

Filed Nov. 14, 1950

HYDRAULIC JACK

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BY
H. J. Stevenson

Dec. 29, 1953

W. S. PINE
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2,664,073

Filed Nov. 14, 1950

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Fig. 4

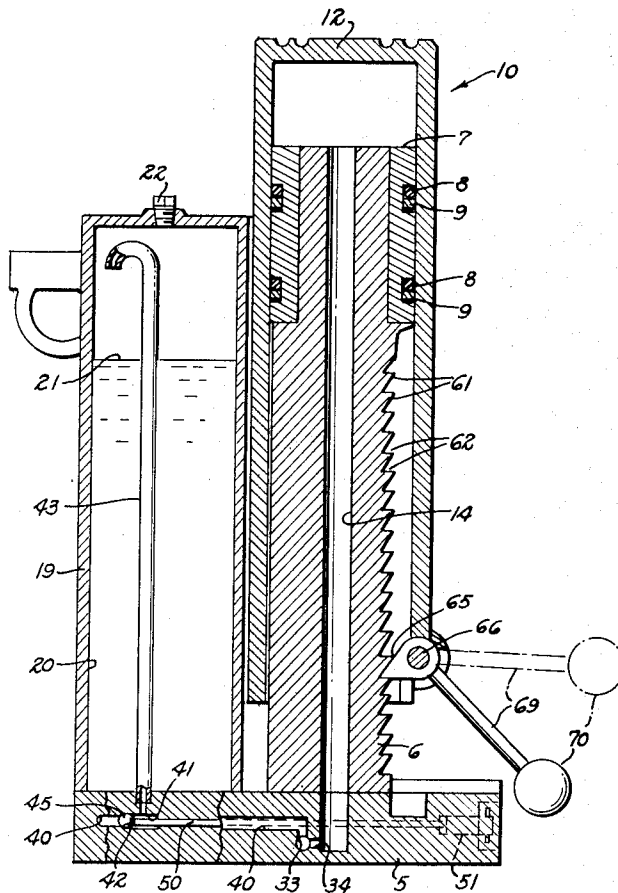
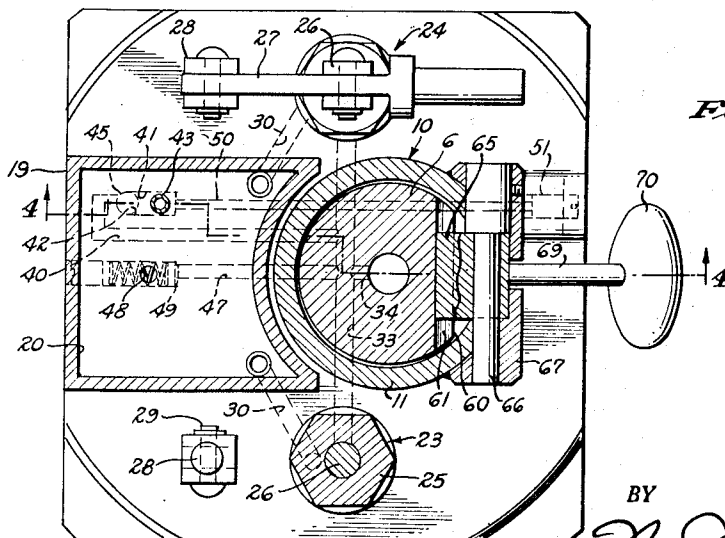


Fig. 3



INVENTOR.
WILLIAM S. PINE

BY

W. J. Stevenson

UNITED STATES PATENT OFFICE

2,664,073

HYDRAULIC JACK

William S. Pine, Los Angeles, Calif.

Application November 14, 1950, Serial No. 195,598

4 Claims. (Cl. 121-40)

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This invention relates generally to lifting devices, and particularly to a hydraulic jack for moving an object. Specifically, the invention pertains to a hydraulic jack of the lifting type having a base and a vertically movable ram.

One object of the invention is to provide a hydraulic jack which includes a base provided with a vertical post, at the upper end of which is a piston head, a cylindrical ram slidable vertically on the post and having an upper closed end, means for introducing pressure operating fluid between the piston and the closed end of the ram to force the latter upwardly, and locking means for releasably retaining the ram in selected vertical positions.

Another object is to provide a hydraulic jack in which the locking means consists of interengaging means on the ram and the post for positively holding the ram in different positions of axial adjustment.

A further object is to provide a jack, of the character referred to, in which the locking means comprises a plurality of longitudinally-spaced ratchet teeth on its periphery, and a weight-actuated pawl pivoted on the ram and engageable successively with the ratchet teeth as the ram is raised, so as to prevent accidental release and lowering of the ram in the event of failure of the hydraulic system.

A further object is to provide a hydraulic jack of the type indicated in which said ratchet teeth are formed at one side of the post, the bottom of the spaces between the teeth being straight and extending transversely of the post, and in which the pawl is pivoted on an axis extending parallel to said bottoms of the teeth, the pawl having a straight end adapted to engage said bottoms of the teeth so as to key the post and ram against relative rotation.

A still further object of the invention is to provide a hydraulic jack of the type specified which is highly efficient in operation, adapted for heavy duty, and one which can be employed with positive safety.

Further objects will appear from the following description and from the drawings, which are intended for the purpose of illustration only, and in which:

Fig. 1 is a perspective view of my improved hydraulic jack;

Fig. 2 is a side elevational view of the jack;

Fig. 3 is an enlarged sectional plan view, taken on line 3-3 of Fig. 2; and,

Fig. 4 is a vertical sectional view, taken on line 4-4 of Fig. 3.

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Referring to the drawings in detail, the present improvements are shown as embodied in a hydraulic jack of the lifter type disclosed in my copending application for patent on Hydraulic Jack, Serial No. 80,999, filed March 11, 1949, and now Patent No. 2,654,568, issued October 6, 1953. The jack includes a flat base 5 adapted to rest upon a floor or other supporting surface. An upright or post 6 is welded or otherwise suitably secured to and projects upwardly from the base and has its upper end reduced in diameter to receive a piston head 7, the head having peripheral grooves in which are disposed sealing rings 8 and 9. A cylindrical ram 10 has a tubular portion 11 slidable axially on the post 6, the ram also having an upper end wall 12. The post 6 has an axial bore 14 through which pressure operating fluid can be forced upwardly between the upper end of the piston head 7 and the end wall 12 of the ram 10 so as to force the ram upwardly to perform a lifting operation. The hydraulic fluid is introduced through the bore 14 by means to be next described.

Disposed alongside the post 6 is a vertical receptacle 19 having walls defining a reservoir 20 for containing a supply of hydraulic fluid 21, the receptacle having a filler plug 22. Actuating pumps 23 and 24 are disposed at the sides of the post 6, each pump including a cylinder 25 and a piston 26 slidable vertically therein. To the upper ends of the pistons 26 are pivotally connected operating levers 27 which are also pivotally connected to the upper ends of links 28, pivoted to the base at 29. The levers 27 have forwardly extending ends to which tubular handles, not shown, may be detachably connected. Upon the upward stroke of each piston 26, fluid is drawn from the bottom of the reservoir 20 through a passage 30 leading from the reservoir into the lower end of the cylinder 25. A ball check valve 31 is provided in each passage 30 for preventing flow of the fluid from the cylinder 25 back to the reservoir 20.

The lower end of each cylinder 25 communicates with the bore 14 of the post 6 by way of a transverse passage 33 and a port 34, a ball check valve 35 being disposed in the bottom of the cylinder 25 to prevent return of the fluid from the bore 14 into the cylinder 25 when the piston 26 is raised.

A return passage 40 connects with the transverse passage 33 and has an enlarged portion or chamber 41, the annular shoulder between the passage 40 and the chamber 41 providing a seat 42. A vertical tube 43 has its lower end in fluid

communication with the chamber 41, the tube extending upwardly within the reservoir 20 with its upper end disposed adjacent the upper end of the reservoir. A ball 45 is disposed within the chamber 41 and is adapted to be forced against the seat 42 to close the return passage 40 so as to prevent return of fluid from the bore 14 to the reservoir 20 and thus trap the operating fluid within the bore 14 and the ram 10 to retain the latter in raised position. A pressure relief passage 47, extending from the transverse passage 33, communicates with the lower end of the reservoir 20 through a port 48. An adjustable spring-actuated valve disc 49 in the passage 47 is adapted to open when the fluid pressure in the system exceeds a predetermined value so as to reduce the pressure and thus prevent damage to the various components of the jack.

It will be apparent that when the ball 45 is seated by means of a locking stem 50 having a screw-threaded forward end 51, and one or both pumps 23 and 24 operated, alternately or simultaneously, fluid is drawn from the reservoir 20 and forced through the passage 33 into the bore 14 of the post and against the end wall 12 of the ram 10. The ram is thus forced upwardly to lift the object under which the jack is disposed. After the object has been raised to the desired height the pumping action is discontinued, and since the fluid is trapped in the post 6 by the ball valves 35 and 45 the ram 10 is retained in its raised position. When it is desired to lower the object the locking stem 50 is merely unscrewed, so as to allow the ball 45 to move away from its seat 42. By this action the operating fluid is permitted to flow from the bore 14, through the passages 33, 40 and the tube 43, into the reservoir 20.

The hydraulic jack described above is more or less conventional in construction. It is well known that such conventional hydraulic jacks are occasionally subject to failure due to escape of the operating fluid from the actuating cylinder or ram, or past the ball check valves. When this condition prevails the ram may descend, either slowly or rapidly, depending upon the rate of leakage of the fluid. Another disadvantage of hydraulic jacks of previous types is that the ram, which directly supports the object being lifted, is free to rotate and this frequently allows the supported object to shift with respect to the jack and causes upsetting of the jack. It has been stated that the important objects of the present invention are to provide means for positively locking the ram in selected positions of axial adjustment and for keying the ram against rotation with respect to the base of the jack so as to guard against both accidental lowering and rotation of the ram. This locking and keying means, which is embodied in a single instrumentality, is constructed and arranged as next described.

The stationary post 6 of the hydraulic jack is provided at its forward side with a flat surface 60 which is milled to provide a plurality of vertically-spaced ratchet teeth 61 having V-shaped spaces 62 therebetween. Adapted to engage in the tooth spaces 62 is the pointed end of a pawl 65 which is pivoted on a pin 66 carried by a bifurcated boss 67 at the forward side of the lower end of the ram 10, the pin extending parallel to the flat surface 60 of the post 6. The pawl is of such a size and is so positioned that a portion thereof will engage the flat surface 60 to prevent rotation of the cylinder with respect to the post even though the tooth engaging edge of the pawl 65 is out of engagement with the ratchet teeth 61.

Projecting forwardly from the pawl 65 is a handle 69 which carries a weighted knob 70 at its free end.

The weight 70 normally pivots the pawl 65 in clockwise direction, as viewed in Fig. 4, so that as the ram 10 is forced upwardly the pointed end of the pawl rides successively over the ratchet teeth. When the ram has been raised to the selected position, the pawl 65, due to its engagement with one of the ratchet teeth 61, locks the ram in its elevated position to prevent accidental lowering thereof. The pawl thus functions as a safety device.

When it is desired to lower the ram, the pawl is pivoted in counterclockwise direction by means of the handle 69, as indicated in broken lines in Figs. 2 and 4. To permit such pivotal movement of the pawl, the ram 10 may be raised slightly by means of a pump 23 or 24.

Referring to Fig. 3, it will be seen that due to the engagement of the straight end of the pawl 65 with the flat surface 60, or the straight bottom of a tooth space 62, the ram is keyed against rotation on the post 6 at all times.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is only illustrative and that the invention may be carried out by modified means.

I claim as my invention:

1. A hydraulic jack, comprising: a post having a piston at one end thereof and having longitudinally spaced ratchet teeth in its periphery, the bottom of the spaces between the teeth being straight and extending transversely of the post; the tops of the teeth being straight and providing a broken substantially flat surface; a cylindrical ram slidable axially on the post and having a closed end; means for introducing pressure operating fluid between said piston and said closed end of the ram to effect relative axial sliding movement of said post and said ram so as to extend the length of the jack; a pawl carried by said ram and pivoted on an axis parallel to said straight bottom of said tooth spaces, said pawl having a straight end engageable in successive tooth spaces during extension of the jack so as to lock said ram in selected positions of axial extension, engagement of said straight end of said pawl in said straight bottom of said tooth spaces serving to key said ram and said post against relative rotation; said pawl having a portion extending within the cylindrical outline of said post at all times, serving to prevent rotation of said ram regardless of the position of the straight end of the pawl and a weighted operating handle carried by said pawl and projecting radially and laterally from the pivotal axis thereof, said handle maintaining said pawl in engagement with said ratchet teeth and adapted, when raised to release said pawl from said teeth.

2. A hydraulic jack comprising a generally cylindrical post having a non-circular surface portion, ratchet teeth on said portion, a piston on one end of said post, a cylinder closed at one end and slideably received on said post and said piston, a member pivotally mounted on the open end of said cylinder having a body portion projecting inside the cylinder for contacting said non-circular portion of said post to prevent rotation, a pawl on the said body portion adapt-

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ed to engage said non-circular surface and the tip of said pawl releasably engaging said ratchet teeth for preventing movement of the cylinder in one direction, and means to force fluid between the closed end of said cylinder and said piston for causing movement of the piston in the opposite direction.

3. A hydraulic jack comprising a generally cylindrical post having a flat surface portion within the cylindrical outline, ratchet teeth in said surface portion, a piston on end of said post, a cylinder closed at one end and slidably received on said post and said piston, a member pivotally mounted on the open end of said cylinder having a body portion projecting inside the cylinder for contacting said flat surface portion of said post to prevent rotation, a pawl on said body portion adapted to engage said flat surface and the tip of said pawl releasably engaging said ratchet teeth for preventing movement of the cylinder in one direction, and means to force fluid between the closed end of said cylinder and said piston for causing movement of the piston in the opposite direction.

4. A hydraulic jack comprising a generally cylindrical post having a non-circular surface portion, one end of said post providing a piston, a cylinder closed at one end and slideably received on said post and said piston, a mem-

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ber movably mounted on the open end of said cylinder having a portion extending within the cylindrical outline of the post at all times adapted to engage said non-circular surface to prevent rotation of said cylinder at all times and an edge releasably engaging said surface for preventing movement of the cylinder in an axial direction, and means to force fluid between the closed end of the cylinder and the piston for causing movement of the piston in the opposite direction.

WILLIAM S. PINE.

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