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2,663,264

ROTARY PUMP

Filed July 18, 1951

2 Sheets-Sheet 1

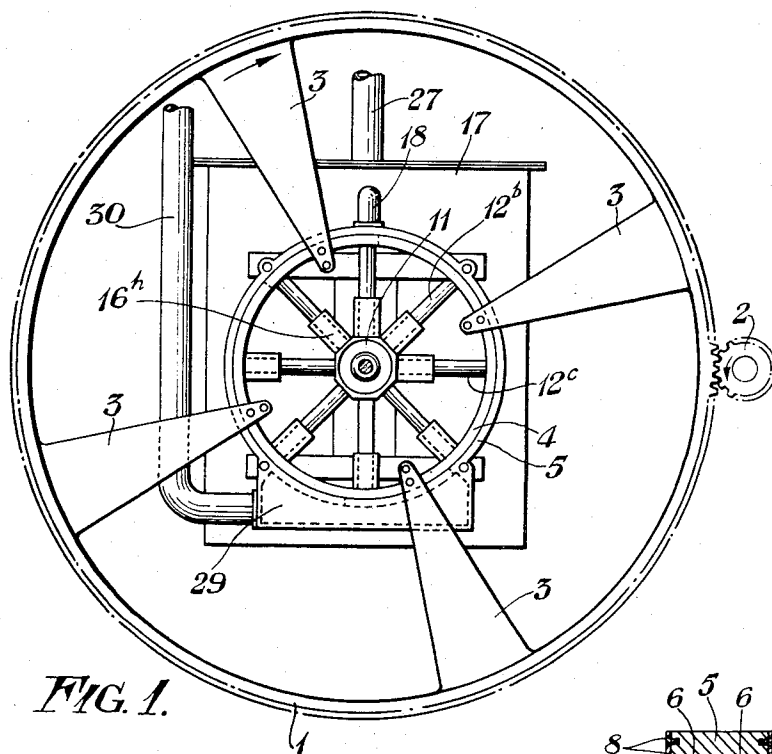


FIG. 1.

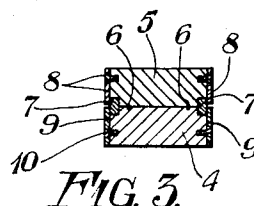


FIG. 3.

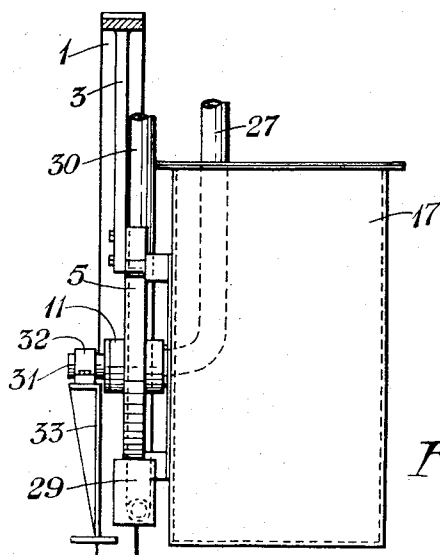


FIG. 4.

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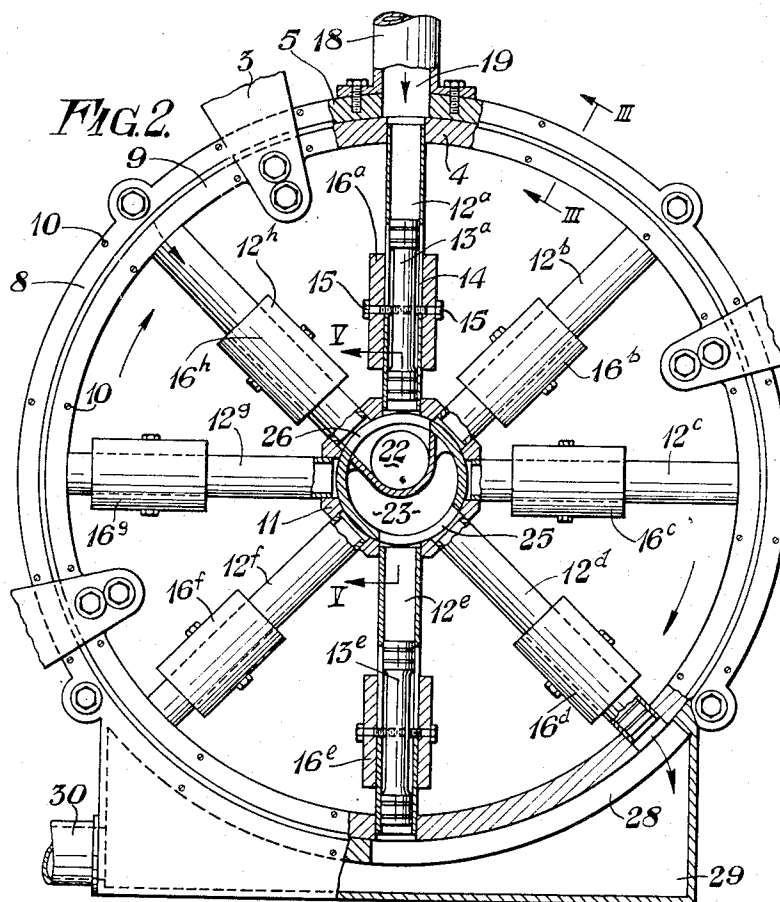
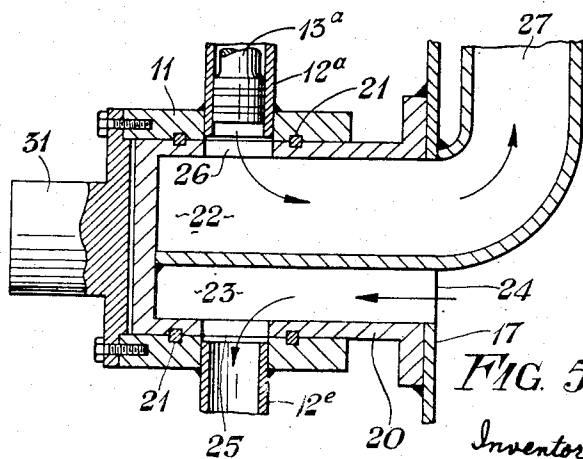


FIG. 5.

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UNITED STATES PATENT OFFICE

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ROTARY PUMP

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July 19, 1950

4 Claims. (Cl. 103-161)

1

The present invention relates to rotary pumps, and has for an object to provide an improved construction of rotary pump.

According to the invention, there is provided a rotary pump which includes means for admitting fluid to cylinders carried by a rotatable annulus and radially disposed to the axis of rotation thereof, and means comprising weighted pistons slidably disposed within said cylinders and adapted to be moved by gravity towards and away from said axis for pumping said fluid through an outlet or outlets.

One embodiment of the invention will now be described with reference to the accompanying drawings, in which:

Figure 1 is a front elevation and Figure 4 is a side elevation showing the general arrangement of the pump;

Figure 2 is a front elevation, partly in section, from which the toothed annulus has been omitted;

Figure 3 is a section on line III—III of Figure 2; and

Figure 5 is a section taken on line V—V of Figure 2.

Referring to the drawings, a toothed annulus 1, adapted to be engaged and slowly rotated by a pinion 2, has formed integral therewith four inwardly extending connector arms 3 secured to inwardly extending lugs formed integral with an inner annulus 4 concentric with annulus 1 which is rotatable in relation to a stationary outer annulus 5 concentric therewith and to which it fits closely, the fit being rendered watertight by means hereafter to be described. The adjacent surfaces of the annuli 4 and 5 are provided with recesses extending around the outer and inner circumferences respectively of the annuli, into which recesses packing is fitted as shown at 6 in Figure 3. The edges of the annuli are similarly recessed and provided with packing rings 7, which are secured in position by rings 8 and 9 bolted to annuli 5 and 4 respectively. By this means the fit of the annuli is rendered watertight, without undue friction being created to impede their relative rotation. The pressure of the rings 8 and 9 against the packing rings 7 may be suitably adjusted by adjustment of the bolts 10. Rings 8 and 9 have, for the sake of clarity been omitted from Figure 1.

Secured to the annulus 4, and radiating from a hollow hub 11 to which they are also secured, are hollow cylinders 12a . . . 12h. At the junctions of said cylinders with annulus 4 and hub 11 said annulus and hub are formed with apertures of a

2

diameter at least equal to that of the interior diameter of the cylinders so that full access to the interior of the cylinders is available from the outer periphery of annulus 4 and from the hollow interior of hub 11. If desired, the cylinders may be formed at junctions with enlarged inner and outer diameters, or with enlargements other than round.

In said cylinders there are respectively located and adapted to move close-fitting double-headed pistons 13a . . . 13h provided if necessary with packing rings to prevent the passage of water between their heads and the walls of the cylinders. The latter are formed with longitudinal slots 14 to accommodate bolts 15, which pass through said slots and which secure the pistons to respective weights 16a . . . 16h which are slidably disposed upon the outsides of the cylinders. It will be apparent that as the annulus 4 rotates, the weights, each carrying a piston, will fall by gravity to and from the hub 11 and the annulus 4. The length of said slots 14 is less than the distance between the heads of the pistons, so that no fluid can escape through said slots 14. The bolts 15 may be threaded into the pistons from opposite sides, and the weight may be other than round, for example square, to provide flat faces for bedding the heads of bolts 15.

From a tank 17 (Figure 1) which is located behind the annuli, is maintained filled with water, and upon which annulus 5 is mounted, there leads an inlet pipe 18, through which water from the tank 17 is fed via a port 19 formed in annulus 5, into the interior of the outer portions of the cylinders as they approach the upper vertical position during the cycle of rotation. As viewed in Figure 2, with the annulus 4 rotating in the direction indicated by the arrow, the port 19 extends in the form of a groove formed in the under face of the annulus 5 to a point slightly to the left of that occupied by the cylinder 12h, so that as the latter reaches a position where the weight 16h tends to fall by gravity towards the hub 11, water from the tank 17 is enabled to enter the interior of the outer portion of the cylinder 12h.

Hub 11 is rotatably mounted upon a hollow boss 20, rigidly secured to tank 17, the fit between hub 11 and boss 20 being a close one, and being rendered water-tight by means of packing rings 21. The interior of said boss 20 is divided into an upper chamber 22 and a lower chamber 23, the latter being in communication with the interior of tank 17 by means of an aperture 24 formed in the front wall thereof, and

also in communication with the interior of the inner portion of cylinder 12e by means of a port 25 formed in boss 20.

In the position of the cylinders as shown in Figure 2, water from the tank 17 enters and fills the interior of the inner portion of cylinder 12e, via aperture 24. As will be seen from Figure 2, the port 25 extends so as to allow the interiors of the inner portions of cylinders in the positions occupied by cylinders 12d and 12e and in intermediate positions to be simultaneously in communication with the chamber 23. Water from tank 17 is thus permitted to enter the interior of the inner portions of the cylinders when they reach the position occupied by cylinder 12d and their respective weights fall into the position occupied by weight 16d.

As the annulus 4 revolves, and a cylinder reaches the position occupied by cylinder 12h in Figure 2, its weight, say 16h, falls by gravity towards hub 11, assisted by the force of the water entering the interior of the outer portion of the cylinder through port 19 as above described. The water in the interior of the inner portion of the cylinder is thus forced out through a further port 26 formed in boss 20, into chamber 22 and thence out through outlet pipe 27, which passes through the interior of tank 17. Port 26 extends so as to allow the interiors of inner portions of cylinders in the positions occupied by cylinders 12h and 12a and in intermediate positions to be simultaneously in communication with chamber 22.

During such revolution of the annulus 4, when a cylinder reaches the position occupied by cylinder 12d in Figure 2, its weight, say 16d, falls by gravity away from the hub 11, assisted by the force of the water entering the interior of the inner portion of the cylinder as above described. The water in the interior of the outer portion of the cylinder is thus forced out through a slot 28 formed in the annulus 5 into a pressure-tight tank 29, which is maintained constantly full of water, and which is secured to the annulus 5, and is a water-tight and pressure-tight fit therewith. The entry of water into tank 29 as above described, results in the expulsion of a similar volume of water through the outlet pipe 30. Slot 28 extends so as to allow the interiors of the outer portions of cylinders in the positions of cylinders 12d and 12e and in intermediate positions to be simultaneously in communication with tank 29.

The action of the pump is thus to draw water from tank 17 through inlet pipe 18 and chamber 23 into the interior of the outer and inner portions of the cylinders as they approach the upper and lower vertical positions respectively, and by virtue of the movement of the weights and pistons simultaneously to force water out of the outlet pipes 27 and 30 through chamber 22 and tank 29 respectively. The pressure of the water in the tank 29 tends to assist in supporting the weight of the annulus 4.

Hub 11 is formed with an integral extension 31, journaled in a bearing 32 supported by a bracket 33. Suitable means may be provided for adjusting the height of bearing 32 so as to render and maintain horizontal the axis of rotation of hub 11.

Preferably the length of the weights 16a . . . 16h is made at least three times the length of the stroke of the pistons 13a . . . 13h.

Although the operation of the pump has been described in connection with the pumping of

water, it will be understood that the device may be used for pumping other suitable fluids. Nor is the invention limited in other respects to the embodiment described and illustrated, but may take other forms within the scope of the appended claims. For example, the annulus 1, instead of being pinion-driven may be rotated by means of a sprocket-chain, or instead of being toothed, may be provided with a flat surface adapted to receive a driving belt.

What I claim is:

1. A rotary fluid pump comprising a first stationary member, a plurality of cylinders supported for rotation upon said first stationary member and extending radially outwardly therefrom, suction and delivery ports in said first stationary member, means selectively communicating the inner end of the cylinders with said ports, a second stationary member surrounding the first stationary member and spaced therefrom, suction and delivery ports in said second stationary member, means selectively communicating the outer end of the cylinders with said ports in the second stationary member, a double ended weighted piston slidable in each of said cylinders, and means for effecting rotation of the cylinders about said first stationary member whereby the pistons are reciprocated by the force of gravity to draw in fluid alternately from said first and said second stationary member and to discharge fluid alternately to said second and said first stationary member.

2. A rotary fluid pump comprising a stationary cylindrical body having suction and delivery ports in the outer surface thereof, channels in said body leading to said ports, a stationary first member surrounding said body and spaced therefrom, an inner annular surface on said member concentric with said body to define an annular space therebetween, suction and delivery ports in the said inner annular surface, suction and delivery ducts leading to said ports, a hollow hub surrounding said cylindrical body and mounted for rotation thereon, a second member disposed within said first member, radially extending cylinders secured at one end to said hub and at the other end to said second member, an outer annular surface on said second member in engagement with the inner annular surface of said first member and rotatable with respect thereto, apertures in the hub wall to provide communication between the bore of the cylinders and the interior of the hub, apertures in said second member communicating the bore of the cylinders with the outer annular surface of the second member, a double headed piston slidably mounted in the bore of each of said cylinders, a weighted body secured to said piston and slidable therewith, and means for effecting rotation of said second member conjointly with the cylinders and the hub whereby said pistons are caused to reciprocate in the cylinders under the force of gravity acting on said weighted bodies to draw fluid through a suction port in the cylindrical body into the inner end portion of each cylinder and to discharge fluid therefrom through a delivery port in said body, and to draw fluid through a suction port in the said first member into the outer end portion of each cylinder and to discharge fluid therefrom through a delivery port in said first member.

3. A rotary fluid pump comprising a stationary cylindrical body having a suction and a delivery port in the outer surface thereof, channels extending longitudinally of said body in communi-

5

cation with said ports, a stationary first annular member surrounding the cylindrical body concentric therewith, an inner peripheral surface on said first annular member, a suction and a delivery port in said inner peripheral surface, suction and delivery ducts leading to said ports in the inner peripheral surface, a hollow hub surrounding said cylindrical body and mounted for rotation thereon, a second annular member disposed within said first annular member, radially extending cylinders secured at one end to the said hub and at the other end to said second annular member, an outer peripheral surface on said second annular member in fluid tight engagement with the inner peripheral surface of said first annular member and rotatable with respect thereto, apertures extending through the hub wall to provide communication between the bore of each cylinder and the interior of the hub, apertures in said second annular member communicating the bore of each cylinder with the outer peripheral surface of said second annular member, a double headed piston slidably disposed in each cylinder in engagement with the wall thereof, an elongated aperture in the cylinder wall extending longitudinally thereof, a bolt secured in the piston and extending outwardly through said aperture, a weighted body secured to said bolt on the outside of the cylinder, and means for effecting rotation of said second annular member con-

6

jointly with the cylinders and the hub whereby said pistons are caused to reciprocate in the cylinders by the force of gravity acting on said weighted bodies, each piston being effective during one revolution of the second annular member to draw fluid through the suction port in the cylindrical body into the inner end portion of the cylinder and discharge the fluid therefrom through the delivery port in the cylindrical body, and to draw fluid through the suction port in the first annular member into the outer end portion of the cylinder and discharge the fluid through the delivery port in the said first annular member.

4. A rotary fluid pump as claimed in claim 3 wherein said means for effecting rotation of said second annular member comprises a third annular member rigidly secured to the second annular member and adapted to be rotated by a driving means.

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