

DESIGN AND FABRICATION OF PNEUMATIC JACK

Vivek.J.V^{#1}, Immanuel Bhyshon.J^{*2} Menison.J.P^{*3} Eswhara Moorthy.M^{*4}

^{#1}Student, Mechanical, Kings Engineering College, Chennai, India

^{*2}Student, Mechanical, Kings Engineering College, Chennai, India

^{*3}Student, Mechanical, Kings Engineering College, Chennai, India

^{*4}Student, Mechanical, Kings Engineering College, Chennai, India

Abstract- To increase the productivity, the skilled labours were going for automation. To overcome this stage we have selected project work is to acquire practical knowledge in the field of mechanism using jack.

We selected PNEUMATIC LIFTING JACK, as our project work and we used this process in all machine attachment like, drilling, milling jig boring, and surface grinding. The material handling mechanism is achieved by movable of handle in this jack.

When the compressed air is passed through the pneumatic cylinder the piston will move. At the end of the piston connected to the moving rod. The moving rod is move to forward and backward stroke will obtained. The fixed rod to fixed in the base table. Now the piston movement to lifting the load.

Due to moving piston is forward stroke at the load is lifted in automatically. After pressing the piston will return to original position.

I INTRODUCTION

The reconditioning , repairing replacing are three virtual processes necessary for the effective working travelling ,the tyres due to continuous fatigue may be even get punctured .And here to repair this problem and continue to travelling, the pneumatic jack plays an outstanding and unavoidable role.

The pneumatic jack are a critical part of vehicle , which is used in various emergency domain. The use of pneumatic for the power of transmission is the later technology and it has the scope to dominate even in the future. All most the four wheelers have the pneumatic jack for the usage in repairing and reconditioning, but the light vehicles uses only manual pneumatic jack in which it is laborious to use, and also requires the manual impact force.

And the one and only predictable solution to this problem is the usage of electric and automatic pneumatic jack. which does not any of the mechanical and impact force and only require the power from the battery used in the car using the travel and if not external power supply is available, and also be in garages, from the power supply line connection.

Thus the aim of this project is to design a pneumatic jack that uses gear arrangement to transfer the motion by availing the power from the cars battery and raising the cars to certain height without any manual work. And perform the repairing are replacing action and reaching the required destination.

1.1 Modeling Of The Quick Lifting Pmeumatic Jack

Before reaching the appropriate design of the quick lifting jack with gear arrangement, one has to understand about the basic functionalities of a hydraulic jack. The hydraulic jack is a device used for lifting heavy loads by the application of much smaller forces. It is based on Pascal's law, which states that when fluid is a rest in a closed vessel and a certain amount of pressure is applied at any point on the surface. The pressure will be uniformly transmitted in all directions simultaneously .

The purpose of the jack is used to lift heavy loads are applied great forces. The jack employs screw thread are pneumatic cylinder In order to apply a very high linear force. A mechanical jack is a device which lifts heavy equipment. The most common form is a cylinder jack, floor jack or garage jack which lifts vehicles so that maintenance can be performed

More power jacks uses pneumatic power to provide more lift over greater distances. Mechanical jacks are usually rated for maximum lifting capacity from the pneumatic jack but it uses the normal power and suddenly it may dislocate from the position where is placed. Thus a typical pneumatic jack comprises as a hydraulic cylinder which consists of air medium to lift the vehicle to a particular height to the maintenance purpose.

The main design constraints associated with mechanical hydraulic jack is that is operates on manual impact force and requires time and energy expenditure, and also sometimes it becomes laborious work to worker working in the garages. After analyzing all these drawbacks the quick lifting hydraulic jack is designed.

A typical mechanical jack is used as the part of vehicle for the maintenance and the replacement of the tires when the need arises in the light vehicles. As already said this requires impact force and thus , to overcome this difficulties, the pneumatic jack with gear arrangement is designed in a economical way.

The four wheeler regularly has to maintained and reconditioned properly for the effective working the all the parts and also for the smooth driving. But on a journey the sudden puncture of the tires may arrive and if it has to be replaced by the driver or the worker in the garage through the mechanical floor jack it requires time and also impact the force is again.

Mostly this type of traditional screw jack that are manipulated with long cranks, pneumatic jacks use high pressure liquid displacement of lift cars. If employed properly, pneumatic car jacks are easy for more peoples and provide more power than ordinary, mechanical screw jacks

The most common use of this mechanical jack is for lifting heavy equipment. These jacks are used as a car jacks , floor jack are garage jack for lifting vehicle for its proper maintenance. While ordinary car jack use mechanical advantages to help lift a vehicle for maintenance, where ordinary car jacks use mechanical advantage to help lift the vehicle for maintenance, more powerful car jacks uses pneumatic cylinder to provide capacity for lifting higher loads over a greater capacity.

The jacks are rated on the basis of a maximum lifting capacity and generally mentioned in tons I.e.1.5 tons,3tons etc... These pneumatic car jacks uses pneumatic cylinder which is the vital part to rise are lower the pneumatic jacks lifting parts.

1.2 Purpose Of The Mechanical Jack

The main purpose of the typical mechanical jacks are,

- It is used to lift heavy load by applying the greater impact force.
- To lift the four wheeler through the mechanical strength.
- To maintain and reconditioning of the arrangements.

1.3 Purpose Of The Pneumatic Jack

The main purpose of the pneumatic jacks are,

- To provide capacity for lifting higher loads over a greater capacity.
- To lift the four wheeler through the usage of pneumatic power automatically
- To repair the parts and tires without applying any of the impact force.

II MAIN THEME OF OUR PROJECT

The purpose of this project is to design an quick lifting pneumatic jack using the power from the battery in car or using the power supply when it is to be utilized in the automobile garages. The principle behind this project is to make the work of the driver or the person who drives the car very easy when the tyres of at the vehicle gets punctured and also to replace the tyres considering the condition of the tyres.

The aim of this project is to design a pneumatic jack that uses gear arrangement to transfer the motion by availing the power from the cars battery and raising the car to a certain height without any manual work. And perform the repairing or replacing action and reaching the required destination.Now the project has mainly concentrated on this difficulty, and hence a suitable high

speed pneumatic jack has been designed. Such that the vehicles can be lifted from the floor land without application of any impact force. Fabrication part of it has been considered with almost case for its simplicity and economy, such that this can be accommodated as one of the essential tools on automobile garages.

2.1 Working Principle

After analyzing the disadvantages in mechanical screw jack, the quick lifting pneumatic jack is an innovative one in which it consists of the gear arrangement combination of worm wheel and the worm shaft. And this plays an significant role in motion transformation. Here the worm arrangement is used due to its high transmission ratio.

Thus the whole working model consists of various parts and arrangement and these various parts perform moron actions to lift the vehicle from flower land. In this model, the lead-acid battery is used to drive the dc motor. The dc motor shaft is connected to the worm with the help of the worm gear arrangement. If the power supply is to the arrangement, step down transformer converts electrical voltage from one level or phase configuration usually down to lower level. They can include features of electrical insolation, power distribution, and control and instrumentation applications. Thus this step down transformer reducer 220-230V to 12V, this is designed in such a way because the four wheeler's battery is 12V only.Thus this power is transmitted to the motor and gear arrangement attached in a conventional way. The connecting rod is connected to the shaft and so the rotating force over the small distance of the wheel becomes in its rotating force. Connecting rods may also convert rotating motion into linear motion.

The transfer of rotating force over a wide area, a supporting rod is fixed to connecting rod, which is joined through electrode welding to the particular length. This plays an significant role in the motion transference and transmission. This supporting rod is elongated to the oval shaped hand lever. This hand lever is one of the conventional form of lever used in pneumatic jack.

The small cylinder and piston arrangement consists of pneumatic air in its base. Thus when the required force is given through the layer, the piston moves up and down simultaneously. Thus the hydraulic oil (I.e petroleum based hydraulic oil) present inside the base container exerts a pressure inside the closed cylinder and produces force, due to which the pressurized fluid inside the small cylinder. Therefore larger force would be created in the larger cylinder and because of this layer area of the bigger cylinder, it provides larger mechanical advantage.Due to this larger mechanical advantage, the bigger hydraulic cylinder lifts the load placed on it easily by applying the principle of the pascal's law. And thus the load can be lifted up to the 2000kg i.e 2ton without any of the manual force through the lifting pad placed on the top of the piston. After the required work done on its reconditioning and maintenance, the piston can be brought down easily by lowering its pressure to a small extent, by twisting the small pressure reducing key slowly and piston

of the larger cylinder comes down frequently and thus the working is completed accordingly for the four wheeler.

2.2 Advantages

- To loaded the light vehicle can be easily lifted.
 - Checking and cleaning are easy.
 - Handling is easy.
 - Easy to repair.
 - Replacement of parts is easy.
 - No oil wastage.
 - Maximum height up to 1.2 feet can be reached.
- The moving parts of this system are cooled by the air itself used.
- Thus this project does not need any cooling arrangements.

2.3 Limitations

- Initial cost is high.
- High maintenance cost.
- Care must be taken for the handling the equipments such as proper wiring connection, air level check up etc.,

2.4 Applications

- Pharmaceuticals rubber stoppers moulding presses.
- Silicon key pads/parts moulding presses.
- Vacuum laminating compressor moulding presses for circuit board manufactures.
- rings moulding presses.
- Medical stopper moulding presses
- Shock absorber parts moulding presses
- Automatic rubber parts moulding presses
- It is very much useful for car owners and auto garages. This automatic electro pneumatic jack is used for lifting the vehicles.

thus this can used for the following types of vehicles;

1. maruthi
2. ambassador
3. fiat
4. mahindra
5. tata

III CONCLUSION

The fabrication of the model lifting jack with pneumatic arrangement has been completed successfully and efficiently and it is found to be good. The initial cost of our project is moderate to other costly pneumatic jacks used in various expensive cars. The objective of this project was to design a quick lifting pneumatic jack which was more efficient than the conventional screw jack used in light weight vehicles in productions today. The overall

results of the quick lifting pneumatic jack to lift the desired load ranging between 50 to 60kg is successful and can be used in light weight four wheelers under various emergency conditions.

Even though this pneumatic jack did not resemble the quality and characteristics of costly pneumatic jack used in expensive cars, it was enough to support the light weight four wheeler vehicles and small garages to use it for various maintenance and reconditioning significantly.

IV REFERENCES

1. Srinivasan.R, "Hydraulic and Pneumatic controls", Vijay Nicole, 2006.
2. Shanmugasundaram.K, "Hydraulic and Pneumatic controls", Chand & Co, 2006.
3. Majumdar S.R., "Pneumatic systems – Principles and maintenance", Tata McGraw Hill, 1995
4. Anthony Lal, "Oil hydraulics in the service of industry", Allied publishers, 1982.
5. Harry L. Stewart D.B, "Practical guide to fluid power", Taraoeala sons and Port Ltd. Broadey, 6. 1976.
7. Michael J, Prinches and Ashby J. G, "Power Hydraulics", Prentice Hall, 1989.
8. Dudelyt, A. Pease and John T. Pippenger, "Basic Fluid Power", Prentice Hall, 1987.