April 13, 1937. T. A. BATEMAN 2,076,536

VALVELESS ROTARY PUMP

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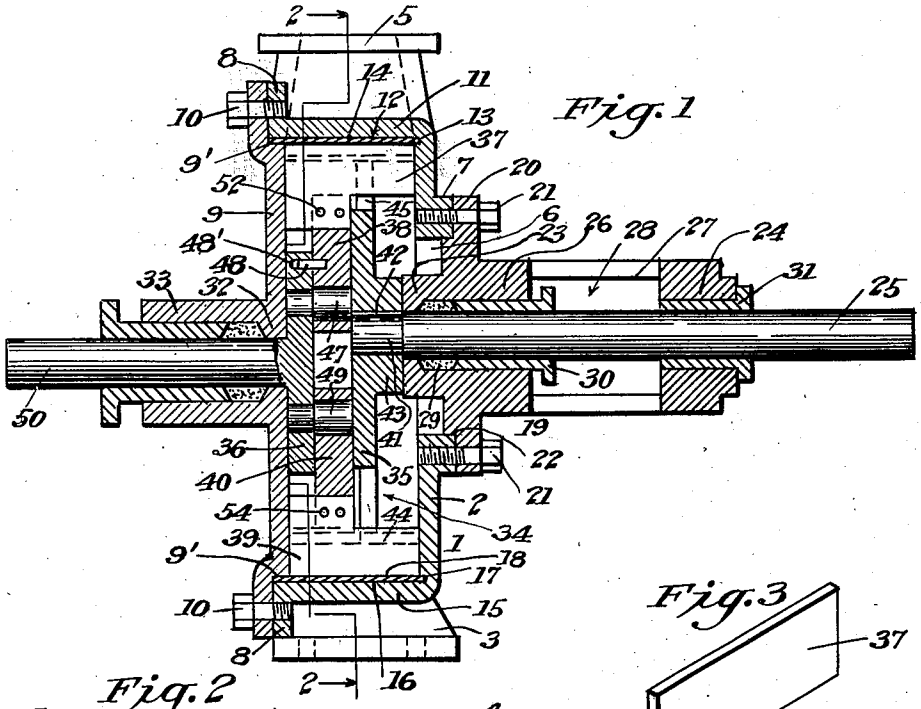


Fig. 1

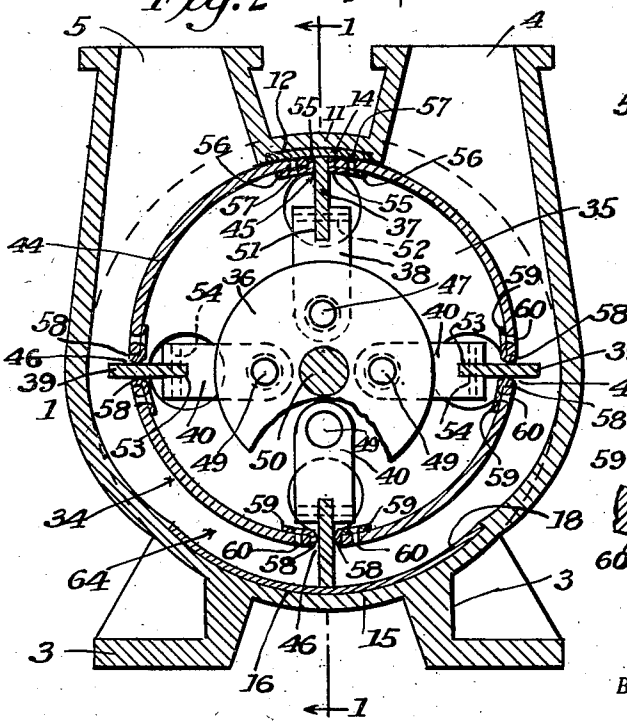


Fig. 2

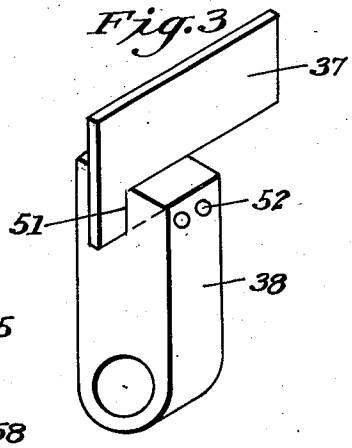


Fig. 3

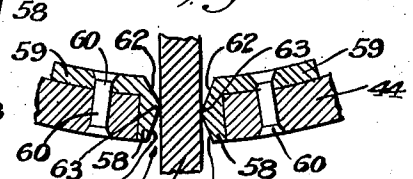


Fig. 4

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VALVELESS ROTARY PUMP

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2 Claims. (Cl. 103—144)

This invention relates to pumps, and more particularly to valveless rotary pumps.

In valveless rotary pumps there is considerable wear of the parts, which causes leakage and impairs the efficiency of such pumps, and the only way to repair such worn parts is to replace the same with entirely new and complete parts, such as the casing and the actuator. Such repairs are expensive and require considerable time.

One of the objects of my invention is to provide an improved valveless rotary pump, constructed and arranged with inexpensive replaceable wearing members, which may be readily replaced, when worn, to eliminate leakage, whereby the pump may be maintained at its highest efficiency, at a minimum cost.

Another object is to provide a valveless rotary pump of simplified construction.

Other objects and advantages will appear hereinafter.

The invention is illustrated in the annexed drawing, which forms a part of this specification and in which,

Fig. 1 is a vertical longitudinal section of a valveless rotary pump embodying my invention, taken on the line 1—1 of Fig. 2.

Fig. 2 is a transverse vertical section of the pump shown in Fig. 1, taken on line 2—2 of Fig. 1.

Fig. 3 is a perspective on one of the impelling vanes and the arm on which said vane is secured.

Fig. 4 is an enlarged fragmentary section, taken on line 2—2 of Fig. 1, illustrating a portion of the actuator, one of the impelling vanes extending through a slot in the rim of said actuator, and replaceable wearing members for said vane mounted on said actuator rim and fitted within said vane slot.

Referring more particularly to the drawing, in which corresponding parts are designated by the same reference characters in all of the figures of the drawing, 1 designates a casing, formed with a rear wall 2 and open at the front thereof, and formed at its lower side with supporting legs 3 and at its upper side with an induction duct 4 and an eduction duct 5, which ducts are located at the right and left respectively of the center of the casing, as illustrated in Fig. 2 of the drawing. The casing 1 is formed with an eccentric opening 6 in its rear wall 2, and with an external annular boss 7 surrounding said opening. Said casing is formed at its open front with an external flange 8, to which a front plate 9 is bolted by means of bolts 10, for closing the front of said casing. The upper wall 11 of the casing 1, between the induction duct 4 and the eduction duct 5, is provided in its inner side with a recess 12, while the rear wall 2 of said casing is provided, in its inner side, with a recess 13, at the rear end of the recess 12, in which recesses is fitted an arcuate wearing plate 14, the rear edge of said plate fitting in the recess 13 and the remaining portion of said plate fitting in the recess 12, said upper wall 11 and said arcuate plate being concentric with the center of the casing 1. The lower wall 15 of the casing 1 is provided with an elongated recess 16 in its inner side, while the rear wall 2 is provided in its inner side, at the inner end of the recess 16, with a recess 17, in which recesses is fitted a wearing plate 18, the rear edge of said plate being fitted in the recess 17 and the remaining portion of said plate fitting in the recess 16, said lower wall 15 and said arcuate wearing plate 18 being concentric with the center of the casing 1, and said plate extending equidistantly at opposite sides of the center of said casing. The front plate 9 is formed on its inner side with an annular external shoulder 9', which fits within the front end of the casing 1 and against the inner side of the wearing members 14 and 18, whereby said wearing members are secured at their forward edges in the recesses 12 and 16 respectively.

A bearing fitting 19, formed with an external annular flange 20 near its forward end, is fitted at its forward end within the opening 6 in the rear wall 2 of the casing 1, with said flange resting against the boss 7 surrounding the opening 6, which flange is secured to said boss by bolts 21, whereby said fitting is detachably mounted on said casing, with its forward end extending through said opening 6 into the rear of said casing and the greater portion of its length extending rearwardly beyond the rear wall 2 of said casing, as illustrated in Fig. 1 of the drawing. Said fitting 19 is formed with an annular external shoulder 22 extending forwardly from the flange 20, which shoulder fits within the opening 6 in the rear wall 2 of the casing 1, for firmly positioning the fitting on said wall eccentrically of said casing. The fitting 19 is formed with a bearing 23 at its forward end and with a bearing 24 at its rear end, in which bearings is journaled a drive shaft 25, which extends through said fitting, there being a packing box 26 in the forward end of said fitting to prevent leakage of fluid from the casing 1 through the bearing 3, which packing box and bearing 24 are connected by webs 27, spaced apart at opposite sides of the center of the fitting 19 and providing an opening 28 in said fitting, between said webs and between said packing box 26 and said bearing 24, through which

opening a packing 29 and the packing box gland 30 may be introduced into or removed from the packing box 26. A bushing 31 is fitted in the bearing 24 of the fitting 19.

The front plate 9 is formed with a central bearing 32, concentric with the casing 1, and with a packing box 33 projecting forwardly therefrom.

Within the casing 1 is mounted a rotor 34 comprising a cup-shaped cylindrical actuator 35, a pistonhead 36, a non-oscillative impelling vane 37 and arm 38, on the outer end of which arm said vane is mounted, and a plurality of oscillative impelling vanes 39 and arms 40, on the outer end of which arms said vanes are respectively mounted. The actuator 35 is keyed concentrically on the inner reduced end 41 of the drive shaft 25 by a key 42, there being a hub 43 formed on the rear wall of said actuator and projecting rearwardly therefrom, in which said reduced end of said drive shaft and said key are fitted, the rear end of said hub abutting against the inner end of the bearing 23. The rim 44 and rear wall of the actuator 35 are provided with a slot 45, through which the vane 37 extends and reciprocates, and with a plurality of slots 46 through which the vanes 39 respectively extend and reciprocate. A pin 47 is secured in the piston head 36 and extends rearwardly from said head, and on the rear extension of said pin is fitted the inner end of the vane arm 38, which arm is prevented from turning on said pin, and the actuator 35 is prevented from turning with relation to the piston head 36, by a locking pin 48, which is secured in the arm 38 and extends into a socket 48' in the piston head 36. A plurality of pivot pins 49 are secured in the piston head 36 and extend rearwardly from said head, and on the rear extensions of said pins are pivotally fitted the inner ends of the vane arms 40 respectively. The piston head 36 is formed on the inner end of a shaft 50 which extends through the bearing 32 and packing box 33 on the front plate 9, and is journaled in said bearing. The vane 37 is secured in a slot 51 in the outer end of the arm 38, by rivets 52, and the vanes 39 are secured in slots 53, in the outer ends of arms 40, by means of rivets 54. A pair of wearing members 55 are fitted in the vane slot 45 in the actuator 35 against the sides respectively of said slot, to take up wear of the vane 37 in said slot, during the reciprocation of said vane through said slot, between said wearing members, as the rotor 34 is rotated in pumping fluid through the pumping chamber 61, said wearing members being formed with extensions 56, respectively, bent at an angle to said wearing members against the inner side of the actuator rim 44, through which extensions respectively and said rim extend rivets 57, whereby said wearing members are replaceably secured in position in said slot. The wearing members 55 are straight and parallel, since the vane 37 reciprocates only in a direction radial to the center of the actuator 35 and the piston head 36. A pair of wearing members 58 are fitted in each of the vane slots 46 in the actuator 35, against the sides of said slots, to take up wear of the vanes 39 in said slots, during reciprocation and oscillation of said vanes through said slots, between the wearing members 58 therein, respectively, as the rotor 34 is rotated in pumping fluid through the pumping chamber of the pump, each of said wearing members being formed with an extension 59, bent at an angle thereto, against the inner side of the actuator rim 44, which extension is secured to said rim by a rivet 60, whereby said wearing members are replaceably secured in position in said slots. The wearing sides of each pair of wearing members 58 are beveled in opposite directions, as at 61 and 62, from points 63, midway between the inner and outer ends of said wearing members, so that the sides of a vane 39 contact with said wearing members only at said points 63, while said beveled faces 61 and 62 allow the vane to oscillate, as the vane reciprocates through a slot 46 in the actuator 35, during rotation of the rotor 34.

The axis of the actuator 35 is positioned eccentrically in the casing 1, and the diameter of said actuator is such that the uppermost point of the periphery of the actuator rim 44 contacts with the wearing plate 14 at the highest point of the inner surface of the casing and midway between the induction duct 4 and the eduction duct 5, and forms a seal between said ducts at said point of contact, while a segmental pumping chamber 64 is formed between the periphery of said actuator rim 44 and the inner surface of the casing 1, extending from the induction duct 4 downwardly and under the actuator 35, and upwardly to the eduction duct 5.

The operation of my pump is as follows:

Power being applied to the drive shaft 25 and the rotor 34 rotated clockwise, as illustrated in Fig. 2 of the drawing, the impeller vanes 37 and 39, reciprocating through the actuator slots 45 and 46, respectively, and contacting at their outer ends with the wearing surface of the wearing plate 18, produce a vacuum at the rear of said vanes and an impelling force in advance of said vanes, which vacuum draws fluid through the induction duct 4 into the pumping chamber 64 and which impelling force pumps said fluid from said pumping chamber out of the casing 1 through the eduction duct 5. The operation of my pump, as above described, may be reversed by rotating the drive shaft 25 and rotor 34 in a reverse or counterclockwise direction, during which operation the fluid is taken into the pump through the eduction duct 5 and pumped out of the casing through the induction duct 4.

When the wearing plates 14 and 18 become worn, the front plate 9, upon removing the bolts 10, is removed from the front of the casing 1, the plates 14 and 18 are withdrawn from their receiving recesses 12 and 13, and 16 and 17 respectively, through the front of the casing, and other new plates 14 and 18 are inserted in said recesses, whereupon the front plate 9 is again secured in position on the front of the casing by the bolts 10.

When the vane wearing members 55 and 58 become worn, upon removal of the front plate 9 from the casing, the rivets 57 and 60 are punched out of the extensions 56 and 59 of said wearing members respectively and out of the actuator rim 44; the wearing members 55 and 58 are removed from the vane slots 45 and 46 respectively; new wearing members 55 and 58 are placed in said vane slots respectively, and the extensions 56 and 59 of said wearing members are riveted to the actuator rim 44 by new rivets 57 and 60 respectively. The front plate 9 is then bolted on the front of the casing 1 and the pump is again ready for service.

I do not limit my invention to the exact construction herein disclosed, since certain changes

may be made therein without departing from the spirit of the invention.

I claim:

1. A pump comprising a casing formed with an induction duct and an eduction duct, a rotor mounted in said casing including an actuator, a piston head, a plurality of vanes, pivot pins secured in said piston head, vane arms turnably fitted at their inner ends on said pivot pins respectively, said vanes being secured on the outer ends of said vane arms respectively, and a pin for securing one of said vane arms to said piston head to prevent turning of said arm on its pivot pin, the rim of said actuator being provided with slots through which said vanes extend respectively, said actuator being journaled eccentrically in said casing with the periphery of its rim in contact with the inner surface of the wall of said casing between said ducts, and said piston head being journaled concentrically in said casing with the outer ends of said vanes in contact with the inner surface of said casing.

2. A pump comprising a casing formed with an induction duct and an eduction duct, a rotor mounted in said casing including an actuator, a piston head, a plurality of vanes, pivot pins secured in said piston head, vane arms turnably fitted at their inner ends on said pivot pins respectively, said vanes being secured on the outer ends of said vane arms respectively, a vane arm mounted on said head in fixed radial relation thereto, a vane secured to the outer end of said arm, the rim of said actuator being provided with slots through which said vanes extend respectively, said actuator being journaled eccentrically in said casing with the periphery of its rim in contact with the inner surface of the wall of said casing between said ducts, and said piston head being journaled concentrically in said casing with the outer ends of said vanes in contact with the inner surface of said casing.

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