

Design and Fabrication Automatic Pneumatic Inbuilt Jack System by using Fifth Wheel Parking System

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Abstract— The fabrication is based on pneumatics which deals with the study and application of the pressurized air to produce mechanical motion. Pneumatic jack is fabricated model which installed on the four wheeler, which is used to solve the problem arising in the conventional jack. This fabricated model consist of small size reciprocating air compressor which is driven by the battery use in four wheeler and an air tank is use to jack store the compressed air, and a pneumatic control valve which regulate the air flow and double acting cylinder used as a jack which perform lifting. This jack is installed on the chassis using jack and the problem related to tyres such as puncture tyres, tyres replacement and wheel balancing can be resolved with less effort and time.

Key words: Compressor, Chassis, Pneumatic Cylinder, Solenoid Valve, Control Circuit and Jack

I. INTRODUCTION

Our survey in the regard in several users of vehicles, revealed the facts that mostly some difficult methods were adopted in lifting the vehicle for reconditioning. Now the project is mainly concentrated on this difficulty, such that the vehicle can be. The lifted from the floor land without application of any impact force. The inbuilt pneumatic jack is a device used to elevate heavy weight without manpower. The operation is made simple so that even unskilled person can use it with ease. As automobile market is growing, advance concepts are being implemented to make automobile more and more versatile and comfortable. Many concepts are implemented day to day to make automobile better these days. In this way the becomes more versatile and can be operated over variety of bad as well as good road conditions. Here we are converting the rotary motion into linear motion for lifting the vehicle using the jack which is fixed at the bottom of the cassis. The motor is operated by the control unit. Is gets power form the battery. The two number of pneumatic jack is arranged under the vehicle body. Out of the one is connected vertically and other is horizontally. When we press the button in the control unit the motor starts rotates. Then the air is compress by using motor. This compress air is used to move the jack from its initial position to the working position. Then the shaft in the cylinder moves down by touches the ground and lifts the front or back wheels of the vehicle. the wheel are grounded safely even after the wheel puncture or any other fault in the vehicle.

A. Pneumatics

The “pneuma” is Greek word and it means wind. The word pneumatics is study of air movement. Pneumatics is used for carrying out the simplest mechanical tasks in more recent times. That has played a more important role in the development of pneumatic technology for automation. Pneumatics systems operate on the supply of compressed air which is must be made available in sufficient quantity and at

a sufficient pressure to suit the capacity of the system. When the pneumatic system is being adopted for the very first time, it wills indeed the necessary to deal with the question arise in front of them that compressed air supply. The supply of compressed air is done by using reciprocating compressor. A compressor is a machine that takes in air 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 that the air at intake. The compressibility of the air was first introduced by Robot Boyle in 1662 and that found that the product of pressure and volumes of particular quantity of gas.

The usual written as

$$PV = C \text{ (or) } P_1 \cdot V_1 = P_2 \cdot V_2$$

In this equation the pressure is the absolute pressure.

In general any gas can be used in pneumatic system but air is the mostly used.

B. Modelling

1) Design Details

The materials are required for the manufacturing of inbuilt pneumatic jack system along with specification are as follows.

Sr. no.	Name	Property	Quantity (in no.)
1	Shaft	Bright bar	2
2	Chassis		1
3	Pedestal bearing	Size-P204	4
4	Battery	12V 7AH	1
5	Solenoid valve	2/ 3	1
6	Pneumatic cylinder	200mm stroke	2
7	Compressor	150psi	1

Table 1: Design Details

2) Design of Shaft



Fig. 1: Design of Shaft

- Shaft length -762mm
- Shaft diameter -200mm

3) Design of Frame



Fig. 2: Design of Frames

- length of frame-1066mm
- breadth of frame-609mm

C. Components and its Specification

The inbuilt pneumatic jack system consist of the following components.

- 1) Double acting pneumatic cylinder
 - 2) Solenoid valve
 - 3) Pneumatic unit.
- 1) *Double Acting Pneumatic Cylinder*
 - Stroke length=200mm
 - Cylindrical shaft dia.=140mm
 - Piston rod : 10mm =10 X10-3m
 - Quantity : 2
 - End cones : Cast iron
 - Media : Air
 - Temperature: 0-80°C
 - Pressure Range: 150psi
 - Max pressure applied in the cylinder (p): 150 psi
 - Area of cylinder (A): $(3.14/4*(D^2))$
 - 2) *Solenoid Valve*
 - Maximum pressure: 150psi
 - Quantity: 1
 - 3) *Pneumatic Unit*
 - Type of cylinder: Double acting cylinder
 - Type of valve: flow control valve & solenoid valve
 - Max air pressure: 150psi
 - Force exerted in the piston (F): Pressures applied X area of cylinder.

II. WORKING

The working medium required is compressed air. The compressed air is transmitted through compress air tubes to pneumatic cylinder where power is converted into reciprocating motion. The reciprocating motion is to be obtained by using an electrically controlled solenoid valve. The input given to solenoid transmitted to the jack through the piston which moves on the cylinder up and down. The jack is placed under the vehicle chassis, where the vehicle to be lifted. The vehicle can be lifted when the solenoid valve is switched. The vehicle over the jack gets the reciprocating motion through the piston which is connected to pneumatic jack. Thus using a pneumatic jack the vehicle can be lifted with ease in operations.

- Power can be easily transmission
- A single compressor can supply power to pneumatic jack.
- Low cost.
- Easy

III. AIR COMPRESSOR

An compressor is a device that converts power (from an electric motor into kinetic energy by compressing and pressurizing air. In which, on command, the compress air can be released in can be released in quick bursts. There are numerous methods of air compression, divided into either positive-displacement or negative displacement.

IV. PNEUMATIC CYLINDER

Pneumatic cylinders are the device which use the power of compressed gas to produce a force in a reciprocating or linear motion. It gives forces to a piston to move in the desired direction. The piston rod transfers the force which it develops

to the object to be moved. We prefer to use pneumatics because they are quieter, cleaner, and do not require large amounts of space for fluid storage.

V. SOLENOID VALVE

It is an electromechanically operated valve. Solenoid valves are the most frequently used device in control of fluid. Their tasks are to switch-off, release, distribute or mix fluids. Solenoid valve are found in many application areas. Solenoids provide fast and safe switching, high reliability, long service life and compact design.

VI. 12V DC BATTERY

A dc motor is any of a class of rotary electrical machines that converts direct current electrical power into mechanical power. The battery is a device consisting of one or more electrochemical cells contains a positive terminal called as cathode and a negative terminal called as anode. It allows ions to move between the electrodes and terminals, which allows current to flow through the battery to perform work.

VII. CONCLUSION

In this paper the inbuilt jack by fifth wheel is studied with a reduced size, pneumatic cylinder and 150psi compressor are use to operate. The various analyses were made on the jack. Before conducting the trial, weight of vehicle, analysis of each part, were made. After trial it helps to evaluate the jack work properly and fifth wheel are help to parallel parking.

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