Nov. 25, 1952 P. BIDIN 2,618,929

PORTABLE HYDRAULIC JACK WITH FILLING MEANS

Filed Oct. 24, 1949 2 SHEETS--SHEET 1

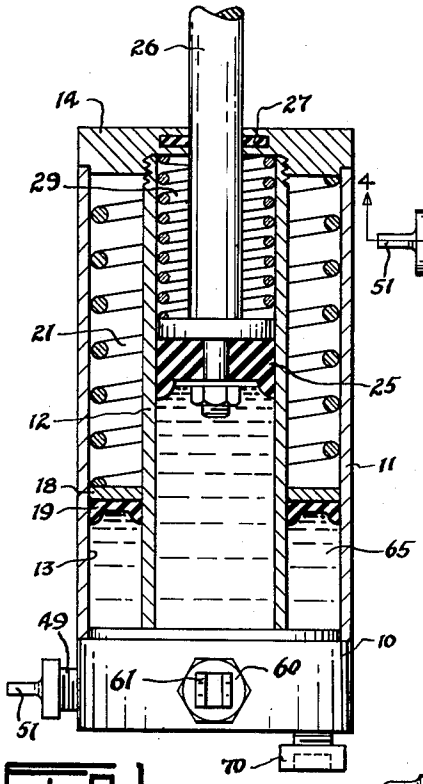


Fig. 1.

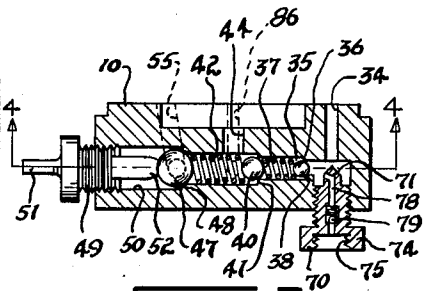


Fig. 2.

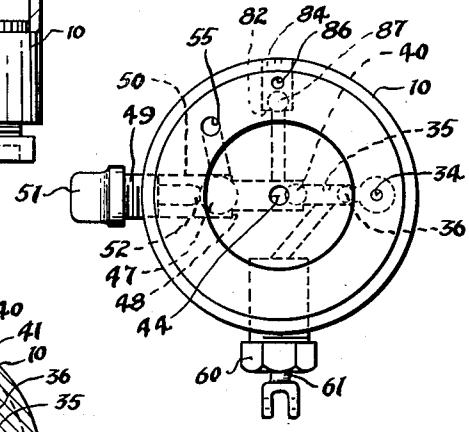


Fig. 3.

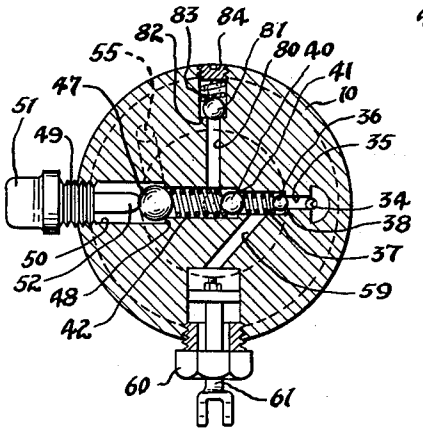


Fig. 4.

INVENTOR
PETER BIDIN
BY
Fetherstonhaugh & Co.
ATTORNEYS

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PORTABLE HYDRAULIC JACK WITH FILLING MEANS

Filed Oct. 24, 1949 2 SHEETS--SHEET 2

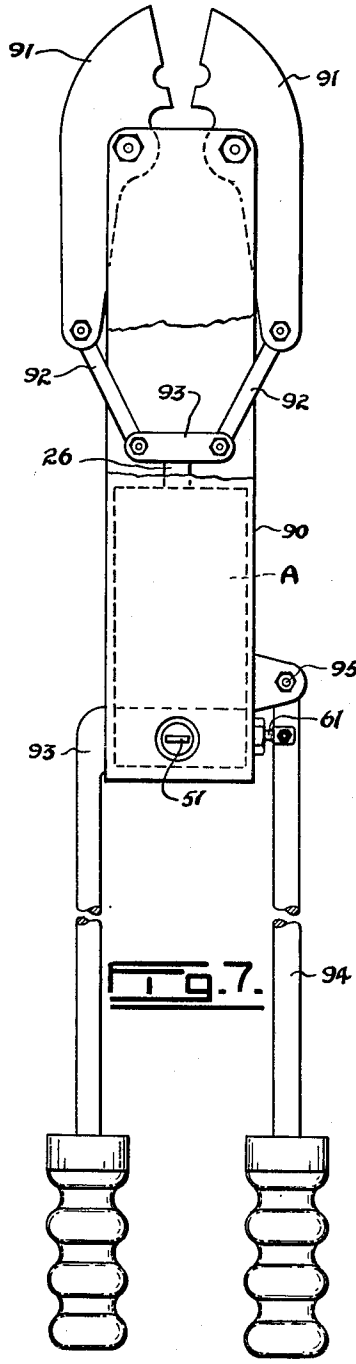


Fig. 7.

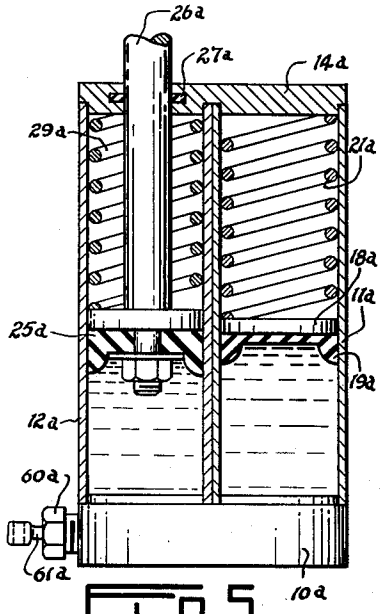


Fig. 5.

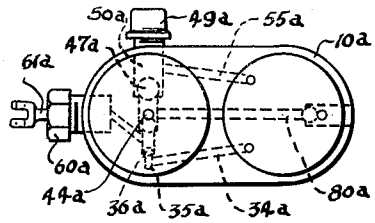


Fig. 6.

INVENTOR
PETER BIDIN
BY
Fetherstonhaugh & Co.
ATTORNEYS

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PORTABLE HYDRAULIC JACK WITH FILLING MEANS

Peter Bidin, Vancouver, British Columbia, Canada

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4 Claims. (Cl. 60—52)

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This invention relates to improvements in hydraulic jacks with filling means.

An object of the present invention is the provision of a portable hydraulic jack which is capable of operating in any position.

Another object is the provision of a hydraulic jack to be used in tools which may be operated in any position, that is, upside down or right side up or at any angle to the vertical.

There are many tools on the market which would be much simpler to operate if it were possible to use a hydraulic jack in them as a power unit. However, this has not been possible up to the present time since there has not been a jack available which could operate in any position. For example, there is a heavy cable cutter known as a "bull cutter." This cutter is actually a heavy pair of shears with very long handles in order to provide as much leverage as possible to cut through metal cables or bars. The tool is cumbersome or very difficult to operate but it has not been possible to use a hydraulic jack to operate cutting blades since the cutter is used in all positions and no jack has been available which would work upside down. There are many other tools in the same state as the bull cutters.

It is the main object of this invention to provide a jack which may be used in different types of tools. Furthermore, this jack can be made very small so that it can be used in comparatively small tools. The jack consists of a pair of cylinders, a piston in each cylinder, a piston rod connected to one piston and extending through the end of the cylinder, a pump connected to each of the cylinders, a hydraulic fluid filling the space between the pistons and through the pump, and means for constantly exerting pressure on the piston opposed to the one with the connecting rod. With this arrangement, the jack may be turned upside down and the means for exerting pressure on the piston opposed to the one with the connecting rod, keeps the pump supplied with the hydraulic fluid.

Examples of this invention are illustrated in the accompanying drawings, in which,

Figure 1 is a vertical section through the portable hydraulic jack with the base thereof shown in full,

Figure 2 is a vertical section through the base alone,

Figure 3 is a plan view of the base,

Figure 4 is a horizontal section taken on the line 4—4 of Figure 2,

Figure 5 illustrates an alternative form of the invention, partly in section,

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Figure 6 is a plan view of the base of the jack shown in Figure 5, and

Figure 7 illustrates the use of the jack in a pair of cutters.

Referring particularly to Figures 1 to 4 of the drawings, 10 is a base having a reservoir cylinder 11 mounted thereon. A working cylinder 12 is also mounted on the base within and spaced from the sides of the reservoir cylinder, the space between said cylinders forming a reservoir 13. A common cap 14 covers the outer ends of these cylinders.

A piston 18 is mounted in the reservoir cylinder and is slidable on the working cylinder. This piston may be provided with a packing ring 19 to prevent liquid from leaking between it and the outer and inner cylinders. A spring 21 lying between the cap 14 and the piston normally urges the latter towards the base.

A working piston 25 is mounted in the cylinder 12 and has a piston rod 26 connected thereto and extending outwardly from the cylinder through the cap 14. A sealing ring 27 may be provided in the cap for preventing fluid from passing therethrough around the piston rod. Spring means is provided either inside or outside the working cylinder for normally urging the piston 25 towards the base. In this form of the invention, a spring 29 is provided in the cylinder between the piston and the cap for this purpose.

The base 10 is provided with a supply passage 34 which extends downwardly from the reservoir 13 to a horizontal main passage 35, having a check valve 36 therein normally pressed by a spring 37 against a seat 38 located near the vertical passage spaced from the valve 36. Another check valve 40 is located in the passage 35 and is normally pressed against a seat 41 by a spring 42. A vertical pressure passage 44 extends from the horizontal passage on the side of the valve 40 remote from the valve 36 to the working cylinder 12. The spring 37 lies between the valves 36 and 40, while the spring 42 lies between the latter valve and another valve 47 normally held against a seat 48 by a plug 49 which is threaded into an enlarged portion 50 of the passage 35 and extends outwardly from the side of the base where it is provided with a handle 51 by means of which it may be turned. The plug is provided with a reduced tip 52 bearing against the valve 47. A return passage 55 extends from the enlarged portion 50 of the horizontal passage upwardly at an angle and opens into the reservoir 13.

A pump passage 59 extends from the portion of the passage 35 between the valves 36 and 40 to-

wards the side of the base and leads to a piston-type pump 60 carried by said base, said pump having a plunger arm 61 by means of which it is operated.

A hydraulic fluid 65 fills the space between the pistons 18 and 25 through the pump 60. In other words, this fluid fills the reservoir beneath the piston 18, vertical passage 34, horizontal passage 35, to the valve 47, passage 59, pump 60, passage 44, and the space between the piston 25 and the base.

Suitable means is provided for filling or replenishing the system with the hydraulic fluid. In this example, a plug 70 is threaded into the base in line with the passage 34 and has a tapered valve section 71 at its inner end which is adapted to close off said passage at the point where it joins the horizontal passage 35. The plug is formed with a head 74 at its outer end having an internally-threaded cylindrical recess 75 formed therein and opening outwardly through the head. A feeding passage 78 extends longitudinally of the plug and communicates at its inner end with the passage 35 and at its outer end with the recess 75. A check valve 79 is provided in this passage, said valve permitting fluid to move inwardly in the passage but not outwardly. The recess 75 is adapted to receive the threaded end of a can (not shown), containing fluid to be added to the system. The plug is normally screwed outwardly to free the valve 71 from the passage 34 so that the latter is in communication with the passage 35.

A pressure relief valve may be provided for this jack. For example, a horizontal passage 80 may extend outwardly through the base from the portion of the passage 35 between the valves 40 and 47 to the side of the base 10. A pressure relief valve 81 is normally pressed on to a seat 82 formed in this passage by means of a spring 83 extending between said valve and plug 84 threaded into the outer end of the passage. The tension on the spring may be adjusted by turning the plug in or out of the passage. A vertical passage 86 extends upwardly from the passage 80 to the reservoir 65, said passage 86 communicating with the passage 80 between the pressure valve and the plug 84.

When it is desired to move the piston rod 26 outwardly from its cylinder, the pump 60 is operated. On the suction stroke of the pump, fluid is drawn from the reservoir downwardly through passages 34, 35 and 59, the check valve 36 allowing this to take place. On the pressure stroke of the pump, valve 36 is closed and the fluid moves along the passages 59, 35 and 44 into the working cylinder 12 against the piston 25. The check valve 40 permits this, but it traps the fluid in the working cylinder, the passage 44, and the portion of the passage 35 between it and the valve 47, which is normally seated. This forms a hydraulic lock to prevent the piston rod from being moved back into the cylinder. The pump is operated until the piston rod has been moved outwardly as far as desired. As the spring 21 constantly presses the reservoir piston 18 against the fluid in the reservoir, this fluid is available to the pump regardless of the position of the jack. In other words, the jack may be turned upside down without affecting its operation.

When it is desired to move the piston rod 26 into the working cylinder, the plug 49 is turned by means of the handle 51 to allow the valve 47 to move off its seat. When this takes place, pressure on the piston rod and/or the spring 29 moves the piston 25 downwardly in the cylinder to force the fluid out through the passages 44, 35 and 55 back into the reservoir. When the piston is at the bottom of this cylinder or has moved inwardly thereof as far as desired, the plug 49 is turned to move the valve 47 back on to its seat.

If the pressure on the fluid in the working cylinder goes above a predetermined point, the relief valve 81 opens to permit fluid to return to the reservoir until the pressure drops below said point.

Figures 5 and 6 illustrate an alternative form of the invention. In this case, the working cylinder 12*a* is located outside the reservoir cylinder 11*a*. These cylinders are mounted on a common base 10*a*. In this example, a supply passage 34*a* extends from the reservoir cylinder to the passage 35*a* in the base beneath the working cylinder. Similarly, a return passage 55*a* extends from the portion 50*a* of the passage 35*a* to the reservoir cylinder.

The alternative of Figures 5 and 6 functions in the same manner as the jack illustrated in Figures 1 to 4, but it is not as compact as the latter.

Figure 7 illustrates a use of the jack. A hydraulic jack A of the type illustrated in Figure 1 is mounted within a support 90 having cutting blades 91 pivotally mounted on its outer end. The inner ends of these blades are connected by links 92 to a head 93 carried by the outer end of the piston rod 26. A handle 93 projects downwardly from one side of the support 90, while a corresponding handle 94 is pivotally mounted at 95 on the support and is connected adjacent its pivot point to the plunger 61 of the pump of the jack.

This tool is grasped by the handles 93 and 94, and the latter is swung back and forth on its pivot to actuate the pump of the jack. This forces the rod 26 outwardly to move the cutting edges of the blades 91 towards each other. When the handle 51 of the plug 49 is turned, the spring 29 forces the piston rod inwardly to move the cutting edges of the blades away from each other. If a larger spring is required than will fit within the working cylinder 12, a tension spring may be located between the cap 14 of the jack and the head 93. This cutting tool may be operated in any position. In other words, a person standing up can cut a cable or bar lying on the ground. This is made possible by the jack A.

What I claim as my invention is:

1. A portable hydraulic jack which may be used in any position, comprising a base, a reservoir cylinder mounted on the base, a piston in the reservoir cylinder, a spring normally urging the reservoir piston towards the base, a working cylinder mounted on the base on the same side thereof as the reservoir cylinder, a piston in the working cylinder, a piston rod extending from the piston through the end of the working cylinder, a main passage in the base extending in a plane substantially at right angles to the cylinders, a supply passage in the base extending from the reservoir cylinder to the main passage, a pressure passage extending from the working cylinder to the main passage at a point spaced from the supply passage, two spaced-apart check valves in the main passage between the supply and pressure passages, said valves opening towards the pressure passage, a piston-type pump connected to the main passage between the two check valves, a hydraulic fluid filling the space between the cylinder pistons through the passages and the pump, a feeding passage opening outwardly at one end from the base and communicating at its opposite end with the main passage between the valve therein nearest the

reservoir cylinder and the latter, and a check valve in the feeding passage opening towards the main passage.

2. A portable hydraulic jack which may be used in any position, comprising a base, a reservoir cylinder mounted on the base, a piston in the reservoir cylinder, a spring normally urging the reservoir piston towards the base, a working cylinder mounted on the base on the same side thereof as the reservoir cylinder, a piston in the working cylinder, a piston rod extending from the piston through the end of the working cylinder, a spring normally urging the working piston towards the base, a main passage in the base extending in a plane substantially at right angles to the cylinders, a supply passage in the base extending from the reservoir to the main passage at an angle to the latter, a pressure passage extending from the working cylinder to the main passage at a point spaced from the supply passage, two spaced-apart check valves in the main passage between the supply and pressure passages, said valves opening towards the pressure passage, a piston-type pump connected to the main passage between the two check valves, a hydraulic fluid filling the space between the cylinder pistons through the passages and the pump, a plug threaded into the base from a surface thereof in line with the supply passage, said plug having a valve section at its inner end to close off the supply passage when the plug is screwed far enough into the base, a feeding passage extending longitudinally through the plug opening outwardly at one end from the plug and communicating at its opposite end with the main passage between the valve therein nearest the supply passage and the latter, and a check valve in the feeding passage opening towards the main passage.

3. A portable hydraulic jack as claimed in claim 2 in which the plug is provided with a head at its outer end, said head having an internally-threaded cylindrical recess therein opening outwardly therefrom and communicating with the feeding passage.

4. A portable hydraulic jack which may be used in any position, comprising a working cylinder, a piston in the cylinder, a piston rod extending from the piston through an end of the cylinder, spring means for returning the piston to the bottom of its cylinder, a reservoir cylinder adjacent the working cylinder, a piston in the reservoir cylinder, a main passage directly connecting the cylinders, two spaced-apart check valves in the main passage, said valves opening towards the working cylinder, a pump connected to the main passage between the two check valves, a hydraulic fluid filling the space between the cylinder pistons through the passage and the pump, means for constantly exerting pressure on the reservoir piston and the fluid in its cylinder, a return passage connecting the reservoir cylinder to the main passage at a point between the check valves and the working cylinder, a manually-operated valve in the return passage, a feeding passage connected to the main passage between the reservoir cylinder and the check valves on the side of the latter remote from the return passage, and a valve in the feeding passage normally preventing fluid from draining out of the main passage through said feeding passage.

PETER BIDIN.

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