



Research Paper

DESIGN, ANALYSIS AND FABRICATION OF AUTOMATIC JACKING SYSTEM WITH EXTENSION ARM

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An Automatic jack can be easily operated by using of pneumatic cylinder which is operated by compressed air cylinder. The jack assembly will be mounted on both the sides of chassis according to the weight distributions of the car. Similarly it will be installed on the other side of the car. The system operates on pneumatic drive which consists of following main parts: Pneumatic cylinder, compressed air cylinder, bell crank liver to lift the vehicle. The bell crank liver actuate separately for either side of car as per the condition. The car gets lifted and load gets distributed on pivot of bell crank liver they guide by c-sec case. The cylinder pushes the bell crank liver under guide of c-section. This jack will be very useful for all the senior citizens and especially for females (ladies) who find it extremely difficult to operate the jack manually in any breakdown condition. As the hydraulic oil is incompressible so the lifting capacity is more in comparison with the pneumatic system which operates on air which is compressible.

Keywords: Light moving vehicles, Integrated automated jack, Pneumatic cylinder, Bell crank liver, Chassis

INTRODUCTION

The invention relates to pneumatic jack and more specifically to an automobile pneumatic jack system. In most of the garages the vehicles are lifted by using screw jack. This needs high man power and skilled labors. In the past both hydraulic and pneumatic jack has been utilized in combination with the structure of automobile.

They have always utilized a separate jack for each of 4 wheels by having the jacks permanently installed on the vehicle. They are ready to operation at all time.

Lifting device has been installed on vehicle, such as air lifting device. Various types of jack or lift devices has been installed on vehicle which are turned in 1 fashion or another from a horizontal attitude into a vertical attitude and then extended for the purpose of lifting the vehicle. It is an object of the invention to provide one cylinder at the center of chesses and c-Chanel, bell crank liver assembly.

It is also an object of invention to provide jack system that can be operated by driver from inside the car. It is also an object of invention the pneumatic system in which the

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compressed air cylinder supplied a pressurized air to the cylinder which push the bell crank liver which can be lift the vehicle. Now the project has mainly concentrated on this difficulty, and hence such that the vehicles can be lifted from the floor land without application of any impact force. A Patent numbered 4,993,688, was registered dated Feb. 19, 1991, of United States by Thomas L.Mueller on Built in Power Jack. In this, there was a front suspension pneumatic jack that is mounted centrally to the rear suspension of the automobile between its rear wheels. The system operated from a compressed air reservoir tank that has connections for front and rear jack.

Need of this Project

It is believed that '***Necessity is the mother of invention***'. Here the necessity lies in reducing the human effort applied during manual operation of the jacks and hence the need of the invention. In day to day life it is very tedious job to operate the jack manually and it is also a very time consuming work as well. So to make it easier for everyone especially for aged person and for lady drivers. To provide a safe and simple automatic pneumatic jacking without manual effort. To provide a jacking system that can be operated from pressurized air that can be operated by valve. There are certain mechanisms already available for the same purpose which has a definite capacity to lift the car on 2 wheels viz. a screw jack. But the general idea of the project is to minimize the human effort while operating the jack. To provide a pneumatic jacking system that is directly and permanently.

Incorporated into the vehicle frame in such a way as to prevent the additional risk of damage or weathering.

BASICS

Pneumatic is the science of transmitting force /or motion through the medium of a confined air. In a pneumatic device, power is transmitted by pushing on a confined air. The transfer of energy takes place because a quantity of liquid is subject to pressure. To operate air-pressurized systems, the operator should have knowledge of the basic nature of compressed air.

CONSTRUCTION

Flat plat is used like a chassis. At the flat plat one pneumatic cylinder is mounted centrally or eccentrically which is attached to a male female flange coupling. The indexing mechanism is used to giving a direction to the cylinder. The compressed air is used to create a pressure to push the cylinder. This compressed air form pressure 5to7 bar to actuating a piston. This piston can push the bell crank liver it made the certain angle with surface and then it can be lift the vehicle. This jack can lift up to 200to250 kg weight.

WORKING

The actual working of pneumatic system that lifts the car by using of pressurized air. The cylinder is mounted centrally on the chassis. When the pressure valve is open then pressurized air is flow on the direction of pneumatic cylinder they can push the piston. These certain amount pressures push the piston in the direction of bell crank liver. The bell crank liver operates under the guidance of c-channel. When bell crank liver form certain angle with surface .These bell crank liver touch the ground and lift the vehicle upward.

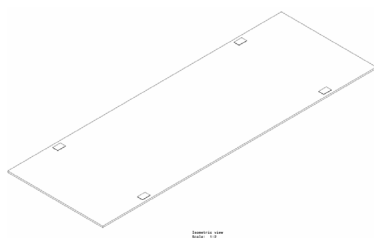
Once the car is lifted to a desired height the tires can be changed. It is the specialty of a simple jack that it possesses a self-

locking system i.e. once the car is lifted to a certain height and even if the power to the jack is cut off the jack can still hold the entire part of car that is lifted by it. And thus, the driver can easily change the tire.

Once the tire is changed, now the concern is to release the pressure in the jack which is in the form of pressurized air. Thus a relief valve is provided on the jack for this purpose. Once the relief valve is opened the air in the cylinder which has lost its pressure energy, starts returning to the control unit. Once the air starts returning the control unit then sends the accumulated air back to the cylinder. And in this way the entire system was working.

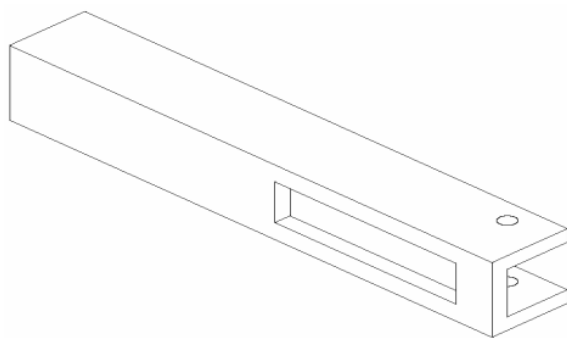
Components Specifications

- Base Frame:
Length-1066.25mm
Width - 370mm



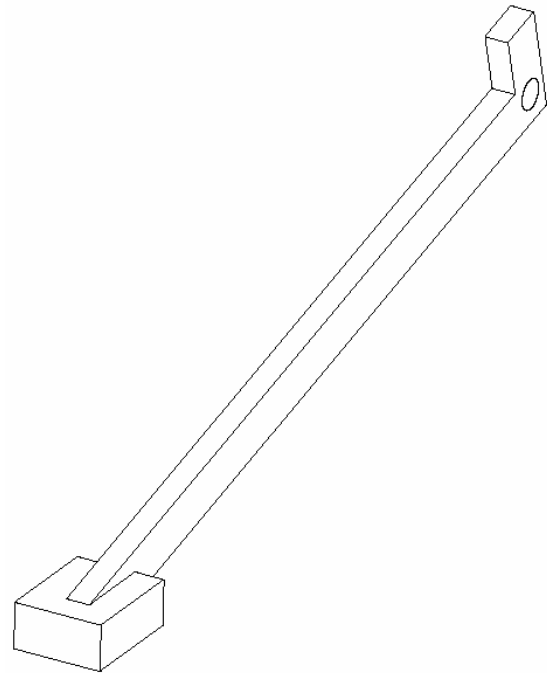
Base frame (Chassis)

- C' Sec Casing:
Length - 160mm
Height - 25mm
Thickness - 5mm



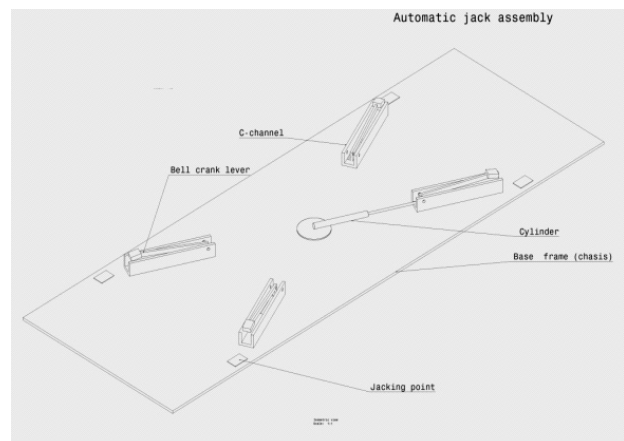
Isometric view
Scale: 2:1

- Bell Crank Lever:
Length - 140mm
Height - 18mm
Thickness - 12.5mm



Isometric view
Scale: 2:1

- Pneumatic Cylinder:
Bore diameter(d)=3 inch=76mm
Stroke length(l)=150 mm
- Automatic jack assembly



Calculation

Cylinder:

Schrader 3"×150 mm pneumatic cylinder

Bore diameter (d) =3 inch=76 mm

Stroke length (l) =150 mm

Weight to be lifted=200 kg

Pressure (P) =Force (F)/Area (A)

$$P=F/A$$

$$P=200/(4/4 \times 7.6^2) \text{ (kg.f/cm}^2\text{)}$$

$$P=200/45.3645$$

$$P=4.4087 \text{ kg.f/cm}^2$$

$$P=432348.15 \text{ Pa}$$

$$P=4.3234 \times 10^5 \text{ Pa}$$

$$P=4.3234 \text{ Bar}$$

Hence, pressure required is 5 Bar (Approximately)

CONCLUSION

This jack is very easy to operate. It is easy to lift the car. This jack will be very useful for all the senior citizens and especially for females (ladies) who find it extremely difficult to operate the jack manually in any breakdown condition.

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