Feb. 13, 1951 E. W. CHAPMAN 2,541,405

ROTARY HAND PUMP

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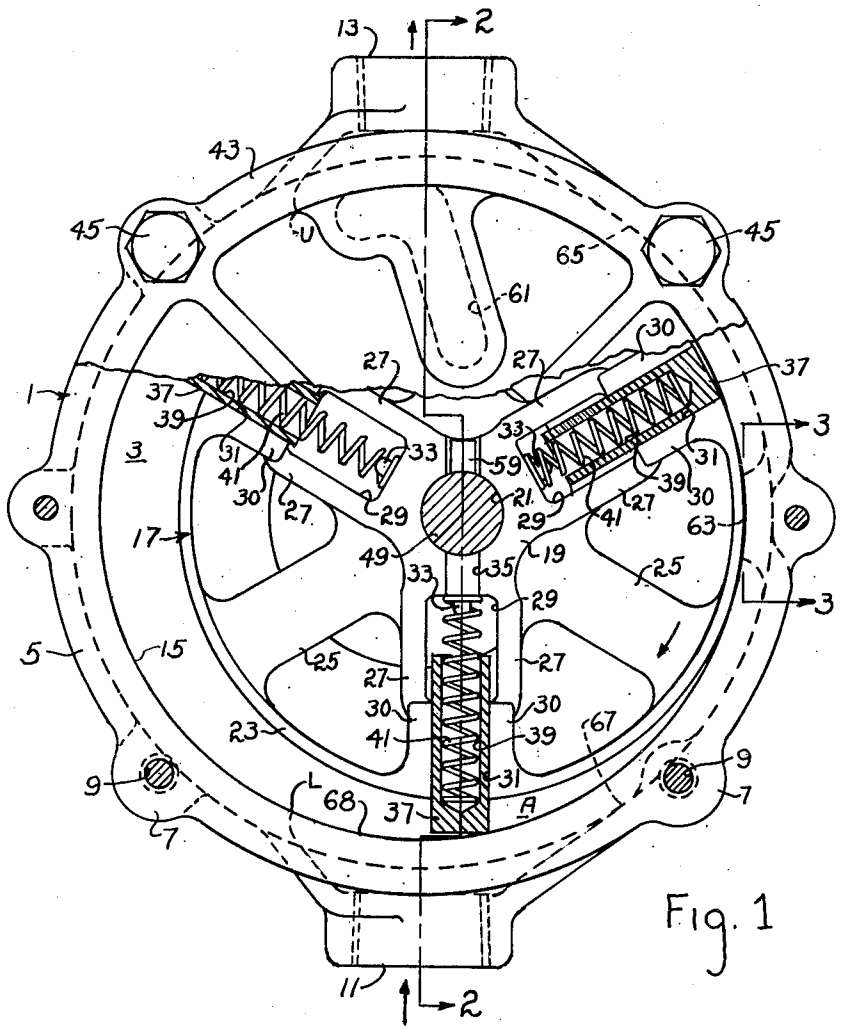


Fig. 1

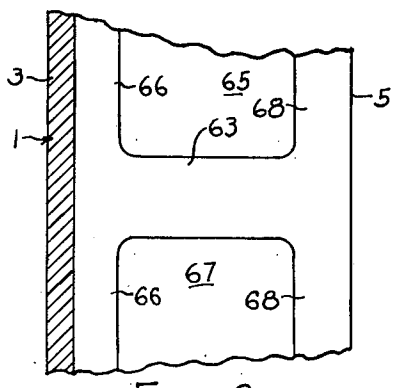


Fig. 3

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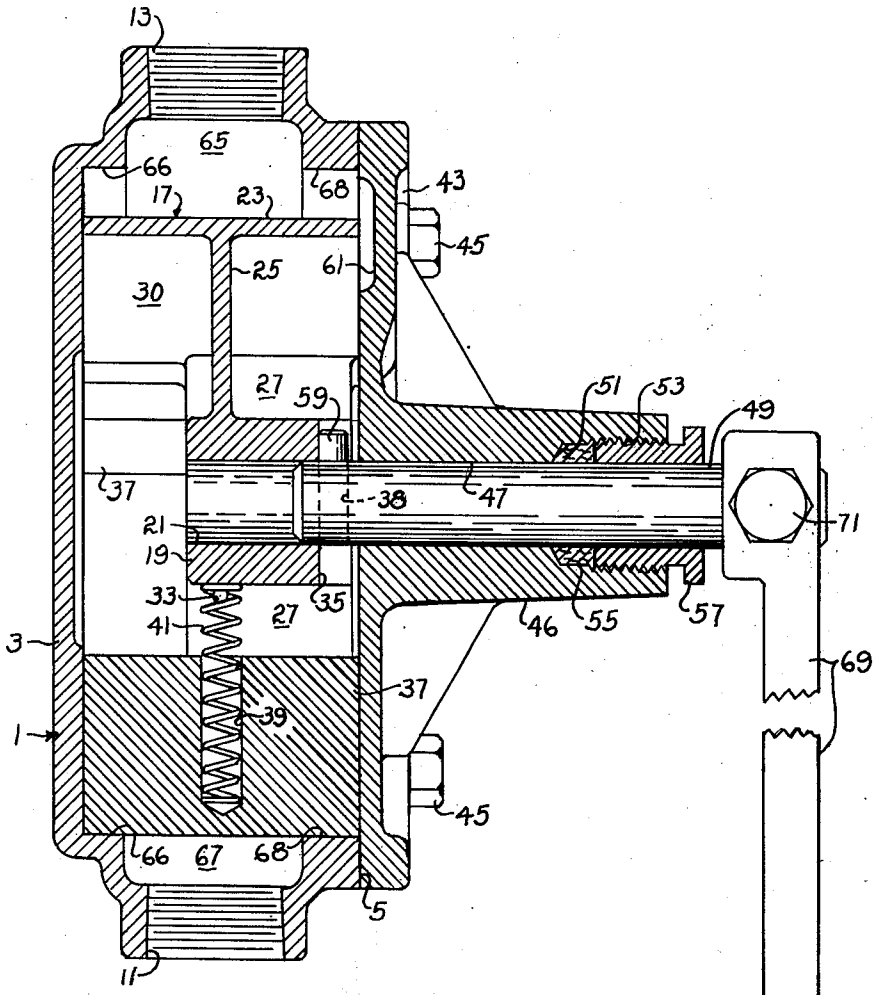


Fig. 2

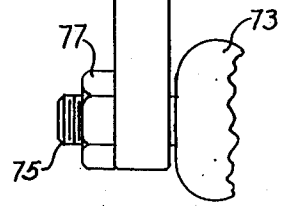


Fig. 5

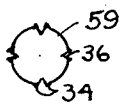
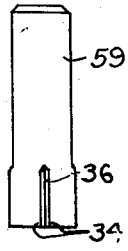


Fig. 4



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ROTARY HAND PUMP

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2 Claims. (Cl. 103—136)

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This invention relates to a pump; more specifically, it relates to a hand operated, rotary, blade type of pump.

It is an object of this invention to provide a pump which is simple in construction.

Another object of this invention is to provide a pump which is economical to produce.

It is still another object of this invention to provide a pump which is readily serviced.

A further object of this invention is to provide a hand operated pump which is easy running and quiet in operation.

Still another object of this invention is to provide a hand operated pump which will prime itself.

It is yet another object of this invention to provide a rotary blade type of pump in which outlet pressure is applied to the inner edges of the blades.

It is yet another object of this invention to provide a hand pump which will pump liquids having a wide range of viscosities.

It is still another object of this invention to provide a hand operated pump which will pump an equal amount of liquid when rotated either clockwise or counterclockwise.

These and other objects will become apparent from a study of this specification and the drawings which are attached hereto and form a part hereof, in which:

Figure 1 is an elevation of the pump taken from the front or crank side with part of the head cut away to show the rotor and the blades in their relative positions in the body.

Figure 2 is a sectional view taken on the line 2—2 of Figure 1.

Figure 3 is a sectional view taken on the line 3—3 of Figure 1 showing the seal pad and channels in the body.

Figure 4 is an elevation of the rotor driving pin.

Figure 5 is a plan view of the pin of Figure 4.

Referring to Figures 1 and 2 of the drawings, the numeral 1 designates the body which is substantially cylindrical in shape, has a back wall 3 and an open front with a circular face 5. Bosses 7 extend out from the periphery of the flange and have tapped holes 9.

The inlet passage 11 to the body and the outlet passage 13 from the body are both tapped to receive pipe and in the drawings are shown to be diametrically opposed. A cylindrical bore 15 extends in from the front of the body and intersects the inlet and outlet passages.

A cylindrical rotor 17, smaller in diameter than the bore, is positioned eccentrically in the bore, preferably on the horizontal center line of the body and to the right of the vertical center line of the body, as viewed in Figure 1.

The rotor is comprised of a hub 19, extending

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only a little over half-way through the rotor from the front, and having a central bore 21 extending all the way through it. The hub is joined to a rim 23 by ribs 27 which are bifurcated or radially slotted as at 29, from the periphery of the rotor to the exterior of the hub. The outer portions of the slots indicated by numeral 31, formed in the portions 30 of the ribs, are preferably machined and join with the wider cast portions 29. The slots are machined across the full width of the rotor. Lugs 33 are cast on the hub, or pins may be inserted in the hub, in line with the center lines of the slots 31. Another slot 35 is formed across the front face of the hub.

Blades 37 are fitted for free movement in the slots 31. The blades are rectangular in shape and have a blind hole 39 extending inward from the hub side to receive a spring 41. The other end of the spring is seated over the lug 33 to urge the outer edge of the blade against the bore 15. The ends of the blades are in sealing relation to the wall 3 and the head 43 which fits against the face 5 and ends of bosses 7 and is secured to the body by cap screws 45.

The head has an outwardly extending boss 46, coaxial with the axis of the rotor, which provides a bearing 47 for the shaft 49 and a recess 51, threaded as at 53 on its outer end, to receive packing 55 and the packing gland 57.

The inner end of the shaft extends a short distance into bore 21 of the rotor and a pin 59, extends from one side of the shaft at right angles to its axis and engages one side of the slot 35 in the rotor.

The pin 59 is provided with longitudinal grooves 36 (Figs. 4 and 5) which are formed by distorting the metal rather than cutting it so as to form ridges 34 adjacent the grooves. The pin is installed by driving or otherwise forcing it into hole 38 in the shaft which is of less diameter than the distance across ridges 34 of the pin so that the pin will be held tightly in the hole.

The head is provided with an L-shaped port 61 extending down from the bore 15, adjacent to the outlet, around the rim of the rotor and at an angle to the radial blades, as viewed in Figure 1. The passage is made wide at the top and angled so that it cannot be closed off by the blades and their retaining spokes 27. The port permits passage of liquid to the interior of the rotor and thus maintains outlet pressure against the inner edges of the blades, which permits use of light springs to keep the outer edges of the blades against the bore. This arrangement provides for a pump which turns easily when pumping light liquids, but also provides means for insuring that the blades remain in contact with the bore when pumping liquids of higher viscosity. This makes the successful pumping of relatively heavy liquids possible.

A channel 65 (Figs. 1 and 3) extends from the outlet passage 13 downwardly and to the right (Fig. 1) and terminates in a sealing pad 63. The channel is formed centrally of the body so that rails 66, 68 will be left on either side upon which the blades may ride. The pad 63 also seals against the rotor and prevents leakage around it.

A second channel 67 extends from pad 63 to the inlet channel 11 and is likewise bounded on either side by rails 66 and 68. The rails are really a part of the original bore 15 so that they are circular in profile.

One end of a crank arm 69 is secured by a set screw 71 to the end of the shaft 49 which projects from the packing gland 57. A handle 73 is secured to the other end by a bolt 75 and a nut 77.

Operation

A suction stub (not shown) extends from the inlet 11 and has its lower end submerged in liquid and a discharge pipe or hose (not shown) is screwed into the outlet 13. The crank arm 69 is rotated in a clockwise direction as viewed in Figure 1.

The rotor is thus rotated in a clockwise direction (Fig. 1) so that the chamber A between the lowermost blade 37 and the sealing pad 63 is expanding. This operation tends to exhaust the air in chamber A, producing a partial vacuum. Liquid enters this chamber through the inlet passage 11 and the channel 67 until the lowermost blade passes the inlet, after which the blade seals against the left-hand edge L of the bore 15. The chamber continues to expand until the succeeding blade contacts the edge L, whereupon the chamber is defined by the two blades, the rotor, the heads and the bore. The first named blade thereafter clears the upper edge U of the bore 15 which opens chamber A to the outlet channel 13; and since the ends of the chamber are now defined by the second blade and pad 63, it now decreases in volume and liquid is forced from it under pressure through the outlet passage 13.

The blades 37 are spaced 120 degrees about the axis of the rotor and the edges L and U of the bore are preferably so disposed that two adjacent blades will just seal the bore.

The upper channel 65 prevents the trapping of liquid between a blade and the pad 63 which would, of course, interfere with the proper operation of the pump. The lower channel 67 prevents the building up of a vacuum as the blades pass the pad.

As the pump is primed, liquid under pressure will enter the interior of the rotor by way of the by-pass port 61 around the rim of the rotor, displacing any air through the clearance around the rotor to the intake chamber. Since the blade receiving slots 29 in the rotor are open on the hub side toward the back wall 3, because the hub does not extend all the way to the back wall, liquid displaced by the inward moving blades will flow into the space provided by the outwardly moving blades. At the same time, outlet pressure is applied to the blades tending to force them outwardly, which reduces the spring force required to maintain them in sealing position.

It is also to be noted that the blades are always guided either by the bore 15 or the rails 66, 68 which are a part of the bore.

The rotor is supported on the end of the shaft 49; that is, the shaft enters the hub of the rotor only a very short distance and is connected in driving relation therewith by means of the pin 59 which extends only from one side of the shaft. This structure enables the rotor to adjust itself to a slight degree in the bore and reduces the accuracy of machining of the parts which would otherwise be needed if the rotor were mounted on the shaft and the shaft piloted in the back head in the usual manner.

It is obvious that various changes may be made in the form, structure and arrangement of parts without departing from the spirit of the invention. Accordingly, applicant does not desire to be limited to the specific embodiment disclosed herein primarily for purposes of illustration; but instead, he desires protection falling fairly within the scope of the appended claims.

What I claim to be new and desire to protect by Letters Patent of the United States is:

1. In a pump, a body having an inlet and an outlet, a bore in said body, a seal pad disposed in said bore, a rotor mounted in said body in continuous sealing relation with said pad, blades mounted in said rotor for movement with respect thereto so as to contact said bore, means including a head for closing the ends of the bore, a cylindrical shaft journalled only in said head, said rotor being supported radially solely by said shaft and comprising a hub of less length than the rotor, disposed immediately adjacent the head and having a cylindrical opening for said shaft, said shaft extending into said hub for only a small part of the hub length, means for drivingly connecting said shaft and rotor at only one point and means for rotating said shaft.

2. In a pump, a body having an inlet and an outlet, a bore in said body, a seal pad disposed in said bore, a rotor mounted in said body in continuous sealing relation with said pad, blades mounted in said rotor for movement with respect thereto so as to contact said bore, means including a head for closing the ends of the bore, a cylindrical shaft journalled only in said head, said rotor being supported radially solely by said shaft and comprising a hub of less length than the rotor, disposed immediately adjacent the head and having a cylindrical opening for said shaft, said shaft extending into said hub for only a small part of the hub length, and rotor driving means comprising a slot on the side of the hub adjacent the head and a pin projecting from one side of the shaft and engaging the slot.

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