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## Three Axes Pneumatic Modern Trailer

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**ABSTRACT:** This project work titled “THREE AXIS PNEUMATIC MODERN TRAILERS” has been conceived having studied the difficulty in unloading the materials. Our survey in the regard in several automobile garages, revealed the facts that mostly some difficult methods were adopted in unloading the materials from the trailer. Now the project has mainly concentrated on this difficulty, and hence a suitable arrangement has been designed. Such that the vehicles can be unloaded from the trailer in three axes without application of any impact force. By pressing the Direction control valve activated. The compressed air is goes to the pneumatic cylinder through valve. The ram of the pneumatic cylinder acts as a lifting the trailer cabin. The automobile engine drive is coupled to the compressor engine, so that it stores the compressed air when the vehicle running. This compressed air is used to activate the pneumatic cylinder, when the valve is activated.

**KEYWORDS:** Modern trailer, Pneumatic Trailer, Modern dumper, Multi direction lifter

### I. INTRODUCTION

Automation can be achieved through computers, hydraulics, hydraulics, robotics, etc., of these sources, hydraulics form an attractive medium. Automation plays an important role in automobile. Nowadays almost all the automobile vehicle is being atomized in order to product the human being. The automobile vehicle is being atomized for the following reasons.

- To achieve high safety
- To reduce man power
- To increase the efficiency of the vehicle
- To reduce the work load
- To reduce the fatigue of workers
- To high responsibility
- Less Maintenance cost

### II. LITERATURE SURVEY

#### A. PNEUMATICS

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.

#### B SELECTION OF PNEUMATICS

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 the



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control system (although equally pneumatic control systems may be economic and can be advantageously applied to other forms of power).

## C. RECIPROCATING COMPRESSORS

Built for either stationary (or) portable service the reciprocating compressor is by far the most common type. Reciprocating compressors can be had in sizes from the smallest capacities to deliver more than 500 m<sup>3</sup>/min. In single stage compressor, the air pressure may be of 6 bar machines discharge of pressure is up to 15 bars. Discharge pressure in the range of 250 bars can be obtained with high pressure reciprocating compressors that of three & four stages.

Single stage and 1200 stage models are particularly suitable for pneumatic applications, with preference going to the two stage design as soon as the discharge pressure exceeds 6 bar, because it is capable of matching the performance of single stage machine at lower costs per driving powers in the range.

## III. COMPONENTS

1. Air compressor
2. Direction Control Valve
3. Cylinder
4. Flow control valve
5. Wheel arrangement
6. Rotating Plate

### 1. AIR COMPRESSOR

The main function of the air compressor is to compress the air up to the required pressure. The maximum capacity of the compressor is 103105 to 12 3105 N/m<sup>2</sup>. This is a two stages or two-cylinder reciprocating air compressor. The two cylinders are for low and high compression. The air pressure is measured at various places by the use of pressure gauges. V-belt and pulley are used to drive the compressor.

### 2. DIRECTIONAL CONTROL VALVES

To control the to and fro motion of cylinder, the fluid energy has to be regulated, controlled and reversed with a predetermined sequence in a pneumatic system.

Pneumatic valves:

The pneumatic cylinder is regulated and controlled by pneumatic valves. These valves are actuated manually, mechanically, electrically, pneumatically, and by various combined mode of actuation.

### 3. CYLINDERS

Cylinders are the one, which offers the rectilinear motion to mechanical elements. Cylinders are classified as light, medium, and heavy duty with respect to their application.

#### A. SINGLE ACTING CYLINDERS

In this type, the cylinder can produce work only in one direction. The return movement of the piston is effected by a built in spring or by application of an external force. The spring is designed to return the piston to its initial position with a sufficiently high speed.

Types of single acting cylinders:

- Diaphragm cylinder
- Rolling diaphragm cylinder

**B. DOUBLE ACTING CYLINDER**

The force exerted by the compressed air moves the piston in two directions in a double acting cylinder. They are used particularly when the piston is required to perform work not only on the advance movement but also on the return. In principle, the stroke length is unlimited, although buckling and bending must be considered before we select a particular size of piston diameter, rod length and stroke length.

**4. FLOW CONTROL VALVES**

These are used to control the rate of flow of a fluid through the valve.

A directional control valve on the receipt of some, external signal, which might be mechanical, electrical or a fluid pilot signal, changes the direction of stops, or starts the flow of fluid in some part of the pneumatic/hydraulic circuit. They can be used to carry out such functions as:

1. Controlling the direction of motion of an actuator
2. Selecting alternative flow paths for a fluid.
3. Stopping and starting the flow of fluid.

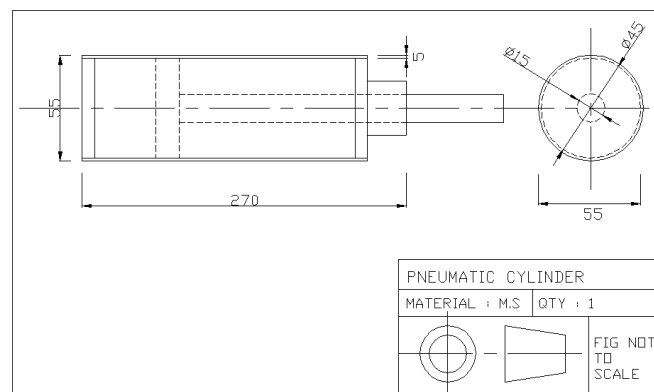
Carrying out logic functions such as AND, OR, NAND

**5. WHEEL ARRANGEMENT**

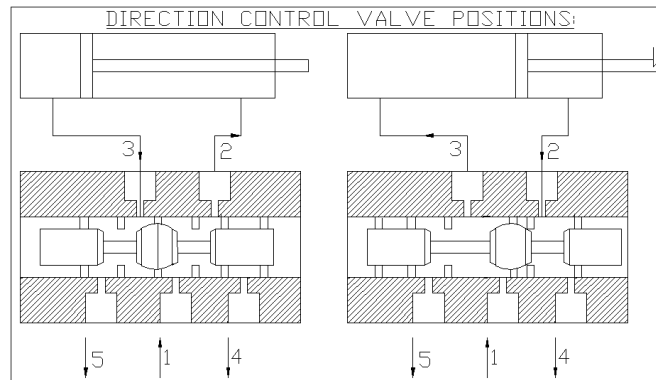
The wheels are fitted to the body of the vehicle with the help of end bearing and bearing caps. The wheels are made up of fibre material.

**6. ROTATING PLATES**

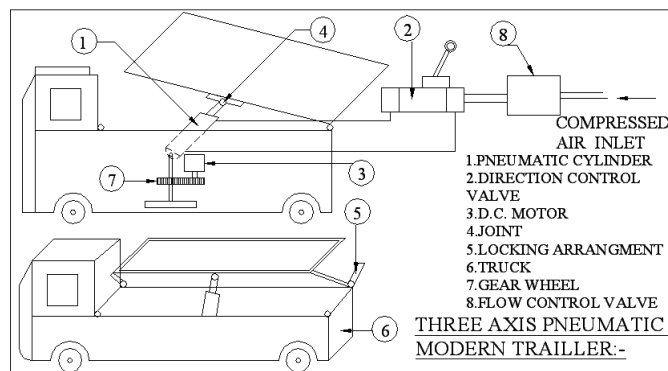
The rotating plates are fixed in the bottom the trailer body, so that the cylinder will rotates in the required side. The plates are made up of mild steel materials.

**IV. SKETCHES****A. PNEUMATIC CYLINDER:**

**B. DIRECTION CONTROL VALVE POSITIONS:**



**C. 2D SKETCH OF THREE AXES PNEUMATIC MODERN TRAILER:**



**V. WORKING PRINCIPLE**

Since pneumatic circuit plays a vital role in this device, it is very necessary to explain the working of this circuit.

Initially starting with air compresses, its function is to compress air from a low inlet pressure (usually atmospheric) to a higher pressure level. This is accomplished by reducing the volume of the air.

Air compressors are generally positive displacement units and are either of the reciprocating piston type or the rotary screw or rotary vane types. The air compressor used here is a typically small sized, two-stage compressor unit. It also consists of a compressed air tank, electric rotor and pulley drive, pressure controls and instruments for quick hook up and use. The compressor is driven by a 1 HP motor and designed to operate in 10 – 100 PSI range. If the pressure exceeds the designed pressure of the receiver a release valve provided releases the excess air and thus stays a head of any hazards to take place.

Then having a pressure regulator where the desired pressure to be operated is set. Here a variable pressure regulator is adopted. Through a variety of direction control valves are available, a hand operated spool valve with detent is applied.

The spool valve used here is 5 ports, 3 positions. There are two exhaust ports, two outlet ports and one inlet port. In two extreme positions only the directions can be changed while the Centre one is a neutral position and no physical changes are incurred.

The 2 outlet ports are connected to an actuator (Cylinder). The pneumatic actuator is a double acting, single rod cylinder. The cylinder output is coupled for further purpose. The piston end has an air cushioning effect to prevent sudden thrust at extreme ends.



Fig 1: Three Axes Pneumatic Modern Trailer

1) A. PRINCIPLES OF WORKING

- The compressed air from the compressor reaches the direction control valve. The direction control valve changes the direction of flow according to the valve position handle.
- The compressed air pass through the direction control valve and it is admitted into the front end of the cylinder block. The air pushes the piston for the lifting stroke. At the end of the lifting stroke air from the valve reaches the rear end of the cylinder block. The pressure remains the same but the area is less due to the presence of piston rod. This exerts greater pressure on the piston, pushing it at a faster rate thus enabling faster return stroke.

The stroke length of the piston can be changed by making suitable adjustment in the hand liver valve operating position.

**VI. LIST OF MATERIALS**

| SI No. | PARTS                            | Qty. | Material     |
|--------|----------------------------------|------|--------------|
| I.     | Pneumatic Double Acting Cylinder | 1    | M.S          |
| II.    | 5/2 Direction Control Valve      | 1    | Aluminium    |
| III.   | Battery                          | 1    | Electronics  |
| IV.    | Wheel                            | 4    | Rubber       |
| V.     | Bearing With Bearing Cap         | 4    | Fiber        |
| VI.    | Polyethylene Tube                | -    | Polyurethane |
| VII.   | Hose Collar And Reducer          | -    | Brass        |
| VIII.  | Stand (Frame)                    | 1    | Mild Steel   |
| IX.    | Dash Pad                         | 1    | Plastic      |
| X.     | D.C Motor                        | 1    | Aluminum     |

**VII. ADVANTAGES, DISADVANTAGES AND APPLICATIONS**

**A. ADVANTAGES**

- It requires simple maintenance cares
- Checking and cleaning are easy, because of the main parts are screwed.
- Handling is easy.



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- Manual power not required
- Repairing is easy.
- Replacement of parts is easy.

## B. DISADVANTAGES

- Initial cost is high.
- Separate air tank or compressor is required.

## C. APPLICATIONS

- All hydraulic and pneumatic dipper applications

## VIII. 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 gates between institution and industries.

We are proud that we have completed the work with the limited time successfully. The “**THREE AXIS PNEUMATIC MODERN TRAILER**” 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 a “**THREE AXIS PNEUMATIC MODERN TRAILER**” which helps to know how to achieve low cost automation. The operating procedure of this system is very simple, so any person can operate. By using more techniques, they can be modified and developed according to the applications.

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