May 12, 1936. J. L. KEMPTHORNE 2,040,178

PUMP OR THE LIKE

Filed Nov. 11, 1933

Fig. 1

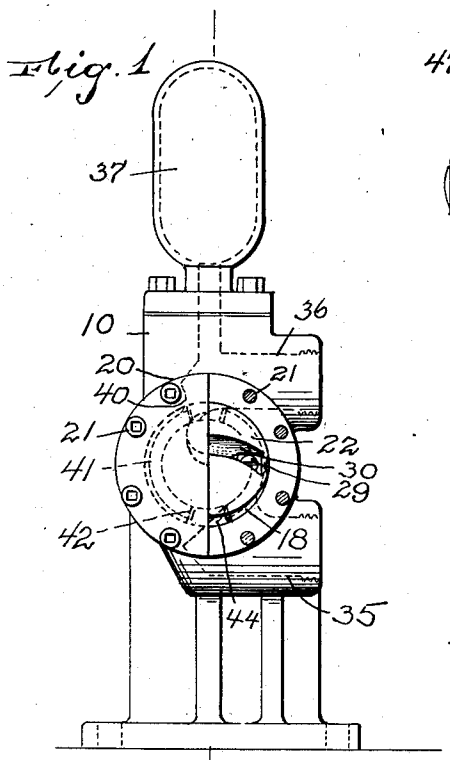


Fig. 3

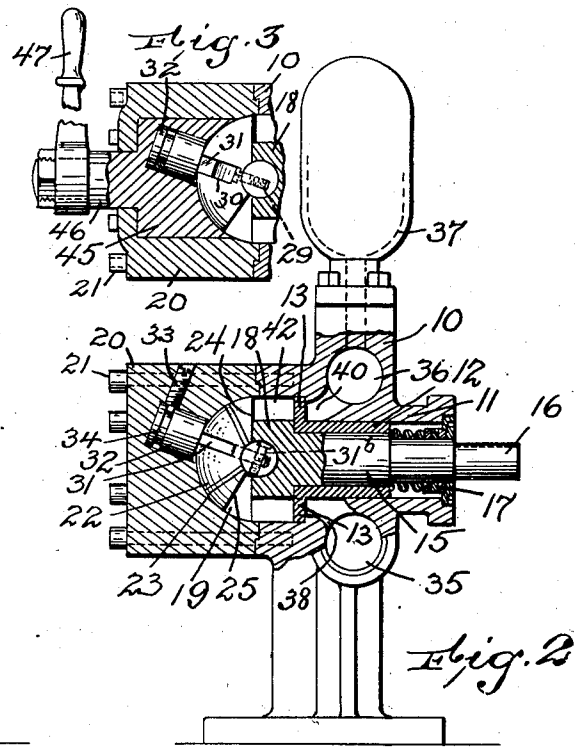
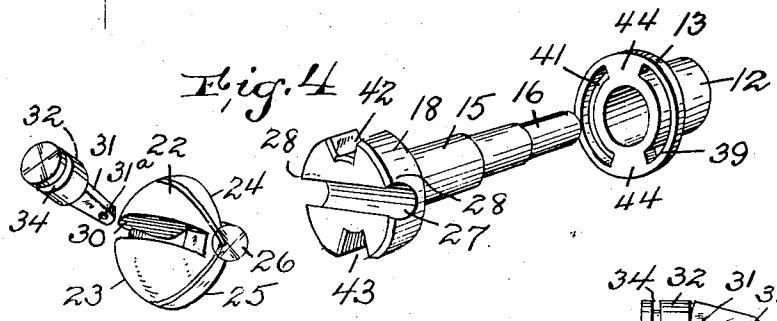


Fig. 2

Fig. 4



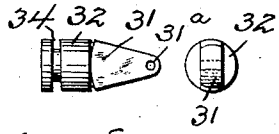


Fig. 5 Fig. 6

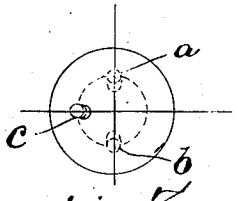


Fig. 7

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PUMP OR THE LIKE

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Application November 11, 1933, Serial No. 697,595

7 Claims. (Cl. 103—142)

This invention relates to an improved mechanical movement particularly adapted for use in pumps, compressors and engines of similar nature.

The invention is designed to provide a pump or the like which will deliver a maximum amount of fluid for the size of pump with a minimum amount of wear. The pump is designed to be compact and also positive in its operation and one in which any repair necessary can be easily made.

The invention also lends itself to an adjustment to regulate the capacity of the pump at a given speed and also to regulate the direction of flow whereby the flow through the pump can be reversed.

The invention is illustrated in the accompanying drawing, in which Figure 1 is an end view of a pump embodying by invention and showing one half the cap removed to expose the rotor. Figure 2 is a section on line 2—2 in Figure 1 with the upper and lower parts in elevation and the rotor and its control pin in elevation. Figure 3 is a section of the left hand portion of Figure 2 with a modification to show one means of readily adjusting the control pin to vary the capacity and/or the direction of flow in the pump. Figure 4 is a perspective view of the operating parts of pump partly separated. Figure 5 is a side view of the control pin and Figure 6 is an edge view of the control pin. Figure 7 is a diagrammatic end view of the end of the cap showing the various positions of the control pin to produce various results in capacity and direction of flow.

The device comprises a suitable casing 10 having a main bearing 11 in which is arranged a sleeve 12. The sleeve has a flange 13 resting against a shoulder 14 in the casing. The sleeve receives a shaft 15 which has an end 16 extending from the casing. This end is for the attachment of a gear or pulley for driving the shaft or it can be directly connected with the shaft of a suitable motor. A liquid, gas, or oil seal 17 of suitable construction is placed in the casing to prevent leakage.

On the inner end of the shaft is a plate 18 which rotates with the shaft and rests against the flange 13. The plate is at the flat end of a hemispherical chamber. The chamber is preferably formed in the face of a cap 20 which fits against the facing of the casing 10 and to all intents and purposes is a part of the casing. The cap is held in place by bolts 21 which pass through the cap and are in screw-threaded engagement with the casing 10. In the spherical chamber is a rotor 22 which is of segmental form of a size less than a hemisphere and with its rounded face 23 fitting the curved wall of the chamber 19 and having two flat faces 24 and 25 which converge toward the centre and are opposed to the plate 18. The rotor 22 and the plate 18 rotate together and are connected by a means that permits the rotor to rock on the plate 18. The rotor 22 and the plate 18 rotate together and are connected by a means that permits the rotor to rock on the plate and which also takes up the larger part of the strain that tends to separate them in a longitudinal direction. The reason for this will be described hereinafter.

The means shown comprises a sealing member 26 which is secured across the narrow end of the rotor and exposes more than half of its cylindrical surface. The plate 18 has a groove 27 with undercut edges 28 forming more than half a cylinder in cross-sectional shape. The sealing member 26 fits in the groove 27 and can not be separated therefrom in a direction longitudinal relative to the shaft 15. The sealing member is preferably made in a separate cylindrical piece partly set into the rotor and fastened by screws 29 to the rotor 22.

On the curved face 23 of the rotor 22 is a slot 30 extending nearly from side to side and parallel with the sealing strip 26. This slot receives the rectangular end 31 of a pin 32 rotatably arranged in the cap but fixed in the cap against any movement other than rotation. This pin 32 is at an angle to the axis of the shaft 15 and plate 18. The form shown includes a screw 33 fitting at its inner reduced end in the peripheral groove 34 in the pin 32. The pin 32 has the part 31 which fits into the slot 30 extended into a slot in the sealing member 26 and the sealing member and the rotor have a limited rocking motion on the part 31. The part 31 of the pin is preferably secured on a pin 31^b which is fastened in the sealing member and passes through a hole 31^a in the end 31 of the pin 32.

The control pin 32 with its end 31 in the slot 30 allows the rotor to rotate with the plate 18 but to be held central on the pin 32. This causes the faces 24 and 25 of the rotor to alternately approach and recede relative to the plate 18. In Figure 2 I show the face 24 against the plate 18 at the end of its expulsion stroke and the face 25 at its maximum open position at the end of its intake stroke. When the shaft 15 and the rotor 22 and plate 18 have completed a half revolution the face 25 will be uppermost and against the plate 18 and the face 24 of the rotor will be

open at the lower part of the chamber. When only a quarter revolution has been made the faces 24 and 25 will be both equi-distant from the plate 18 and at an angle thereto.

The casing has an inlet port 35 and an outlet port 36. The latter may be supplied with a conventional form of air chamber 37, if desired. The inlet port has its inner end 38 opening into the port 39 of the flange 13. The exhaust port has its inner end 40 opening into the exhaust port 41 of the flange 13. The flange 13 does not rotate and is shown as a bearing element for the plate 18 but the flange 13 can be made integral with the casing and the ports 39 and 41 cast directly in the casing 10.

The plate 18 rotates across the face of the flange 13 and has two ports 42 and 43 which extend from front to back and communicate alternately between the chamber 19 and the ports 39 and 41.

The operation of the device is as follows. Assuming the parts to be starting from the position shown in Figures 1 and 2 the ports 42 and 43 are passing across the spaces 44 on the flange 13 and as they leave the space the rotation of the parts brings port 42 in communication with port 39 of the flange 13 and thus with the inlet port 35. The face 24 of the rotor 22 as the rotor rotates with the plate 18 begins to yawn and retreats from the plate 18 thus causing a suction which draws in fluid. When the rotor arrives at its maximum opening after completing a half revolution the port 42 passes across the lower space 44 of the flange and is cut off from the inlet port 39. It then passes into communication with the outlet port 41 and rotating with the plate 18 and on the pin 32 begins to close the face 24 toward the plate 18 and forces the fluid previously taken in to pass out through the port 41 into the outlet port 36 and this continues until all the fluid is expelled and port 42 again reaches upper space 44 where it is shut off from the outlet. While one face is drawing in fluid the other is expelling fluid and vice versa. This operation of the rotor is due to its rotation with the plate and its control pin to be positioned above the axis of rotation of the shaft. To reverse this operation and reverse the flow of fluid through the pump the control pin is shifted to a point diametrically opposite the upper position.

The diagram in Figure 7 shows the control pin at *a* when the pump is expelling through port 36 and shows it at *b* when the pump is reversed and expelling through port 35. When the control pin is placed at *c* which is equi-distant between *a* and *b* the pump will not force fluid from the pump and is inactive as a pumping device even when running. The various positions of the control pin may be changed by removing the cap 20 and replacing it in a different position. This adjustment is made in this way when changes are infrequent.

For ready adjustment I show a construction in Figure 3 which illustrates the control pin rotatable circumferentially in its relation to the axis of rotation of the shaft 15 and the plate 18. The control pin is secured in a bushing 45 rotatable in the cap 20 and having a projecting stud 46 on which a handle 47 is secured. The construction is one form of ready adjustment of the position of the control pin relative to the ports 39 and 41. By moving the handle 47 to turn the bushing 45 the pump can be regulated to vary its capacity, to reverse the flow or to be inactive except for an internal surging, all this without varying the speed of the pump. The modification in Figure 3 also shows a construction having the pin 31 made rectangular but extending only into the rotor and short of the sealing member 26.

This description of the pump is predicated on a fixed casing and a rotatable shaft but it will be evident that a rotatable casing and a fixed shaft will bring about the same result as the mechanical movement which is the gist of this invention remains the same.

Various changes can be made in the form and proportion of the parts without departing from the scope of my invention.

I claim:—

1. A mechanical movement for pumps, compressors and the like comprising a casing having a substantially semi-spherical chamber, a revolvable plate forming the flat side of the chamber, a sleeve in the casing, a flange on the sleeve against which the rear face of the plate rotates, the flange having curved ports and the plate having ports to pass across the ports of the flange, the casing having ports leading to the curved ports of the flange, a segmental shaped rotor occupying a major portion of the chamber and bearing on the curved wall thereof, a sealing member secured to the rotor, the plate having a diametrically arranged slot to receive the member whereby the rotor can rock.

2. A pump or the like comprising a casing having a substantially semi-spherical chamber therein, a rotatable plate forming the flat wall of the chamber, the plate having a diametrically arranged slot with curved walls and with overhanging edges, the segmental rotor fitting the curved wall of the chamber and having a sealing member seated to rock in the slot of the plate and holding the rotor and plate against separation whereby the wear is minimized on the curved surface of the rotor, the casing and the plate having inlet and exhaust ports, the rotor having a slot on its curved face and parallel with the sealing member, a rotatable pin in the casing, said pin being seated in the slot in the rotor, said pin rotating on an axis inclined to the axis of rotation of the plate.

3. A pump or the like comprising a casing having a substantially semi-spherical chamber therein, a rotatable plate forming the flat wall of the chamber, the plate having a diametrically arranged slot with curved walls and with overhanging edges, a segmental rotor fitting the curved wall of the chamber and having a sealing member seated to rock in the slot of the plate and holding the rotor and plate against separation whereby the wear is minimized on the curved surface of the rotor, the casing and the plate having inlet and exhaust ports, the rotor having a slot on its curved face and parallel with the sealing member, a rotatable pin in the casing, said pin being seated in the slot in the rotor, said pin rotating on an axis inclined to the axis of rotation of the plate and means for shifting said pin circumferentially relative to the axis of rotation of the plate.

4. A pump or the like comprising a casing having a substantially semi-spherical chamber therein, a rotatable plate forming a flat wall across the diameter of the chamber, the plate having a diametrically disposed recess, a sealing strip fitting in the recess and held agains movement laterally of the strip, a rotor secured to the sealing strip, said rotor being segmental in shape

and having flat faces opposite the plate, a rotatable pin extending from the curved wall of the casing and inclined relative to the axis of rotation of the plate, said pin having a rectangular portion extending through the rotor and into the sealing strip, said rotor and sealing strips having slots to receive the pin and to allow a limited rocking movement of the rotor and strip.

5. A pump or the like comprising a casing having a substantially semi-spherical chamber therein, a rotatable plate forming a flat wall across the diameter of the chamber, the plate having a diametrically disposed recess, a sealing strip fitting in the recess and held against movement laterally of the strip, a rotor secured to the sealing strip, said rotor being segmental in shape and having flat faces opposite the plate, a rotatable pin extending from the curved wall of the casing and inclined relative to the axis of rotation of the plate, said pin having a rectangular section extending through the rotor and into the sealing strip, said rotor and sealing strips having slots to receive the pin and to allow a limited rocking movement of the rotor and strip and a pin in the strip and passing through the end of the pin that extends through the rotor.

6. A mechanical movement for pumps, compressors and the like comprising a casing having a substantially semi-spherical chamber, a rotatable plate forming the flat side of the chamber, a rotor of segmental shape occupying a major portion of the chamber, means for sealing the diametrical juncture of the flat faces of the rotor and of the plate, the rotor having a slot in the curved face and parallel with the sealing means, and a pin projecting from the curved wall of the casing and extending into the slot, said pin being mounted so as to oscillate on an axis radial to the center of the plate.

7. A mechanical movement for pumps, compressors and the like comprising a casing having a substantially semispherical chamber, a rotatable plate forming the flat side of the chamber, a rotor of segmental shape occupying a major portion of the chamber, means for sealing the diametrical juncture of the flat faces of the rotor and of the plate, the rotor having a slot in the curved face and parallel with the sealing means, and a pin projecting from the curved wall of the casing and extending into the slot, said pin extending into the sealing means, the sealing means being slotted to receive the pin, and means for securing the end of the pin to the sealing means.

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