"THREE AXIS PNEUMATIC TRAILER"

Patel Umang M. [1] , Patel Shailesh H. [2] , Patel Sandip J . [3] , Mr. Rahul M Desai . [4]

1. *Student of Mechanical Engineering at Samarth College Of Engineering And Technology Himatnagar, Gujarat, India*
2. *Student Mechanical Engineering at Samarth College Of Engineering And Technology, Himatnagar, Gujarat, India*
3. *Student Mechanical Engineering at Samarth College Of Engineering And Technology, Himatnagar, Gujarat, India*
4. *Assistant professor of mechanical engineering department at Samarth College Of Engineering And Technology, Himatnagar, Gujarat, India*

ABSTRACT

Three Axis Pneumatic Modern Trolley has been conceived having study 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 trolley. The trolley will unload the material in only one single direction. It is difficult to unload the material in small compact streets and small roads. In our projects these are rectified to unload the trolley in all three sides very easily. Now the project has mainly concentrated on this difficulty, and hence a suitable arrangement has been designed. Such that the vehicle can be unloaded from the trailer in three axis 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 trolley cabin. The automobile engine drive is coupled to the compressor engine, so that it stores 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 Cylinder, Valves, Compressor

---

1. 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

1.2 SELECTION OF PNUMATIC SYSTEM

If less force and higher speed is required, then pneumatic system Should be selected.

As air is compressible in nature, it can not be pressurized to large amount of pressure. Since the pressure of compressed air is less (about 10 bar), force developed is also less.

Pneumatic system are faster in operation because, air is very less viscosity. it can flow very quickly. Air rushes into the cylinder once the valve is opened and within no time, the cylinder extends.

1.2.1 ADVANTAGES OF PNUMATICS OVER HYDRAULICS

- The air used in pneumatic devices is dried and free from moisture so that it does not create any problem to the internal parts of the system
- Moreover, to avoid corrosive actions, oil or lubricants are added so that friction effects can be reduced. Compressed air is used in most of the machines and in some cases compressed carbon dioxide is used.
- As most of the pneumatic devices are air based, they have a less complicated design and can be made of inexpensive material.
- Mass production techniques can be adopted to produce pneumatic systems, which not only save money but save time too
- Initial cost is less; hydraulics equipment cost as much as twice the price of pneumatic equipment.

2.1 METHODOLOGY

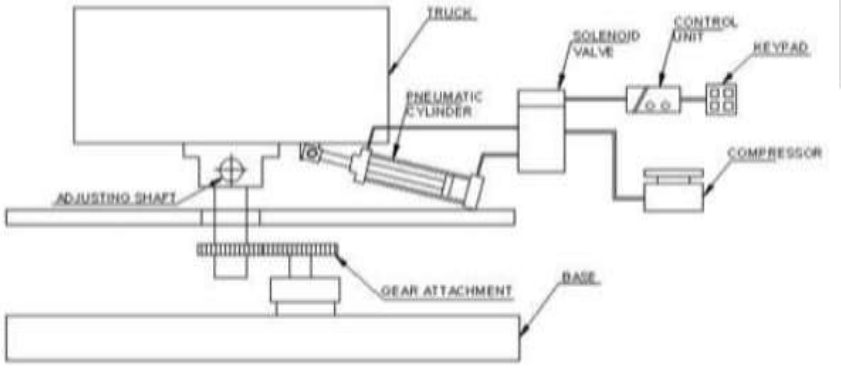


Fig 2.1 Line Diagram For Three Axis Pneumatic Trolley

In this project we are using single cylinder instead of three as per used in current dumping trolley. In this we are mounting a pneumatic cylinder on rotating plate which will rotate along with axis.

The project mechanism has mainly concentrated on the difficulty of loading and hence a suitable arrangement has been designed. Such that the load can be unloaded from the trolley in three axis 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 trolley 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 active the pneumatic cylinder. When the valve is activated.

Pneumatic three axis trolley is nothing but one of the lifting system in automobile at the time of emergency. in this lifting system pneumatically operated one. Here the additional pneumatic cylinder and control valve is provided in the automobile it self. In this project, the control vale is used to activate/deactivate the air input.

The valve is ON at the time of emergency; the compressed air goes to the pneumatic cylinder. Then the compressed air passes through the tube, and then pushes the pneumatic cylinder, so that the lifting is applied at the time of valve is ON position. The speed of the pneumatic cylinder is varied by using flow control valve. This is the way of controlling lifting speed of the trolley at the time of emergency.

In our project we have to apply pneumatic trolley mechanism in load lifting vehicles. The control valve is fixed in near of the driving persons in the four wheels. the air tank contains the compressed air already filled. The valve was ON at the time of emergency, the control valves was activated. The compressed air is flow is controlled by the valve. Then the compressed air goes to the pneumatic cylinders. The pneumatic cylinders piston moves forward at the time of compressed air inlet to the cylinder.

2.2 COMPONENTS AND DESCRIPTION

2.2.1 SINGLE ACTING PNEUMATIC CYLINDER

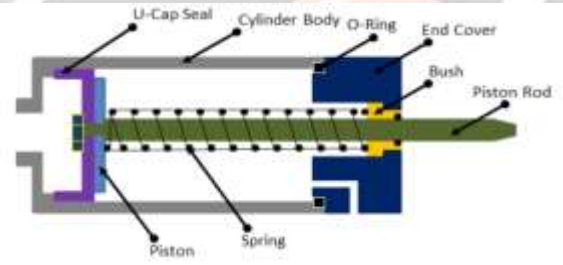


Fig. 2.2 Single acting cylinder

These cylinders produce work in one direction of motion hence they are named as single acting cylinders. Figure 6.4.1 shows the construction of a single acting cylinder. The compressed air pushes the piston located in the cylindrical barrel causing the desired motion. The return stroke takes place by the action of a spring. Generally the spring is provided on the rod side of the cylinder.

2.2.2Piston compressors

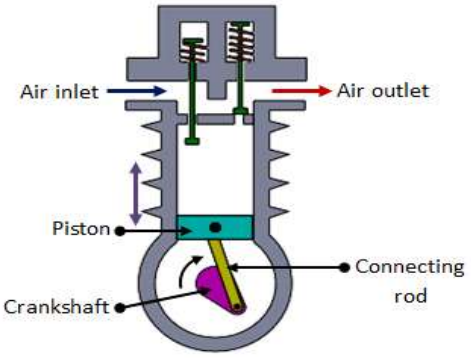


Fig. 2.3 Single acting piston compressor

Piston compressors are commonly used in pneumatic systems. The simplest form is single cylinder compressor (Fig. 6.1.3). It produces one pulse of air per piston stroke. As the piston moves down during the inlet stroke the inlet valve opens and air is drawn into the cylinder. As the piston moves up the inlet valve closes and the exhaust valve opens which allows the air to be expelled. The valves are spring loaded. The single cylinder compressor gives significant amount of pressure pulses at the outlet port. The pressure developed is about 3-40 bar.

2.3.3FLOW CONTROL VALVE

Fig 2.4 flow control valve 5/2

Flow Control Valves are used to reduce the rate of flow in a section of a pneumatic circuit, resulting in a slower actuator speed. Unlike a Needle Valve, a Flow Control Valve regulates air flow in only one direction, allowing free flow in the opposite direction.

2.3.4 DC Motor

Fig 2.5 12 v dc Motor

The electrical motor is an instrument, which converts electrical energy into mechanical energy. According to faraday‘s law of Electromagnetic induction, when a current carrying conductor is placed in a magnetic field, it experiences a mechanical force whose direction is given by Fleming‘s left hand rule.

2.3.5 BATTERY

Fig 2.6 12 v dc battery

A dc motor is simple working device which converts electrical energy into mechanical energy. Dc motor is provide

the rotary motion of the trolley. Her 12 v dc , 15 rpm rotate the gear.

2.3.6 GEAR

Fig 2.7 chain and sprocket

A gear is a rotating machine part having cut teeth , or cogs, which mesh with another toothed part to transmit torque. Geared devices can change the speed, torque, and direction of a power source. Gears almost always produce a change in torque, creating a mechanical advantage, through their gear ratio, and thus may be considered a simple machine. The teeth on the two meshing gears all have the same shape. Two or more meshing gears, working in a sequence, are called a gear train or a transmission. A gear can mesh with a linear toothed part, called a rack, producing translation instead of rotation.

2.3.8 BEARING WITH BEARING CAP

The bearings are pressed smoothly to fit into the shafts because if hammered the bearing may develop cracks. Bearing is made up of steel material and bearing cap is mild steel

Fig 2.8 Bearing With Bearing Cap

2.3.10 WHEEL ARRARNGEMENT

A caster (also *castor* according to some dictionaries) is a wheeled device typically mounted to a larger object that enables relatively easy rolling movement of the object. Casters are essentially special housings that include a wheel, facilitating the installation of wheels on objects. Casters are found virtually everywhere, from office desk chairs to shipyards, from hospital beds to automotive factories.. They range in size from the very small furniture casters to massive industrial casters

Fig 2.9 Wheel

2.3.11 FORWARD AND REVERSE SWITCH

The forward and reverse motor control switch is provide the direction of motor for forward and backward.

3 DRAWING

Fig 3.1 Auto cad drawing

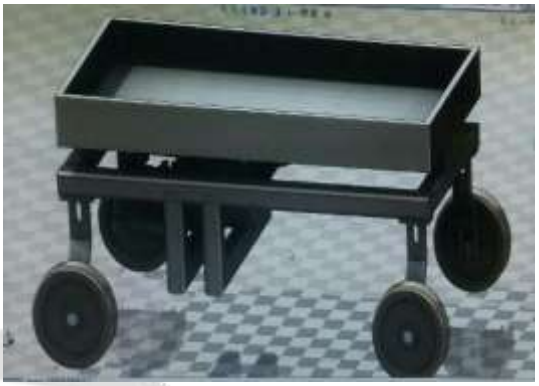


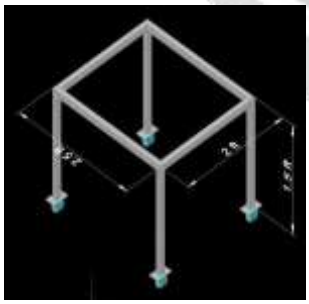
Fig 3.2 auto cad drawing

Fig 3.3 top view

Fig 3.4 side view

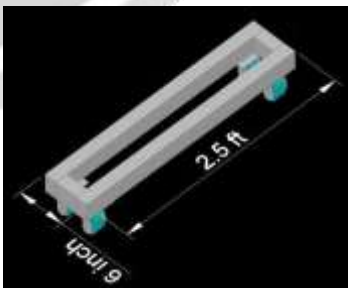
3.2 DIMENSION OF TRAILER

3.2.1 TRAILER BASE FRAME



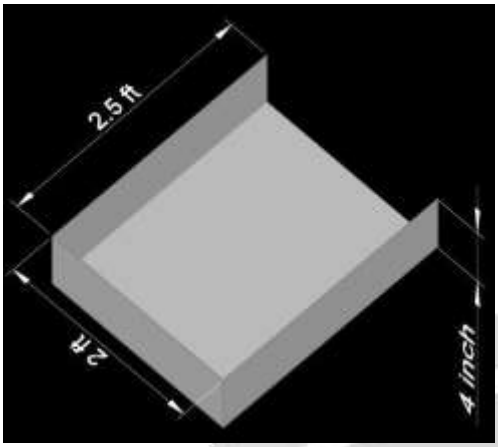
Height : 1.5 foot
Breath : 2 foot
Length : 2.5 foot

3.2.2 CYLINDER BASE



length 2.5 foot
breath 6 inch
height 1 inch

3.2.3 TRAILER



Length : 2.5 foot
Height : 4 inch
Breath : 2 foot

3.3 SPECIFICAION

3.3.1 Single acting pneumatic cylinder

PRODUCT DESCRIPTION

model	: MA 25-200
road type	: single road
action type	: double acting
fluid	: air
Bore	: 25mm
Stroke	: 200mm
Port size	: 1/8”
Temperature	: -5 c - +70c
Max. working pressure	: 1.0 Mpa
Assure proof pressure	: 1.35 Mpa
Main material	: stainless steel
Color	: stainless color
Cushion type	: no cushion
Package content	: 1xAir cylinder

Fig 3.5 single acting pne0umatic cylinder

3.3.2 Flow control Valve

Technical Data

Port size : 0.635 x 10^{-2} m
Pressure : 0-8 x 10^{5} N/m²
Media : Air
Qua : 1

Fig 3.6 flow control valve

3.3.3 Connectors

Technical data
Max working pressure :10 x 10 ^{5} N/m^{2}
Temperature :0-100 ^{o} C
Fluid media : Air

Fig 3.7 connector

3.3.4 Hoses

Technical date
Max pressure : 10 x 10 ^{5} N/m^{2}
Outer diameter :6 mm
Inner diameter :4 mm

Fig 3.8 hose

3.3.5 MOTOR

Fig 3.9 11 v dc motor

3.3.5.1 Application

Provide the rotating motion of the trolley.

3.3.5.2 Rating

Electrical

System voltage 12 v

Polarity

Earth return

Thermal

Operating temperature range -20c to +90c

3.3.5.3 characteristics

Electrical

Typical light running current
2.5 amps (normal speed)
3.5 amps (high speed)

3.3.5.4 Mechanical

Rated torqe at output gear 30.0 nm at 13.5v
Operating speed (nomonal) - normal speed : 45wipes/minutes
- high spedd : 65 wipes/minutes
- Waights : 1 kg

Direction of rotation : clock wise and anticlockwise

4.1 EXPERIMENTATION

Fig 4.1 three axis pneumatic trailer

Working of a modern three axis pneumatic trolley is based on the action of pneumatic cylinder and rotation of gear. The automobile gear drive is coupled to the compressor so that it store the compressed air when the vehicle is running. This compressed air is used to activate the pneumatic cylinder, when the valve is activated. The ram of the pneumatic cylinder act as a lifting the trolley cabin.

When the dc motor which is connected to the spur gear is operated using a battery , the gear rotates and thus the rotating disc also rotates. Since the load cabin is directly connected to the rotating disc , it also rotates.

When the load cabin reaches at the place where the load has to be dumped.

During the forward stroke of cylinder, it pushes truck body upward thus giving necessary lift for dumping. So, in the forward stroke of the cylinder the truck is unloaded. In the return stroke of the cylinder the body of the truck comes to its original position.

5.1 FUTURE SCOPE

Modification on the current system can be possible. Providing ball and socket joint or universal joint at the tip of the pneumatic cylinder piston using external or internal compressor.

Introduction of single hydraulic cylinder instead of pneumatic etc can make the system a little more efficient.

Another change that can be made is to introduce some rollers in between the load cabin and body of the vehicle. This setup will make the rotation of the load cabin easier and thus the rotating dick will no longer have to experience the complete load.

Dual stage cylinder can be used.

Wheel staring adopted for easy handling.

Sensor and alarm can be used.

This arrangement fitted in automated guided vehicle.

5.2 CONCLUSION

A prototype which exhibits the expected results is developed. With analysis of working and with the help of pneumatic system. Lifting operation can be easily carried out without much effort. This mechanism is not only applicable dumping truck but also for various manufacturing industries. Thus we have developed a three axis pneumatic trolley which helps to know how to achieve low cost automation. The operating procedure of this system is very simple so, person can operate. By using more techniques, they can be modified and developed according to the applications. Further modifications and working limitation will put this work in the main league of use.

5.3 ADVANTAGES:-

- Air is cheaply and easily available.
- It requires simple maintenance cares
- Checking and cleaning are easy, because of the main parts are screwed.
- Handling is easy.
- Manual power not required
- Repairing is easy.
- Replacement of parts is easy.

5.4 DISADVANTAGES

- Initial cost is high.
- Separate air tank or compressor is required.
- handling of the large air is major problem

5.5 APPLICATIONS

- All pneumatic dipper applications.
- Material handling unit
- Construction site
- Agriculture

REFERANCE

- Industrial fluid power by James Johnson
- Patent US3817493- hydraulic jack for trailer – Google patent
- Patent US4711461 – Three axis trailer
- Master's thesis, institute of technology, Nirma university, may 2007
- Automotive industry standards "IAS-053; automotive vehicle-types-technology
- Automotive industry standards "IAS-093; code of practice for construction and approval of truck cabs, truck bodies, and trailers.
- A text book of fluid mechanics and machinery, laxmi publication, new delhi 2000, by r k bansal
- Theory of machines, s chand and company ltd, new delhi 2008,by r s khurmi and j k gupta
- S tiwari, - evolution of empirical relationship between high leval design parameter with performance cretaria of a ladder type chassis frame

WEBSITE

- www.nptel.com
- www.internationaljournalssrg.org
- www.paperpublications.org
- www.scribd.com
- www.Researchscript.com
- www.ijrasat.com
- www.irjet.net