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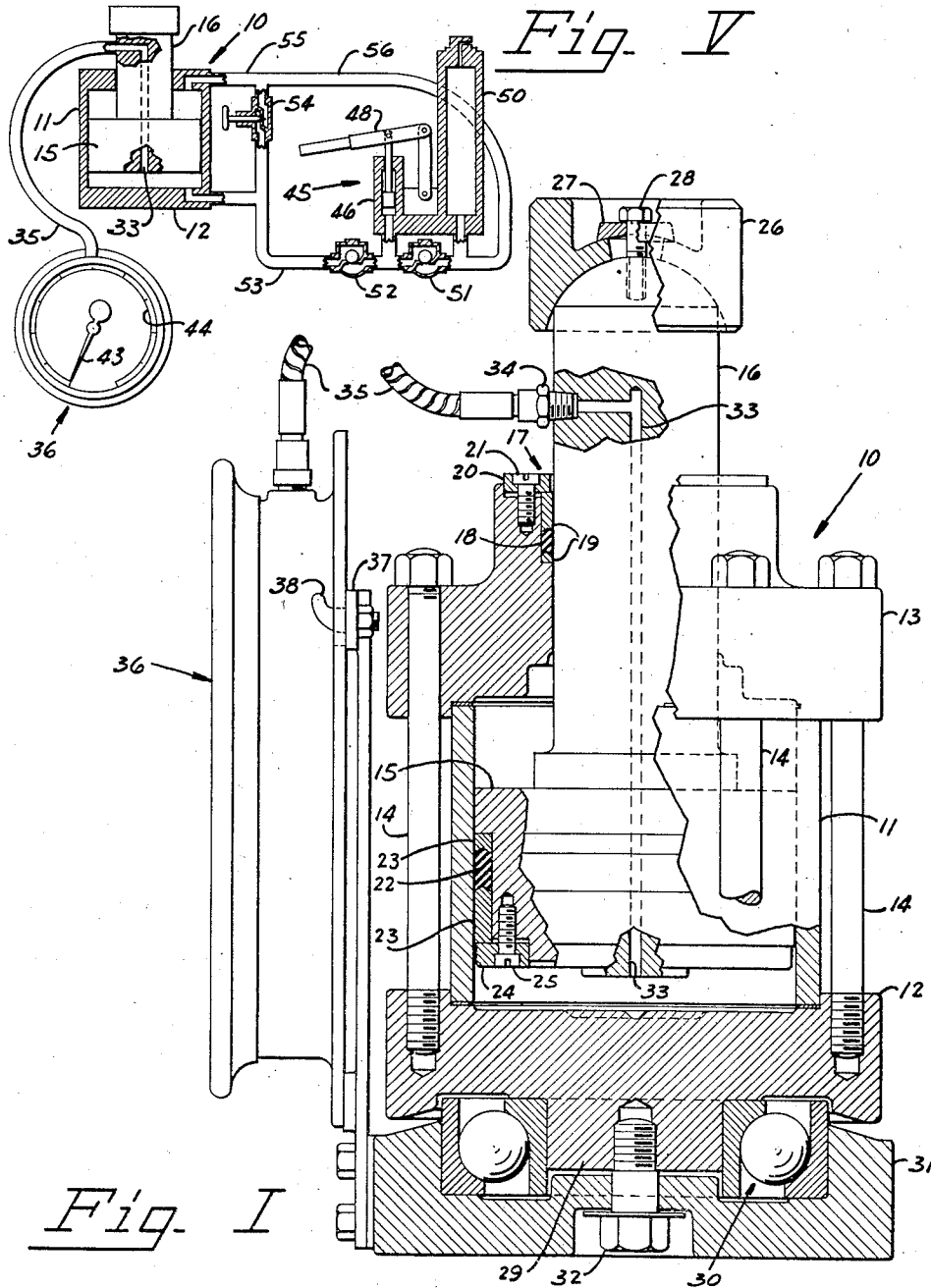
H. O. HEM

2,380,362

LOAD INDICATING HYDRAULIC JACK

Filed March 2, 1944

2 Sheets-Sheet 1



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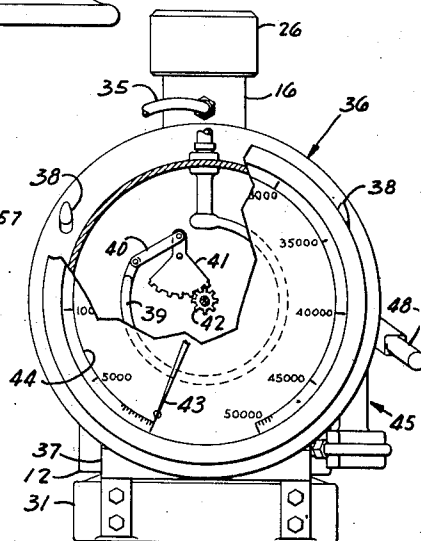
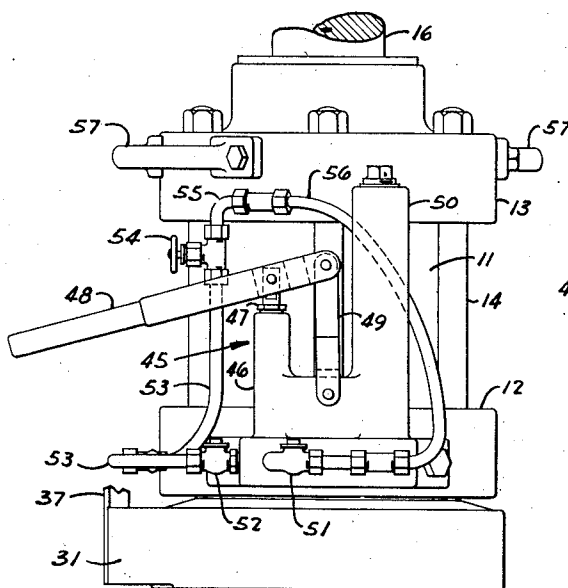
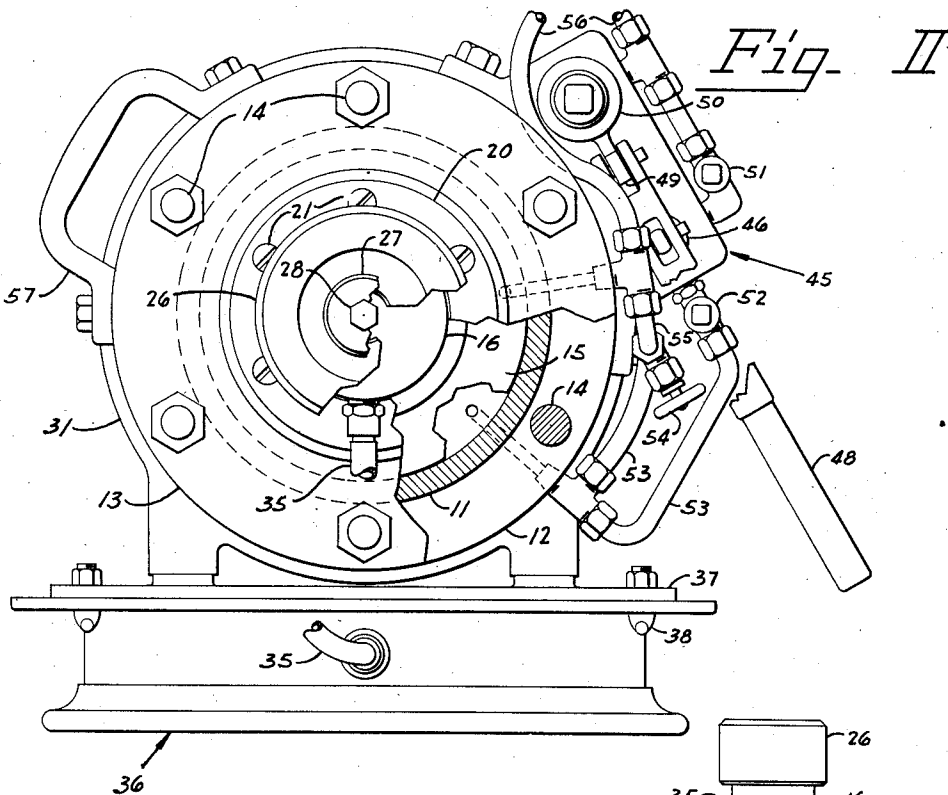
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UNITED STATES PATENT OFFICE

2,380,362

LOAD INDICATING HYDRAULIC JACK

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Application March 2, 1944, Serial No. 524,691

1 Claim. (Cl. 73—141)

This invention relates to hydraulic jacks and in particular to hydraulic jacks equipped with pressure gages to indicate the force exerted.

It has long been known that the pressure under a piston of a hydraulic jack is proportional to the force exerted by the jack. Some hydraulic jacks have been equipped with pressure gages to indicate this pressure and thus indicate the force exerted. In general these indications have not been precise because no attempt was made to reduce or eliminate the friction between the piston and the cylinder wall, or between the piston rod and the packing joint surrounding it. This friction either adds to or subtracts from the load as indicated by the hydraulic pressure depending upon whether the piston is being forced upward or allowed to slide downward.

The object of this invention is to increase the accuracy of the load indications taken from the pressure on a hydraulic jack by providing means to reduce or eliminate the effect of the friction between the piston and the cylinder and between the piston rod and the packing gland.

Another object is to provide a hydraulic jack with a rotatable base such that the body of the jack may be rotatably oscillated while the jack is supporting a load.

More specific objects and advantages are apparent from the following description in which reference is had to the accompanying drawings forming a part of this specification.

In the drawings:

Figure I is a side elevation, partly in section, showing a hydraulic jack incorporating the invention.

Figure II is a plan view, partly in section, of the hydraulic jack shown in Figure I.

Figure III is a side elevation showing the hydraulic pump attached to the jack.

Figure IV is an elevation, partly in section, of the pressure indicating gage.

Figure V is a schematic diagram of the hydraulic connections.

A simple hydraulic jack embodying the invention consists of a frame 10 which includes a cylinder 11 whose lower end is closed by a plate 12 and whose upper end is closed by a cylinder head 13. The plate 12 and cylinder head 13 are connected by a plurality of studs 14 which when tightened hold the cylinder 11 rigidly in place and apply pressure to seal the joints at its ends.

A piston 15, which is fitted into the cylinder 11, has a piston rod 16 extending upwardly through the cylinder head 13. Fluid is prevented from escaping along the piston rod 16 by a packing 17

comprising a resilient ring 18 located between clamping rings 19. A washer 20 surrounding the piston rod 16 is drawn down toward the cylinder head 13 by a plurality of cap screws 21 to cause the clamping rings 19 to exert pressure on the resilient ring 18 and thus cause it to effectively seal the space around the piston rod 16 without preventing axial motion thereof.

Leakage past the piston 15 in the cylinder 11 is prevented by a similar piston ring arrangement comprising a resilient ring 22 clamped between steel rings 23 which are held in place by a thick washer 24 secured to the piston body by a series of screws 25. When the screws 25 are tightened pressure is exerted on the resilient ring 22 causing it to expand radially and effectively seal the space between the piston 15 and the cylinder 11.

The upper end of the piston rod 16 is fitted with a shoe 26 which by means of a spherical seat between itself and the piston rod 16 is allowed freedom of motion to align itself with the surface against which force is to be applied. The shoe 26 is held in place by a retainer 27 and a cap screw 28 threaded into the piston rod 16.

The plate 12 which closes the bottom end of the cylinder 11 is provided on its under surface with an integral cylindrical tenon 29 which fits within the inner race of a combination radial and axial thrust ball bearing 30 whose outer race is fitted within a base member 31. Accidental disassembly of the ball bearing is prevented by a bolt 32 extending up through the base 31 and threaded into the tenon 29 of the cylinder plate 12. The ball bearing 30 allows the jack frame 10 to be rotatably oscillated even though there may be a load on the jack.

Hydraulic pressure under the piston 15 is transmitted through a hole 33 extending upwardly through the piston and piston rod, a side connection 34 and a flexible hose 35 to a pressure gage 36. For convenience a stand 37 is bolted to the side of the base 31 and at its upper end is provided with hooks 38 upon which the pressure gage 36 may be hung.

The pressure gage 36 is of the conventional "Bourdon" tube type wherein the hydraulic pressure tends to straighten a curved, elliptical cross-section, elastic tube 39 the motion of whose end is transmitted through a link 40, a sector 41 and a pinion 42 to an indicator 43 which cooperates with an annular chart 44 to indicate the magnitude of the pressure. The chart 44 is calibrated so that the graduations represent pounds force exerted by the hydraulic jack through the shoe 26.

Hydraulic pressure for raising the piston 15 is provided by a hand operated hydraulic pump 45 which includes a piston cylinder 46 enclosing a piston whose rod extends upwardly through a packing nut 47 and pivotally connects to an operating lever 48. The operating lever 48 is fulcrumed on a movable link 49 connected to the base of the hydraulic pump 45. A reservoir 50 is provided as storage for the hydraulic fluid not in use.

Referring to Figure V, which is a schematic diagram of the hydraulic system, manipulation of the lever 48 draws oil from the reservoir 50 through the first check valve 51 and forces it through a second check valve 52, a pipe 53 and the plate 12 into the space within the cylinder 11 under the piston 15. This causes the piston to rise in the cylinder and also causes the pressure to rise in proportion to the force being exerted. When it is desired to lower the piston a valve 54 is opened to allow the hydraulic fluid to flow from the under side of the piston through the pipe 53, the valve 54, a pipe 55 leading to the upper side of the piston and a pipe 56 leading to the reservoir 50. When force is exerted by the hydraulic pressure under the piston 15 that pressure is also communicated through the hole in the piston rod and the tube 35 to the pressure gage 36 which registers the amount of the force.

The indication of the pressure gage 36, which should be proportional to the force being exerted, may not be correct due to the friction between the resilient rings 18 and 22 and the piston rod

16 and piston 15 respectively. This frictional force is eliminated by a few rotary oscillations of the frame 10 produced by moving the operating lever 48 sideways or by grasping the handle 57 (Figure II) and oscillating the frame. The rotary motion of the cylinder does not increase or decrease the force with which the jack pushes against the load. It merely allows the piston to find its equilibrium position where the hydraulic pressure just balances the exerted force. With the effect of the friction removed the pressure gage 36 gives accurate indications of the forces exerted.

The hydraulic jack described constitutes in a portable, compact structure a high-precision, high-capacity weighing scale.

Having described the invention, I claim:

In a device of the class described, in combination, a hydraulic jack comprising a frame, a cylinder in said frame, a pump mounted on said frame and connected to the cylinder, a piston fitted in the cylinder including a piston rod to which loads may be applied, a pressure gage connected to indicate the pressure below the piston, an axial thrust bearing supporting said frame, and a base to receive the axial thrust bearing, a handle for said pump, said handle being adapted to move vertically to operate said pump and horizontally to oscillate said frame on said thrust bearing whereby the effect of the friction between the piston and the surrounding cylinder may be easily eliminated from the gage reading.

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