

FABRICATION OF PNEUMATIC JACK

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ABSTRACT

A pneumatic jack is a device which is used to uplift heavy vehicles, doors, etc. The main aim of this project is to shift people from hydraulic jack to pneumatic jack. In this type of jack air is used as a fuel. We design technology that lifts the vehicle without the need for manual labour. It is built within the car and is easily manipulated by the driver; we simply elevate the steering wheel as needed.

Keywords: Power Screw, 2, Air Compressor, DC Valve, FRL Unit, Integrated Pneumatic Jack.

I.INTRODUCTION

When a car gets punctured or broke down, we have to lift it at a certain height so that the punctured tyres can be changed. Today, we are using different types of methods to do it easily and efficiently. The screw jack or hydraulic jack is used to do so. To lift a car, we must remove it from the vehicle and secure it under the axle. The screw is then turned with human force. But in this, lots of man power and time are required. To make it easy, pneumatic jacks are introduced. It does not require any fuel, in this, with the help of air, heavy weights can be lifted up.

- It helps to reduce man power.
- It requires less time and is easier to do work on it.
- The production cost of this jack is less in comparison to other jacks.
- The maintenance of this jack is very less or you can say free of cost.
- It is very simple to transport and carry.

II. NEED OF INVENTION

The fact is that "necessity is the mother of invention" in the world, and the necessary condition is that manual jack operation requires a lot of work, so there is a need for invention.. First person who wrote about about air and wind power is Alexendria .Further it is developed by german physicist Otto Von Guericke (1602 to 1686). The field of pneumatic has changed over years and years. In the following few decades standard jacks are used to uplift the vehicles the standard jacks takes a lots of time to change the tyres of vehicles and it requires lots of man power also.

Standard jacks are difficult to carry from one place to another place as it is big and heavy.

By seeing all this difficulties pneumatic jacks are introduced which requires less man power, easier to carry and transport from one place to another without any difficulties and it completes the work in very short period of time , it is also bennefitial for nature also as it does not require any fuel to work because in this types of jack air is used as a fuel.They are cheaper than other jacks and it is the requirement of modern era.

The general purpose of this project is to minimize the human effort while operating the jack. It can be used by every types of man and women and even teenagers can use it very easily.

LITERATURE SURVEY

(2009)[1] Thomas J. Prather: This included an introduction to the vehicle lift system. A drive assembly was mechanically coupled to the piston. The drive assembly was turned in the first direction to raise the piston's higher end in relation to the housing. The drive assembly was moved in the opposite direction to lower the piston's upper end in relation to the housing. To deliver electrical power to the drive assembly, the drive assembly was attached to the power supply port, which is removable.

Farhad Razzaghi (2007)^[2]: In this, electrically powered jack shown for normally raising and lowering of automobile from ground surface. The mechanism may be used in joining with a typical portable car jack, during which the mechanism constitute a power drill, a rod, and a numerous jack adapters.

[3] Manoj Patil (2014): Screw jack is designed in this broad essay to overcome human effort. Operating on pregnant ladies and the elderly is a challenging task.. Changing the tyre is not a pleasant experience. Especially women can't apply more force to operate. For that, electric operated car jack is introduced

[4] Lokhande Tarachand This study looked at how changing helix angles affected the efficiency of a square threaded mechanical screw jack.

PNEUMATIC JACK

A pneumatic jack is powered by compressed air and are used to uplift the vehicles, heavy doors and many heavy items or components. Pneumatic Jack works on the principle of actuated air and uses piston cylinder arrangement for its operation to be performed.

Pneumatic jacks rely on compressed air, which must be provided in sufficient quantity and at a pressure that matches the system's capability. However, while implementing the pneumatic system for the first time, it will be important to address the issue of compressed air supply. The reciprocating compressor is an important feature of any compressed air delivery plant. A compressor is a device that takes in air or gas at a specific pressure and then delivers it at a high pressure. The capacity of a compressor is the amount of compressed and delivered air, and the volume expressed is the volume of air at intake circumstances, such as atmospheric pressure and normal ambient temperature.

III. WORKING PRINCIPLE

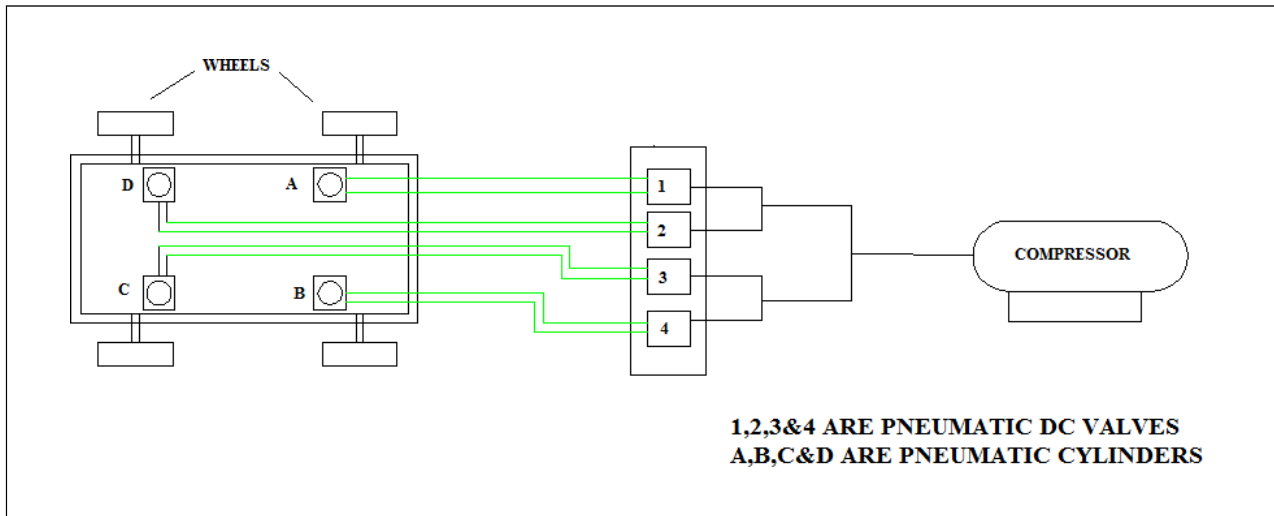


Fig. No.3.1. Layout Of Model

1. Firstly we connect hoses as shown in figure.
2. When we give supply to the compressor then compressor begins to run.
3. At normal condition compressed air is supply at bottom side.
4. The flow control valve is connected to cylinder for the controlling of the flow.
5. The circular disc is connected to the end of piston.
6. So piston will goes downward and the rear wheel goes upward
7. In that way we can lift the wheel as per requirement.

IV. DESIGN CALCULATIONS

Assume the vehicle's overall weight is 60 kg.

One pneumatic cylinder near the wheel lifts 15 pounds of weight. Determine the force exerted to the trailer in N.

$$F = 15 \times 9.81$$

$$= 147.15 \text{ N}$$

We know the formula $F = P$

XA

Where,

F= Applied Force (N)

P = pressure used (N/mm²) A

=area of cylinder (mm²)

We consider the normal pressure is 5 bar =0.5 N/mm²

$$F= P \times A$$

$$147.15 = 0.5 \times A$$

$$A = 374.71$$

We now need to determine the cylinder's needed diameter. We're aware of this.

$$A = \frac{\pi}{4} \times d^2$$

Where,

A= area of cylinder (mm²)

d = diameter of cylinder (mm) $A = \frac{\pi}{4}$

$$\times d^2$$

$$374.71 = \frac{\pi}{4} \times d^2$$

$$d = 19.35 \approx 20 \text{ mm}$$

The standard cylinder available in market is 20 mm, 25mm, 32mm

We select 20mm

$$20 \text{ mm} > 19.35 \text{ mm}$$

As a result, we choose a cylinder diameter of 20 mm, which is considered safe.

For pneumatic cylinder $\phi 20 \times 75$

V. CONCLUSION

This integrated pneumatic car jack is highly desirable jack to become available in vehicles that can be operated by the compressed air. It is especially beneficial to pregnant women and the elderly. To design easy to operate. To manufacture Low cost working product. To reduce human efforts. To utilize for commercial business. To design low maintenance of product.

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