

July 2, 1929.

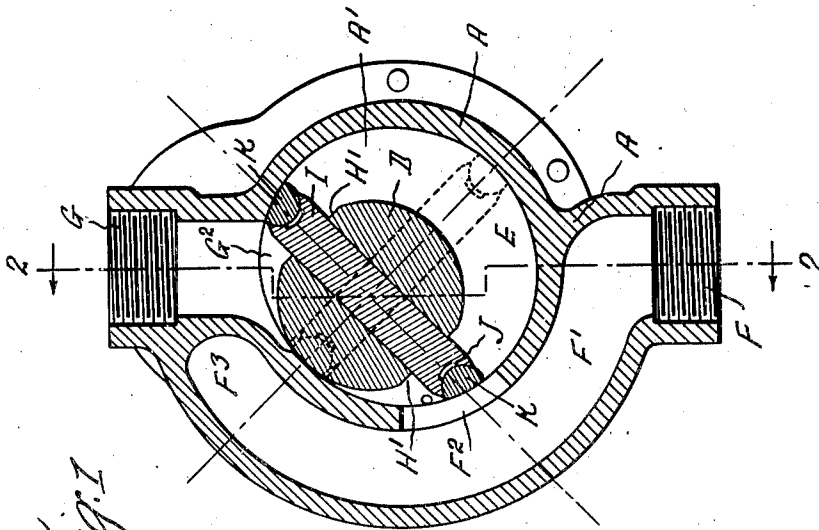
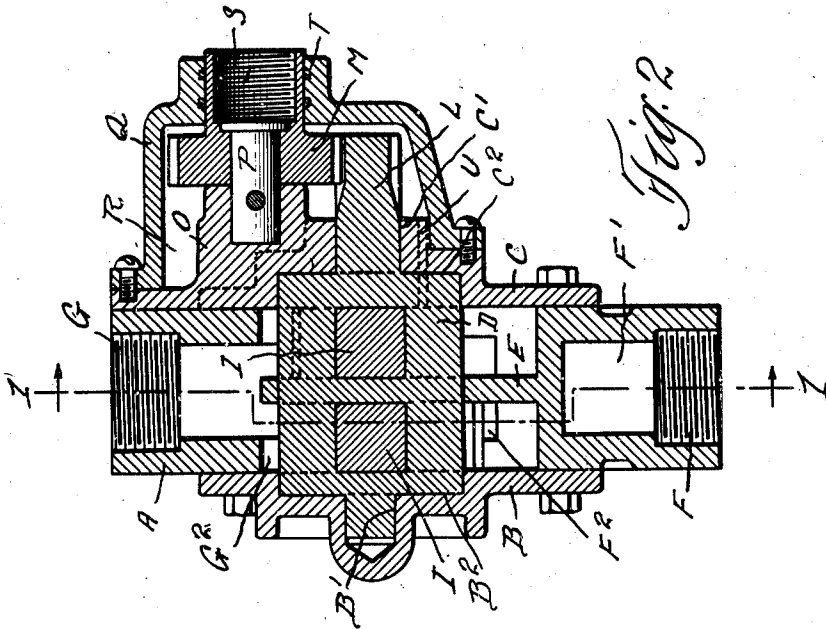
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1,719,134

ROTARY PUMP

Filed Aug. 19, 1926

2 Sheets-Sheet 1



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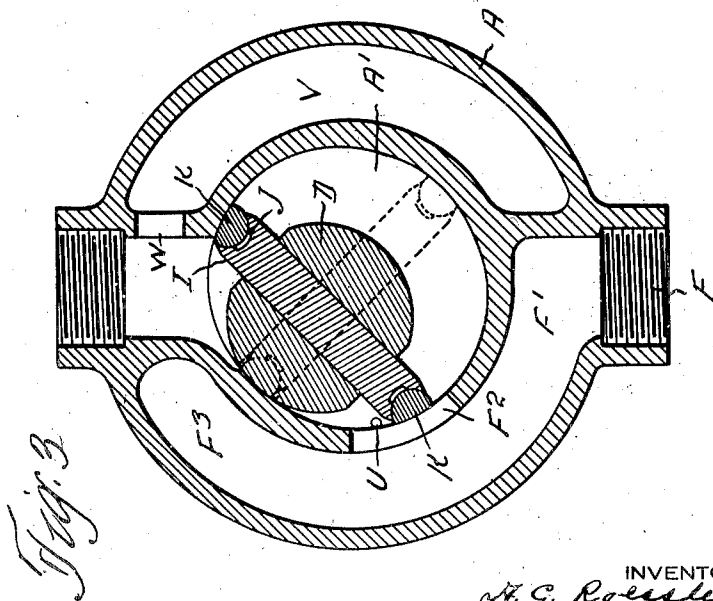
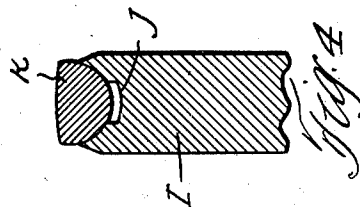
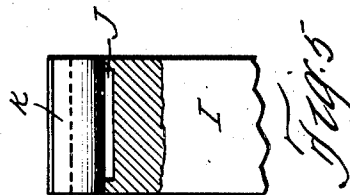
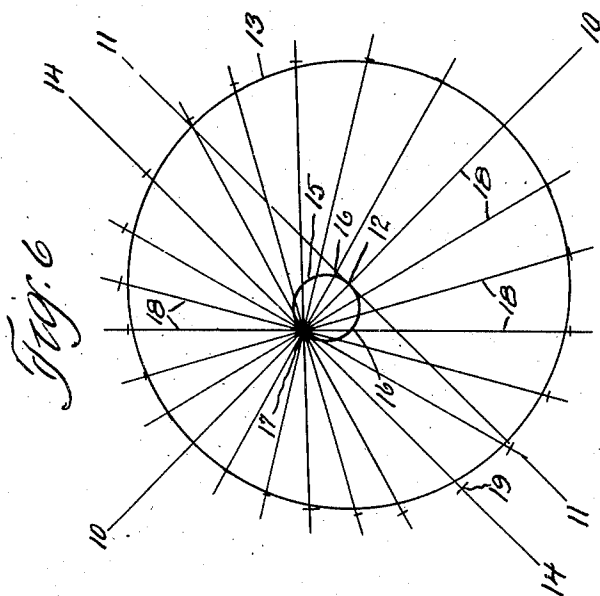
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ROTARY PUMP

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2 Sheets-Sheet 2



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1,719,134

UNITED STATES PATENT OFFICE.

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ROTARY PUMP.

Application filed August 19, 1926. Serial No. 130,135.

This invention relates generally to pumps and more particularly to certain improvements in the rotary pump disclosed in my application No. 618,173 filed February 10, 1923.

The object of this invention is to provide a rotary pump which shall be smooth in action and practically free from pulsations.

Another object is to provide a rotary pump which shall be reversible in action and which can be fabricated in a practical manner without the use of packing and packing glands.

Another object is to provide a rotary pump in which the friction is reduced to a minimum, thereby rendering the operation exceedingly easy, and therefore, reducing the power to operate to a minimum and a still further object is to produce a pump having a free and uninterrupted flow without turbulence.

Another and very important object of the invention is to provide a pump embodying all of these characteristic features, which can be easily operated by hand.

With these objects in view the invention consists in the novel features of construction and arrangement all of which will be fully described hereinafter and set forth in the appended claims.

In the drawings forming a part of this specification, Fig. 1 is a longitudinal sectional view of a hand pump constructed in accordance with my invention, this section being taken on the line 1—1 of Fig. 2; Fig. 2 is a vertical section taken on the line 2—2 of Fig. 1; Fig. 3 is a vertical sectional view similar to Fig. 1 and showing a slight modification; Fig. 4 is an enlarged sectional view of one end of the blade; Fig. 5 is a side view of the blade partly in section and showing the rocker at the end of the blade in elevation; and Fig. 6 is a diagrammatic view illustrating the generation of the curve of the bore of the cylinder.

In carrying out my invention, I employ a pump body or casing A the bore A' of which is constructed in substantially the same manner as the bore of the cylinder of my application 618,173 previously referred to, that is to say, the bore of the cylinder is constructed upon a limaçon curve and the details of the generation of this curve will be more fully described hereinafter. This casing has its ends closed by means of plates

B and C securely bolted to the casing, the end plate B being formed with a bearing B' and the end plate C with a bearing C' for the rotor D, the rotor being cylindrical in shape and the bearings B' and C' are therefore circular. The end plates are also formed with circular recesses B² and C² respectively in which the circular ends of the rotor turn. The bearing B' is a closed one and therefore avoids the necessity of packing whereas the drive shaft connected to the rotor passes through the bearing C'.

The casing A is divided through its center by a wall E thus virtually forming two pumps mounted side by side and it will of course be understood that the central partition E has a circular opening therein to accommodate the rotor D. The intake or suction opening F is located at one end of the casing and the outlet or discharge opening G is preferably arranged diametrically opposite the opening F. The opening F communicates with the passage F' and the inlet or suction port F² cut in the wall of the cylinder establishes communication between the inlet or suction passage in the bore of the pump. The passage F' extends beyond the upper end of the port forming a pocket F³ which acts as a vacuum chamber thus always keeping the fluid well up to the pump and preventing hammering. It will of course be understood that both the inlet and outlet openings are in communication with the two halves of the pump or in other words is in communication with the chambers on both sides of the central partition E. The rotor D has two slots or openings cut therein as indicated at H, these openings or slots being arranged upon opposite sides of a central partition which aligns with the partition E and are preferably arranged at right angles to each other. Sliding in the slots H are the blades I working in the bore on opposite sides of the central partition E and at each end of each blade is mounted a rocker K which contacts with the curved surface of the pump cylinder or bore. The ends of the blades are grooved and provided with an undercut J and in these grooves are mounted the rockers K which are free to oscillate as the motor revolves. This oscillation is produced by the outer ends of the rocker making a contact with the pump bore during rotation and it will be seen that unless the friction or contact surface between

the blade and rockers is less than that between the rocker and bore, free oscillation will be prevented holding the rockers rigid, in which case they would bind against the bore and prevent rotation of the motor, and for that reason the grooves are undercut so that there is less surface of the rocker in contact with the end of the blade than with the bore of the cylinder.

The drive end of the rotor is furnished with a drive shaft L and preferably has teeth cut on the end thereof and these teeth mesh with the drive gear M supported upon a shaft keyed to the boss O integral with the end plate C, a pin P being passed through the boss and plate to maintain the same rigid. The gear and shaft end are covered by a suitable housing Q forming an air tight chamber R and the hub S of the gear projects through the housing Q and is threaded internally to receive the threaded end of a crank for the operation of the pump. The hub S passes through the housing with a running fit and is supplied with washers T or other suitable means to seal the hub bearing. The passage U extends to the suction side of the pump. The rotor shafts turning in the bearings B' and C' are of course made with good running fits. Seepage can therefore take place through the bearings C' and this seepage accumulates in the chamber R and is sucked up by the operation of the pump through the passage U and returned to the suction side of the pump. An alternative of this construction would be to make a connection between the chamber R and the suction port or suction pipe returning to the pump thus allowing any accumulation of seepage to drain back to the pipe line. The ports are located in such a manner that the inlet port is closed before the outlet port opens, the outlet port being indicated at G² and in this manner all back pressure from the suction is prevented and likewise compression of the fluid in the pump chamber. A certain amount of lead may be given so that the blade travels say the width of the rocker after closing the suction port and before reaching the discharge port. In this case the discharge port must open at the moment that the distance between the bore and rotor at the lower edge of the rocker is the same as at the other end of the blade that is between the bore at the suction side and the rotor. If this relationship is not maintained hammering will occur with considerable vibration.

The pump can of course be rotated in either direction and when it is desired to drive the pump in both directions the body may be provided with a supplemental vacuum chamber V indicated in Fig. 3 which communicates with the outlet port through a passage W.

By arranging the blades at right angles

to each other it is obvious that when one end of one blade is approaching the outlet port the corresponding end of the other blade will be about half way between the inlet and outlet ports and inasmuch as these blades operate in separated chambers, both of which communicate with both the inlet and outlet ports, a constant uninterrupted flow of liquid through the pump is obtained without turbulence.

The ends of the blades being provided with rockers in undercut grooves the friction between the rocker and blade is reduced to a point below the friction between the rocker ends and bore and consequently these rocker ends will always turn sufficiently to maintain a working contact between the blades and the bore and inasmuch as the blades with rockers attached thereto are of constant length and as the bore is constructed upon the limaçon curve previously referred to there will be the proper working contact during the entire movement of the blades.

In Fig. 6 I have illustrated a diagram for the generation of the curve which is as follows. 10, 10 and 11, 11 indicate two lines crossing each other at right angles at the point 12 and from this point 12 is described a circle 13. Through the line 10, 10 is drawn line 14, 14 parallel with the line 11 and the distance between the lines 11 and 14 is the amount of eccentricity existing between the rotor D and the bore of the casing A. On the line 10, 10 midway between the lines 11 and 14 there is described a circle 15 which circle is divided into any desired number of points 16 and from the point 17 there are drawn lines 18 from the point 17 through the various points 16 and on these lines 18 there are marked off points 19, these being measured from the point 16 and the distances from the points 16 to the points 19 are all equal to the radius of the circle 13. A line drawn through the various points 19 will give the correct limaçon curve which is the curvature of the bore of the cylinder and as the rotor turns within the cylinder driving the blades, the movements of the blades back and forth through the slots will cause the central point of each blade to describe a circle similar to 15 and in this manner the blades will be held in constant contact with the walls of the pump cylinder due to the fact that their lengths are fixed and the curvature of the bore is upon the curve indicated. From the above it will be noted that the bore of the pump is not in the form of a true circle at any point or for any arc whatever. At each end of the openings in the rotor, the surface is cut back as shown at X. These cut backs flatten the rotor at the points where they are located, thus allowing foreign matter to pass over the top from the discharge to suction side of the

pump when the blade is in the position where the rotor makes contact with the bore.

In rotary pumps as heretofore constructed the difficulties in operation have resulted from imperfections in manufacture and imperfections or errors of design. In order to compensate for errors in manufacture the provision of rollers at the ends of the blades has been sufficient but such rollers or other appliances are not sufficient to provide for the combined errors of manufacture and the departure from theoretically correct designs. For this reason centrifugal force springs and flexible devices have been employed for the purpose of securing blade contact with the pump barrel. By constructing the bore upon the limaçon curve as hereinbefore set forth, it is possible to dispense with various forms of flexible devices and employ a blade of fixed dimensions having roller contacts with the bore of the pump and which will effectively prevent pounding and slippage.

Having thus described my invention, what I claim is:—

1. A reversible rotary pump comprising a casing having partitions to form a bore, and

a plurality of vacuum chambers, a rotor mounted in said bore, a rigid blade slidable in said rotor and having fluid tight contact with the peripheral wall of said bore, and inlet and outlet ports each communicating with said bore and a vacuum chamber, whereby a portion of the chambers in advance of the flow of fluid will act to keep the fluid well up in the pump to prevent hammering.

2. A reversible pump comprising a casing having partitions to form a bore and oppositely disposed non-communicating chambers, a rotary impeller mounted in said bore, said casing having inlet and outlet ports each in communication with said bore and the adjoining chambers, whereby the flow of fluid in the pump will act to create a vacuum in a portion of the chamber in communication with the inlet port, in advance of the flow of fluid to keep the fluid well up in the pump thereby to avoid hammering.

In testimony whereof, I hereunto affix my signature.

AMANDUS C. ROESSLER.