

Design of Multi-Side Pneumatic Trailer For Logistic Purpose

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Abstract- This project work titled “**MULTI-SIDE PNEUMATIC MODERN TRAILER**” 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 going 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- Multi-Axis, Pneumatics, Logistics,Trailer.

I. INTRODUCTION

Automation can be achieved through computers, 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.

1. To achieve high safety
2. To reduce man power
3. To increase the efficiency of the vehicle
4. To reduce the work load
5. To reduce the fatigue of workers
6. To high responsibility
7. Less Maintenance cost

1.1 PNEUMATICS

The word ‘pneumatic’ comes from Greek and means breather wind. The word pneumatics is the study of air movement and its phenomena is derived from the word pneumatic. 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 will 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.

The usual equation is written as

$$PV = C \quad (\text{OR}) \quad P_1V_1 = P_2V_2$$

In this equation the pressure is the absolute pressured which for free is about 14.7 Psi and is of courage capable of maintaining a column of mercury, nearly 30 inches high in an ordinary barometer. Any gas can be used in pneumatic system but air is the mostly used system now a days

1.2 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 out standing advantages in terms of safety.

1.3 PRODUCTION OF COMPRESSED AIR

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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. Clean condition of the suction air is one of the factors, which decides the life of a compressor. Warm and moist suction air will result in increased precipitation of condense from the compressed air.

Compressor may be classified in two general types.

1. Positive displacement compressor.
2. Turbo compressor

Positive displacement compressors are most frequently employed for compressed air plant and have proved highly successful and supply air for pneumatic control application.

The types of positive compressor

1. Reciprocating type compressor
2. Rotary type compressor

Turbo compressors are employed where large capacity of air required at low discharge pressures. They cannot attain pressure necessary for pneumatic control application unless built in multistage designs and are seldom encountered in pneumatic service.

1.4 RECIPROCATING COMPRESSORS

Built for either stationary (or) portable service the reciprocating compressor is by far the most common type. Reciprocating compressors lap be had is sizes from the smallest capacities to deliver more than 500 m³/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

II. IDENTIFY, RESEARCH AND COLLECT IDEA

The trailer is thought to have been first conceived in the farms of late 19th century Western Europe. As early as 1905, the first motorized dumping vehicles were developed. The first motorized dump trucks in the United States were developed by small equipment companies such as Galion Buggy Co. among many others around 1910. Such companies flourished during World War I due to massive wartime demand. Companies like Galion Buggy Co. continued to grow after the war by manufacturing a number of express bodies and some smaller dump bodies that could be easily installed on either stock or converted (heavy-duty suspension & drive train) Model T chassis prior to 1920. Galion and Wood Mfg., Co. built all of the dump bodies offered by Ford on their heavy-duty AA and BB chassis during the 1930s. Galion (now Galion Godwin Truck Body Co.) is the oldest known truck body manufacturer still in operation today.

The first known Canadian dump truck was developed in Saint John, New Brunswick when attached a dump box to a flat bed truck in 1920. The lifting device was attached to a cable that fed over sheave (pulley) mounted on a mast behind the cab. The cable was connected to the lower front end of the wooden dump box which was attached by a pivot at the back of the truck frame. The operator turned a crank to raise and lower the box. The first dump bed apparatus on a wheeled vehicle patented in Canada The present invention relates to

trailer hitches, and, in particular, to a three-axis trailer hitch having an improved rotatable coupling about a longitudinal axis extending between the towing vehicle and the trailer. Trailer hitches providing mechanical coupling about three independent axes between a towing vehicle and a trailer are known in the art. One representative example is disclosed in U.S. Pat. No. 2,133,065. The trailer hitch disclosed in this patent employs a universal joint or coupling providing limited angular movement about a first or transverse axis and about a second or vertical axis. Rotatable coupling about a third or longitudinal axis is achieved by a longitudinally extending, internally tapered socket member attached to the universal joint. The internally tapered socket member receives the forward end of an externally tapered pintle, the rear end portion of the pintle being securely connected to the trailer. The tapered forward end of the pintle is rotatable secured within the internally tapered socket member by locking pin or bolt. The trailer is disconnected from the universal joint by manually releasing the sliding lock pin and withdrawing the tapered pin from its mating socket. It is a principal object of the present invention to provide a strong, safe, and simple trailer hitch having improved rotational coupling about the longitudinal axis extending between the towing vehicle and the trailer. It is another object to provide a trailer hitch having a tightly coupled rotatable joint of low friction. An additional object is to provide a trailer hitch requiring a relatively simple adjustment to compensate for any wear of the abutting parts of the rotatable joint. The above objects of and the brief introduction to the present invention will be more fully understood, and further objects and advantages will become apparent, from a study of the following detailed description in connection with the drawings.

III. WRITE DOWN YOUR STUDIES AND FINDINGS

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

WORKING PRINCIPLE

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 Center 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 to further purpose. The piston end has an air horn effect to prevent sudden thrust at extreme ends.

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 passes 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 lever valve operating position.

IV. CONCLUSION

This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We feel that the project work is a good solution to bridge the gap between institution and industries.

The “MULTI-SIDE PNEUMATIC MODERN TRAILER” is working with satisfactory conditions. As for this trailer is concerned in India, single piston arrangement is the most commonly used. Instead, with the same Piston

arrangement available, repositioning the system with the help of the spur gears meshed normal to each other, the trailer can be lifted in the other two sides just by changing the position with the help of a motor connected with the battery.

Thus we have developed a “MULTI-SIDE PNEUMATIC MODERN TRAILER” which helps to know how to achieve low cost automation. The operating procedure of this system is very simple. By using innovative techniques, this system can be modified and developed based on the human need in our day to day life

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