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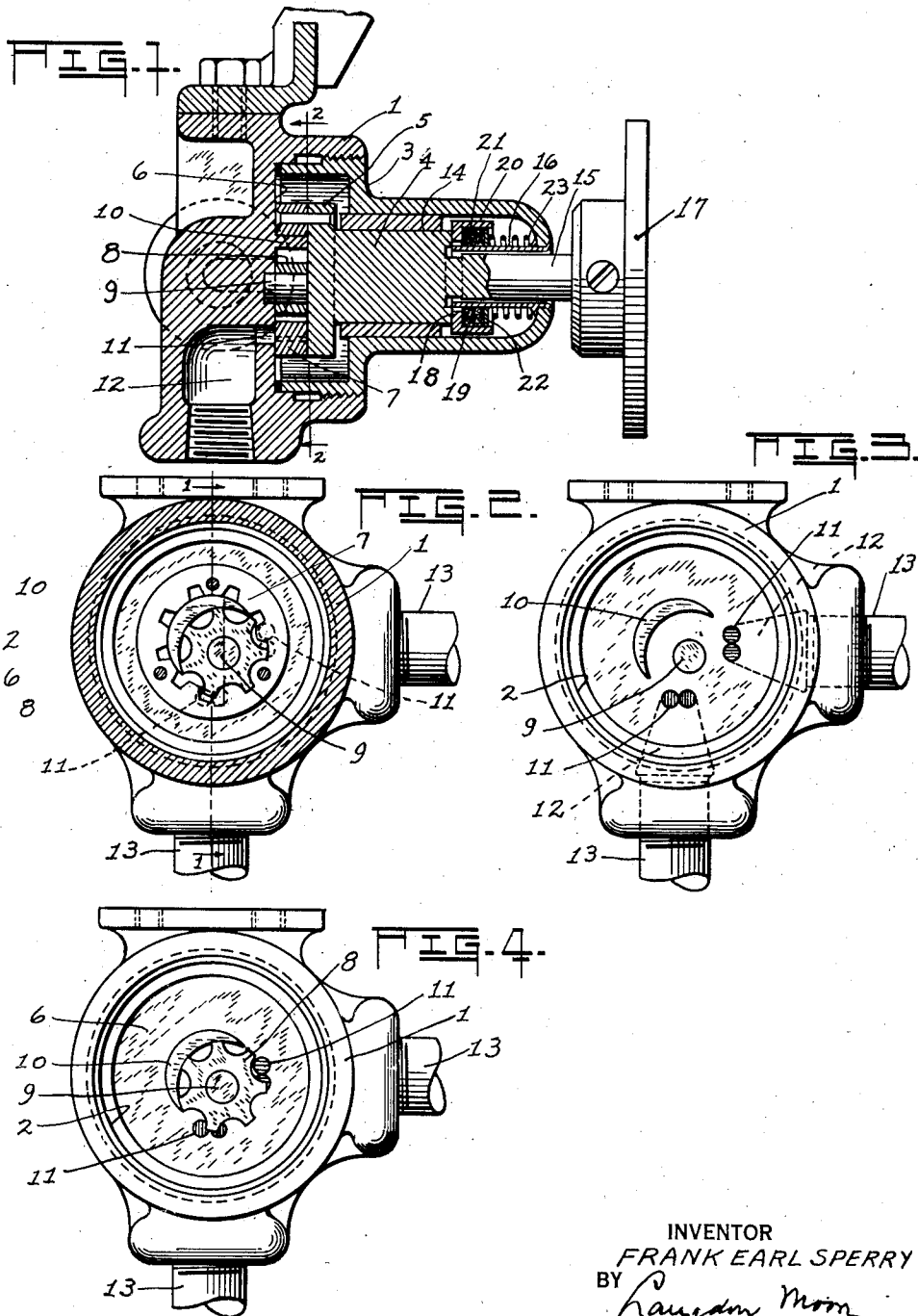
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ROTARY PUMP

Original Filed Sept. 13, 1928

2 Sheets-Sheet 1



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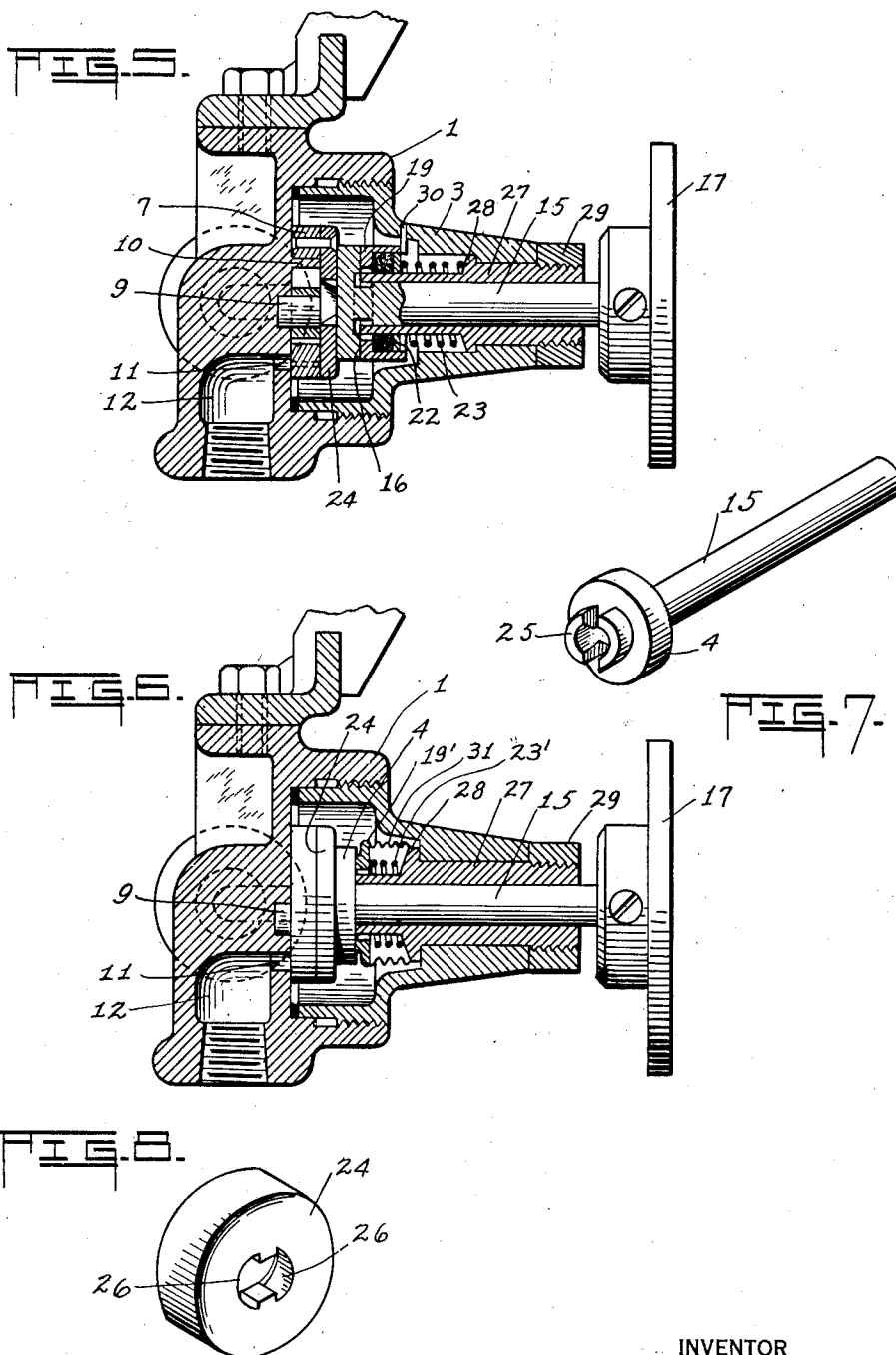
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2 Sheets-Sheet 2



INVENTOR
FRANK EARL SPERRY
BY *Langdon M. Munn*
ATTORNEY

UNITED STATES PATENT OFFICE

FRANK EARL SPERRY, OF BATAVIA, ILLINOIS, ASSIGNOR TO MECHANICAL DEVICES COMPANY, OF BLOOMINGTON, ILLINOIS, A CORPORATION OF ILLINOIS

ROTARY PUMP

Original application filed September 13, 1928, Serial No. 305,685. Divided and this application filed January 17, 1930. Serial No. 421,352.

This invention relates to pumps and more particularly to pumps of the rotary type and is a division of my prior co-pending application, Serial No. 305,685, filed September 13, 1928.

It is an object of this invention to provide a rotary pump having a constant and uniform discharge which is of simple construction and positive in operation.

A preferred embodiment of this invention is illustrated upon the accompanying sheets of drawings, it being understood that minor detail changes may be made without departing from the scope thereof.

In the drawings:

Figure 1 is a vertical sectional view taken on the line 1—1 of Figure 2.

Figure 2 is a view in section taken on the line 2—2 of Figure 1 looking in the direction of the arrows.

Figure 3 is a top plan view of the pump casing with the rotor and pinion removed.

Figure 4 is a view similar to Figure 3 illustrating the pinion in position and showing its relation to the intake and discharge ports.

Figure 5 is a view in section similar to Figure 1 illustrating a modified form of seal.

Figure 6 is a view similar to Figure 5 illustrating another type of seal.

Figure 7 is a detail view of the rotor shaft in perspective illustrating a method of attachment of a rotor thereto.

Figure 8 is a detail view in perspective of a rotating piston or rotor illustrating the means by which it is adapted to the shaft shown on Figure 7.

The embodiment of this invention illustrated upon the drawings comprises a pump case 1 having a cylindrical chamber 2 into which is threaded the cover housing 3. The cover provides a bearing for the rotor shaft 4 which is provided with an enlarged concentric head 5. The bottom wall 6 of the case presents a flat surface at right angles to the axis of the rotor shaft and over which the rotor of the pump wipes or bears. The enlarged head of the rotor shaft mounts an internal toothed rotor 7 which is secured in

central fixed relation thereto. The teeth of this rotor engage a toothed idler pinion 8, which idler is rotatably mounted upon a stud 9 secured to the case 1 in eccentric relation to the toothed rotor. The space between the outer circumference of the teeth of the pinion and the inner circumference of the rotor is filled with a crescent shaped extension 10 extending upward from the flat surface of the case 1.

The teeth of the pinion mesh with the teeth of the internal gear or rotor at their tangential point to form a fluid-tight joint. The height of the pinion 8, stud 9 and crescent 10 is equal to the depth of the rotor 7 and are received therein when the operating shaft is held in proper position within the shaft housing, the flat outer surface of the rotor wiping over the flat surface of the base of the case chamber and the flat surface of the enlarged head 5 wiping over the flat surface of the pinion 8 and crescent 10.

The pump case 1 is provided with intake and discharge ports 11 the centers of which are arranged to lie in a circle concentric with the rotor midway between the teeth of the rotor, and the center of the idler stud is arranged to lie in a line passing through the center of said circle and midway the shortest distance between the centers of said ports so that the fluid-tight joint between the rotor and idler is formed intermediate the said ports. In the type of pump illustrated, the intake and discharge ports 11 open into chambers 12 in the pump case which are screw threaded to receive the intake and discharge pipes 13. Inasmuch as the pump will operate equally as well in which ever direction the shaft is rotated, no distinction has been made between the intake and discharge port chambers or pipes.

The rotor shaft is shown in Figure 1 as being mounted to rotate within a bushing 14 rigidly attached to the interior of the housing 3 which shaft is reduced in diameter to the outer end of said bushing and reduced portion 15 passes through the sleeve 16 extending between the shouldered portion 4 of the shaft and the exterior of the housing 3 at which point it is rigidly secured. The re-

duced portion of the shaft 15 exterior of the housing 3 is engaged by an operating member 17 of any desired construction by which rotative movement may be imparted to said shaft and through the shaft to rotor and idler. A fluid tight joint is formed between the shouldered portion 18 and a thrust bearing ring 19 provided with an annular flange 20 by placing a compressible yielding packing ring 21 within the annular flange, which is held against the bearing ring by means of a follower disk or washer 22 mounted upon the sleeve 16, which, in turn, is engaged by a compression spring 23, also arranged about the sleeve 16, the other end of which engages the housing 3. This compression spring 23 not only maintains the flat surface of the annular rotor 7 in engagement with the flat surface of the case 1 with the flat surface of the enlarged head of shaft 4 bearing over the outward surface of the idler 8 and crescent 10 but also maintains the bearing surface of the thrust 19 against the bearing surface of the shoulder 18 of the shaft 4 and at the same time compresses the compressible packing ring 21 thereby maintaining the operating parts in proper position and forming a fluid tight seal upon the operating shaft.

In the forms illustrated in Figures 5 and 6, the rotor 7 is secured or made integral with a plate 24 of the same diameter, which plate is keyed upon the enlarged portion 4 of the rotor shaft, in the manner shown in Figures 7 and 8, by providing concentric keys 25 extending outward from the shaft adapted to be received in sockets 26 upon the plate 24. In the form shown in Figure 5 the rotor shaft is centered and rotates in an elongated bushing 27 which is provided with an outstanding collar 28 adapted to be drawn into fluid tight engagement with a shouldered portion of the casing 3 by the exterior nut 29, as shown. A fluid seal is formed between the shoulder 18 upon the enlarged portion of the operating shaft and the sealing ring 19 in the same manner as described in connection with Figure 1 with the exception that the coil spring 23 is placed between the follower disk 22 and the interior shoulder of the collar 28. In this type the bearing ring 19 is held against rotation with the shaft by the pin 30 passing through the side wall of the case and engaging the flange of said ring. In the form shown in Figure 6, the compressible packing is dispensed with and the sealing ring 19¹ is provided with an outstanding flange against which the spring 23¹ bears to hold the same in engagement with the bearing surface 18 of the shaft and, to prevent leakage about the bearing ring and bushing, a thin metallic cylindrical bellows 31 is interposed between the bearing ring 19¹ and bushing shoulder 28, with one end of the bellows engaging and embracing the outstanding flange of the ring 19¹ to which

it is secured and the other end of the bellows embracing and engaging the outer surfaces of the collar 28.

The bearing surfaces of the shaft and thrust rings 19 and 19¹ are hardened, ground and lapped to effectually seal fluid leakage from the pump pressure chamber around the shaft to the atmosphere.

It is to be noted that the pump described herein includes a rotor, the outer surface of which wipes over a flat bearing surface upon the pump casing and the operating parts of the pumping mechanism are all contained within the recess of said rotor. The pumping mechanism comprises the internal toothed track of the rotor co-operating with the toothed idler pinion producing in effect an action similar to a gear pump, however, the construction described possesses but a single bearing surface, namely, the exterior or open face of the rotor so that when slippage of fluid or leakage of pressure between the bearing surfaces of the rotor and pump casing occurs it escapes into the chamber within the housing 3, which chamber is closed by the seal ring 19 whereby such slippage or leakage acts upon the enlarged rotor shaft head to more firmly seat the rotor upon the case bearing surface. Furthermore, there being a suction created at the intake port of the pump, such suction or negative pressure will tend to assist the pressure within the chamber and the tension of the coil spring 23 to more firmly seat the rotor. Another advantage of this improved pump, when used with liquid fluids, is that after the pump has once been tested a certain amount of liquid will always be entrained or contained between the gears, or internal gear and idler, and crescent 10 and the coil spring 23, in addition to the pressure chamber surrounding the rotor, will maintain a fluid seal between the casing and rotor so that as soon as the pump is started the bearing surface will be moistened by the contained fluid and the pump will immediately operate at maximum efficiency as to vacuum maintenance.

What I claim is:

A rotary pump comprising a case having a bearing surface, a rotor having a bearing surface adapted to rotate over the bearing surface of the case, said rotor having a recess upon the bearing side, pumping mechanism contained within said recess and intake and discharge means leading from the pumping mechanism through the pump case, a chamber formed in said case about said rotor the walls of which are spaced apart from the sides and back of said rotor, a shouldered rotor shaft, a cap secured to the case closing the said chamber and providing a bearing for the reduced portion of the rotor shaft including a sleeve extending about the reduced portion of the rotor shaft between the shoulder of the said shaft and exterior of said cap

and secured to said cap, a thrust bearing ring
about said sleeve adapted to bear against the
shoulder of the rotor shaft within the cap, a
compressible packing about said sleeve and
5 contained within the thrust bearing ring and
a compression spring arranged between said
packing and end of the cap, whereby a fluid
seal is formed between the shaft and cap so
that such leakage of fluid or pressure between
10 the bearing surfaces of the case and rotor is
held within the chamber and cap to assist the
tension of the spring to more firmly seat the
rotor upon the bearing surface of the case.

Signed at Bloomington, Illinois, this 14th
15 day of January, 1930.

FRANK EARL SPERRY.

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