

Fabrication of Pneumatic Three Axis Dumping Trolley

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ABSTRACT:

The older dropping trolley/dumper has been conceived by observing the difficulty in unloading the materials. The survey in this regards in several automobile garages, revealed the facts that mostly some difficult methods were adopted in unloading the materials from the trailer. This paper has mainly focused on above difficulty. Hence a prototype of suitable arrangement has been designed. The vehicles can be unloaded from the trailer in three axes without application of any impact force. The Direction of the mechanism can be control with the help of chain and gear mechanisms which attached the ram of the Pneumatic cylinder which lifting the trailer cabin in require side. Further modifications and working limitations will put this work in the main league of use. This concept saves time & energy which leads to efficient working.

Keywords:

Motor, Chain mechanism, Pneumatic cylinder.

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

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. 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 the air at intake conditions namely at atmosphere pressure and normal ambient temperature. The compressibility of the air was first investigated by Robert Boyle in 1662 and that found that the product of pressure and volume of a particular quantity of gas.

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 control system (although equally pneumatic control systems may be economic and can be advantageously applied to other forms of power). The main advantage of an all pneumatic system are usually economic and simplicity the latter reducing maintenance to a low level. It can also have outstanding advantages in terms of safety.

COMPONENTS AND DESCRIPTION

MAJOR PARTS:

The major parts “PNEUMATIC THREE AXIS MODERN TIPPER” are described below:

- Air compressor
- Direction Control Valve
- Cylinder
- Connecting hoses
- Flow control valve
- Bearing with bearing cap
- Wheel arrangement
- Vehicle model frame
- Rotating Plates

AIR COMPRESSOR:

The main function of the air compressor is to compress the air up to the required pressure.



Directional control valve:

Directional control valves are one of the most fundamental parts in hydraulic machinery as well and pneumatic machinery. They allow fluid flow into different paths from one or more sources. They usually consist of a spool inside a cylinder which is mechanically or electrically controlled. The movement of the spool restricts or permits the flow, thus it controls the fluid flow.



PNEUMATIC 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.

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.

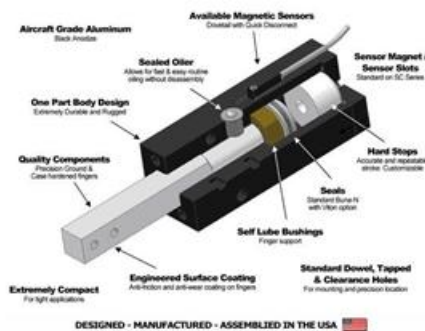
Types of single acting cylinders:

- Diaphragm cylinder
- Rolling diaphragm cylinder

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. We use cylinders that are double acting type (i.e.) the compressed air can be passed to either end of the cylinder. These cylinders are made up of cast iron.



Key points:

Pneumatic cylinders come in many basic versions. All cylinders can be tweaked to better fit an application. Custom designs can perform better and save money when standard cylinders don't fit the job.

BATTERIES:

In isolated systems away from the grid, batteries are used for storage of excess solar energy converted into electrical energy. The only exceptions are isolated sunshine load such as irrigation pumps or drinking water supplies for storage. In fact for small units with output less than one kilowatt. Batteries seem to be the only technically and economically available storage means. Since both the photo-voltaic system and batteries are high in capital costs. It is necessary that the overall system be optimized with respect to available energy and local demand pattern. To be economically attractive the storage of solar electricity requires a battery with a particular combination of properties:

- (1) Low cost
- (2) Long life
- (3) High reliability
- (4) High overall efficiency
- (5) Low discharge
- (6) Minimum maintenance

(A) Ampere hour efficiency

(B) Watt hour efficiency

We use lead acid battery for storing the electrical energy from the solar panel for lighting the street and so about the lead acid cells are explained below.

D.C 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. Constructional a dc generator and a dc motor are identical. The same dc machine can be used as a generator or as a motor. When a generator is in operation, it is driven mechanically and develops a voltage. The voltage is capable of sending current through the load resistance. While motor action a torque is developed. The torque can produce mechanical rotation. Motors are classified as series wound, shunt wound motors.

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 an 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 driver 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 value provided releases the excesses air and thus stays a head of any hazards to take place.

Then having a pressure regulator where the desired pressure to the operated is set. Here a variable pressure regulator is adopted. Through a variety of direction control valve 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 Centro ore is a neutral position and no physical changes are incurred. The 2 outlet ports are connected to an actuator (Cylinder). The pneumatic activates is a double acting, single rod cylinder. The cylinder output is coupled to further purpose. The piston end has an air horn effect to prevent sudden thrust at extreme ends.

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.

ADVANTAGES:

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.

DISADVANTAGES:

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

APPLICATIONS:

All hydraulic and pneumatic dipper applications.
 Easy to unload the materials

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 TIPPER**” 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 TIPPER**” 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 per the applications.

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ISSN No: 2348-4845

International Journal & Magazine of Engineering, Technology, Management and Research

A Peer Reviewed Open Access International Journal

Advent Technology, Vol.2, No.4, April 2014E-
ISSN: 2321-9637.-

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