April 26, 1949. C. K. COOK 2,468,322

PISTON FOR HYDRAULIC JACKS

Filed Aug. 9, 1947

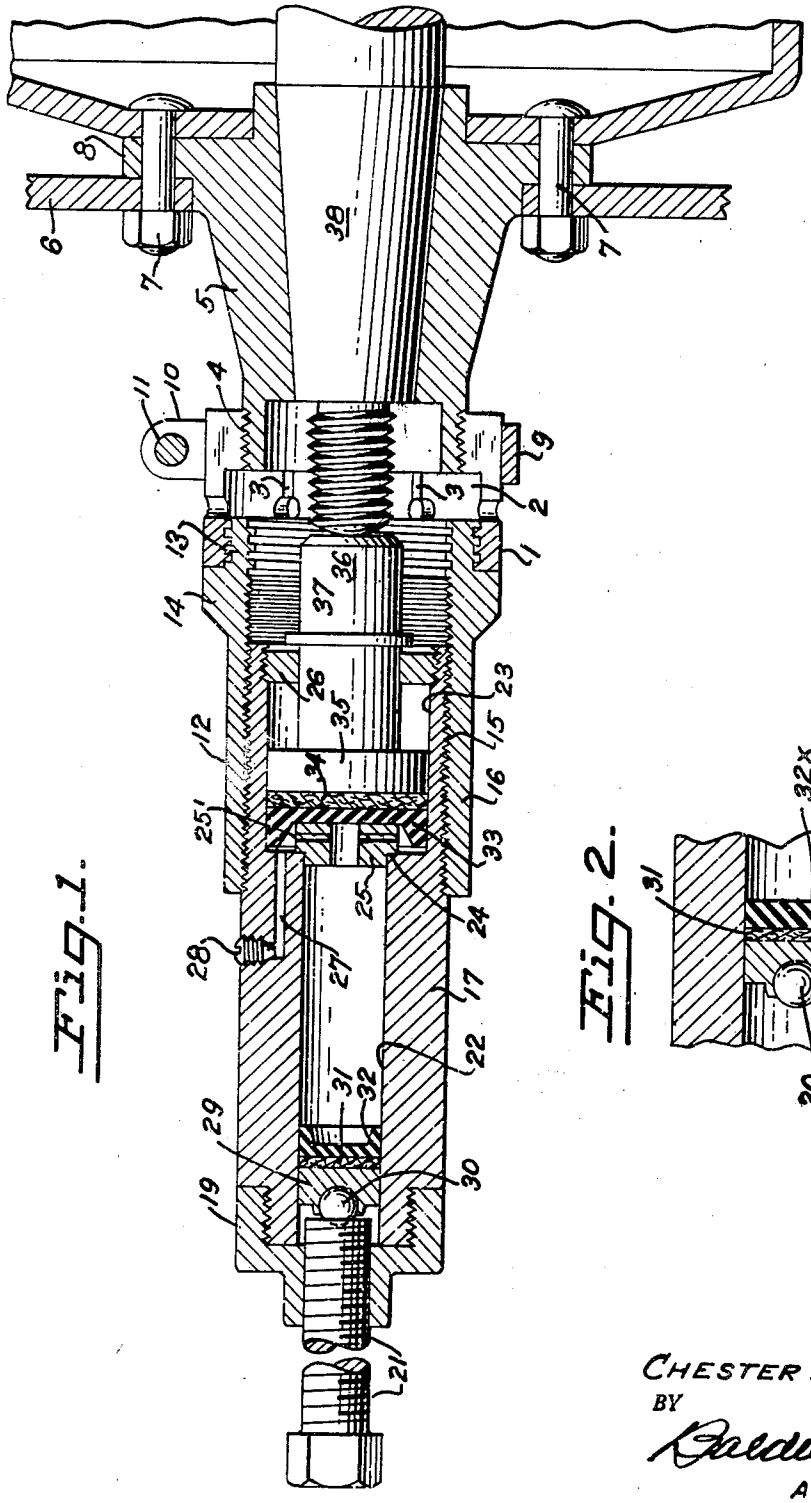


Fig. 1.

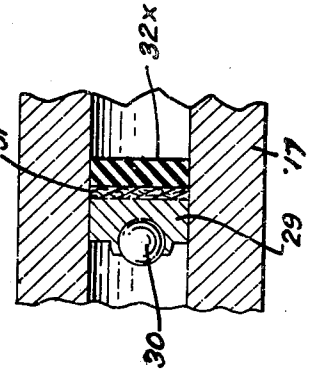


Fig. 2.

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Patented Apr. 26, 1949 2,468,322

UNITED STATES PATENT OFFICE

2,468,322

PISTON FOR HYDRAULIC JACKS

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Application August 9, 1947, Serial No. 767,739

3 Claims. (Cl. 309—23)

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This invention relates to pistons and more particularly to pistons for wheel pullers, pressure jacks and the like.

Among the objects of the invention is the provision of a leakproof packing for slow moving pistons within the cylinders of relatively high pressure means for transmitting power, as distinguished from the pistons for reciprocating engines and the like.

Another object is the provision of a piston having a soft resilient impervious packing covering its entire end area, without any opening therethrough, or mechanical mounting means that will compress or distort the compressible area of the packing.

A further object is the provision of a compact, sturdy and simple piston for a wheel puller that will efficiently multiply or compound the power applied in the most direct manner.

Other objects and advantages will appear as the description progresses. In this specification and the accompanying drawings, the invention is disclosed in its preferred form. But it is to be understood that it is not limited to this form because it may be embodied in modifications within the purview of the claims following the description.

In the accompanying one sheet of drawings:

Fig. 1 is a longitudinal section of a wheel puller showing the pistons constructed in accordance with this invention and adapted to automotive practice, certain of the parts being shown in full lines.

Fig. 2 is a fragmentary vertical section of a modified form of packing pad in the piston assembly.

In detail, the construction illustrated in the drawings, consists of the adapter chuck having the internally threaded annulus 1, with the concentric jaws 2, 2 formed thereon by the longitudinal slots 3, 3 extending back to the annulus 1.

The inner peripheries of these jaws are threaded to engage the external threads at 4 on the conventional wheel hub 5 of the disc wheel 6 which is bolted at 7, to the flange 8 of the hub 5. The circumference of the jaws is provided with an annular groove to receive the constricting band 9 encircling the jaws, and provided with the lugs 10, adapted to be drawn together by the bolt 11; whereby the constriction of this band contracts the jaws 2 to take up any lost motion in the threads at 4 and causes a positive locking of the threads to prevent stripping or distortion of the threads when the pulling force is applied. These hub threads are often bruised and in mutilated

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condition and this spring jaw structure of the adapter chuck is important.

The sleeve 12 has the externally threaded end 13 and shoulder 14 engaging the annulus 1. "Acme" or square threads are advisable at 13 because of their greater strength than standard "V" threads.

The sleeve 12 has the internal running thread 15 engaging the external thread 16 on the cylindrical body 17, adapted to telescope within the sleeve 12.

The reduced end of the knurled body 17 is externally threaded to receive the knurled cap 19. The jack screw 21 is threaded into the cap 19 coaxially with the smooth low pressure cylinder 22 in the body 17. The opposite end of the body 17 is counterbored to form the high pressure cylinder 23 separated by the shoulder 24, having the annular bushing 25. The counterbore is threaded at its open end to receive the annular guide plug 26 screwed therein.

The body 17 has the longitudinal bypass 27 extending from the counterbore 23 to the threaded side outlet closed by the depressed screw plug 28.

The hydraulic system comprises the primary piston 29 forming a close sliding fit within the bore 22. It has the hard steel ball 30 loosely confined therein and protruding beyond its outer end, for swivel contact with the slightly countersunk end of the jack screw 21, to minimize the friction and prevent the turning of the screw from rotating the piston assembly.

In the structure of the piston the flat, circular leather disc 31 is interposed between the end of the piston and the packing cup 32. The counterbore 23 is similarly equipped with the soft rubber cup 33, leather disc 34, and the secondary piston 35 having a close sliding fit within the counterbore. The stem 36 of the piston is guided in the annular plug 26 beyond which it extends coaxially into the sleeve 12. This extension of the stem is provided with an annular groove to receive the snap ring 37 adapted to abut the plug 26 to prevent injury to the cup 33 against the bottom of the counterbore 23.

When in operative position the piston stem 36 abuts the end of the taper shaft or spindle 38 extending through the hub 5 within which it is splined, keyed or frictionally held. The protruding bushing 25 abuts the face of the cup 33 and prevents distortion of the sealing flange against the shoulder 24. The bushing has the lateral bypass 25' for freer circulation of the liquid X in the initial stroke of the jack screw 21.

In assembling the hydraulic system it is prefer-

able to first introduce the secondary piston assembly into the counterbore; place the plug 26 and snap ring 37. Then stand the sleeve 12 on end and fill the primary and secondary bores 22, 23 partially full of hydraulic oil or liquid of the desired gravity. Then insert the primary piston assembly 29—32 and place the end cap 19.

Thus assembled, the puller is laid horizontally with the outlet screw plug 28 on top. The jack screw 21 is then screwed in until the secondary piston 35 bottoms against the plug 26.

The screw plug 28 is then removed and the jack screw 21 is screwed in until the primary piston assembly bottoms at 24. If excess liquid bleeds through the outlet, the plug 28 can be replaced with assurance that there is no air in the system. If there is no overflow, the necessary liquid can be introduced through the bypass 27 to completely fill the system.

The invention operates substantially as follows: The jack screw 21 should be backed out until its inner end is flush with the end of the body 17. Then screw the adapter clutch jaws 2 on to the hub 5 and tighten the band 9. Then screw the body 17 into the sleeve 12 until the stem 36 of the secondary piston abuts the end of the shaft 38. Then continue to screw the body 17 into the sleeve 12 until the secondary piston 35 displaces the liquid X from the counterbore 23, which forces the primary piston 29 into the starting position shown in Fig. 1.

To withdraw the hub 5 from the taper shaft 38, screw the jack screw 21 inward to drive the primary piston 29 forward. This forces the liquid through the bushing 25 and advances the secondary piston 35 and transmits the power applied to the jack screw 21 directly to the end of the shaft 38. This generates a counterforce to pull the hub 5 free of the taper shaft 38.

The diameter of the primary bore 22 is less, and its length greater than, the secondary bore 23. Therefore the force applied to the piston 29 is multiplied in an increased ratio of about five to one in the thrust of the secondary piston 35. This ratio may be increased or diminished as desired in designing the embodiment of the invention.

It is preferable to use a relatively fine thread (SAE) on the jack screw 21 to increase the power applied per inch of travel of the jack screw. But coarser threads can be used at 16 to facilitate longitudinal adjustment of the puller in practice.

The leather discs 31 and 34 perform important functions in the piston assembly by stabilizing the structure of the packing cups 32, 33 under compressive pressure, and absorbing the lubricating liquid when at rest, which exudes against the cylinder walls under pressure. These discs cohere to the end faces of the pistons and provide a porous cushion for the packing cups, into the texture of which the contacting faces of the soft discs extend and are held against excessive lateral distortion under high pressure.

The packing cups 32, 33 are of impervious material, such as soft dense rubber or plastic compounds, adapted to maintain maximum sealing contact with their respective cylinder walls. There is particular merit in the absence of any central opening through either the discs or the cups for attaching them to their respective pistons, as in general practice. The texture of the cups is such that any mechanical compression surrounding such central studs by lock nuts thereon, would mechanically distort the cups and discs and cause leakage around such studs, under liquid pressure.

For use under very high liquid pressure, the sealing elements 32, 33, may be in the form of circular pads 32x without peripheral flanges, as shown in the modification in Fig. 2. When such pads are squeezed by the pressure, they expand laterally and are forced against the cylinder walls, performing the same function as the flanges, without the danger of folding or spalling.

The density of the liquid column X, prevents the dislodgement of the packing elements 31, 32, and 33, 34, from their respective pistons 29, 35. When pressure is applied by the jack screw 21 to the piston 29, the cup 32, forces the liquid against the cup 33 on the piston 35. When the jack screw 21 is backed up and the cylinder body 17 is screwed into the sleeve 12, and the piston stem 36 abuts the spindle 38, the liquid column X moves the cup and piston 32—29 backward. In operation the liquid column is always under positive applied pressure, never under negative pressure.

For the discs 31 and 34, natural leather is preferred, because at present no synthetic product is available having equivalent values for the present purpose, except in a lesser degree. When working pressure is applied to the liquid X between the pistons as described, the soft fibrous structure of the discs 31, 34 expands laterally and their peripheries are forced against the polished walls of their respective cylinders and the liquid impounded in the discs 31, 34 lubricates these sliding surfaces, behind the packing cups 32, 33. This relatively high pressure on the liquid, causes the "grain" side of these discs to adhere permanently to their respective pistons.

The flanged packing cups 32, 33 formed of a composition such as stated above are resistant to decomposition by chemical reaction with the liquid X, such as used in liquid shock absorbers in automotive practice. The applied pressure causes these cups 32, 33 to squeeze into the fibrous surface of the "flesh" sides of their respective discs, which prevents excessive lateral distortion of the planar areas of the cups, the annular flanges of which are sqeezed against the polished surfaces of their respective cylinders 22, 23.

The leather backing discs prevent the intrusion of any portion of the cups 32, 33, between the pistons 29, 35 and their respective cylinder walls. This prevents the cups from spalling under frictional contact with the cylinder walls, against which they are squeezed by the liquid under applied pressure. This spalling disintegration of such soft packing cups, has heretofore been a serious disadvantage in their use under high pressure. In the present invention thin peripheral sealing edges are not required on the flange of the cups, as in "cup leathers," which reduces the danger of such thin edged folding back and spalling away, during the piston stroke.

Having fully described this invention and its mode of operation, what I claim and desire to secure by Letters Patent is:

1. A packing for pistons slidable within cylindrical walls comprising a pervious disc bearing against the full end area of said piston and in peripheral contact with said cylinder wall; and an impervious resilient cup bearing against the full area of said disc and having a peripheral flange bearing against said cylinder wall.

2. A packing for pistons having flat continuous end areas, and slidable within cylindrical walls;

a flat pervious disc such as leather, covering the entire end area of said piston and in peripheral contact with said cylinder wall; and a cup composed of resilient material such as rubber, covering the entire planar area of said disc and having a cylindrical flange bearing against said cylinder wall.

3. A packing for pistons having flat continuous end areas and slidable within cylinder walls; a porous compressible disc covering the entire end area of said piston and in peripheral contact with said cylinder wall; and a flat compressible sealing pad covering the entire planar area of said disc and having peripheral contact with said cylinder wall and expansible laterally under pressure.

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