Dec. 13, 1927. 1,652,323

P. A. PETTERSSON

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Filed Dec. 15, 1921 2 Sheets-Sheet 1

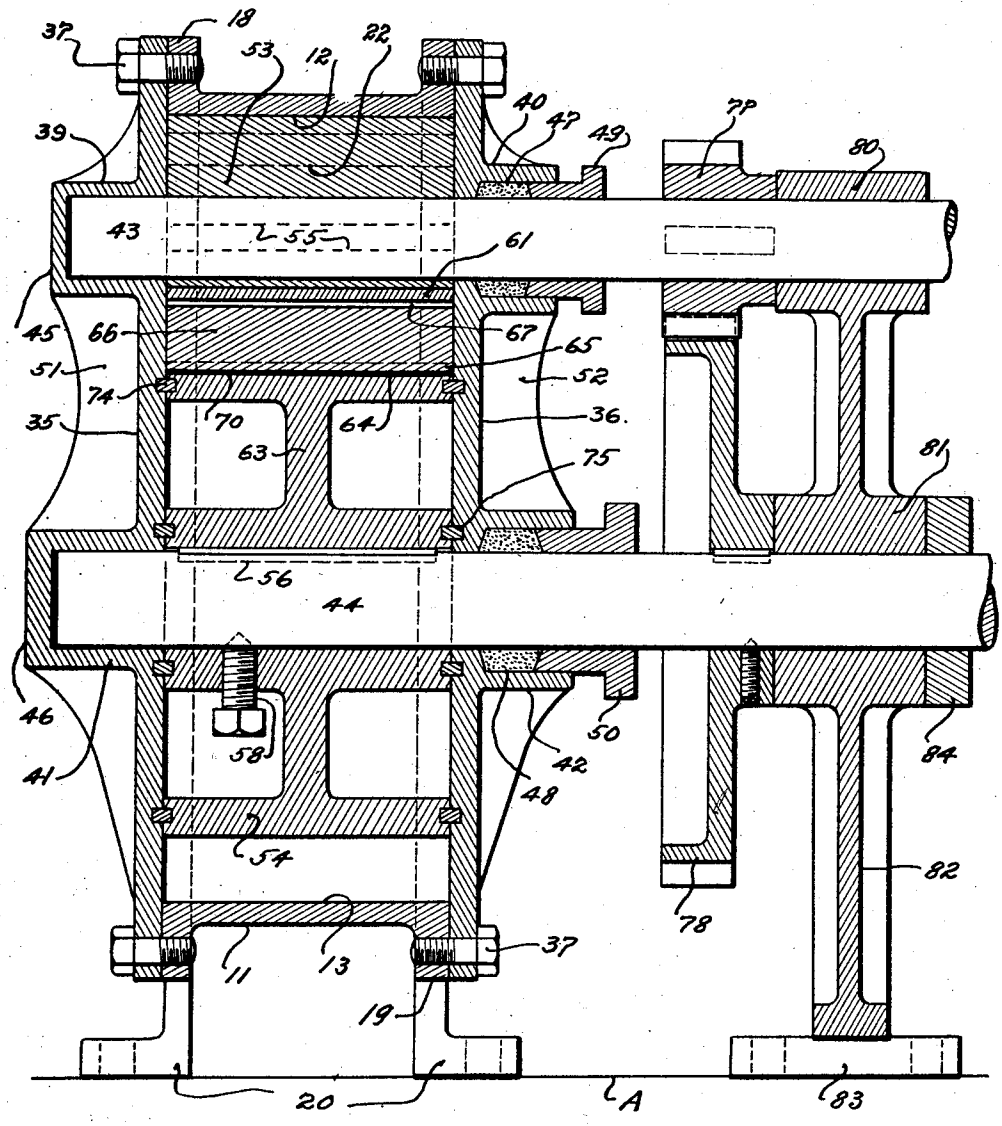


Fig. I

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2 Sheets-Sheet 2

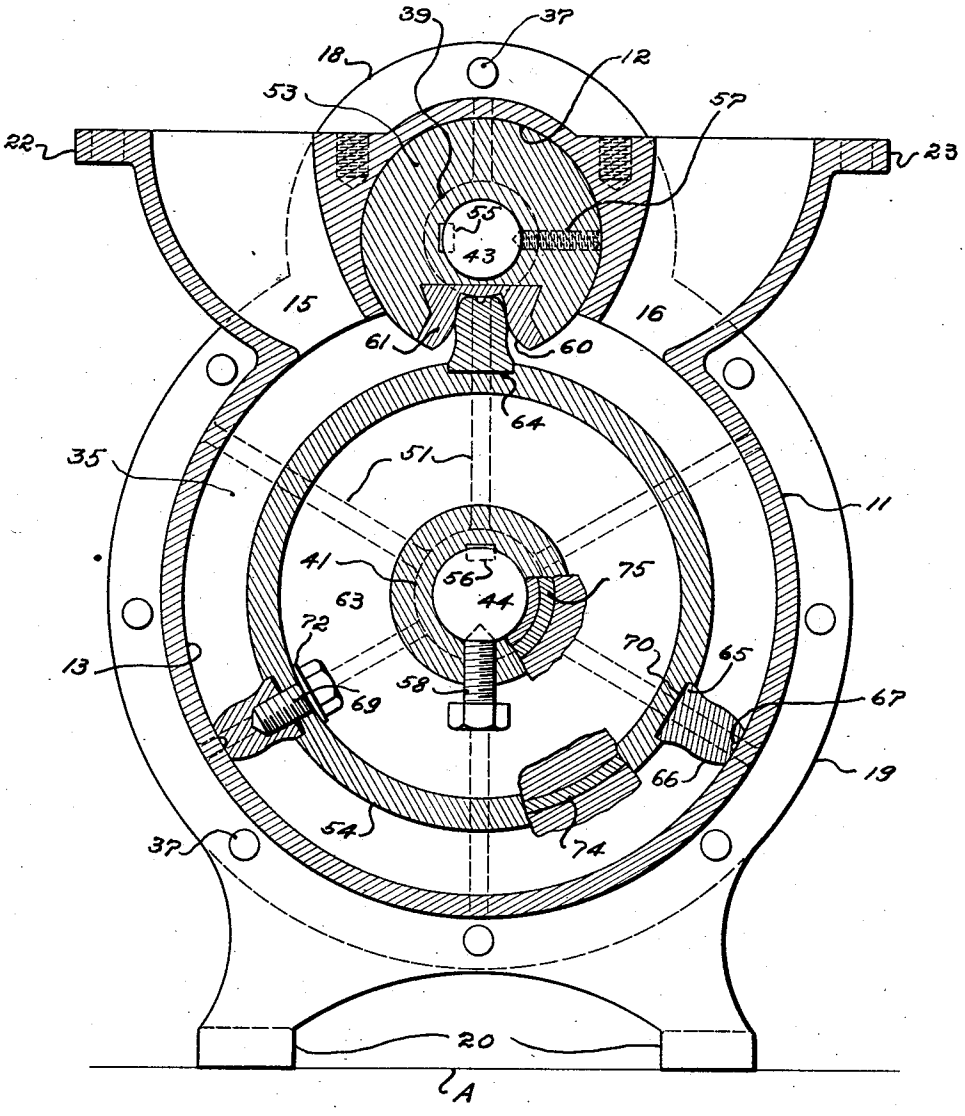


Fig. II

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Patented Dec. 13, 1927. 1,652,323

UNITED STATES PATENT OFFICE.

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PUMP.

Application filed December 15, 1921. Serial No. 522,640.

This invention relates to improvements in rotary pumps, particularly of the valveless type.

The main object of the invention is to provide a pumping device of the character described with impelling members which shall be self-emptying at each engagement thereof so as to eliminate back surging of the fluid acted upon.

Another object is to produce a pumping device of the nature set forth wherein the approaching or contacting surfaces of the fluid impelling members are so proportioned as to have differential velocities in order to reduce slippage therebetween.

A further object is the production of a pumping device of the type specified having impelling members carrying interchanging elements which shall be adjustable to compensate for wear and capable of being renewed when worn beyond adjustment.

Still another object is the provision in a pumping device of the class mentioned of sealing means for the stratifying of the fluid slippage on the sides of the larger and slower moving impeller.

A still further object is to furnish a pumping device of the kind referred to, including impellers embodying interengaging cog-elements the pitch circles whereof shall at all times be located below the inlet and outlet openings of the chambers wherein they operate so as to make them fluid sealed.

An additional object is to supply a pumping device of the genus alluded to, composed of few parts of simple, light but strong and durable construction, readily assembled or taken apart, conveniently operated as well as easily repaired, besides amenable to low cost of manufacture.

Other objects and advantages of the invention will become apparent as the specification proceeds.

With the aforesaid objects in view, the invention consists of the novel combinations and arrangements of parts hereinafter described in their preferred embodiments, pointed out in the subjoined claims, and illustrated on the annexed drawings, wherein like parts are designated by the same reference characters throughout the several views.

Briefly described, the invention under consideration includes in its organization, a casing provided with intersecting chambers of different sizes wherein are mounted to rotate drum-shaped impelling members. The larger one of these members carries at the circumference thereof spaced cog-like elements adapted to engage one at a time with a gap having the contour of the adjacent flanks of a pair of gear teeth and formed on the smaller impeller. Each of the cog-elements is capable of entirely filling the tooth-gap so that every ounce of fluid is forced out of the latter whereby surging back and forth thereof is prevented when the impelling members are revolved. The outside periphery of the smaller member that also includes the tooth-gap rotates at an interrelatively higher surface speed than the face of the larger member which carries the cog-elements, this being conducive to decrease of slippage between the approaching or contacting surfaces of the impellers. The tooth gap is preferably formed in a shoe which is removably seated in the smaller member so that when worn too much it may be renewed. Similarly the cog elements are disconnectedly attached to the face of the larger member in order to enable the same to be set out to take up wear, or for replacement at such times as it is needed. For the purpose of preventing slippage of the fluid on the sides of the larger and slower revolving member, annular tighteners are lodged, in grooves provided therefor, halfway each in this member and the adjacent walls of the casing the same serving to stratify in a radial direction the fluid around the shaft which drives the member, so that a reduced pressure prevails upon the stuffing box thru which this shaft has to pass. Means are provided for driving the shafts by which the impelling members are rotated in perfect correlation, and the power for setting the members in motion may be applied to either one of these shafts.

The advantages of the invention as here outlined are best realized when all of its features and instrumentalities are combined in the one and same structure, but, useful devices may be produced embodying less than the whole.

It will be obvious to those skilled in the art to which the invention appertains, upon becoming conversant with the details thereof, that the same may be incorporated in several different constructions. The accompanying drawings, therefore, are submitted merely as showing the preferred exemplification of the invention.

In the said drawings:—

Figure I is a substantially central longitudinal section of a rotary pump constructed according to the present invention; and

Fig. II is a transverse section taken approximately thru the middle of the pump casing.

Referring now to the said views for a detailed description of this improved pumping device, the numeral 11 denotes the middle part of the pump's casing or housing, which is divided into two intersecting chambers 12 and 13, of different diameters. Ports 15 and 16 are formed in the said part 11, preferably at or near the points of intersection of the said chambers, on opposite sides thereof, as clearly seen in Fig. II. These ports, it is understood, are provided, respectively, for the ingress and egress of the fluid handled by the pump, and may be utilized optionally and interchangeably for either purpose, depending upon the direction of motion imparted to the impellers, before referred to and hereinafter specifically described.

Following the contour of the aforementioned chambers 12 and 13, are outwardly directed flanges 18 and 19, the particular function of which will presently appear. As indicated in the drawing, these flanges are provided at the opposite ends of the said chambers and may be cast integral therewith, as well as joining each other. From the lower portions of the flanges 19, project feet 20, respectively positioned two on each side of the said housing 11, and formed with suitable openings to receive bolts wherewith the pump is rigidly held, in the approved manner, to a primary support, designated by the reference letter A in the drawing hereto annexed.

The ports 15 and 16, above spoken of, are widened in their upper portions and also surrounded by flanges 22 and 23, to which are connected inlet and outlet pipes (not shown) wherewith the pump is furnished, as usual. The piping, of course, may lead to and from any convenient direction.

Heads 35 and 36 are placed against the outer faces of the aforesaid flanges 18, 19, and the corresponding ends of the chambers 12, 13. These heads may be held in position by any suitable fastenings, such for instance as cap screws 37.

Hollow bosses 39, 40 and 41, 42 are provided in pairs on the said heads 35, 36, the same being in alignment with the centers of the chambers 12, 13, respectively, and adapted to support shafts 43, 44, revolvably therein. The bosses 39 and 41, on the head 35, are closed at their outer ends, as denoted by 45 and 46, in Fig. II, on the left-hand side, whereas the bosses 40 and 42 are outwardly open, as represented in the same view, on the right. The latter-named bosses are internally enlarged to provide stuffing-boxes 47 and 48, with which coact glands 49 and 50, serving to keep the packing therein at the proper consistency and pressure to prevent leakage. The means for actuating the glands have not been shown, as any appropriate contrivance known in the art may be employed for that purpose. At 51 and 52 are indicated reinforcing ribs that radiate from the several bosses 39, 40, 41 and 42, outwardly toward the edges of the heads 35 and 36.

Revolvably contained within the chambers 12, 13 between their said heads 35, 36, are rotatable members 53, 54. The latter are affixed to the shafts 43, 44, previously mentioned, as by keys 55, 56, and set-screws 57, 58.

Of the said members, sealing rotor 53 is the smaller and consists, preferably, of a solid body into which is cut an axially parallel gap or channel 60, that conforms in shape to the normal space intervening between the adjacent flanks of a pair of gear-teeth. As shown, the gap 60 may be formed in an open shoe 61, fitting tightly in a correspondingly-shaped recess provided in one side of the member 53. The sides of the shoe that come into contact with the adjacent parts of the recessed member, it will be noted, are given a double transverse taper so as to retain the same firmly, after being driven endwise into position. The shoe 61 may be made of fibre, Babbitt metal, or any other suitable material.

The other member 54 is constructed on the order of a flat-faced drum or pulley, the rim and hub portions of which are united by an approximately central web 63. At specified distances apart in the rim of this member, are provided transverse grooves 64, each of which affords a seat for the base 65 of a gear-tooth 66. By preference, three gear-teeth 66 are applied, equidistantly as shown, to the circumference of the member 54, and they jointly and severally constitute the impellers hereinbefore mentioned. These gear-teeth are spaced apart from each other in conformity with the length of pitch-line of the tooth-space supplied by the gap 60, in the member 53.

In the outer ends of the said gear-teeth 66, are formed sealing grooves 67, arranged to receive each a small portion of the liquid which is being pumped. This serves as a tightening, packing or sealing medium in reducing the slippage as well as eliminating by friction at the point of juxtaposition with the casing or housing 13. The several gear-teeth are secured, at the base 65, each by a screw-bolt, as 69, driven thereinto from the inner face of the rim of the member 54.

Shims 70, of tin foil or the like, may be interposed between the bottoms of the grooves 64, and the bases of the gear-teeth 66 seated therein. Provision is thus made

for setting out any one or all of the gear-teeth, as required, to properly juxtapose their outer or top surfaces with respect to the inner surface of the casing 13 to the desired extent.

At 72 is indicated a dished washer, through which passes the screw-bolt 69, that maintains the gear-tooth 66 in position, radially on the rim of the member 54. It will be observed that this washer furnishes a proper bearing surface for the underside of the head of the bolt, being interposed between the same and the internal periphery of the member directly opposite the base of the gear-tooth, in each instance.

In order to minimize the seepage of fluid intermediate the ends of the member 54 and the shaft 44 thereof, packing rings 74 and 75, of metal or other suitable material, are lodged in grooves provided therefor in the rim and hub portions of the said member, as also in the contiguous parts of the heads 35 and 36, opposite the same. The rings, it will be noticed, extend substantially half-way each into the corresponding grooves of the member and its heads. The double annular packing thus provided serves to diminish the pressure to which the stuffing-box 48, for the shaft 44, is subjected.

Considering that the external circumference of the member 53 coincides with the outer extremities of the gear-tooth flanks bounding the gap 60, and this circumference has a rolling or approaches a rolling contact with the outer face of the rim of the member 54, which is also the base or foot circle of the gear-teeth 66, it is clear that these surfaces pass each other at a differential rate of speed, since the coacting circular pitch lines of the gap 60 and teeth 66 move together at the same velocity. This feature of construction, it has been demonstrated in practice, reduces to a minimum the back slippage of the fluid which is being transported between any two of the gear-teeth or impellers 66, from the port 15, around the chamber 13, to the port 16, or vice versa.

Upon the shafts 43 and 44, at a certain distance from the glands 49 and 50 thereon, are fixed a pinion 77 and gear 78, meshing one into the other. The coacting pinion and gear, it will be noted, are sufficiently distant from the glands to allow the latter all needed accommodation incidental to the packing of the stuffing-boxes 47 and 48, and they are maintained in position by suitable keys and set-screws as shown. The ratio of the pinion 77 to the gear 78 is the same as the proportion existing between the size of the gap 60, in the member 53, and the number of teeth 66, on the member 54. In practice, the ratio of 1 to 3 has been found to give excellent results.

The outer ends of the shafts 43 and 44 are journalled in bearings 80, 81 formed with a frame or bracket 82, the basal portions 83 whereof stand upon the primary support A. Either one of these shafts, it is understood, can be driven by power derived from any convenient source, for instance by means of a pulley and belting, or through the instrumentality of any preferred form of power-transmitting mechanism.

With the view of taking end strains off the member 54, a collar 84 is secured to the shaft 44, so as to bear against the outer face of the bearing 81 thereof, in opposition to the hub part of the gear 78. The power is applied, preferably, to the extremity of the shaft, 43 or 44, that projects beyond the outer bearing, 80 or 81.

The operation of the improved rotary pump herein described is perfectly obvious to any expert in the art looking over the foregoing specification, with the accompanying drawings, and therefore no time will be wasted in setting forth the same. Suffice it to say that the device embodying the present invention is of an essentially practical character, and fully capable of realizing the objects and results for which it has been produced.

While a certain preferred embodiment of this device has been shown and described, it will be understood that changes in the form, arrangements, proportions, sizes and details thereof may be made, without departing from the scope of the invention as defined by the appended claims.

Having described my invention what I desire to secure by Letters Patent and claim, is:—

1. A rotary pump comprising a casing having a chamber, an impelling rotor in the chamber, inlet and outlet passages, a sealing rotor cooperable with the impelling rotor for effecting flow of fluids through the pump, said sealing rotor comprising a body portion provided with a gap in a peripheral portion thereof, and a shoe of rigid material in said gap.

2. A rotary pump comprising a casing having a chamber, an impelling rotor in the chamber, inlet and outlet passages, a sealing rotor cooperable with the impelling rotor for effecting flow of fluids through the pump, said sealing rotor comprising a body portion provided with a gap in a peripheral portion thereof, a recessed shoe in said gap, the walls of the recess portion of said shoe adapted to constantly engage with the impelling rotor portion cooperating therewith to prevent fluid slippage.

3. A rotary pump comprising a chamber, an impelling rotor in the chamber, inlet and outlet passages, a sealing rotor cooperable with the impelling rotor for effecting flow of fluids through the pump, said sealing rotor comprising a body portion having a gap, the shoe in said gap causing cooperation

with a portion of said impelling rotor, said shoe having a double transverse taper whereby it may be firmly retained in the gap of the sealing rotor.

4. A rotary pump comprising a chamber, an impelling rotor in said chamber and having impelling elements, inlet and outlet passages for the chamber, a sealing rotor having a gap in which said elements are adapted to extend when the rotors are operated, a recessed shoe in said gap, the side portions of the shoe being curved to cooperate with the side faces of said elements for effecting a continuous sealing and prevent fluid slippage.

5. In a rotary pump, cooperable rotary members, one of said members having a gap, the other of said members having adjustable elements cooperable with said gap, means for adjusting said elements and means for holding said elements and adjusting means in place.

6. In a rotary pump, cooperable rotary members, one of said members having an impeller-engaging gap and the other of said members having an impeller element cooperable with said gap, said gap being formed in a shoe of rigid material detachably connected to the member carrying it.

7. A rotary pump comprising a chamber, inlet and outlet passages leading to and from said chamber, an impelling rotor in said chamber, and having radial impelling cogs, means for adjusting the cogs radially, and means for holding the cogs rigidly in adjusted position.

8. In a rotary pump having a chamber and a rotor therein, an impelling member carried by the rotor, shims for adjusting the position of the member, and securing means for holding the member in shimmed position.

9. In a rotary pump having a chamber and a rotor therein, an impelling member carried by the rotor and extending into a groove provided in said rotor, shims placed in said groove and behind said member for adjusting the member, and a bolt secured to said member and to said rotor for holding the member and shims in place.

PEHR AXEL PETTERSSON.

CERTIFICATE OF CORRECTION.

Patent No. 1,652,323. Granted December 13, 1927, to

PEHR AXEL PETTERSSON.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, line 18, for the word "interchanging" read "interengaging"; page 2, line 122, for the word "by" read "any"; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 14th day of February, A. D. 1928.

M. J. Moore,
Acting Commissioner of Patents.

Seal .