Feb. 16, 1943. V. L. DU BOIS 2,311,162

FLUID PUMP OR MOTOR

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Fig. 1.

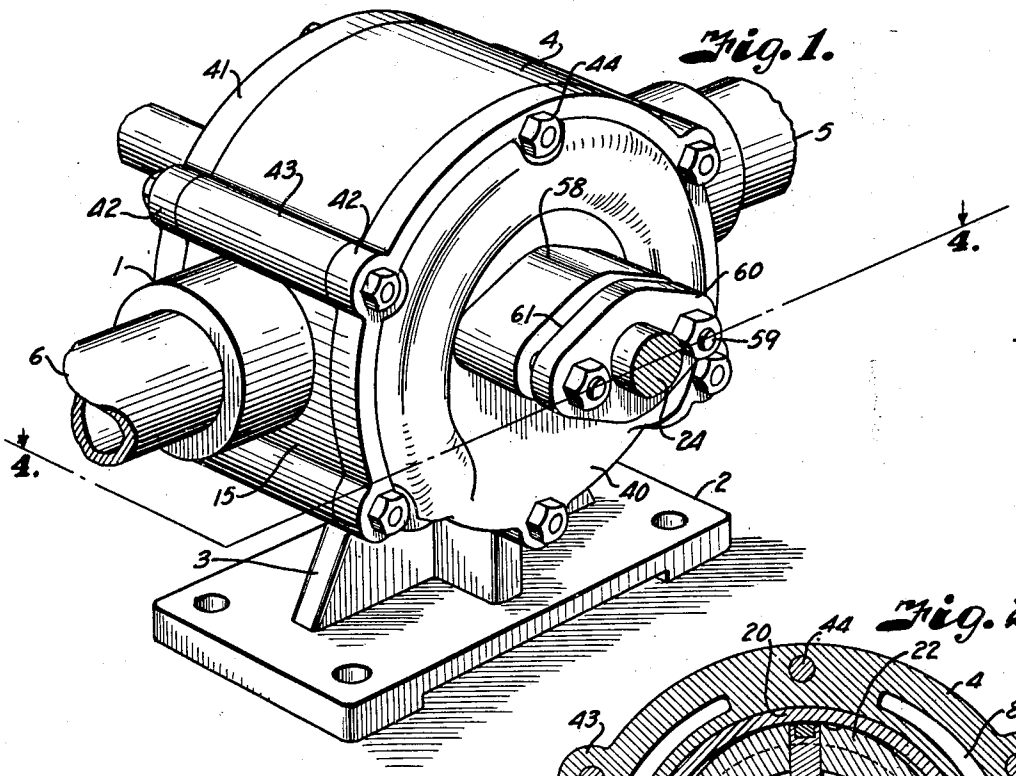

Fig. 2.

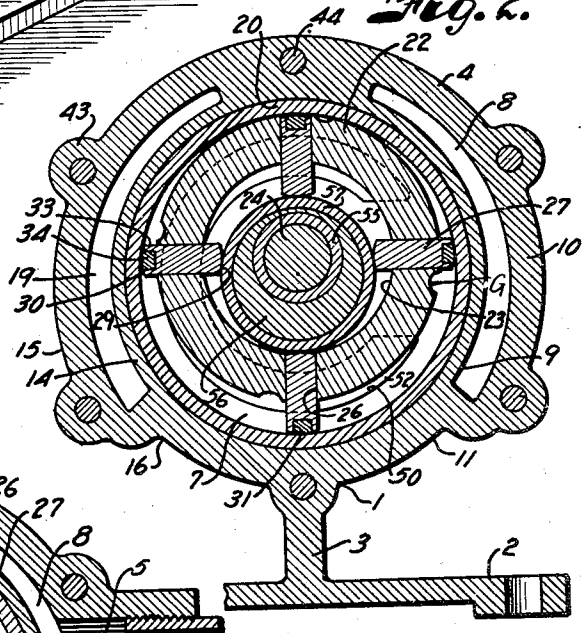

Fig. 3.

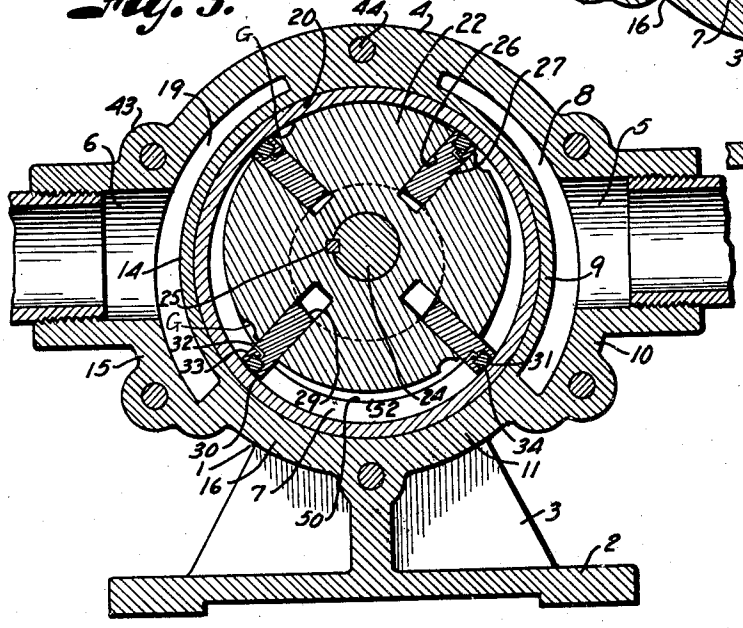

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Fig. 4.

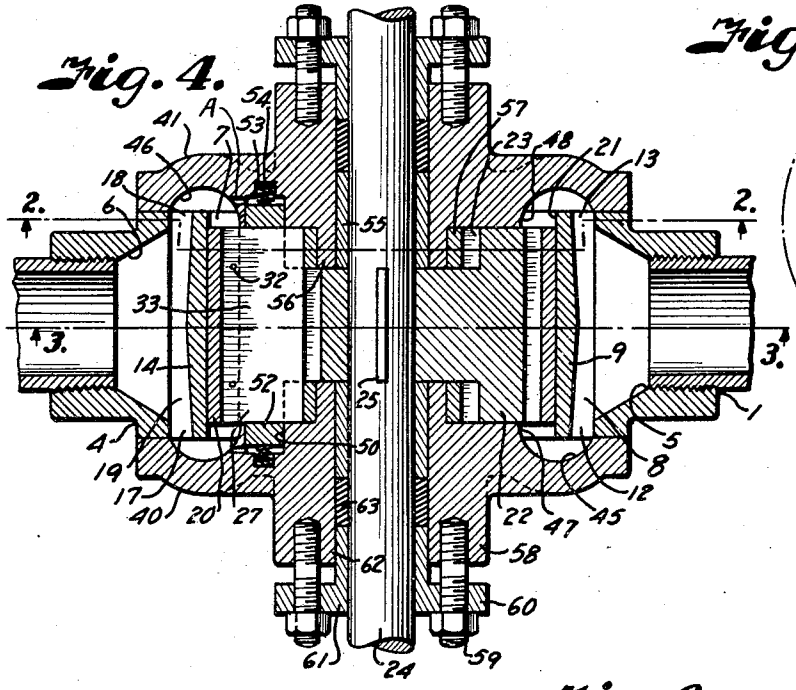


Fig. 5.

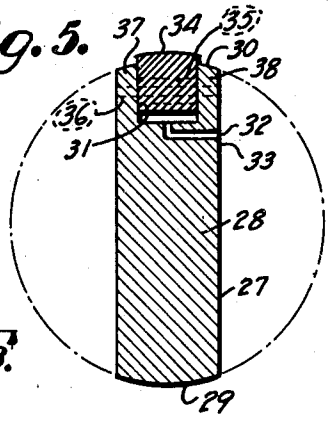


Fig. 7.

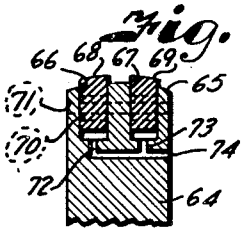
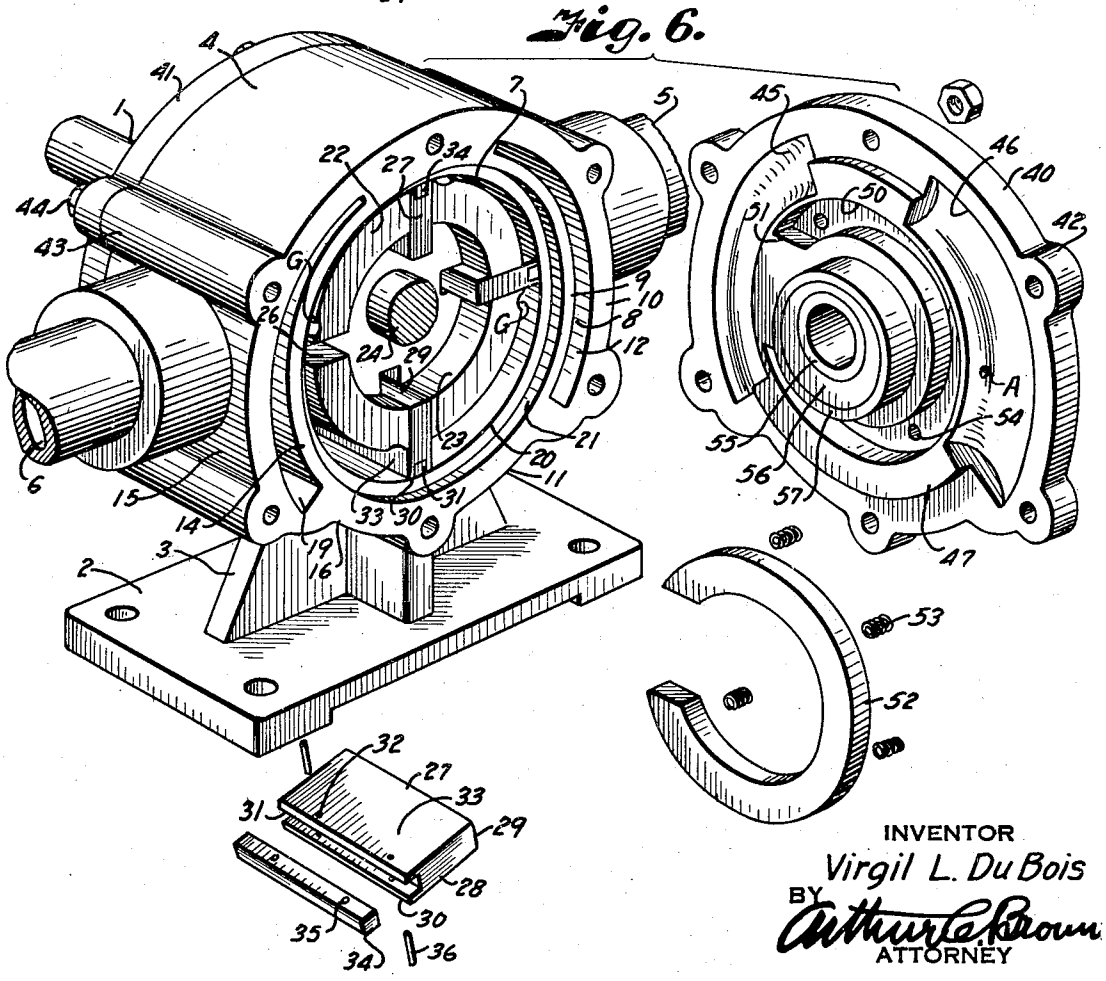


Fig. 6.



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2,311,162

FLUID PUMP OR MOTOR

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Application May 20, 1940, Serial No. 336,231

2 Claims. (Cl. 103—136)

This invention relates to fluid pumps or motors and more particularly to pumps or motors of rotary fluid type, the principal objects of the invention being to provide balanced, convenient, relatively economical and highly efficient rotary fluid pumps or motors.

Other objects of the invention are to provide for easily replacing parts of the device that receive the most wear; to equalize the wear on moving parts of the device; to eliminate irregularities, vibration, wobble, chatter and the like in the device; to improve the seal between parts of the device for preventing leakage therefrom; and to provide improved elements and arrangements of them in a rotary fluid pump or motor of the character noted.

In accomplishing these and other objects of the present invention, I have provided improved details of structure, the preferred forms of which are illustrated in the accompanying drawings, wherein:

Fig. 1 is a perspective view of a rotary fluid pump and motor embodying the features of the present invention.

Fig. 2 is a vertical cross-section through the device embodying this invention substantially on the line 2—2, Fig. 4.

Fig. 3 is a section similar to Fig. 2, taken on the line 3—3, Fig. 4.

Fig. 4 is a horizontal section through the device substantially on the line 4—4, Fig. 1.

Fig. 5 is a detail vertical cross-section through a vane employed in the device, illustrating the manner of effecting wiping contact between the vane and an enclosing device.

Fig. 6 is a detail perspective view of a device embodying my invention, parts thereof being shown in disassembled spaced relation to more clearly illustrate their construction.

Fig. 7 is a detail vertical cross-section through a modified form of vane, showing a double arrangement of the insert illustrated in Fig. 5.

Referring more in detail to the drawings:

1 designates a rotary field pump or motor embodying the features of the present invention, which preferably includes a base 2 adapted to be mounted on a suitable support and having a standard 3 on which is mounted a stator 4. The stator, standard and base are preferably cast in iron or steel and the stator is of generally cylindrical conformation and provided with a preferably diametrically opposed inlet 5 and outlet 6 relative to the interior 7 of the stator, the inlet 5 leading to an inlet chamber 8 in the stator that is bounded by arcuate portions 10 and 11 of the stator to provide openings 12 and 13 from the inlet chamber 8 to the interior 7 of the stator. An arcuate portion 14 of the stator that is spaced inwardly from arcuate portions 15 and 16 of the stator defines openings 17 and 18 leading from the interior 7 of the stator to an outlet chamber 19 therein connected with the outlet 6 of the stator.

20 designates a liner that is mounted in the interior 7 of the stator, the liner being of less width than the interior of the stator to provide shoulders 21 formed by the stator on opposite sides of the liner.

22 designates a rotor, the outer periphery of which is preferably the same width as the liner, the rotor being offset on opposite sides concentrically of the outer periphery thereof to provide duplicate shoulders 23. The rotor is, also, provided with a centrally arranged bore to provide for sleeving the rotor on a shaft 24, the shaft and rotor preferably having keyed connection, as shown at 25. The rotor is, also, preferably provided with spaced radially arranged slots 26 each of which is adapted to reciprocably seat a vane 27 and to allow movement of such vanes relative to and in wiping engagement with the liner 20 when the rotor is rotated either by fluid pressure on the vanes, or upon rotation of the shaft 24. Transverse grooves G are also preferably provided in the rotor adjacent each vane to entrap solids which might otherwise cause serious damage to the pump.

The vanes are each preferably constructed, as shown in Fig. 5, of a body member 28, the ends of which are preferably curved, as at 29 and 30, the curve corresponding to an arc of a circle having a radius extending from the center of the vane. The outer ends 30 of the vanes are preferably slotted, as at 31, throughout the width of the vanes, the slots 31 being provided with a duct 32 opening onto at least one side face 33 of the vane, as shown. Inserts 34 are mounted in the slots 31 preferably in outwardly movable relation thereto as by providing the inserts 34 with transverse slots 35 of greater depth than pins 36 that are mounted in the slots and vane walls 37 and 38 that define the slots 31. The inserts 34 are preferably of a material that will not score a sleeve or lining they are intended to contact and a graphited metallic packing material has been found preferable for this purpose.

It is apparent that the stator and rotor are of uniform construction on opposite sides thereof and in order to close the ends of the stator cylinder and make the vanes in the rotor effective for

acting upon, or to be acted on by, fluid passing through the pump, duplicate cap members 40 and 41 are provided. The cap members are preferably cast in substantially circular shape and preferably have bosses 42 thereon provided with apertures aligned with apertures in bosses 43 on the stator to receive fastening devices 44 to secure the cap members on the stator. Oppositely disposed grooves 45 and 46 are arranged on the inner face 47 of each cap member in diametrically opposed position and in alignment with the outlet openings of the stator inlet and outlet chambers 8 and 19 respectively, the arrangement being such that fluid entering the inlet chamber 8, Fig. 4, passes out of the outlets 12 and 13 therefrom into the grooves 45 and back into the stator cylinder interior for impingment against a vane or vanes adjacent thereto to rotate the rotor.

The cap members are, also, provided with bosses 47 and 48 on the inner faces thereof between the ends of the grooves 45 and 46, the bosses being arcuate on their inner and outer faces to fit within the stator cylinder interior 7 on the shoulders 21 thereof and abut the side faces of the liner 20. The inner faces of the cap members are further provided with a substantially crescent shape recess 50, the ends of which are separated by a boss 51 arranged substantially intermediately of the ends of the grooves 45 adjacent the inlet end of the stator. An aperture A communicates the recesses 50 with the grooves 46. A sealing ring 52 of a shape similar to the recess 50 is mounted in the recess of each cap member and is normally forced inwardly relative to and toward the rotor by springs 53 that are mounted in apertures 54 in the cap members at the bottom of the recesses 50. It will be noted that with the present arrangement the midportions of the sealing rings relative to their ends seal the rotor, stator and cap members at the pressure, discharge, or outlet portion of the pump, the seal being augmented by actuation of the pump, that is to say, the seal becomes closer and tighter in response to increase of pressure exerted by the pump due to the communication of such pressures from the grooves 46 to the back of the rings through the vents A.

Extending inwardly from each cap member and arranged concentrically relative thereto is a bearing bushing 55 defining a bearing opening in which the shaft 24 is mounted. An eccentric cam 56 surrounds the bushing and a bushing 57 surrounds the eccentric cam, the outer periphery of the bushing 57 being arranged to engage the inner curved ends 29 of the vanes and force them respectively outwardly in their slots in the rotor depending upon the position of the eccentric cam relative thereto.

In order to close and seal the ends of the cap members relative to the stator and rotor, the outer faces of the cap members are provided with cylindrical bosses 58 which have threaded recesses for receiving the inner ends of fastening devices 59, the outer ends of which are engaged in apertures in flanges 60 on glands 61 that are mounted in the bores 62 of the bosses 58 and bear against packings 63 or the like which in turn bear against the bushings 55 in the cap members.

The operation of a motor or pump constructed as described is as follows:

Assumng the device to be used as a motor, fluid applied to the inlet 5 passes through the inlet chamber 8 out of the openings 12 and 13 into the grooves 45 of the cap members and into the interior 7 of the stator and more particularly between the outer periphery of the rotor and the inner periphery of the liner where it impinges against a vane for moving the vanes of the rotor and shaft. The sealing rings 52 effect a good seal, particularly at the discharge end of the motor, and as the fluid approaches the grooves 46 in the end caps it passes to the outlet openings 17 and 18 into the outlet chamber 19; thence to the outlet 6 for suitable disposition. The operation is substantially the same when the device is used as a pump and power is applied to rotate the shaft 24; the inlet 5 being applied, in such an instance, to a suitable source of supply and the outlet 6 being applied to a suitable point of disposal for fluid being pumped.

In Fig. 7 a modified form of vane is shown which preferably consists of a body 64 having a curved outer end 65 provided with spaced transverse slots 66 and 67 in which inserts 68 and 69 are mounted. The inserts have transverse slots 70 therein for receiving pins 71 of lesser diameter than the height of the slots so that the inserts may be forced outwardly relative to the slots 66 and 67 in the vanes upon application of fluid pressure to ducts 72 and 73 through a manifold 74 that opens onto at least one side face of the vanes.

The operation of vanes constructed in accordance with the modified form of invention is substantially similar to that of the preferred form of invention, that is to say, the inserts wipe against the inner surface of a liner between the rotor and stator to effect a good seal therebetween, reduce wear, and prevent scoring of the liner.

The arrangement of elements in the pump or motor provided by this invention is such that the parts are balanced on each side of the center of the device, which results in a minimum amount of wear in the moving parts of the device. Vibration and chattering are, also, kept at a minimum and an effective seal is provided to prevent leakage of fluid from the device. Due to the difference in materials between the liner, the vanes and the inserts, it is contemplated that wear will normally occur on the inserts which may be easily replaced. The material of the inserts prevents scoring the liner, but if scored, the liner may also be easily replaced, as may be the vanes and sealing rings in the end cap members.

It is apparent, therefore, that a balanced, sealed, convenient, relatively economical and highly efficient pump or motor is provided by the present invention.

What I claim and desire to secure by Letters Patent is:

1. In a fluid pump, a stator having an inlet and an outlet, a rotor rotatably mounted in said stator, a shaft engaged with said rotor, vanes reciprocably mounted in said rotor in wiping engagement with said stator, end plates closing the ends of said stator having grooves communicating with said inlet and outlet respectively and with the interior of the stator, each of said plates having a recess therein interiorly of and adjacent the grooves communicating with the outlet, and sealing means in the recesses having engagement with the ends of the rotor to prevent leakage from the outlet of the stator, said sealing means having spaced ends to provide passage for escape of fluid from said stator to the inlet thereof.

2. In a device of the character described, a stator having an inlet and an oulet on opposite sides thereof, a rotor rotatably mounted in the stator, vanes reciprocably and radially arranged in the rotor, means closing the ends of the stator, each of said means having a recess therein adjacent the outlet of the stator, and substantially duplicate sealing means in the recesses in said closing means of crescent shape and having solid intermediate portions arranged adjacent the outlet side of the stator and adapted to engage the ends of the rotor to prevent leakage from the outlet of the stator.

VIRGIL L. DU BOIS.