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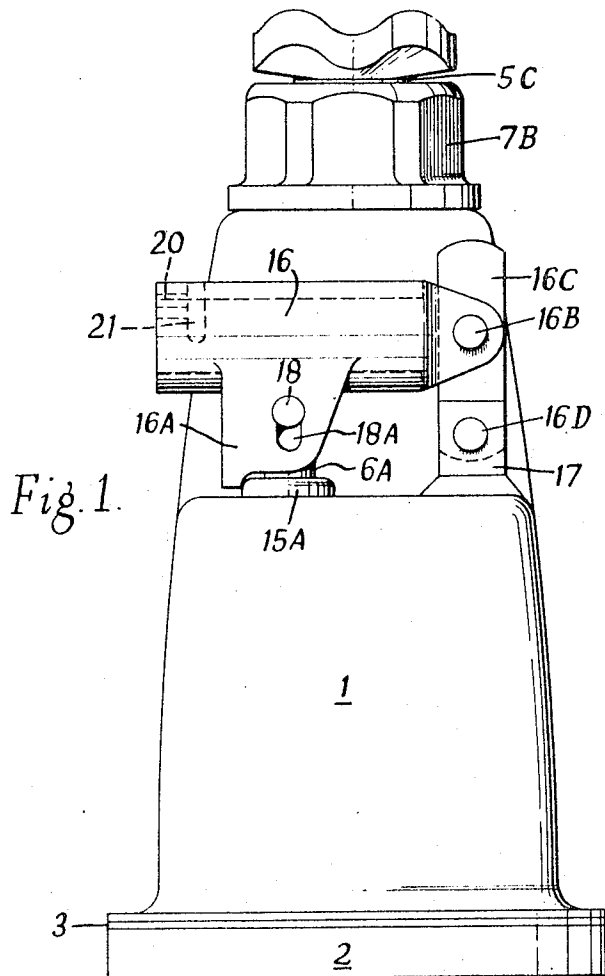
F. RUDKIN

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HYDRAULIC LIFTING JACK

Filed Dec. 14, 1967

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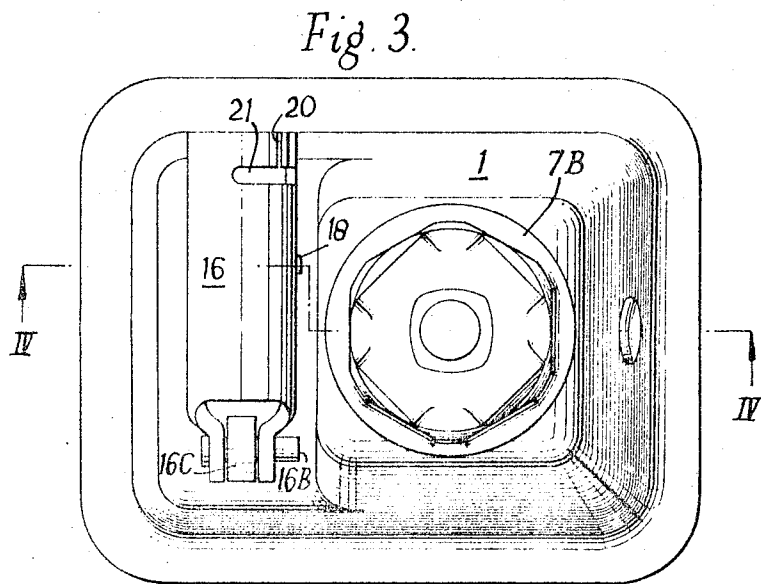
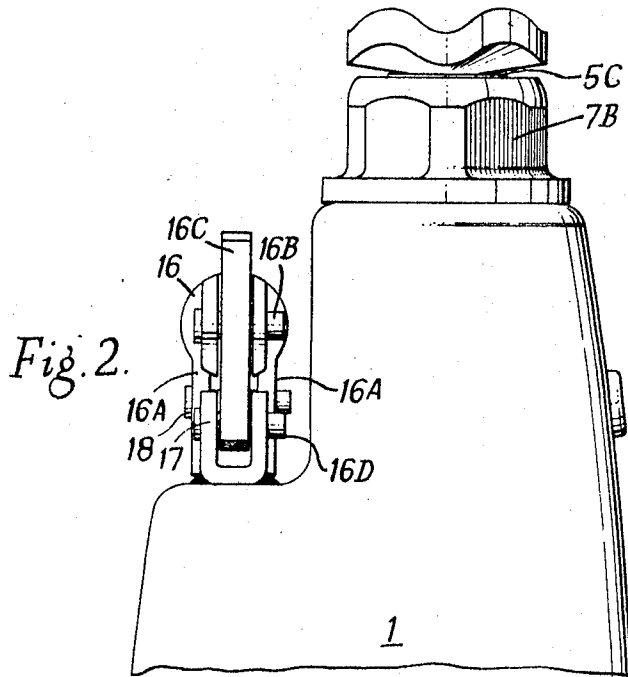
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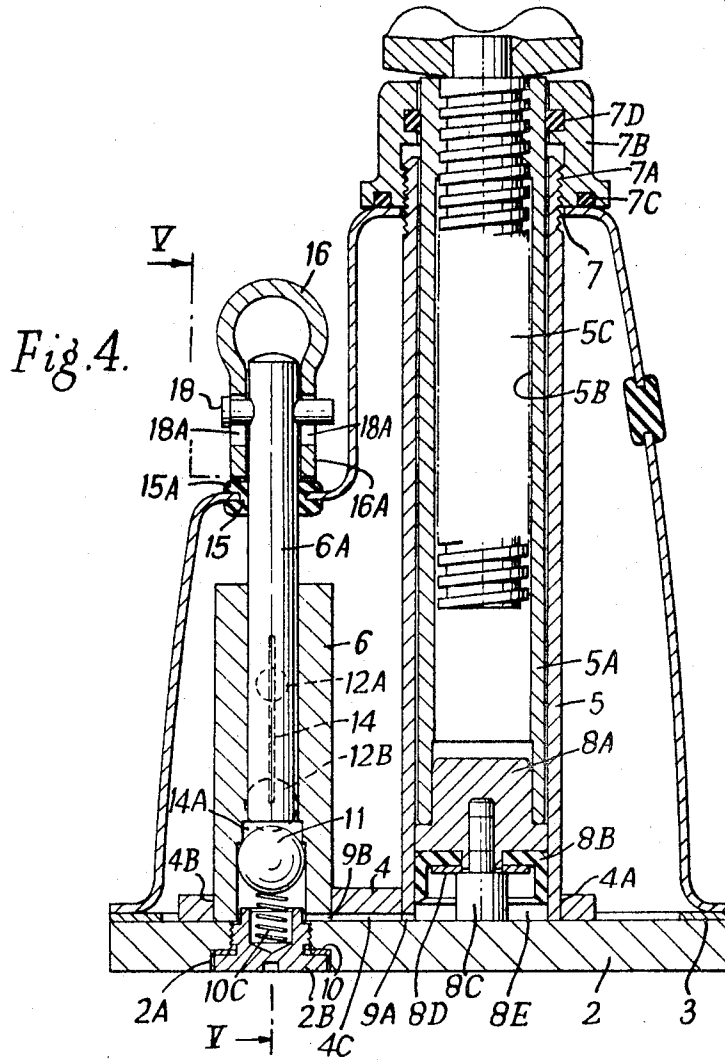
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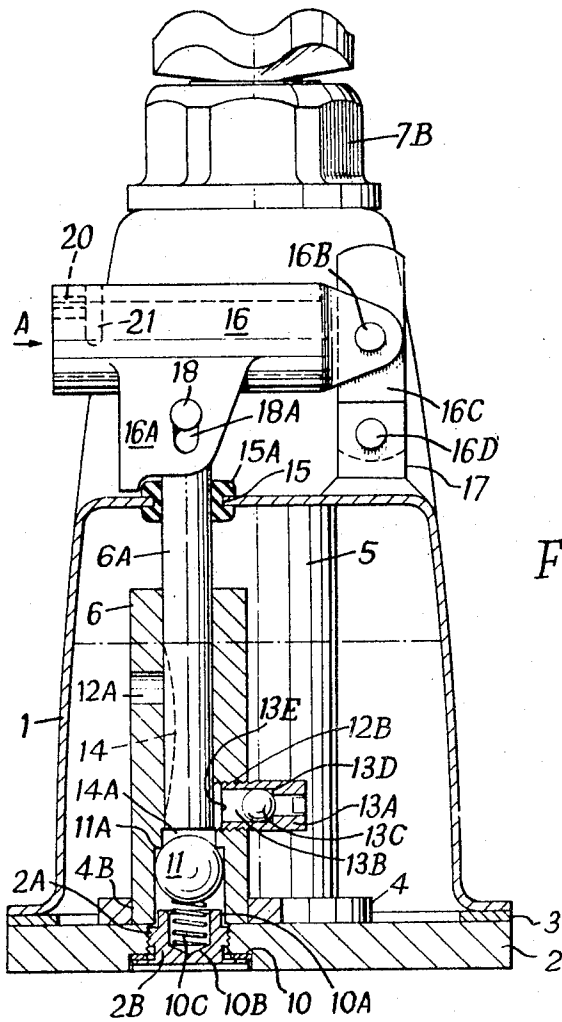
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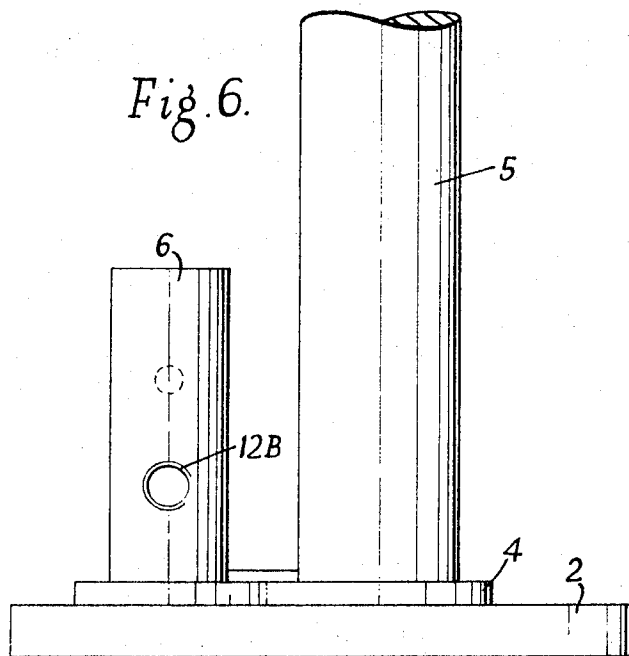
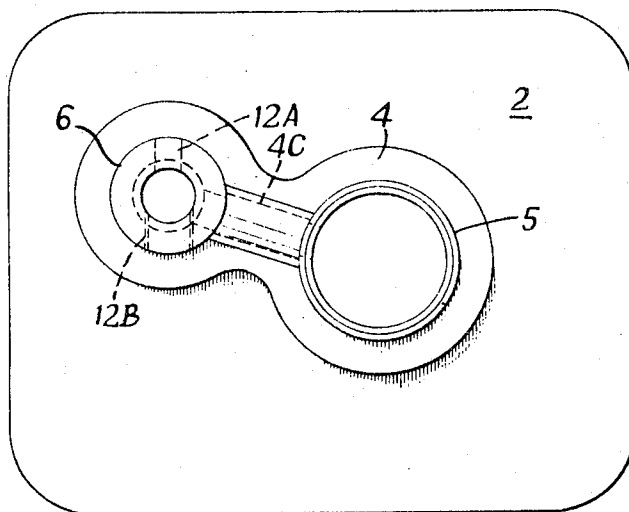


Fig. 8.



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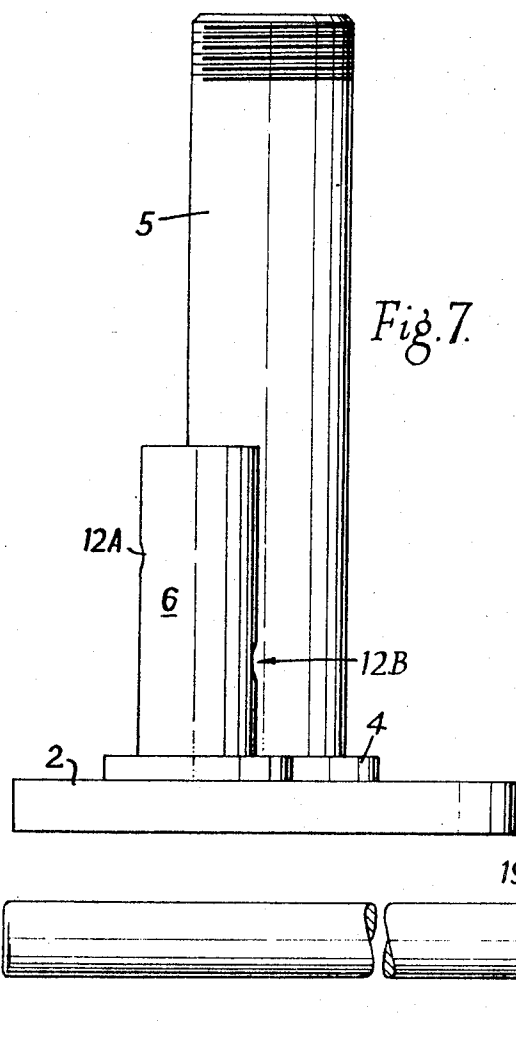


Fig. 7.

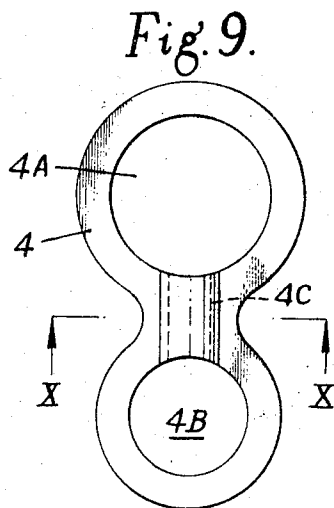


Fig. 9.

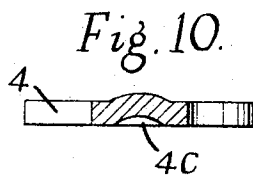


Fig. 10.

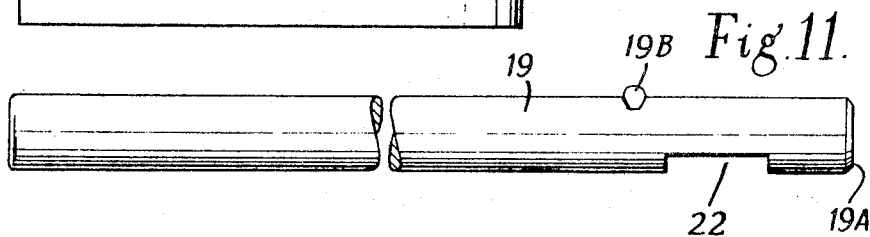


Fig. 11.

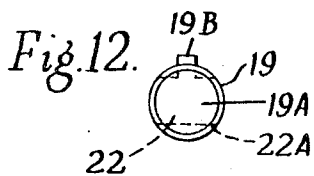


Fig. 12.

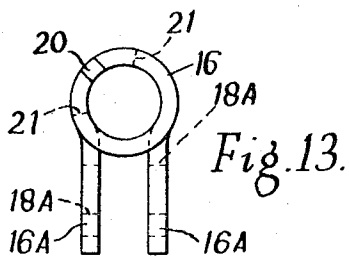


Fig. 13.

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HYDRAULIC LIFTING JACK

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Filed Dec. 14, 1967, Ser. No. 690,565

Int. Cl. F15b 15/18; F16h 41/00; B66f 3/38

U.S. Cl. 60—52

5 Claims

ABSTRACT OF THE DISCLOSURE

A lifting jack has a ram cylinder and an operating plunger housing upstanding on a base plate, and they are fixed on the base in spaced relation by a mounting plate fixed on the base and having two spaced bores, each receiving a respective one of the housing and the ram cylinder. A pressure fluid conduit between the plunger housing and the ram cylinder is constituted by the base plate and the mounting plate. Pressure release is obtained by axial rotation of an operating handle.

Background of the invention

This invention relates to hydraulic lifting jacks, of the general type in which an operating handle is manually stroked to activate a plunger, so that each power stroke causes pressure fluid, for example oil, to be forced into a ram-containing cylinder and thereby raise the ram gradually by small increments. A non-return valve prevents loss of pressure during the return strokes of the plunger.

This general type of jack has long been known, but in the past they have been constructed of parts that have required accurate and complex machining, and have been rather slow to assemble.

It is therefore an object of this invention to provide a jack of this general type which is made mainly of simple and inexpensive parts which either permit machining to be dispensed with, or reduce greatly the need for machining. Use of the mainly simple parts enables assembly to be made simple. Further, use of the mainly simple parts which can be simply assembled reduces the cost of manufacture of the jack.

Summary of the invention

According to this invention a hydraulic lifting jack comprises: a base; a hollow cover on the base; a mounting plate fixed on the base; two spaced bores in the mounting plate; an upstanding cylinder mounted in one bore; an upstanding housing mounted in the other bore; a ram movably mounted in the cylinder; and an operating plunger movably mounted in the housing.

Preferably a passage for conveying pressure medium between the cylinder and the housing is constituted by a groove in a face of the mounting plate in contact with the base plate, whereby the latter closes the groove to form the passage.

To render operation of the jack easier, the manually operable handle can serve not only for operating the plunger for pumping fluid, but also as a release member for releasing fluid pressure when the ram is to be lowered. Thus in accordance with this invention a jack may have a handle socket rockably mounted on the cover and operatively connected to the plunger, and an elongated handle having an axis and being insertible in a normal position in the socket, manual movement of the handle to and fro causing the socket to rock and the plunger to move to and fro between upper and lower pumping positions, and the handle being capable of axial rotation from the said normal position so that, in the lower position

of the handle, socket and plunger, the said axial rotation depresses the plunger beyond the said lower position whereby to release hydraulic pressure acting on the ram.

The invention also includes a method of making a hydraulic jack which method comprises the steps of: fixing a mounting plate on a base, the mounting plate having two spaced bores therein; mounting a cylinder in upstanding manner in one bore, the cylinder being adapted to mount a movable ram therein; mounting a housing in upstanding manner in the other bore, the housing being adapted to mount a movable operating plunger therein; and placing a hollow cover on the base.

Brief description of the drawings

FIGURE 1 is a side elevation;
 FIGURE 2 is a rear elevation as seen from the right of FIGURE 1;
 FIGURE 3 is a top plan;
 FIGURE 4 is a section on IV—IV of FIGURE 3;
 FIGURE 5 is a section on V—V of FIGURE 4;
 FIGURE 6 is an elevation of a partly assembled jack, corresponding to FIGURE 4;
 FIGURE 7 is an elevation of the partly assembled jack, corresponding to FIGURE 5;
 FIGURE 8 is a top plan of the partly assembled jack;
 FIGURE 9 is a top plan of a mounting plate;
 FIGURE 10 is a section on X—X of FIGURE 9;
 FIGURE 11 is a side elevation of an operating handle;
 FIGURE 12 is an end elevation of the handle; and
 FIGURE 13 is an end elevation of a handle socket, looking in the direction of arrow A of FIGURE 5.

Description of the preferred embodiment

A hollow body or cover 1 is mounted on a flat base plate 2 with an interposed gasket 3, this assembly providing a closed reservoir for the hydraulic fluid (oil) the approximate normal level of which is indicated by the dot-dash line in FIGURE 5. (The manner in which these parts are held together will be described below.)

The hollow body 1 is a simple steel pressing and the base plate 2 is a generally rectangular, flat steel plate bored at 2A to receive a screw-in plug 2B.

Welded or brazed on to the base plate 2 is a generally flat mounting plate 4 (FIGURES 8 to 10) which has two spaced bores 4A and 4B, the former being the larger, as shown. A pressed out groove 4C, together with the upper face of the base plate, constitutes a passage between the two bores 4A and 4B (see also FIGURE 4).

Fixed in the bores 4A, 4B and upstanding from the mounting plate 4 are respectively a cylinder 5 and a plunger housing 6 (FIGURES 6 to 8). In the cylinder 5 is slidably mounted a ram 5A in a threaded bore 5B of which is carried an axially rotatable extension screw 5C. In the plunger housing 6 is slidably mounted a plunger 6A. The cylinder 5 projects upwardly out of the body 1, through a hole 7. The upper portion of the cylinder 5 is externally threaded at 7A to receive a corresponding internally threaded cap or nut 7B. When the cap or nut is screwed home it presses down on the top of the body and clamps the assembly of body and base plate together. Sealing washers 7C, 7D prevent leakage of oil.

It will be seen that the main constructional parts of the jack are simple in themselves and simple to assemble, in contrast to known jacks in which expensive castings or stampings of complex shape are used, and which require expensive drilling operations to form bores and passages.

The assembly of cylinder 5, ram 5A and extension screw 5C is well known and need not be described in detail, except to indicate that the ram has a plug 8A, leather

cup 8B, ram pin 8C, and cup-retaining washer 8D. Below the cup 8B there is a space 8E within the cylinder 5 and when pressurized oil enters the space 8E, the ram is pushed upward gradually by increments.

The space 8E in communication with the interior of the plunger housing 6 through the passage 4C, slots 9A and 9B being formed respectively in the cylinder 5 and plunger housing 6 for this purpose (FIGURE 4).

The plug 2B is threaded into the bore 2A, a washer 10 preventing oil leakage. The plug has a reduced neck 10A (to permit oil to flow between the interior of the plunger housing 6 and the slot 2B) and a counterbore 10B in which is mounted a strong compression coil spring 10C. A sealing valve ball 11 is normally pressed into sealing contact with a shoulder 11A of the bore of the plunger housing 6. (In FIGURES 4 and 5 the parts are shown in rest or inoperative position and the small axial clearance between the ball 11 and the lower end of the plunger 6A will be noted.)

The plunger housing 6 has two ports, 12A and 12B (see also FIGURES 6 to 8) the latter being threaded to receive a suction valve body 13A which is bored at 13B to receive a ball 13C. The ball 13C normally abuts a seat 13D, closing the bore 13B. The ball 13C is retained by three upsets of the valve body 13A; one of these upsets is indicated by 13E.

An axial slot 14 is cut in the plunger 6A (FIGURES 4 and 5). In the normal rest position shown, the lower end of this slot is closed by the bore of the plunger housing 6 and the upper end of the slot communicates with the reservoir of oil in the hollow body 1, by way of the port 12A. As will be explained below, the plunger 6A can be pushed down from the normal rest position, whereby the lower end of the plunger depresses the ball 11 against the spring 10C, so that: (i) the ball no longer abuts the shoulder 11A, permitting flow of oil upward past the ball to an enlarged part 14A of the bore above the ball, and (ii) the lower end of the slot 14 communicates with the enlarged part 14A, thus permitting upward flow of oil from the enlarged part 14A through the slot 14 and port 12A to the reservoir of oil.

The pumping mechanism will now be explained.

As seen in FIGURES 4 and 5 the plunger 6A projects upwardly from the hollow body 1 through a sealing grommet 15A of rubber in a hole 15. It projects between depending arms 16A of a handle socket 16 which is pivotally mounted by a pin 16B on a link post 16C, itself pivotally mounted by a pin 16D in a bracket 17, of inverted U-shape, which is welded to the body 1, see FIGURES 1, 2 and 5. The plunger 6A is pivotally connected to the handle socket arms 16A by a pin 18 which rides in a pair of slots 18A. It will be seen that in the lower or rest position shown the pin 18 is at the upper ends of the slots 18A.

A removable operating handle 19 is shown in FIGURES 11 and 12. Its end 19A is inserted into the handle socket. A pressed-out ear 19B enters an axial slot 20 of the handle socket 16 (see FIGURES 1, 3, 5 and 13). This axial slot 20 terminates in a lateral slot 21 which extends in both directions from the inner end of the slot 20, over an arc of more than 90°, see FIGURE 13. When the handle has been pushed home in the socket, the ear 19B is in the slot 21 and the handle can be rotated about its axis in either direction. (It will be noted that the end 19A of the handle is chamfered; this enables the end 19A to ride over the top of the plunger 6A, which lies in the path of the handle, see FIGURE 4.)

The handle has a cut-out flat 22, diametrically opposite the ear 19B. When the handle is first inserted in the socket (which must be raised slightly from the lower or rest position) the ear 19B can only ride along the slot 20; this is at an angle of 45° to an axial vertical plane of the socket (see FIGURE 13), so that initially an edge 22A of the flat 22 engages the top of the plunger 6A, but

the flat coincides fully with the plunger top when the handle is fully inserted. Then the handle is rotated about its axis, to the right as would be seen in FIGURE 13, so that the ear 19B abuts the upper end of the slot 21 and lies in the axial vertical plane of the handle socket; in this position the flat 22 is at right angles to that plane, so that when the handle is fully depressed, the parts are in the rest position shown. If, however the handle be rotated about its axis to the lower end of the lateral slot 21, the flat 22 moves to a position parallel to the said axial vertical plane and is no longer in contact with the top of the plunger 6A; on the contrary, the full diameter of the handle has engaged the plunger top, causing the plunger to be depressed beyond the normal rest position, as has been mentioned above.

To operate the jack, it is placed below the object to be lifted; the extension screw is turned until contact is made with the object and the handle is then stroked to and fro, in known manner. On each up stroke the plunger 6A is lifted; a charge of oil is sucked in from the reservoir through bore 13B, past the ball 13C lifted off its seat, to the bore of the plunger housing 6 above the ball 11. On each down or power stroke of the handle and plunger the charge of oil pushes the ball 11 down against the spring 10C and passes via slot 9B, passage 4C and slot 9A to chamber 8E. Thus with successive strokes pressurized oil is forced into the chamber 8E and the ram 5E is pushed up gradually so that the object is lifted.

It is a very simple matter to release the pressure to lower the object. The handle, the down position of FIGURES 4 and 5, is rotated axially until the ear 19B is at the lower end of the slot 21 (i.e., to the left of the socket 16 as seen in FIGURE 13). As described above, the full diameter of the handle engages the top of the plunger 6A, which is depressed beyond the FIGURE 5 position. This produces over-riding of the non-return action of the ball 11, as mentioned above, and the oil can flow back through slot 9A, passage 4C, slot 9A, past ball 11 to space 14A, thence through slot 14 and port 12A to the reservoir.

It will be noted that the pair of slots 18A in the handle socket arms 16A permit the pin 18 to ride down when the plunger is depressed beyond the lower or rest position shown. The handle can be rotated until the ear 19B is in line with the axial slot 20, and then withdrawn from the socket.

What I claim is:

1. A hydraulic lifting jack comprising:

- a base;
- a hollow cover on the base;
- an upstanding cylinder mounted on the base;
- an upstanding housing mounted on the base;
- a connection for movement of hydraulic fluid from the cylinder to the housing;
- a ram movably mounted in the cylinder;
- an operating plunger movably mounted in the housing; and manually operable plunger reciprocating means operatively connected to the plunger for moving the plunger to and fro between normal upper and lower pumping positions characterized in that: (i) the plunger reciprocating means is capable of further movement to depress the plunger beyond the normal lower position; (ii) the plunger is formed with passage means and the housing is formed with an exhaust port; and (iii) the said further movement is such that the passage means will be placed in a position whereby pressure fluid can pass through the passage means and the exhaust port to release the hydraulic pressure acting on the ram.

2. A jack according to claim 1 having a handle socket rockably mounted on the cover and operatively connected to the plunger, and an elongated handle having an axis and being insertable in a normal position in the socket, manual movement of the handle to and fro causing the socket to rock and the plunger to move to and fro between said upper and lower pumping positions, and the

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handle being capable of axial rotation from the said normal position, the said axial rotation being the said further movement.

3. A jack according to claim 2 wherein the plunger projects upwardly from the housing and wherein the handle has a flat which in the said normal position engages the upper end of the plunger.

4. A jack according to claim 1 wherein the passage means is a groove in the plunger.

5. A jack according to claim 1 wherein a non-return valve is provided in the housing below the plunger, so that at each stroke of the plunger from the upper to the lower pumping position, pressure fluid passes the valve and

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thence through a passage to the cylinder, for raising the ram.

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