April 12, 1949. H. A. LIGHTBURN 2,466,815

HYDRAULIC JACK

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FIG. 1

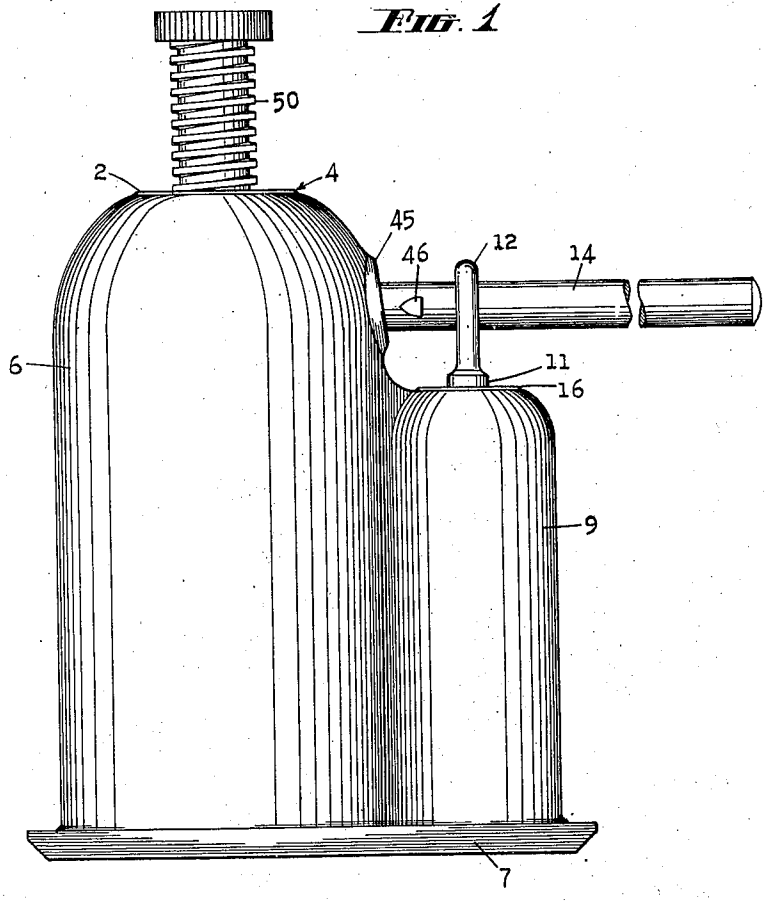
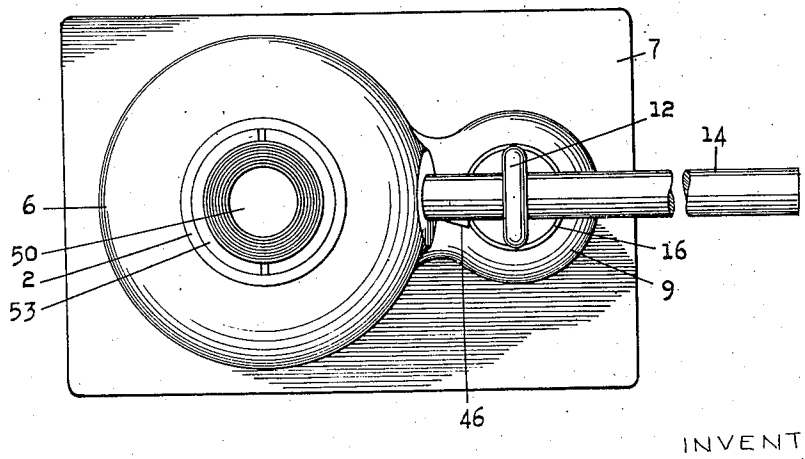



FIG. 2




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FIG. 3

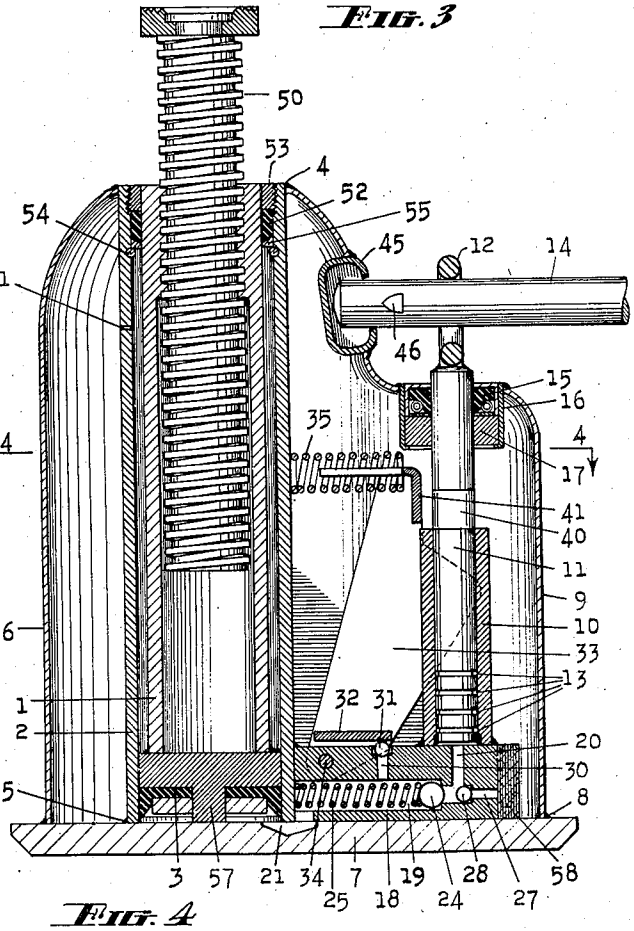



FIG. 5

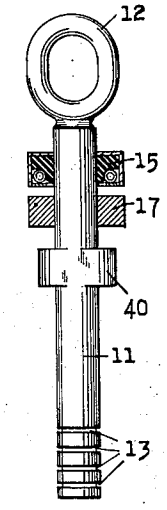
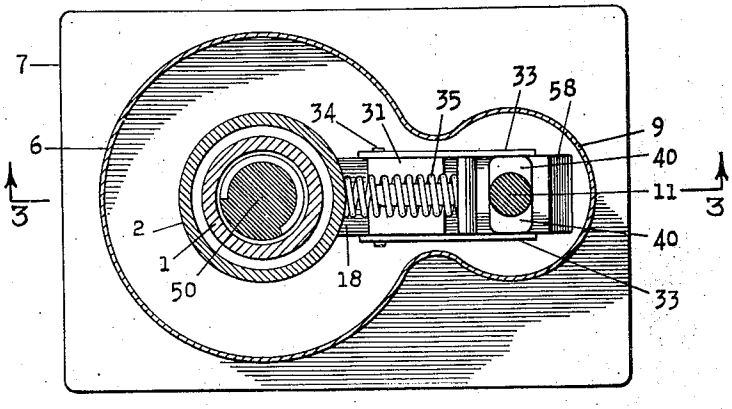



FIG. 4




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# UNITED STATES PATENT OFFICE

2,466,815

## HYDRAULIC JACK

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Application August 10, 1945, Serial No. 609,973
In Australia August 28, 1944

10 Claims. (Cl. 60—52)

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This invention relates to improvements in hydraulic jacks, and in particular it relates to improvements in the housing of jacks and to the control mechanism whereby the jack is actuated.

An object of the invention is to dispose the mechanism of the jack in an improved housing which will give a neat appearance and which will at the same time allow for the mechanism to be simply and effectively assembled, and which also forms an oil reservoir in which all working parts are immersed, a further object being the construction of the mechanism itself in such a manner that the jack can be located under its load, raised and lowered entirely by manipulation of the handle without removing the handle from the jack, the operating handle actuating the plunger which operates the ram of the jack and also the release whereby the ram is lowered as well as positioning the jack under the load.

The mechanism comprises a main ram cylinder in which is disposed the lifting ram, this cylinder being in communication with a valve block which carries the cylinder of the operating plunger, the handle which allows operation of the plunger being engaged in the main housing of the jack and being linked to the plunger in such a manner that up and down movement of the handle actuates the plunger but when the handle is partly withdrawn it may be actuated to remove the plunger to effect the release of a valve which allows the ram of the jack to be lowered by permitting the oil or other hydraulic fluid to be displaced from beneath the ram back into the housing which encloses the mechanism.

The housing itself is constructed to completely enclose the entire mechanism excepting the handle and the ram, and is preferably of all-welded construction so that the mechanism is sealed in when it has been assembled.

In order however that the invention may be more clearly understood it will now be described with reference to the accompanying drawings in which:

Fig. 1 is a side elevation of a hydraulic jack constructed according to this invention,

Fig. 2 is a plan of same,

Fig. 3 is a central vertical section through the jack, on line 3—3 of Fig. 4,

Fig. 4 is a sectional plan of the jack as on line 4—4 of Fig. 3, and

Fig. 5 is a sectional side elevation showing the plunger assembly.

The jack comprises a lifting ram 1 disposed in a cylinder 2 and provided with a cup washer 3 of any usual or approved construction.

The cylinder is welded at its top 4 and at its base 5 to its supporting means, these comprising a housing 6 upon a base plate 7, the housing being welded at 8 to the base plate 7.

The housing 6 has an integral extension 9 in which is disposed the cylinder 10 of the operating plunger pump, the plunger 11 having at its upper end a socket 12 into which the handle 14 of the jack is adapted to be engaged. The plunger 11 is of hardened steel and has labyrinth grooves 13 to minimise oil leakage.

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A hydraulic seal 15, which surrounds the top of the plunger 11, and which is rigidly secured in a socket 16 in the extension 9 of the housing 6, prevents egress of the hydraulic fluids at this locality. A guide block 17 in the socket 16 forms a guide for the plunger 11.

Secured upon the base plate 7 is a valve block 18 which has in it a main bore 19 through which the cylinder 10 is placed into communication with the inside of the cylinder 2, the path of the hydraulic fluid being through the channel 20 into the bore 19 and from the bore 19 through the channel 21 to the cylinder 2.

The bore 19 has at its inlet end a ball 24 which is arranged to prevent the hydraulic fluid from passing back from the cylinder 2 to the pump cylinder 10, the ball 24 being loaded by means of a spring 25 which tends to hold same on its seat.

A channel 27, which communicates with the channel 20, allows the hydraulic fluid to be drawn to beneath the piston 11, the channel 27 having within it a ball 28 which allows the flow of hydraulic fluid to take place only in an inward direction so that when the fluid is drawn into the cylinder 10 beneath the piston 11 it can only leave this space past the ball 24 to the cylinder 2. The channel 20 is elongated or duplicated to prevent the ball 28 from blocking the flow of liquid inward to the cylinder 10.

The bore 19 is also in communication with the inside of the housing 6 through a channel 30 which has in it a ball 31 arranged to allow the fluid from the cylinder 2 to lift same, but this ball 31 is normally held down on to its seating by the platform 32 of a lever 33 which is pivoted at 34 to the block 18. The platform 32 is formed as an integral part of the lever 33.

Disposed between the top of the lever 33 and the cylinder 2 is a spring 35 which normally maintains sufficient pressure on the lever to hold the ball 31 on to its seat so long as the pressure within the jack does not exceed a safe value. The spring causes the ball 31 to act as a safety valve to release the fluid from the pressure circuit when this pressure reaches the maximum permissible value.

Disposed upon the plunger 11 is a cam 40 which is adapted when the plunger 11 is turned about its axis, to engage a cam plate upon the lever 33 and to move this lever to release the pressure from the ball 31. The releasing of the pressure from the ball 31 allows the hydraulic fluid to be displaced from beneath the hydraulic ram 1, the fluid flowing through the channel 21 into the bore 19 and thence through the channel 30, past

the ball 31, back into the inside of the housing 6.

The handle 14, by means of which the plunger 11 is operated, has its end projecting into a socket 45 which takes the end of the lever and provides the reaction point for the operation of the plunger 11, the lever having on it a projection 46 which normally prevents same from being withdrawn through the member 12 upon the top of the plunger 11 but which allows this lever to be withdrawn when such lever is revolved to make the projection 46 coincide with the major axis of the member 12. The projection 46 allows the jack to be located and removed from beneath the vehicle by the handle 14.

To operate the cam 40 to engage the cam plate 41 upon the lever 33, the handle 14 is withdrawn from the socket 45, whereupon the handle 14, is free to be swung around to revolve the plunger 11 about its axis and thus bring the cam into engagement with the cam plate 41.

The hydraulic ram 1 is provided with an extension member 50 which may be adjusted to engage the means to be lifted prior to the raising of the ram 1.

An aperture 51 through the cylinder 2 allows the hydraulic fluid to leak from beneath the ram 1 when this has been raised to its fullest extent, the fluid passing from the cylinder 2 back into the inside of the housing 6 and thus to the main hydraulic fluid supply.

During construction the various parts are assembled on the base and are welded or otherwise secured into position, the housing 6 being placed over same and the unit entirely sealed, excepting that a threaded ring 53 is provided which allows the ram 1 to be inserted after assembly of the remaining parts, this ring allowing filling of the housing 6 with hydraulic fluid and also permitting replacement of the fluid at a later time.

A packing 52 of any suitable material is provided beneath the threaded ring 53. A spring clip 54 placed into an annular groove in the inside face of the cylinder 2, prevents the ram 1 from being withdrawn and also serves to locate a gland ring 55 which forms a support on which the packing may rest.

When it is desired to raise the ram 1 it is only necessary to actuate the handle 14 to reciprocate the plunger 11, this causing hydraulic fluid to be drawn through the channel 27 from the inside of the housing 6, such fluid passing beneath the plunger 11 and being ejected therefrom past the ball 24 into the bore 19 and then through the channel 21 into the base of the cylinder 2, the forcing of the hydraulic fluid into this cylinder 2 gradually raising the ram 1.

When it is desired to allow the ram to return, it is only necessary to manipulate the handle 14 to disengage its ends from the socket 45 whereupon the lever 33 can be swung back by revolving the plunger 11 to engage the cam 40 with the cam plate 41 upon the lever, this action compressing the spring 35 and bringing the platform 32 away from the ball 31 and thereby allowing the hydraulic fluid to return from the cylinder 2 through the channel 21 into the bore 19 and then through the channel 30 past the ball 31 back into the inside of the housing 6. Downward movement of the ram 1 is limited by the projection 57 which contacts with the base 7 of the jack. A filter 58, secured over the mouth of the channel 27, restrains any solids which might otherwise be drawn into the pressure circuit by the action of the plunger 11.



It will be noted that the plunger 11 is not provided with any cup washer but utilizes labyrinth grooves 13 to limit the leakage past the plunger, this arrangement giving better operation and preventing air locks commonly met with in hydraulic jacks.

What I claim is:

1. An improved hydraulic jack comprising; a housing arranged to contain a hydraulic liquid, a main cylinder within such housing, a lifting ram in the cylinder, a pump cylinder, a rotatable operating plunger in the pump cylinder, a socket on the housing, a socket on the plunger, a handle arranged to pass through the socket on the plunger and engage the socket on the housing to reciprocate the plunger but withdrawable from the socket on the housing to rotate the plunger, valve means to control the flow of the hydraulic fluid from the housing into the pump and main cylinder, a release valve, and means on the plunger to actuate the release valve when the plunger is revolved.

2. An improved hydraulic jack according to claim 1 characterised by stop means on the handle to limit withdrawal of the handle through the socket on the plunger.

3. An improved hydraulic jack comprising a housing arranged to contain a hydraulic liquid, a vertical main cylinder within said housing, a lifting ram slidable in said cylinder, a pump including a vertical pump cylinder, a plunger reciprocal and rotatable in said pump cylinder, and a handle for operating said plunger from the outside of said housing to reciprocate or rotate the same, a valve block in said housing joining said main cylinder to the pump cylinder at the lower ends of both said cylinders, said valve block having channels and valves to control the flow of the hydraulic liquid from said housing into said pump and main cylinder, a ball valve controlling a return passage from said main cylinder through said valve block into said housing and cooperating with a valve seat formed in said valve block, said ball valve being urged toward its open position by the hydraulic pressure in said main cylinder, a lever pivoted to said valve block and having a portion near its pivot point to cooperate, in one position of said lever, with said ball valve so as to keep the latter closed, a spring resting with one end thereof against said main cylinder and acting with its other end on a point of said lever remote from its pivot point to urge the lever into its valve closing position with a force sufficient to normally prevent opening of the ball valve unless the load acting on said ram exceeds a maximum permissible value whereby said ball valve operates as a safety valve, and cam means on said plunger arranged for cooperation with a portion of said lever remote from its pivot point to displace said lever positively from its valve closing position against the action of said spring when said plunger is rotated, whereby said return valve operates as a release valve.

4. An improved hydraulic jack comprising; a housing arranged to contain a hydraulic liquid, a main vertical cylinder within such housing, a lifting ram in the cylinder, a vertical pump cylinder, a rotatable operating plunger in the pump cylinder, a socket on the housing, a socket on the plunger, a handle arranged to pass through the socket on the plunger and engage the socket on the housing to reciprocate the plunger but withdrawable from the socket on the housing to rotate the plunger, a valve block joining the main cylinder to the pump cylinder, channels and

valves in the block to control the flow of the hydraulic liquid from the housing into the pump and main cylinder, a release valve in the block, and means on the plunger inside of the housing to actuate the release valve when the plunger is revolved.

5. An improved hydraulic jack comprising; a housing arranged to contain a hydraulic liquid, a main vertical cylinder within such housing, a lifting ram in the cylinder, a vertical pump cylinder, a plunger in the pump cylinder, a socket on the housing, a socket on the plunger, a handle arranged to pass through the socket on the plunger and engage the socket on the housing to reciprocate the plunger but withdrawable from the socket on the housing to rotate the plunger, a valve block joining the main cylinder to the pump cylinder, channels and valves in the block to control the flow of the hydraulic liquid from the housing into the pump and main cylinder, a release valve in the block, spring loading means for release valve to act as a safety valve, and cam means on the plunger inside of the housing to actuate the release valve when the plunger is revolved.

6. An improved hydraulic jack comprising; a housing arranged to contain a hydraulic liquid, a main vertical cylinder within such housing, a lifting ram in the cylinder, a vertical pump cylinder also in such housing, a rotatable operating plunger in the pump cylinder said plunger projecting from the housing, a handle, a socket on the housing in which to engage the handle, means on the plunger to slidably engage the handle said means allowing the plunger to be rotated by the handle when same is withdrawn from the socket on the housing, a valve block joining the main cylinder to the pump cylinder, channels in the block, ball valves to control the flow of the hydraulic liquid through the channels from the housing into the pump and main cylinder, a release valve in the block, and means on the plunger inside of the housing to actuate the release valve when the plunger is revolved.

7. An improved hydraulic jack comprising; a housing arranged to contain a hydraulic liquid, a main vertical cylinder within such housing, a lifting ram in the cylinder, a vertical pump cylinder also in such housing, a rotatable operating plunger in the pump cylinder said plunger projecting from the housing, a handle, a socket on the housing in which to engage the handle, means on the plunger to slidably engage the handle, said means allowing the plunger to be rotated by the handle when same is withdrawn from the socket on the housing, a valve block joining the main cylinder to the pump cylinder, channels in the block, ball valves to control the flow of hydraulic fluid through the channels from the housing into the pump and main cylinder, a release valve in the block, a member pivoted to the block in contact with the release valve, a spring between the pivoted member and the main cylinder to cause the release valve to act as a safety valve, and means on the plunger inside of the housing to displace the pivoted member against the action of the spring when the plunger is revolved.

8. An improved hydraulic jack comprising; a housing arranged to contain a hydraulic liquid, a base welded to the housing, a main cylinder within such housing welded to the base and housing, a lifting ram in the cylinder, a valve block on the base, a pump cylinder secured to the valve block and disposed within the housing, a plunger



in the pump cylinder projecting from the housing, a seal between the plunger and the housing, a socket on the housing, a socket on the plunger, a handle arranged to pass through the socket on the plunger and engage the socket on the housing to reciprocate the plunger but withdrawable from the socket on the housing to rotate the plunger, channels and valve means in the valve block to control the flow of the hydraulic liquid from the housing into the pump and main cylinder, a release valve also in the valve block, and cam means on the plunger inside of the housing to actuate the release valve when the plunger is revolved.

9. An improved hydraulic jack comprising: a housing arranged to contain a hydraulic liquid, a base welded to the housing, a main cylinder within such housing welded to the base and housing, a lifting ram in the cylinder, a valve block on the base, a pump cylinder secured to the valve block and disposed within the housing, a plunger in the pump cylinder projecting from the housing, a seal between the plunger and housing, a socket on the housing, a socket on the plunger, a handle arranged to pass through the socket on the plunger and engage the socket on the housing to reciprocate the plunger but withdrawable from the socket on the housing to rotate the plunger, channels and valve means in the valve block to control the flow of the hydraulic liquid from the housing into the pump and main cylinder, a release valve also in the block, spring loading means for the release valve to act as a safety valve, and cam means on the plunger inside of the housing to actuate the release valve when the plunger is revolved.

10. An improved hydraulic jack comprising; a housing arranged to contain a hydraulic liquid, a base welded to the housing, a main cylinder within such housing welded to the base and housing, a lifting ram in the cylinder, a valve block on the base, a pump cylinder secured to the valve block and disposed within the housing, a plunger in the pump cylinder projecting from the housing, a seal between the plunger and housing, cam means on the plunger, a socket on the housing, a socket on the plunger, a handle arranged to pass through the socket on the plunger and engage the socket on the housing to reciprocate the plunger but withdrawable from the socket on the housing to rotate the plunger, channels and ball valves in the block to control the flow of the hydraulic liquid from the housing into the pump and main cylinder, a ball release valve in the valve block, a pivoted member in contact with the release valve ball, said member being in the path of the cam means on the plunger, and spring means engaging the pivoted member to normally hold the ball valve closed.

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