POSITIVE DISPLACEMENT PUMP OF THE CONSTANT DELIVERY TYPE

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This invention relates to certain improvements in positive displacement pumps, and has for one of its objects, to provide a reliable and noiseless pump of simple manufacture, and of a large capacity. Another object of the invention is to provide a positive displacement pump wherein there is a minimum of surface friction. A further object of the invention is to provide a pump of the constant delivery type with improved means in its construction whereby the operative parts compensate for natural wear, thus providing for efficient operation over a long service life.

A still further object of the invention is to provide simple mechanism to actuate the vanes or blades of the pump or blower.

Another further object of the invention is to provide a blade type of positive delivery pump with packing means at the inner blade edges. Other and further objects will appear in the specification and be specifically pointed out in the appended claims, reference being had to the accompanying drawing, exemplifying the invention, and in which:

Figure 1 is a longitudinal vertical section taken through this improved pump, approximately on the line I—I of Fig. 2.

Figure 2 is a transverse vertical section taken approximately on the line II—II of Fig. 1.

Figures 3, 4 and 5 are sections similar to Fig. 2, on a reduced scale, showing different operating positions of the blades with respect to suction and discharge.

Figure 6 is a transverse vertical section similar to Fig. 2, showing a different embodiment of the invention with respect to the blades.

Referring by numerals to the accompanying drawing, 1 designates a housing which comprises a cylindrical body 2 having end walls 3 and 4, the end walls being secured to the body by studs or bolts 5. The body 2 on respective sides of its vertical longitudinal center, is provided with an intake connection 6 and a discharge connection 7, said connections paralleling each other and having their ends terminating on the same plane to simplify the machine facing operation of the end surfaces to which the intake and discharge manifolds may be sealingly bolted or attached.

Each of the end walls 3 and 4 is recessed or counterbored as designated at 8, said counterbores being in longitudinal alignment and are disposed eccentric to the cylinder of the body 2 of the housing, and are for the reception of respective end members 9 and 10 of a blade operating rotor 11.

The blade operating rotor 11 comprises the end members 9 and 10 which are held apart or supported by a series of rods 12 which are pinned or keyed at their ends to respective end members 9 and 10. Before the rods 12 are secured to and between the end members 9 and 10, a sleeve 13 is provided on each rod, and mounted on each rod is a plurality of spaced pairs of links 14 and 15 a spacer member 16 between each pair of links.

The end member 9 of the rotor 11 is provided with a concentric extension shaft 16 which extends through the end wall 3 of the housing 1 and keyed on the extending end of said shaft is a grooved pulley 17. The end member 9 of the rotor 11 is also provided with a concentric recess 18 for the reception of a bearing block 19, said block being for the support of one end of a shaft 20 which is fixed to said block by the pin 21.

The shaft 20 is longitudinally extended through the housing 1 concentric thereto and in eccentric disposition to the rotor 11, the position of said shaft however to the rotor, being within the arc or circumference described by the rods 12 of the rotor.

The shaft 20 is provided with a longitudinal sleeve 22, said sleeve and shaft being for the support of a plurality of hinges 23, each having a leaf extension 24 provided with a pin aperture 25 parallelizing the shaft 20.

The hinges 23 and their brackets 24 are for the support of a plurality of blades 25, said blades being of the approximate length of the distance 35 between the end members 9 and 10 of the rotor 11 and of the approximate depth from the periphery 27 to the hub or bearing portions of the hinges, and being secured to the leaf extensions 24 of the hinges in a desired manner, such as by spot welding or riveting.

A packing strip 40 is supported in a bracket 41 at the inner end of each blade 26, said packing strips being held in resilient contact with the hubs of the hinges 23 by a kinked spring 42 or the like.

From the disclosure of the drawing, it is to be noted that three sets of links 14 are mounted on each rod 12. Each set of links of a respective rod, at their extending ends, is adapted to be cooperably connected by pins 26 to a respective leaf extension of a hinge 23, by the insertion of a pin in the aperture 25 of the respective leaf extensions.

With this arrangement, there are therefore, 55
three leaf extensions 24 secured to each blade 26, and there are three sets of links 14 cooperably connecting a respective blade, from a respective rod 12.

The end member 10 of the rotor 11 is in the form of a ring, the opening of the ring or end member providing a bearing on the bearing block 29 which is fixedly secured to the shaft 28 by the pin 30, said bearing block also serving to receive the eccentric end opening 31 in the end wall 4 of the housing and is fixedly secured against turning by the screw 32.

With further regard to the end members 8 and 10 of the rotor 11, said end members are adapted to rotate on and for relief of the bearing wear between said end members and the blocks, bearing bushings 33 are provided. Obviously, if desired, either ball or roller bearings could be used in lieu of the bushings 33.

In operation, a driven belt is mounted over the grooved pulley 17 and the rotor 11 is revolved in the direction of the arrow 34, whereby the blades 26 will be caused to alternately communicate with 28 and pass the inlet and exhaust ports of respective connections 6 and 7.

By reason of the rotor 11 being disposed eccentrically in the housing and the shaft 28 on which the blades 26 are mounted, being disposed concentrically in the housing and in a position within the arc described by the rods 12 of the revolving rotor, the links 14 connecting the hinges of respective blades 26, will become active on respective blades to cause them to in turn travel faster as they pass and leave the inlet port, and to travel slower upon reaching and passing the outlet port.

During revolving of the rotor, the supporting rods 12 will be alternately carried towards and away from the fixed shaft 28, thus causing the links 14 to exert a toggle action on respective blades 26 wherein the peripheral travel of the blades is increased in effecting a suction action, and subsequently decreased during a discharge action.

Figs. 2, 3, 4 and 5 of the drawing show the blade positions taken at consecutive partial rotation of the rotor. Fig. 2 illustrates the approximate positions of the blades, which are further designated as A, B and C, wherein a suction action is taking place in the sector D of the cylinder or housing between the blades A and B, and complete simultaneous discharge is being carried on from the sector E and whereas blade C has just entered the dead sector F. Figs. 3 to 5 inclusive, show the carrying out of intermediate operating stages.

Fig. 2 also shows the position of the rotor when a blade is at each end of the dead sector F, said pair of blades which are designated as B and C, containing a pocket of fluid at prevailing discharge pressure, in said sector. Obviously, the pocketed fluid in the sector F between the blades B and C, will be discharged into the intake or suction side of the pump. To provide for the utilization of the energy of the expanding compressed charge from the dead sector F, a lip 35 is extended into the intake connection 6 for its entire width and in a manner to form a clearance passage at and in a manner to form a clearance passage at

70 the intake connection, 6, in a direction shown by the arrow 36, thereby assailing the preceding blade by ejector action of the re-expanding compressed fluid in completing the filling of the housing chamber when the rotor is positioned, as shown in Fig. 4.

The embodiment shown in Fig. 6 provides for a variation of the pump construction wherein four blades 31 and their respective rod supports 38 and links 39 are employed. This embodiment as shown, consists in employing bent blade 31, which in their manufacture may be cut from bent stock material, thereby providing the blades 10 of a structure which will present longitudinal rigidity therefor. Blades of this specifically formed structure provide for the use of linkage that will result in decreasing the arc between adjacent blades at dead sector, thus resulting in a consequent minimum engagement of discharge fluid between pairs of blades travelling through the dead sector G, to the suction side of the pump.

Having thus described my invention so that those skilled in the art will be able to practice the same, what I desire to secure by Letters Patent is defined in what is claimed, it being understood that various changes in the displacement pump shown and described above in detail and not amounting to invention may be made without departing from the spirit and scope of my invention.

What I claim is:—

1. A pump comprising a housing having an intake port and a lip extended into said port; an eccentrically disposed rotor within the housing; blades concentrically disposed in the housing; and toggle actuating means carried by the rotor having rearward connection with the blades; said lip being disposed outwardly from the inner periphery of the housing and inwardly inclining into the inlet port.

2. A pump comprising a housing having an intake port and a lip extended into said port; an eccentrically disposed rotor within the housing; blades forming parts for the rotor; a fixed support for the inner ends of said blades, disposed concentrically in the housing; and actuating means for the blades, connected at one end to the rotor and at their other ends to the blades; said lip being of the approximate length of the width of the intake port and inclining inwardly therein.

3. A pump comprising a housing having inlet and exhaust ports; an eccentrically disposed rotor within the housing; a shaft extending through said housing, disposed concentrically therein; a series of blades radially extending from said shaft for cooperation with said ports; a lip of the approximate width of the inlet port and extending in the direction of travel of said blades into the inlet port and being disposed outwardly of the inner periphery of the housing; and actuating means for the blades connected at one end to the rotor and at their opposite ends to respective blades.

4. A pump comprising a housing having inlet and exhaust ports; an eccentrically disposed rotor within the housing; a shaft extending through said housing, disposed concentrically therein; hinges on said shaft and radially extending blades each having a groove extending the width thereof for the reception of parts of the hinges and actuating means for the blades connected to the blader and to the parts of said hinges.

5. A pump comprising a housing having inlet and outlet ports; an eccentrically disposed rotor within the housing; a shaft extending through said housing, disposed concentrically therein; hinges
on said shaft and radially extending blades secured to said hinges; each blade being bent length of its width for the reception of parts of the hinges; and links carried by the rotor having their extending ends connected to the parts of said hinges of said blades.

6. A pump comprising a housing having inlet and exhaust ports; an eccentrically disposed rotor within the housing; a fixed concentric shaft in the housing; a plurality of blades each being grooved and of longitudinal length; hinges mounted on said shaft and secured to respective blades within the grooves; and swingable means carried by the rotor having connection with said rods.

7. A pump comprising a housing having inlet and exhaust ports; an eccentrically disposed rotor within the housing; a fixed concentric shaft in the housing; a plurality of blades; hubbed hinges mounted on said shaft and secured to respective blades; swingable means carried by the rotor having straddling connection with said hinges; and a packing element carried by each blade in contacting relation with the hubs of said hinges.

8. An operating mechanism for displacement purposes comprising a series of circumferentially disposed rods; turnable end members for supporting the rods; a supporting element paralleling the axis of said end members; blades fixedly connected to said hinges; and connecting members cooperably secured in pairs to the rods and to the hinges of the blades; in straddling relation with the hinges.

9. An operating mechanism for displacement purposes comprising a series of circumferentially disposed rods; turnable end members for supporting the rods; a sleeve mounted on each rod in approximate abutment at its ends with respective end members; a blade hinge turnedly mounted on said element, blades fixedly connected with hinges to said element; and connecting members cooperably secured in pairs on the sleeves and to the hinges.

10. An operating mechanism for displacement purposes comprising a series of circumferentially disposed rods, turnable end members for supporting the rods; a blade supporting element paralleling the axis of said end members disposed adjacent and within the arc described by said rods when the end members are revolved; blades connected with hinges to said element; and connecting members cooperably secured to the hinges of said element; and pairs of connecting members cooperably secured to the rods and to the hinges of the blades; in straddling relation with the hinges.

11. An operating mechanism for displacement purposes comprising a series of circumferentially disposed rods; turnable end members for supporting the rods; a blade supporting element disposed parallel with and offset from the axis of said end members; blades connected with hinges to said element; and connecting members cooperably secured in pairs to the rods and the hinges.

12. An operating device for displacement purposes comprising revolvably mounted end members; a series of circumferentially disposed rods carried by said end members; a blade supporting element disposed parallel with and offset from the axis of said end members; blades connected with hinges to said element, and connecting members cooperably secured to the rods and the hinges.

13. An operating device for displacement purposes comprising turnably mounted end members; a series of circumferentially disposed rods secured at their ends in said end members; a sleeve mounted on each rod in approximate abutment at its ends with respective end members; a blade supporting element paralleling the axis of said end members and disposed adjacent and within the arc described by said end members when the end members are revolved; blades connected with hinges to said element, and connecting members cooperably secured on the sleeves of the rods and to the hinges of the elements.

14. An operating mechanism for displacement purposes comprising a series of circumferentially disposed rods; turnable end members for supporting the rods; a supporting element paralleling the axis of said end members; blade hinges turnedly supported on said element and having an extending portion; blades connected to the extending portions of said hinges; and connecting members swingably secured to the rods and to the extending portions of said hinges.

15. A pump comprising a housing having paralleling inlet and exhaust connections having their outer extending ends terminating in the same plane; an eccentrically disposed rotor within the housing; a fixed concentric shaft in the housing; hubbed hinges turnedly mounted on said shaft having extending parts; a plurality of blades fixed to the extending parts of said hinges; and swingable links carried by the rotor and having pivotal connection with the extending parts of said hinges.

HERBERT J. KRATZER.