May 29, 1951 J. C. MILLER 2,554,536

ROTARY PUMP

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FIG. 1.

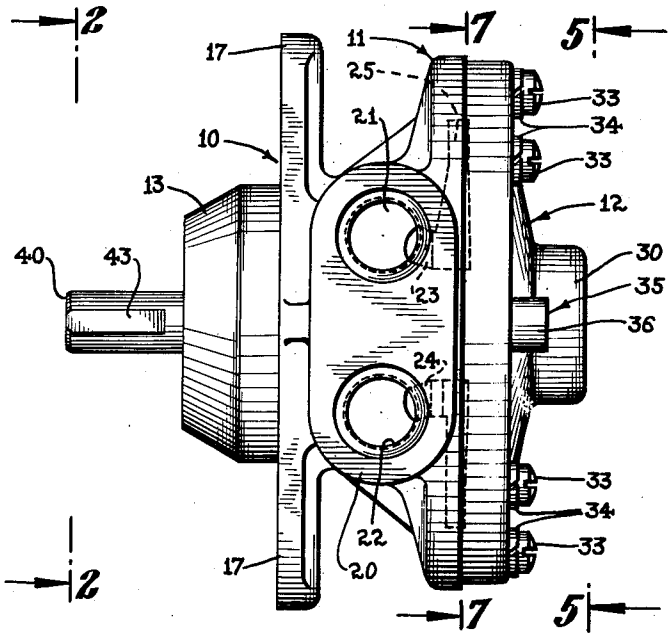

FIG. 2.

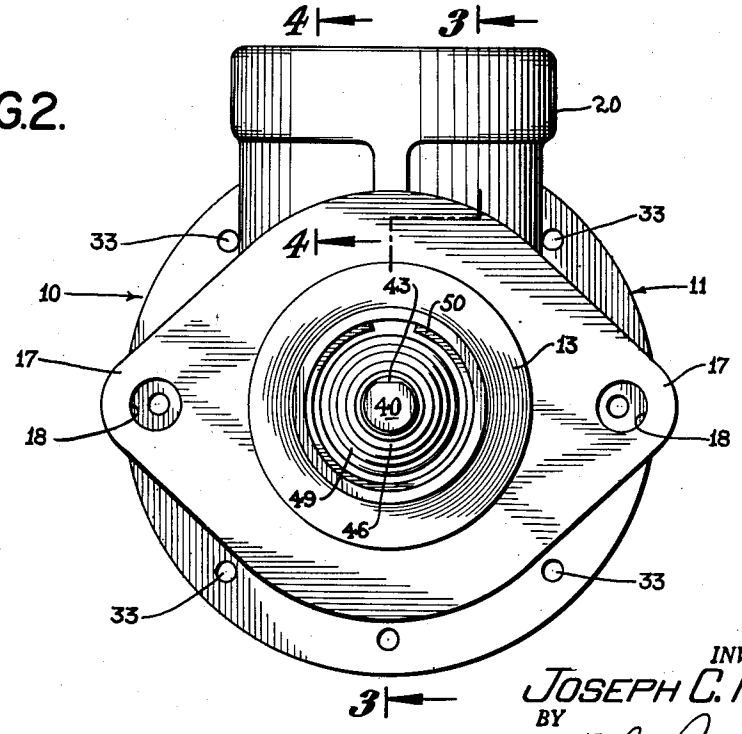

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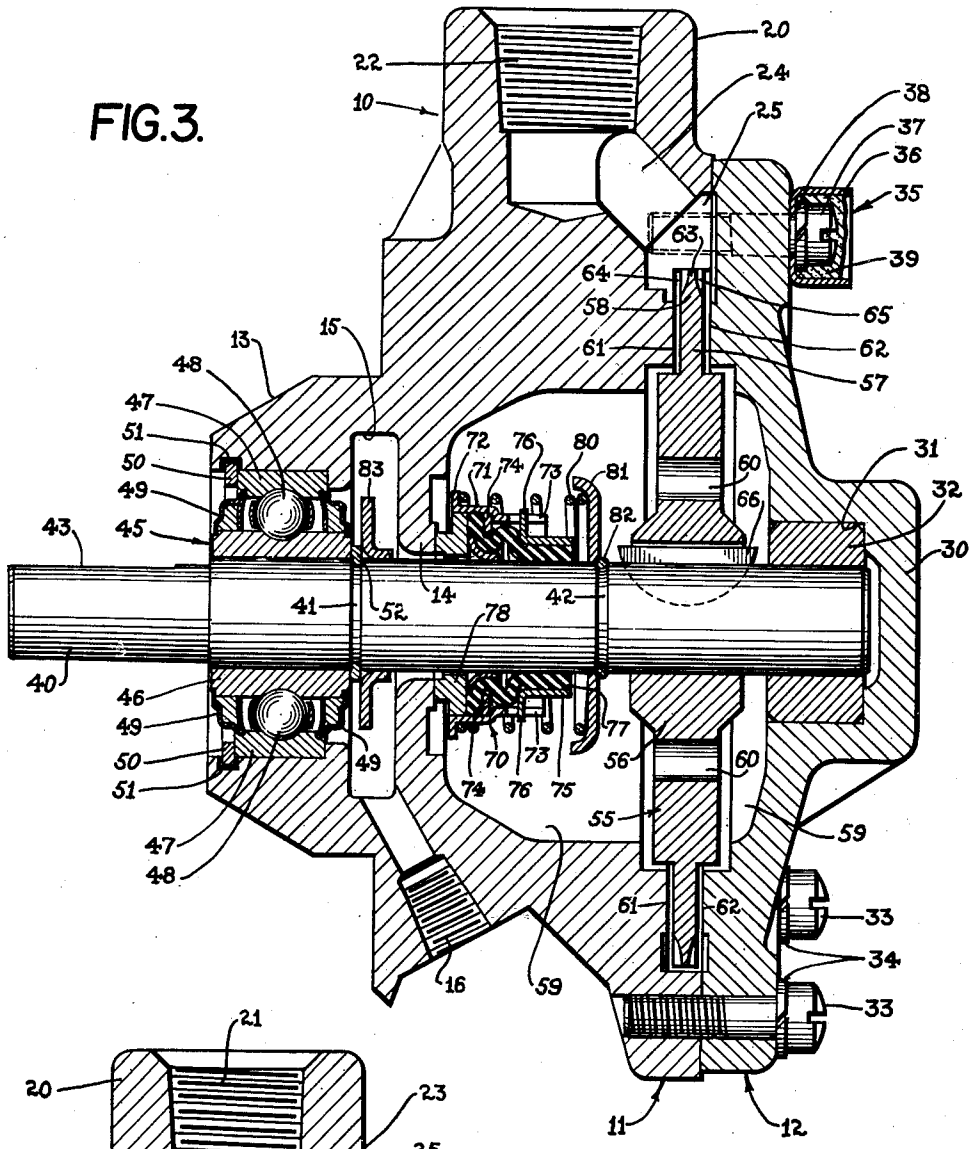
FIG.3.



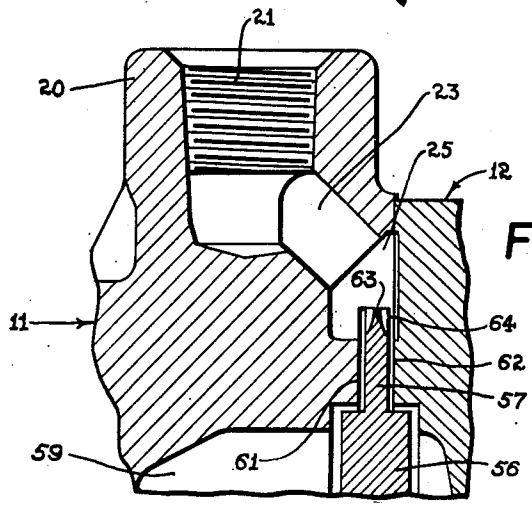


FIG.4.

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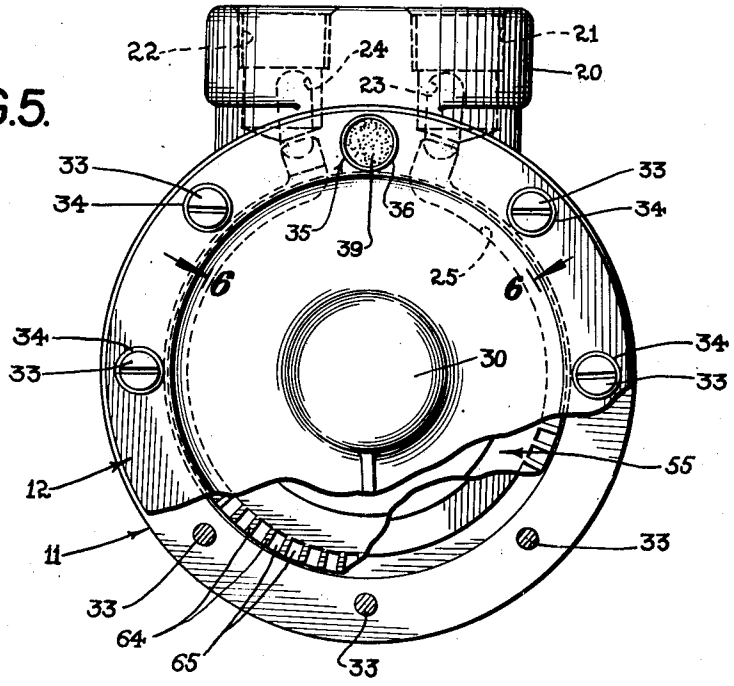
FIG.5.



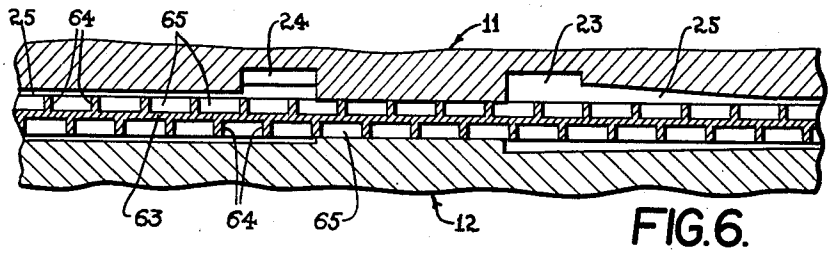


FIG.6.

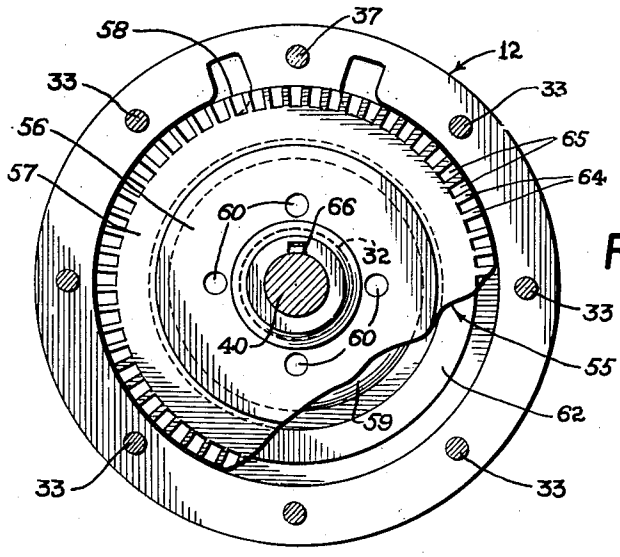


FIG.7.

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ROTARY PUMP

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Application March 25, 1947, Serial No. 737,132

1 Claim. (Cl. 103—96)

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This invention relates to pumps, and more particularly to rotary pumps having improved features of construction.

This invention has for a principal object the provision of a rotary pump that is capable of performing its intended functions in an effective and trouble-free manner.

Another object of the invention is to provide an impeller type rotary pump having its parts so constructed and arranged as to permit of ready assembly and dismantling.

Another object of the invention is to provide a pump having a rotary shaft operable from the exterior of the pump casing and effectively sealed against leakage therealong by means contained wholly within the pump casing.

A further object of the invention is to support the drive shaft of a rotary pump in an improved arrangement of bearings and sealing means to balance the pump impeller and minimize the possibility of leakage along the surface of the shaft.

A still further object of the invention is to provide a pump of the character indicated that is simple, compact and staunch in construction, that is reasonable in initial cost, and that is low in maintenance costs.

To the end that the above objects may be attained, the pump of this invention preferably comprises a two-section casing consisting of a main body and a cover detachably secured to the main body. The main body and the cover are so formed as to obtain opposing pairs of faces, respectively defining a central compartment, an arcuate passage embracing the central compartment, and a circular passage establishing communication between the main compartment and the arcuate passage. The axial width of the circular passage is substantially less than the corresponding dimension of either the central compartment or the arcuate passage. The main body is provided with a liquid inlet port and a liquid outlet port that communicate with the arcuate passage. The cover has an internal blind bore that carries a bearing sleeve which is coaxial with a bearing unit positioned within the main body.

An impeller, rotatable with the shaft but movable axially with respect to the shaft, includes a hub portion within the central compartment and having at least one through port to equalize the pressure on both sides of the impeller; an intermediate web portion of reduced thickness positioned within the circular passage and having its opposite surfaces closely adjacent to corresponding faces of the main body and the cover;

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and a marginal portion positioned in the arcuate passage. The marginal portion is machined to obtain a plurality of circumferentially spaced buckets on opposite sides.

Wholly within the main compartment and to the side of the impeller facing the bearing unit, is a sealing unit that embraces the shaft and bears against a side surface of an internal flange integral with and forming a part of the main body. Intermediate the sealing unit and the bearing unit is an annular groove formed in the main body and communicating with a drain port that extends to the exterior of the casing. A disc, rotatable with the shaft, projects into the annular groove and serves as a "slinger" to direct any liquid that may seep past the sealing unit centrifugally to the outer confines of the annular groove, whence it is withdrawn through the drain port.

The above mentioned objects, as well as other objects, together with the advantages attainable by the practice of this invention, will be readily apparent to persons skilled in the art upon reference to the detailed description that follows, taken in conjunction with the annexed drawings, which respectively describe and illustrate a preferred embodiment of the invention.

In the drawings:

Figure 1 is a top plan view of a pump constructed in accordance with this invention;

Figure 2 is an end view taken along line 2—2 of Figure 1;

Figure 3 is an enlarged cross-sectional view taken along staggered line 3—3 of Figure 2;

Figure 4 is an enlarged fragmentary view taken along line 4—4 of Figure 2;

Figure 5 is a view taken along line 5—5 of Figure 1, with parts broken away for better illustration;

Figure 6 is an enlarged fragmentary view taken along arcuate line 6—6 of Figure 5; and

Figure 7 is a view taken along line 7—7 of Figure 1, a portion of the impeller being broken away for better illustration.

Referring now to the drawings, and more particularly to Figures 1, 2, 3 and 4, there is illustrated therein a two-section casing generally denoted by numeral 10 and consisting of a hollow main body or casting 11 and a cover 12. Main body 11 includes a rear tubular boss 13 adapted to accommodate a bearing unit, to be described further along, and an internal circular flange 14. An annular groove 15, formed in boss 13 immediately adjacent flange 14, communicates with a tapped drain port 16. A pair of lateral wings 17

constitutes an integral part of the main body and is provided with a pair of diametrically spaced openings 18 for the reception of screws, bolts, or the like, whereby the casing may be readily mounted in desired location. Also integral with the main body is an upwardly extending boss 20 having a tapped liquid inlet port 21 and a tapped liquid outlet port 22 that respectively communicate with passages 23 and 24, which, in turn, communicate with corresponding ends of an arcuate channel or passage 25 in the forward end of the main body.

Cover 12 is preferably circular, and includes a central boss 30 that is provided with an internal blind bore 31 for housing a low-friction, self-lubricating bearing sleeve 32 composed principally of graphite. The cover is detachably secured to the main body by suitable means, including a plurality of screws 33 and lock washers 34. For the purpose of discouraging tampering with the pump, the cover is additionally coupled to the main body by a connector assembly 35, best shown in Figures 3 and 5. This connector assembly preferably comprises a cup 36 and a screw 37 that extends through a lock washer 38, the end wall of cup 36 and cover 12, and engages a tapped opening (not shown) in the forward end of the main body. With the parts assembled as indicated in Figure 3, the head of screw 37 is wholly within cup 36 and the portion of the interior of the cup not occupied by the screw head and lock washer 38 is filled with a thermoplastic material, such as a suitable wax 39. In practice, the exposed surface of sealing wax 39 is impressed with a distinctive identifying insignia.

A rotary shaft 40 is provided with a pair of annular grooves 41 and 42 and is machined at its outer end to obtain a longitudinal flat surface 43 for connection to a driving unit (not shown). As is illustrated in Figure 3, the forward end of the shaft is positioned within sleeve bearing 32 and the rearward end portion of the shaft is supported in an anti-friction bearing unit 45 that is located within tubular boss 13 of the main body. Bearing unit 45 preferably includes an inner bearing ring 46, an outer bearing ring 47, a plurality of ball bearings 48 disposed between the bearing rings and a pair of combined dust shields and lubricant-retaining seals 49. Main body 11, shaft 40 and bearing unit 45 are restrained against relative axial movement, when the parts are assembled as illustrated in Figure 3, through the medium of a first split retainer ring 50, that registers with an annular recess 51 in boss 13 and bears against the rearward end surface of outer bearing ring 47, and a second split retainer ring 52, that registers with annular groove 41 in shaft 40 and bears against the forward end surface of inner bearing ring 46.

The impeller of this invention is generally designated by numeral 55 and comprises a hub portion 56 of substantial thickness for requisite strength and rigidity; an intermediate web or disc-like portion 57 of reduced thickness; and a marginal portion 58. Hub portion 56 is positioned across a central compartment 59 formed by the casing main body and cover, and has at least one, and preferably a plurality of through ports 60 to equalize fluid pressure on its opposite sides. Intermediate portion 57 of the impeller is positioned in a circular passage defined by opposing internal faces 61 and 62 of main body 11 and cover 12, respectively. The marginal portion 58 of the impeller is located in arcuate passage 25. The sides of impeller web portion 57 form a close fit with corresponding adjoining surfaces 61 and 62, sufficient clearance being provided, however, to permit of rotation of the impeller.

Marginal portion 58 is milled or otherwise machined to obtain a circular peripheral web 63 and a series of equi-spaced radial ribs or vanes 64 which define a plurality of circumferentially arranged generally concave buckets 65 on each side of the impeller. It is recommended that vanes 64 on one side of web 63 be staggered with respect to the vanes on the opposite side so that the buckets are correspondingly staggered, as best shown in Figure 6.

Impeller 55 is concentric with and coupled to shaft 40 by a connector means, such as a key 66, to effect rotation of the impeller with the shaft but permitting axial movement of the impeller with respect to the shaft, whereby the impeller is permitted to float axially and intermediate portion 57 may readily seek its proper position between internal faces 61 and 62 of the casing during operation.

A sealing unit 70, concentric with shaft 40, is positioned within central compartment 59 intermediate impeller 55 and internal flange 14, and includes a first tubular member 71 having an external flange 72 at one end, and a plurality of angularly spaced slots 73 at its other end. A washer 74 is positioned within tubular member 71. A second tubular member 75 has a plurality of laterally projecting teats 76 that register with corresponding slots 73. Within the tubular members is a distortable bellows type sealing sleeve 77, preferably made of natural or synthetic rubber, depending upon the liquid to be transmitted by the pump. A low-friction sealing ring 78, made of a carbon-containing material, is non-rotatably positioned in the rearward end of tubular member 71 and bears against the forward face of internal flange 14. A helical compression spring 80 bears against flange 72 of tubular member 71 and a retainer ring 81, that, in turn, bears against a resilient split ring 82 in annular groove 42 to maintain the rearward end face of ring 78 in engagement with the adjacent surface of internal flange 14.

A ring 83 is press-fitted to shaft 40 so as to rotate therewith, and projects into annular groove 15. This ring serves as a "slinger" to prevent any of the liquid, that is being handled by the pump and that may seep past sealing unit 70, from following the shaft and flowing to bearing unit 45 and thence to the exterior of the pump casing.

In operation, shaft 40 is adapted to be rotated in a counter-clockwise direction, as viewed in Figure 2, to impart clockwise rotation to impeller 55, as viewed in Figure 5. Liquid to be pumped by the structure herein illustrated and described is admitted by way of inlet port 21 and passage 23 to arcuate passage 25, where it is picked up by impeller buckets 65 and discharged under pressure through passage 24 and outlet port 22 in the usual manner. Any of the liquid in the pump that may leak past sealing unit 70 is picked up by disc 83, and projected by centrifugal action to the outermost confines of annular groove 15, flowing by gravity through drain port 16, whence it is disposed of, as desired, by a conduit (not shown).

From the foregoing, it is believed that the construction, operation, and advantages of my present invention will be readily comprehended by

persons skilled in the art. It is to be clearly understood, however, that various changes in the apparatus set forth above may be made without departing from the scope of the invention, it being intended that all matter contained in the description or shown in the drawings shall be interpreted as illustrative only and not in a limiting sense.

I claim:

In a rotary pump, a casing comprising a main body and a cover attached to the main body, opposing pairs of faces of the main body and the cover, respectively, defining a central compartment, an arcuate passage embracing the central compartment, and a circular passage intermediate the central compartment and the arcuate passage and establishing communication therebetween, the axial width of the circular passage being substantially less than the corresponding widths of the central compartment and the arcuate passage, respectively, said cover having a blind internal bore, a first bearing within the bore, a second bearing carried by the main body and coaxial with the first bearing, a rotary shaft supported in the bearings, an impeller carried by the shaft, connector means for effecting rotation of the impeller upon rotation of the shaft while permitting relative axial movement between the impeller and the shaft, said impeller comprising a hub portion positioned within the main compartment, an intermediate web portion of reduced thickness positioned within the circular passage and having its opposite surfaces closely adjacent to corresponding faces of the main body and the cover, respectively, and a marginal portion positioned in the arcuate passage, said marginal portion having a plurality of circumferentially spaced buckets formed on opposite sides, and a sealing unit wholly within the central compartment intermediate the impeller and the second bearing, said sealing unit embracing the shaft and engaging the casing in a manner to prevent liquid flow along the shaft to the second bearing, said main body having an annular groove intermediate the sealing unit and the second bearing and a drain port establishing communication between the annular groove and the exterior of the casing, and a disc rotatable with the shaft and projecting into the annular groove.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
390,332	Andrews	Oct. 2, 1888
1,397,273	Finn	Nov. 15, 1921
2,034,549	Abrahamson	Mar. 17, 1936
2,283,844	Brady, Jr.	May 19, 1942
2,296,640	Hansen	Sept. 22, 1942
2,319,776	Copeland et al.	Nov. 8, 1943
2,426,950	Riede	Sept. 2, 1947

FOREIGN PATENTS

Number	Country	Date
368,786	Germany	Feb. 12, 1943