents, moisture, cutting oil or often fluids. Coils are rated in various voltages such as 115 volts AC,230volts AC,460volts Ac,575 Volts AC.6Volts DC,12Volts DC,

24 Volts DC,115 Volts DC &230Volts DC. they are designed for such

Frequencies as 50Hz to 60Hz.

#### *b) Frame*

The solenoid frame serves several purposes. Since it is made of laminated sheets, it is magnetized when the current passes through the coil. The magnetized coils attract the metal plunger to move. The frame has provisions for attaching the mounting. They are usually bolted or welded to the frame. The frame

has provisions for receivers, the plunger. The wear strips are mounted to the solenoid frame, and are made of materials such as metal or impregnated less Fiber cloth.

***c) Solenoid plunger***

The solenoid plunger is the mover mechanism of the solenoid. The plunger is made of steel laminations which are riveted together under high pressure, so that there will be no movement of the lamination with respect to one another. At the top of the plunger a pin hole is placed for making a connection to some device. The solenoid plunger is moved by a magnetic force in one direction and is usually returned by spring action. Solenoid operated valves are usually provided with cover either the solenoid or the entire valve. This protects the solenoid from dirt and other foreign matter, and protects the actuator. In many applications it is necessary to use explosion proof solenoids.

### *4.2 Working Of Solenoid Valve*

The solenoid valve has 5 openings. These ensure easy exhausting of 5/2Valve.the spool of the 5/2 valve slide inside the main bore according to spool position: the ports get connected and disconnected.

The working principle is as follows.

**Position-1**

When the spool is actuated towards outer direction port ‘P’ gets

Connected to ‘B’ and ‘S’ remains closed while ‘A’ gets connected to ‘R’.

**Position-2**

When the spool is pushed in the inner direction port ‘P’ and ‘A’

Gets connected to each other and ‘B’ to ‘S’ while port ‘R’remains closed.

### *4.3 Solenoid Valve (Or) Cut Off Value*

The control valve is used to control the flow direction is called cut off valve or solenoid valve. This solenoid cutoff valve is controlled by the electronic control unit. In our project separate solenoid valve is used for flow direction of vice cylinder. It is used to flow the air from compressor to the single acting cylinder.

### *4.4 Flow Control Valve*

In any fluid power circuit, flow control valve is used to control the speed of actuator. The flow control can be achieved by varying the area of flow through which the air in passing. When area is increased, more quantity of air will be sent to actuator as a result its speed will increase. If the quantity of air entering into the actuator is reduced, the speed of the actuator is reduced.

### *4.5 Pressure Control Valve*

The main function of the pressure control valve is to limit (or)

Control the pressure required in a pneumatic circuit.

Depending upon the method of controlling they are classified as

1. Pressure relief valve
2. Pressure reducing valve

### *4.6 Hoses*

Hoses used in this pneumatic system are made up of polyurethane. These hose can with stand at a maximum pressure level of 10 $x10^5 N/m^2$.

### *4.7 Connectors*

In our system there are two type of connectors used. One is the Hose connector and the other is the reducer. Hose connectors normally comprise an adopt h5ose nipple and cap nut. These types of connectors are made up of brass (or) aluminum (or) hardened pneumatic steel

### *4.8 Vibration Circuit*

Vibration circuit is used to sense the mechanical vibration. This circuit is constructed with

1. Piezo electric plate.
2. Operational amplifier
3. 555 IC timer

Piezo electric plate is the special type of sensor which is used to sense the mechanical vibration. Piezo electric plate converts the mechanical vibration to electrical signal. The converted electrical signal is in the range of small milli voltage signal. Then the electrical signal voltage is given to amplifier unit through 0.1uf capacitor in order to filter the noise signal. The amplifier circuit is constructed with operational amplifier LM 741. The amplified output is in the form of AC signal the diode is used to rectify the negative signal. The rectified signal is given to comparator. The comparator circuit is constructed with LM 741 operational amplifier in which the signal is given to inverting input terminal. The reference voltage is given to non inverting input terminal. It converts the input signal to +12V to -12V square pulse. The square pulse is given to base of BC 547 transistor whenever the positive side of square pulse is come the transistor conducts emitter and collector side is short circuited because the transistor is act as switch. The collector side is connected to trigger terminal of the 555 IC. When the transistor is conducted negative signal is given to trigger terminal because the emitter is connected to ground side. Now the 555 IC conducts and generates the square pulse. The frequency of the square pulse is depends upon the resistor and capacitor connected in between 7$^{th}$ (discharge) and 6th (threshold) terminal. The square pulse is given to base of the Q2 transistor.

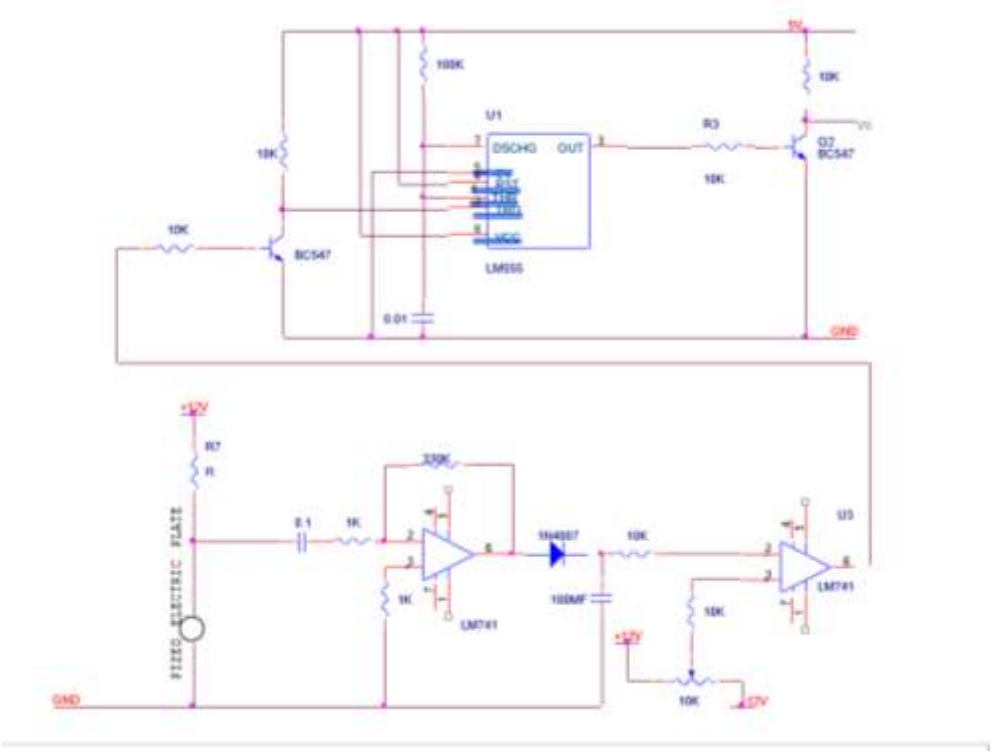


Fig 3. Vibration Circuit

The transistor is turn ON and turn OFF depends upon the square pulse. The Q2 transistor output is 0 to 5V pulse. Whenever the Piezo electric plate sense the vibration the Q2 transistor outputs the 0 to 5V pulse. This pulse is given to microcontroller or other related circuit to inform that vibration has been cocurated.

### *4.9 Relay Control*

By using a level sensor we will get the level of feed water. This signal controls the feed water valve for maintaining a constant level. In our project we are using an ON-OFF control valve i.e. solenoid valve. The advantage of using ON-OFF control valve is

1. There is no dead time
2. There is no transfer lag.

### *4.10 Circuit Diagram Description*

In this circuit transistor BC547 is used as a switch. The control signal is given to the base terminal of the transistor. The collector is attached to the relay coil. Relays are electromechanical devices. There are two types of relays.

1.Normally closed 2. Normally opened

We are using normally opened type relay. When the controller output from the PC is high the transistor will be in the ON state, so relay is energized. When the controller output from the PC is low the transistor will be in the OFF state, so relay is de-energized the valve will open. When the relay is de-energized the valve will close. So according to the controller output the valve will open or close and thus level is maintained

## 5. Control Unit

In our project the main device is a controller. It is used to control the whole unit of this project. The controller is connected to the control unit. The control unit is connected with the battery to get the power supply controllers are destined to play an increasingly important role in revolutionizing various industries and influencing our day to day life more strongly than one can imagine. Since its emergence in the early 1980's the controller has been recognized as a general purpose building block for intelligent digital systems. It is finding using diverse area, starting from simple children's toys to highly complex spacecraft. Because of its versatility and many advantages, the application domain has spread in all conceivable directions, making it ubiquitous. As a consequence, it has generate a great deal of interest and enthusiasm among students, teachers and practicing engineers, creating an acute education need for imparting the knowledge of controller based system design and development. It identifies the vital features responsible for their tremendous impact; the acute educational need created by them and provides a glimpse of the major application area.

## 6. Factors Determining The Choice Of Materials

The various factors which determine the choice of material are discussed below.

### *6.1 Properties*

The material selected must posses the necessary properties for the proposed application. The various requirements to be satisfied

Can be weight, surface finish, rigidity, ability to withstand environmental attack from chemicals, service life, reliability etc.

The following four types of principle properties of materials decisively affect their selection

- Physical
- Mechanical
- From manufacturing point of view
- Chemical

The various physical properties concerned are melting point, thermal Conductivity, specific heat, coefficient of thermal expansion, specific gravity, electrical conductivity, magnetic purposes etc. The various Mechanical properties Concerned are strength in tensile,

Compressive shear, bending, torsion and buckling load, fatigue resistance, impact resistance, elastic limit, endurance limit, and modulus of elasticity, hardness, wear resistance and sliding properties. The various properties concerned from the manufacturing point of view are,

- Cast ability
- Weld ability
- Surface properties
- Shrinkage
- Deep drawing etc.

### *6.2 Manufacturing Case*

Sometimes the demand for lowest possible manufacturing cost or surface qualities obtainable by the application of suitable coating substances may demand the use of special materials.

### *6.3 Quality Required*

This generally affects the manufacturing process and ultimately the material. For example, it would never be desirable to go casting of a less number of components which can be fabricated much more economically by welding or hand forging the steel.

### *6.4 Availability Of Material*

Some materials may be scarce or in short supply, it then becomes obligatory for the designer to use some other material which though may not be a perfect substitute for the material designed. The delivery of materials and the delivery date of product should also be kept in mind.

### *6.5 Space Consideration*

Sometimes high strength materials have to be selected because the forces involved are high and space limitations are there.

### *6.6 Cost*

As in any other problem, in selection of material the cost of material plays an important part and should not be ignored. Sometime factors like scrap utilization, appearance, and non-maintenance of the designed part are involved in the selection of proper materials.

Fig 4. Fabrication of Automatic Air Bag Alternative System

## 7. Conclusion

The project successfully This project is made with pre planning, that it provides flexibility in operation. This innovation has made the more desirable and economical. This project "FABRICATION OF PNEUMATIC SEAT

MOVING SYSTEM" is designed with the hope that it is very much economical and help full to hospitals and nursing homes. This project helped us to know the periodic steps in completing a project work. Thus we have completed.

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