

INBUILT HYDRAULIC JACK WITH MASTER CYLINDER

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I. INTRODUCTION

About Hydraulic Jack

A hydraulic jack is a device used to lift heavy loads. The device itself is light, compact and portable, but is capable of exerting great force. The device pushes liquid against a piston; pressure is built in the jack's container. The jack is based on Pascal's law that the pressure of a liquid in a container is the same at all points.

A hydraulic jack is a jack that uses a liquid to push against a piston. This is based on Pascal's Principle. The principle states that pressure in a closed container is the same at all points. If there are two cylinders connected, applying force to the smaller cylinder will result in the same amount of pressure in the larger cylinder. However, since the larger cylinder has more area, the resulting force will be greater. In other words, an increase in area leads to an increase in force. The greater the difference in size between the two cylinders, the greater the increase in the force will be. A hydraulic jack operates based on this two cylinder system.

In the recent past there has been a significant increase in the use of hydraulics in our industries. The use of oil hydraulic systems as a means of power transmission in modern machines evolved a few decades earlier in the western world. But its applications in Indian industries are of comparatively recent choice and hence, there is great deal of urgency and importance to master the art of its applications and maintenance. Hydraulic systems are not extensively use in machine tools, material handling devices, transport and other mobile equipment, in aviation systems, etc.. At the moment there exists a big gap between the availability and requirement of skilled man power in this vital field of the modern engineering in India. To bridge the gap, it is essential that our design and application engineers and maintenance personnel from the lowest to the highest level are given extensive on job training so that operational efficiency and effectiveness of machineries using a hydraulic system as the prime source of power transmission can be maintained at an optimum level. Apart from the fluid power system designer, a good maintenance and millwright mechanic should also have first hand theoretical knowledge to enable him totackle practical problems encountered during installation, operation and maintenance of the hydraulic equipment. A jack is a mechanical device used to lift heavy loads or apply great forces. Jacks employ a screw thread or hydraulic cylinder to apply very high linear forces. A mechanical jack is a device which lifts heavy equipment. The most common form is a carjack, floor jack or garage jack which lifts vehicles so that maintenance can be performed. More powerful jacks use hydraulic power to provide more lift over greater distances. Mechanical jacks are usually rated for a maximum lifting capacity (for example, 1.5 tons or 3 tons).

Features

The jack uses compressible fluid, which is forced into a cylinder by a plunger. Oil is usually used for the liquid because it is self-lubricating and has stability compared with other liquids. When the plunger comes up, it pulls the liquid through a check valve suction pump. When the plunger is lowered again, it sends liquid through another valve into a cylinder. A ball used for suction in the cylinder shuts the cylinder and pressure builds up in the cylinder. The suction valve present in the jack opens at each draw of the plunger. The discharge valve, which is outside the jack, opens when oil is pushed into the cylinder. The pressure of the liquid enables the device to lift heavy loads.

Classification of Jack

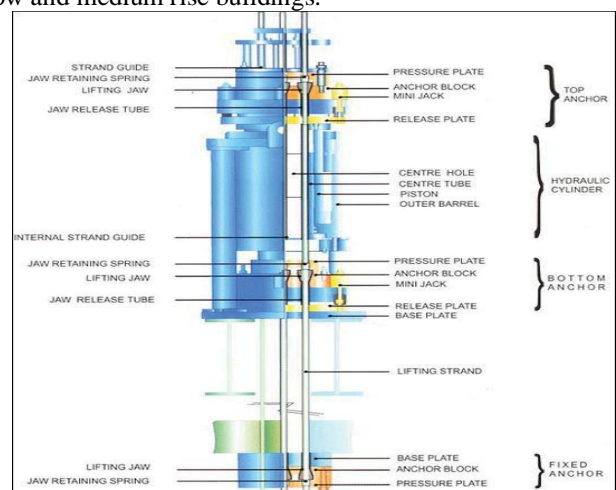
Mechanical Jack

A mechanical jack is a device which lifts heavy equipment. The most common form is a car jack, floor jack or garage jack which lifts vehicles so that maintenance can be performed.

Car jacks usually use Mechanical advantage to allow a human to lift a vehicle by manual force alone. More powerful jacks use hydraulic power to provide more lift over greater distances. Mechanical jacks are usually rated for a maximum lifting capacity (for example, 1.5 tons or 3 tons). The jack shown at the right is made for a modern vehicle and the notch fits into a hard point on a unibody. Earlier versions have a platform to lift on the vehicles' frame or axle.

Hydraulic Jack

Hydraulic jacks are typically used for shop work, rather than as an emergency jack to be carried with the vehicle. Use of jacks not designed for a specific vehicle requires more than the usual care in selecting ground conditions, the jacking point on the vehicle, and to ensure stability when the jack is extended. Hydraulic jacks are often used to lift elevators in low and medium rise buildings.



A hydraulic jack uses a fluid, which is incompressible, that is forced into a cylinder by a pump plunger. Oil is used since it is self lubricating and stable. When the plunger pulls back, it draws oil out of the reservoir through a suction check valve into the pump chamber. When the plunger moves forward, it pushes the oil through a discharge check valve into the cylinder. The suction valve ball is within the chamber and opens with each draw of the plunger. The discharge valve ball is outside the chamber and opens when the oil is pushed into the cylinder. At this point the suction ball within the chamber is forced shut and oil pressure builds in the cylinder. In a bottle jack the piston is vertical and directly supports a bearing pad that contacts the object being lifted. With a single action piston the lift is somewhat less than twice the collapsed height of the jack, making it suitable only for vehicles with a relatively high clearance. For lifting structures such as houses the hydraulic interconnection of multiple vertical jacks through valves enables the even distribution of forces while enabling close control of the lift.

Pneumatic jack

A pneumatic jack is a hydraulic jack that is actuated by compressed air - for example, air from a compressor instead of human work. This eliminates the need for the user to actuate the hydraulic mechanism, saving effort and potentially increasing speed. Sometimes, such jacks are also able to be operated by the normal hydraulic actuation method, thereby retaining functionality, even if a source of compressed air is not available.

A house jack, also called a screw jack is a mechanical device primarily used to lift houses from their foundation. A series of jacks are used and then wood cribbing temporarily supports the structure. This process is repeated until the desired height is reached. The house jack can be used for jacking carrying beams that have settled or for installing new structural beams. On the top of the jack is a cast iron circular pad that the 4" x 4" post is resting on. This pad moves independently of the house jack so that it does not turn as the acme-threaded rod is turned up of plumb

II. ADVANTAGES OF HYDRAULIC JACK

Safety First:

Hydraulic jacking System is one of the most safest mode to lift heavy loads, complete work is executed on ground level preventing risks of accidents. For decades, there has been not a single report that proves its credibility in being the safest and most likely method for the lifting load construction. The hydraulic jack systems has now gained a lot of popularity.

Easier In use:

Hydraulic jacks have the advantage of working quickly to raise or lower items..

Less limitations:

The maximum mechanical advantage possible for a hydraulic jack is not limited by the limitations on screw jacks and can be far greater.

Faster Erection:

The shell plates are erected at ground level in place of being installed at the height of about 30 feet or more, in order to save construction time required for the alignment of plates. The time and manpower needed for lifting the plates to the height is amputated. Construction work remains unaffected by snow or rain.

Self Locking:

An advantage of jackscrews over some other types of jack is that they are self-locking, which means when the rotational force on the screw is removed, it will remain motionless where it was left and will not rotate backwards, regardless of Load.

III. RESULTS

Advantages of this System

- The maintenance of vehicle will be very easy and cheap.
- This type of system is very useful for ladies and old people since during the problem of puncher of tyres, they can easily change the wheel.
- Time saving of maintenance
- This is also very useful for heavy vehicles such as trucks and buses, since there is a common problem of breaking leaf spring plates
- A single person can go on a long drive without worrying about getting stuck in the way.

Disadvantages of this System

- Cost will increase slightly.
- Weight of vehicle will increase slightly.

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