

Design and Fabrication of Pneumatic Platform Control

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Abstract - The aim of the project is to design and fabricate a model to fill the clearance gap between the platform and the train car. The project deals with an idea to reduce the accidents that occur usually at stations when the train begins to move or comes to rest. The major components required to design the pneumatic controller are double acting cylinder, 5/2 way lever operated directional control valve, pneumatic tubes and latex rubber. Double acting cylinder works as a pneumatic actuator and has a rod at its end which is fixed to the latex rubber. Latex rubber is preferred because of its properties like low friction and high elastic limit. The elastic nature of the rubber is used to regain its original shape once the stress is removed. The 5/2 way lever operated directional control valve is a switch which causes extension and retraction motion in the cylinder.

1. INTRODUCTION

Many accidents occurs in daily life, this project deals with one of those accidents that occur due to a wider clearance gap between the train and the platform .Detraining, rushing of crowd and carelessness are the major causes for such accidents. Statistics prove that accidents happen when the train is in motion. For every two days five or more accidents are seen to occur in the southern railways. The impact of this type of accidents include human death, loss of organs, fracture etc. Though technology has grown these accidents are still growing at a higher rate. To minimize the accidents we have made a simple pneumatic operation by using a double acting cylinder, the extension and retraction strokes of motion can be produced to reduce the clearance gap. Thereby using pneumatic operation we can reduce and avoid such accidents.

2. CIRCUIT DESIGN

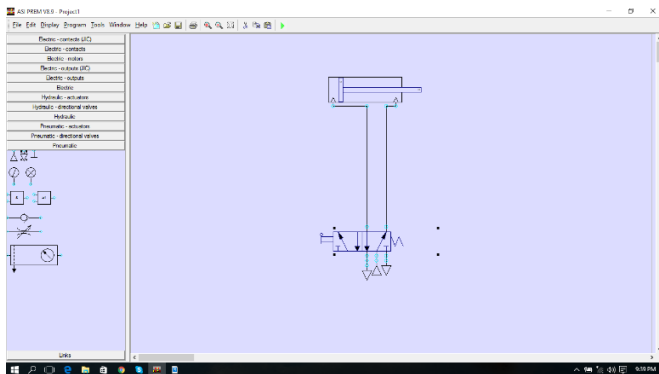


Fig3.1. Circuit Design

The main components used in our project are

1. Double acting cylinder
2. 5/2 way lever operated directional control valve
3. Pneumatics tubes
4. Woods
5. Latex rubber

2.1 Double acting cylinder:



Fig 2.1 Double acting cylinder

A double acting cylinder is a cylinder in which the working fluid acts alternately on both sides of the piston. It has a port at each end, supplied with hydraulic fluid for both the retraction and extension of the piston.

A double-acting cylinder is used where an external force is not available to retract the piston or where high force is required in both directions of travel.

2.2. 5/2 way lever operated directional control valve:



Fig 2.2 5/2 way lever operated directional control valve

It allows the fluid flow into different paths from one or more sources. The usually consist of a spool inside the cylinder which is mechanically or electrically controlled. The movement of spool restricts and permits the flow, thus it control the fluid flow. It has 5 ports and 2 spool. The operation control of directional control is within lever the present in its top. If we move the lever in forward direction, the extension stroke is carried out and when it's pulled backward, the retraction stroke takes place.

2.3. Pneumatic tubes:



Fig 2.3 Pneumatic tubes

Pneumatic tubes are systems that propel cylindrical containers through a network of tubes by compressed air or by partial vacuum .they are used for transporting solid objects, as opposed to conventional pipelines which transport fluids.

2.4. Latex Rubber:

Latex is rubber which is used to reduce the friction and fill the gap. It's found in nature but there are synthetic latexes made by polymerized monomer such as styrene. Latex can be processed into sheet rubber.

General composition of latex:

| | |
|----------|----------|
| Rubber | 30-40% |
| Proteins | 2-2.5% |
| Ash | 0.7-0.9% |
| Resins | 1-2% |
| Sugar | 1-1.5% |
| Water | 55-65% |

2.4.1. Friction:

Friction is a force that is created whenever two surfaces move or try to move across each other. Friction always opposes the motion or attempted motion of one surface across another surface. Friction is dependent on the texture of both surfaces.

Dry friction resists relative lateral motion of two solid surfaces in contact. The two regimes of dry friction are 'static friction' between non-moving surfaces, and kinetic friction (sometimes called sliding friction or dynamic friction) between moving surfaces.

Static friction is friction between two or more solid objects that are not moving relative to each other. For example, static friction can prevent an object from sliding down a sloped

surface. The coefficient of static friction, typically denoted as μ , is usually higher than the coefficient of kinetic friction. Coefficient of friction is one for rubber.

3. PNEUMATIC PLATFORM CONTROL

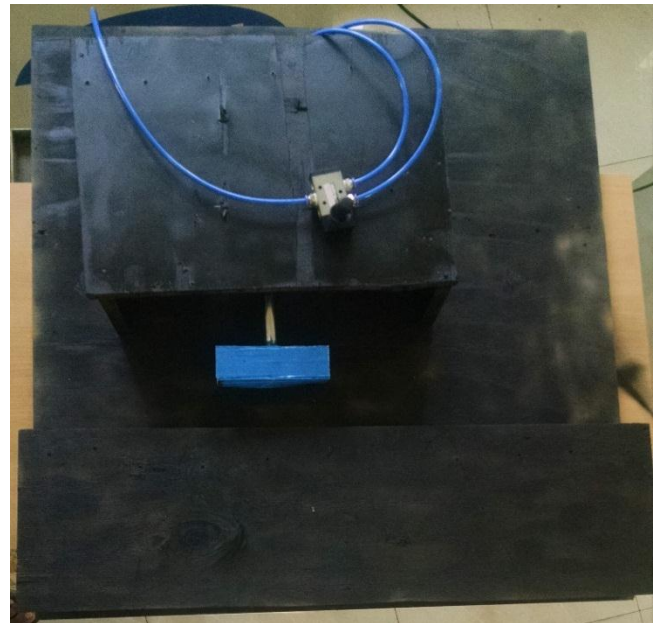


Fig 3.1 Pneumatic platform control

The double acting cylinder is most commonly used pneumatic actuator. At first the connections are done and adjust the pressure to 3kg/cm², then the pressure from the compressor is allowed to flow through the FRL unit, where it is filtered, regulated, lubricated and it is allowed to pass through the 5/2 way lever operated Directional Control Valve with the use of pneumatic tubes which propels the pressure .

When the air flow through the 5/2 way lever operated directional control valve, the direction movement of piston is controlled. There are two motion which occurs in double acting cylinder is, i) Extension
 ii) Retraction

Extension: A part that is added to something to enlarge or prolong it, a continuation.

Retraction: A part which extends that is to be return back to its normal position.

During the extension of stroke the piston moves outward, where at the end of piston is attached with the Latex rubber. Both the piston and the rubber is connected by the chemical composition.

Now, when a piston moves outward it terminates the platform gap reasonably, where the distance between the platform and train car is reduced.

During retraction stroke the piston moves to its origin position so that the rubber which is attached with the piston is also return inwards along with it.

This both strokes are mainly used to reduce the platform gap which is normally 460mm to 510mm(18 inches to 20 inches).This is carried out only on sub running track ,where the train enter the station into which it has to stop. This operation

will be in process until the whole train reaches the main running track.

After the retraction stroke is carried out, both retraction and extension is fully controlled by an engine driver with the help of lever operated directional control valve. This operation may be so simple but it is mandatory to save many humans life and it also protect from such accident which occurs between the train and platform gap.

4. CONCLUSION

This process is not applicable to metro trains and bullet trains but it perfectly suits conventional trains. The described process consists of advantages and some disadvantages like deformation of latex rubber when rubbed against the platform and the manual operation of the pneumatic controller .Therefore to overcome these problems sensor technology can be used to actuate the operation automatically which is an ongoing process.

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