May 10, 1960 N. F. ATHERTON 2,935,851

HYDRAULIC PRESSURE APPLYING TOOL

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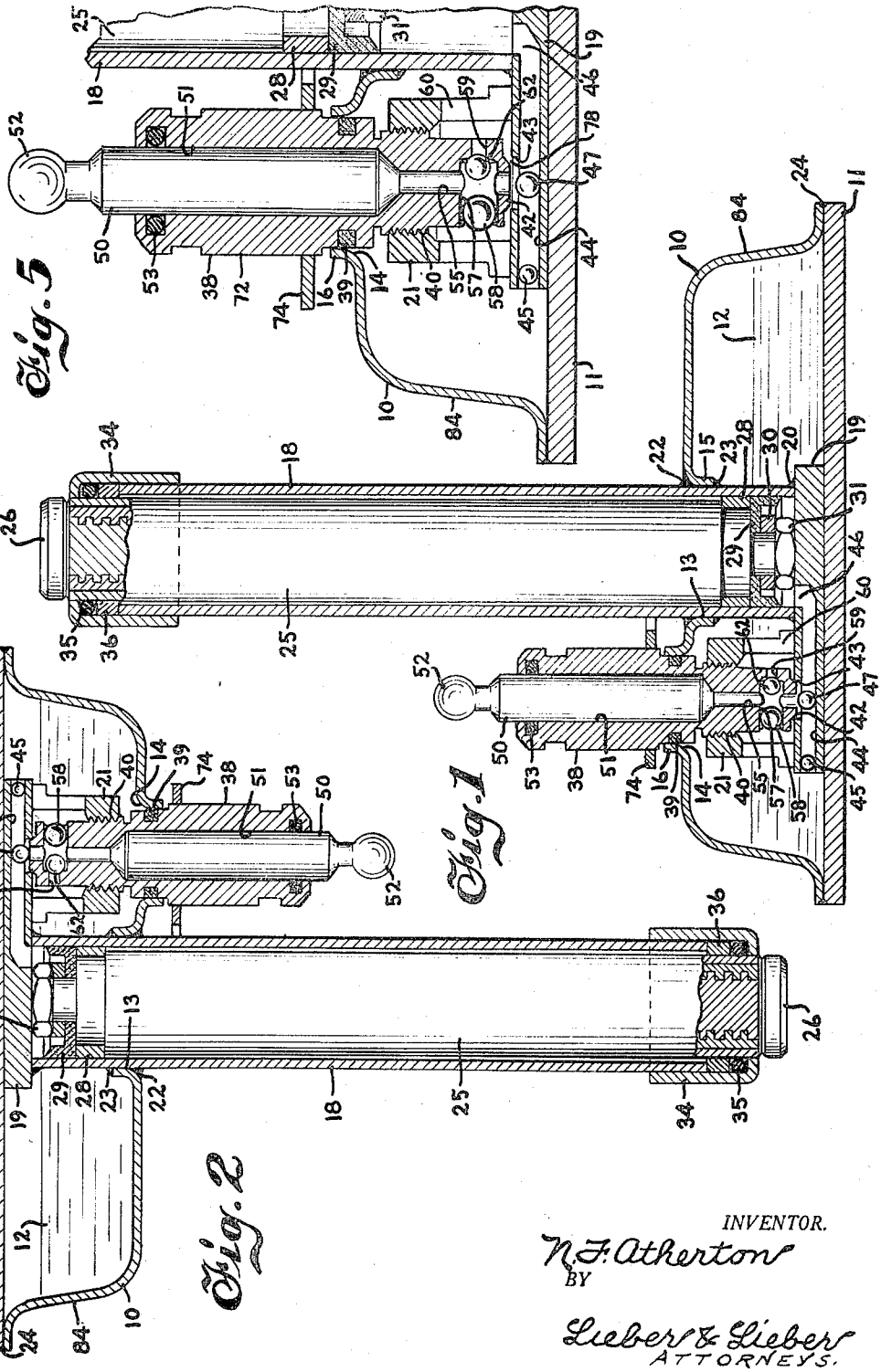


Fig. 5

Fig. 1

Fig. 2

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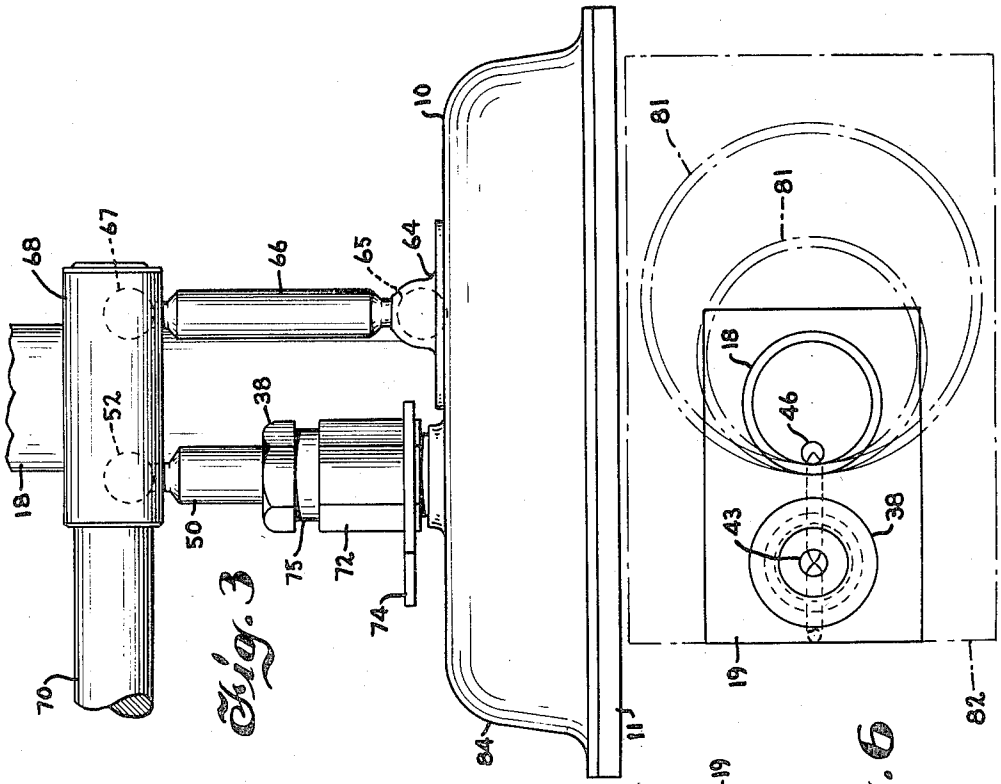


Fig. 3

Fig. 6

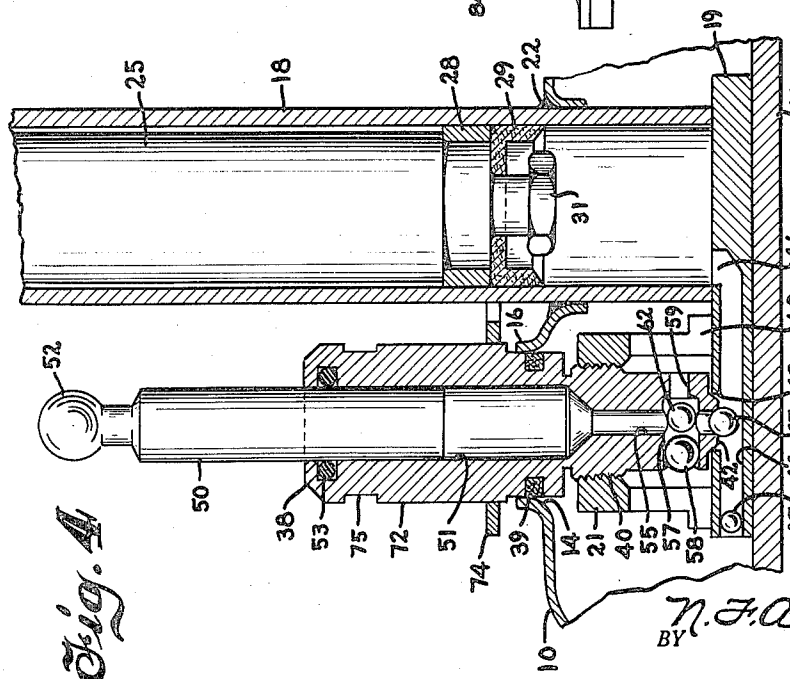


Fig. 4

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HYDRAULIC PRESSURE APPLYING TOOL

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2 Claims. (Cl. 60—52)

This invention relates to hydraulic pressure applying tools, such as hydraulic jacks, and in particular to improvements in the release valving therefor, and to the fabrication of such a jack.

Many uses for a jack of this type require a dependable but inexpensive unit which is expendable. They are expected to perform with somewhat the same efficiency as other jacks but must be produced in large volume at a minimum of cost to the user.

These jacks must frequently be capable of use in a variety of positions and must have a release valve which permits the jack to contract quickly. Such a valve should best be operative without the use of special or separate tools which often become mislaid or lost.

In accordance with this invention a jack has been provided which fulfills the above requirements.

Another object of the invention is to provide a jack which is very economical to manufacture and which utilizes a maximum number of common parts, consequently requiring minimum toolage, for various sizes of jacks.

Another object of the invention is to provide a hydraulic jack in which the entire pump for supplying pressure to the lifting cylinder may be quickly and easily moved to a fluid releasing position; thus serving as a release valve.

Other objects and advantages will appear hereinafter as this disclosure progresses, reference being had to the accompanying drawings in which:

Figure 1 is an elevational view, in section and with parts broken away and removed, of a jack made in accordance with this invention, and in the retracted position with the pump in the pressure delivering position.

Figure 2 is a view similar to Figure 1 but showing the jack as used in the inverted position.

Figure 3 is an enlarged fragmentary view in elevation of a portion of the jack and showing the pump actuating handle and linkage therefor.

Figure 4 is a fragmentary view, generally similar to Figure 1, but on an enlarged scale and showing the piston in the partially extended position.

Figure 5 is a view similar to Figure 4 but showing the pump moved, or "backed off" to the pressure releasing position.

Figure 6 is a plan view of the relationship between the pump and various sizes of cylinders useable therewith.

Referring more particularly to the drawings, a dish-shaped member 10 is welded around its periphery to the base plate 11 to form a housing for the unit and a reservoir for the fluid 12. The member 10 is stamped from sheet steel and has an opening 13 in its upper central portion and another opening 14 adjacent thereto. These openings 13, 14 are formed by a punching operation which also forms an annular flange 15, 16, respectively, therearound. The reservoir is rather flat in appearance, like a disk, the plate 11 forming the lower side and portion 10 forming the upper side. A pressure tube in the form of cylinder 18, formed from relatively thin tubular

stock, extends through opening 13 and has a transfer plate 19 welded to its lower end as at 20. A valve body standard 21 is rigidly secured, as by welding, to the upper side of transfer plate 19.

The dish-shaped member 10, transfer plate 19, cylinder 18 and valve body standard 21 are all secured together to form a unitary assembly. To assemble this unit, the valve body standard 21 is first welded to the transfer plate 19 and the latter is then welded to cylinder 18. Cylinder 18 is then inserted in position in opening 13 and welded therein, as at 22, 23. The base plate 11 may then be positioned over the downwardly open recess of the member 10 and the peripheral edge thereof is then welded to the member 10 as at 24.

A ram assembly 25 is reciprocatingly mounted within cylinder 18 and includes a load engaging saddle or pad 26 at its upper end, and a ram bearing 28, flexible ram cup 29 and retaining washer 30 secured by nut 31 at its lower end.

A cap top 34 is press-fitted over the upper end of cylinder 18 and holds the flexible ram wiper 35 and the steel ram stop ring 36 securely in place. An inwardly turned flange of the top 34 aids in guiding the ram. The top cap is press-fit to the cylinder so as to function as a safety relief device. If the pressure in the cylinder exceeds a pre-determined amount, the cap simply is blown off the cylinder. This would, of course, happen only on extremely rare occasions and is a valuable safety feature.

A pump body 38 extends through opening 14 and is in sealing relationship therewith by means of the sealing ring or packing 39. The body is threadably engaged as at 40 with the standard 21 and extends downwardly therethrough. At the lowermost end of the body is a beveled end or projection 42 which is adapted to seat in the aperture 43 in the transfer plate 19. A fluid passage in the form of bore 44 extends through plate 19 and places aperture 43 in fluid communication with the interior of cylinder 18 as at 46. Thus a conduit is formed between the cylinder and reservoir. A ball 45 is press-fit in the end of bore 44 to thereby seal the same. Ball 47 in bore 44 is located adjacent the valve projection 42 and permits flow of hydraulic fluid in only one direction, that is, into the cylinder, when the projection 42 is seated in the valve seat formed by aperture 43, as will more fully appear hereinafter.

A pump plunger 50 is reciprocatingly mounted in the cylinder 51 formed in the valve body and has a ball-like upper end 52. An O-ring seal 53 in a groove in the valve body acts to seal the plunger in the body.

A vertical bore 55 in the valve body connects the cylinder 51 with bore 44 of the transfer plate. Ball 47 is adapted to seat against the lower end of the bore 55 when the body 38 is screwed down into the pumping position and the plunger is not delivering fluid to the cylinder 18. In other words, the ball 47 acts to prevent return flow of fluid from the cylinder 18 to the reservoir and holds the ram in its load holding position.

A cross bore 57 extends partially through the valve body and has a ball 58 press-fit into its outer end to seal the latter. A smaller cross bore 59 connects the bore 57 with the fluid in the reservoir. Openings 60 in the standard permit free flow of fluid from the reservoir to bore 59. A ball 62 in bore 57 permits fluid flow from the reservoir into vertical bore 55 but prevents return flow from bore 57 through bore 59 by seating on the shoulder formed between bores 57 and 59.

The pump unit and the lifting cylinder are thus both mounted directly to the transfer plate which contains a connecting passage therebetween. This assembly is self-contained and rests directly on the baseplate, the latter requiring no machining or passageways.

The means for actuating the plunger 50 is shown in Figure 3 and includes a link retainer 64 secured to the top of member 10 and in which is swivelly mounted the ball end 65 of pump link 66. The upper end of link 66 is also formed as a ball 67. An adapter sleeve 68 swivelly receives the ball ends 67 of the link and 52 of the plunger. The actuating handle 70 to which sleeve 68 is attached is moved vertically about ball 67 as a pivot to pump the plunger up and down.

A major portion 72 of the length of the pump body is hexangular in cross section and over which is adapted to fit in mating relationship the release handle 74. A circular portion 75 is cut from the pump body and when the handle is moved to this circular portion it is free to turn without turning the pump body. By means of the handle 74 the body is turnable in the housing opening 14 and is thus raised up or down by means of its threaded connection to the standard 21.

As shown in Figure 1, the beveled projection at the lower end of the pump body is seated in the inlet aperture 43 in the transfer plate. By turning the handle a small abount, on the order of one quarter of a turn, the pump body can be raised to the release position shown in Figure 5.

When a downward pumping stroke is imparted to the plunger 50, the ball 62 seals bore 59 and fluid is forced out opening 43, through bore 44 and into the cylinder 18 to raise the ram. At the end of the downward stroke of the plunger, the pressure in cylinder 18 and bore 44 acts to seat ball 47 in bore 55. On the suction or upward stroke of the plunger; ball 62 unseats and fluid is sucked into cylinder 51 through bores 59, 57 and 55, thus recharging the pump for the next pumping stroke. The process is repeated until the ram has been extended the desired amount.

When it is desired to withdraw the ram into cylinder 18, the pump body 38 is given a slight turn by means of handle 74 so as to unscrew the threaded portion 40 slightly and thus raise the body to the position shown approximately in Figure 5. By this means a considerable opening 78 is quickly made between the beveled projection 42 and the opening 43 to release the fluid in cylinder 18 to the reservoir. The release arrangement is very simple with no additional levers or valves to get out of adjustment, the pump housing acting as a valve part.

Thus the transfer plate 19 provides a fluid passageway from the valve to the cylinder 18. The plate 19 also serves as a mounting plate for securing the cylinder 18, standard 21 and pump body thereto. Such an arrangement results in an economical structure which can readily be assembled.

As shown in Figure 6, various sizes of transfer plates may be used depending on the size of lifting cylinder. When a larger jack is required, for example one having a larger cylinder 81 as shown by the broken lines, then a correspondingly larger transfer plate 82 would be used. However, it will be noted that the distance between the aperture 43 and the opening 46 in the transfer plate 19 is the same regardless of the size cylinder and plate used. By maintaining this distance constant, common toolage, such as drilling jigs and fixtures, may be used for forming the fluid passage in the transfer plates. A common size pump unit including the standard 21 can be used for any size cylinder desired.

Attention is directed to the fact that the annular side wall 84 of the housing 10 is formed on a taper, in other words, the side slops upwardly and inwardly as shown in Figure 1. This construction permits the use of a smaller reservoir and still insures that the jack will be operative in either of the positions shown in Figures 1 and 2.

It will be noted that the inlet 59 for the pump is located below the horizontal centerline of the height of the reservoir, when the jack is in the position shown in Figure 1, and the level of the fluid is sufficiently high to insure

full extension of the ram 25 without the fluid level in the reservoir dropping below the pump inlet 59.

When the jack is inverted to the position shown in Figure 2, the pump inlet 59 is well above the horizontal centerline of the reservoir height. In order to be sure the inlet 59 is covered with fluid for any position of ram extension, the level of fluid must be considerably higher in the reservoir when the jack is inverted than when it is in the normal position of Figure 1. This is accomplished by having the upper portion of the reservoir of smaller cross-sectional area, for example, by tapering the sides upwardly and inwardly as shown. This results in being able to use a smaller reservoir and consequently one requiring less material to manufacture.

By means of this invention, an expendable tool is provided which is economical to manufacture and has a built-in safety feature. A release means is provided for quickly dumping the pressure fluid in the ram cylinder by means of a tool which cannot be forgotten or lost and is always ready for instant use. The jack is operative in either the normal or inverted position without the necessity of an exceptionally large reservoir.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

I claim:

1. A hydraulic pressure applying tool comprising, a housing formed by a base plate and a cap peripherally secured thereto to define a fluid reservoir, a separate fluid transfer plate seated against said base plate entirely within said reservoir, a pressure cylinder having one end secured to said transfer plate, said cylinder extending outwardly from said reservoir through said cap and being secured thereto, a hollow threaded spacer member secured to said transfer plate laterally of said cylinder, said spacer member being housed entirely within said reservoir and having side wall openings placing the interior thereof in direct communication with said reservoir, said transfer plate having a passageway therein communicating with said cylinder and with said reservoir through the side wall openings of said spacer member, and a pump body threadably received by said spacer member within said reservoir and having one end thereof normally seated against said transfer plate to shut off communication between the passageway in said transfer plate and said reservoir, said pump body extending outwardly from said reservoir through said cap and having sliding coaction therewith to permit positive longitudinal movement thereof upon rotation to and from seated fluid delivery position and pressure releasing position.

2. A hydraulic pressure applying tool comprising, a housing formed by a base plate and a cap peripherally secured thereto to define a fluid reservoir, a separate fluid transfer plate seated against said base plate entirely within said reservoir, a pressure cylinder having one end secured to said transfer plate, said cylinder extending outwardly from said reservoir through said cap and being secured thereto, a hollow threaded spacer member secured to said transfer plate laterally of said cylinder, said spacer member being housed entirely within said reservoir and having side wall openings placing the interior thereof in direct communication with said reservoir, said transfer plate having a passageway therein communicating with said cylinder and with said reservoir through the side wall openings of said spacer member, a pump body threadably received by said spacer member within said reservoir and having one end thereof normally seated against said transfer plate to shut off communication between the passageway in said transfer plate and said reservoir, said pump body extending outwardly from said reservoir through said cap and having sliding coaction therewith to permit positive longitudinal movement thereof upon rotation to and from seated fluid delivery position and pres-

sure releasing position, and a check ball confined in said transfer plate passageway by said normally seated end of said pump body.

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