Dec. 3, 1929. H. W. LANDENBERGER ET AL 1,738,375

FLUID PUMP

Filed Nov. 19, 1925 2 Sheets-Sheet 1

Fig. 2.

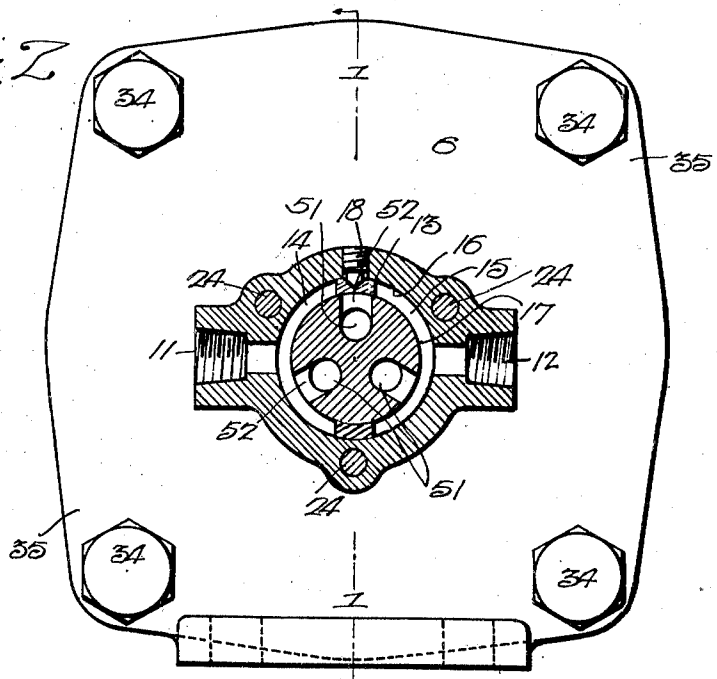
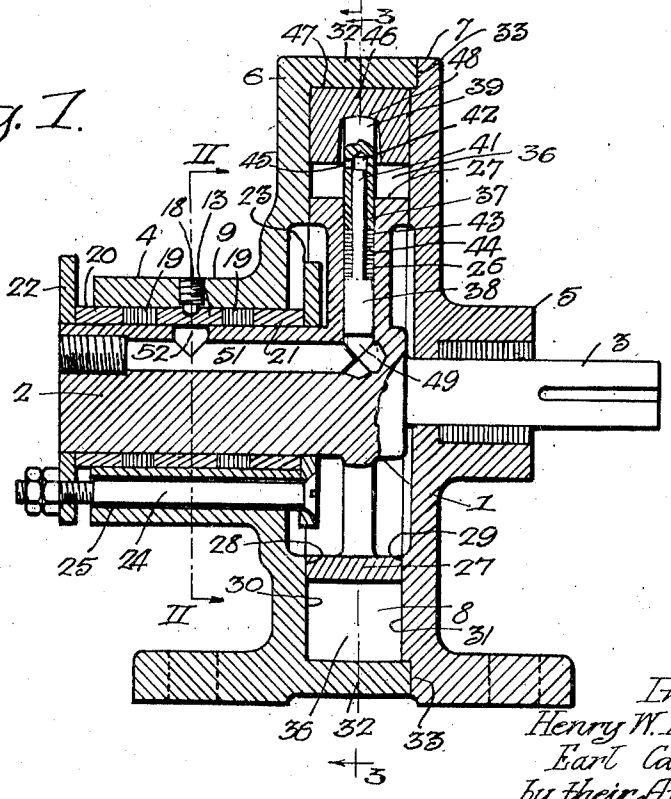


Fig. 1.



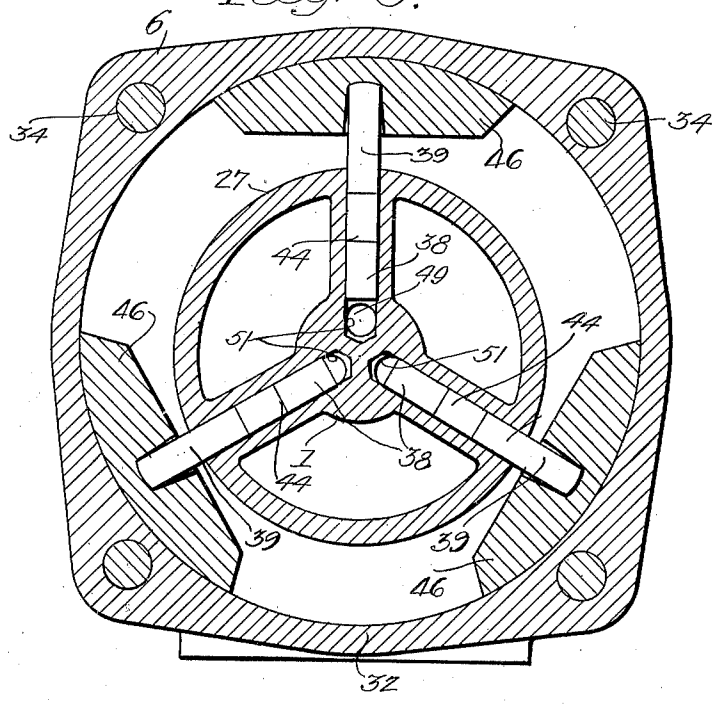
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by their Attorneys—
Howson & Howson

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Fig. 3.



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UNITED STATES PATENT OFFICE

HENRY W. LANDENBERGER AND EARL CANNON, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNORS TO AMERICAN FLUID MOTORS COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA

FLUID PUMP

Application filed November 19, 1925. Serial No. 70,126.

Our invention relates to fluid motors and it has particular relation to rotary-plunger pumps.

Rotary pumps of the eccentric vane type must be operated at comparatively low pressures, usually less than 100 pounds per square inch, inasmuch as the line contact of the vane with the stationary portion of the pump permits excessive leakage or slip at the higher pressures.

Centrifugal pumps may be operated at the higher pressures but their discharge decreases with the increase in pressure, so that to obtain a rotary pump for high pressures, wherein the discharge is substantially independent of the pressure, a plunger pump must be used.

Due to the lubrication and packing problems, plunger pumps are usually limited to the use of oil or other viscous fluids, where the viscosity is such as to prevent excessive leakage past the pistons and valves, which are of necessity without packing. The leakage, which results from the use of such packless plungers and valves, constitutes the lubricant for the rubbing parts of the pumps. Water, however, may not be used in such pumps without packing, since excessive slip or leakage occurs at the higher pressures.

An object of our invention, therefore, is to provide a rotary-plunger pump which shall be adapted to pump non-viscous fluids and which shall accomplish the above-noted desired results.

Another object of our invention is to provide a plunger construction, wherein the packing is pressed into engagement with the cylinder wall with a varying force depending upon the stroke.

A further object of our invention is to provide a fluid motor, wherein the self-tightening packing of the plunger is automatically lubricated during the operation of the motor.

Other objects and applications of our invention, as well as details of construction and operation, whereby our invention may be practiced, will appear more fully hereinafter, when taken in connection with the accompanying drawing, wherein

Fig. 1 is a longitudinal sectional view, taken on the line I—I of Fig. 2;

Fig. 2 is a transverse sectional view, taken on the line II—II of Fig. 1; and

Fig. 3 is a similar view but taken on the line III—III of Fig. 1.

In the illustrated embodiment of our invention shown in the drawing, a rotor 1 of a rotary-plunger pump comprises a barrel section 2 and a driving-shaft section 3. These sections may be respectively supported by bearings 4 and 5 provided by a pair of supporting plates 6 and 7 which are spaced to provide a chamber 8, for reasons as will appear presently.

The bearing 4 comprises a tubular flange 9, which extends outwardly from the supporting plate 6 and is provided with suction and discharge passages 11 and 12, respectively. A ring 13 having port openings 14 and 15 in the opposite sides thereof is positioned intermediate an inner surface 16 of the tubular flange 9 and an outer surface 17 of the barrel section 2. A set screw 18 is so mounted in said tubular extension 9 as to secure the ring or slotted bushing 13 in a position where the port openings 14 and 15 are in alignment with the suction and discharge openings 11 and 12, respectively.

The running joint between the barrel section 2 and the slotted ring 13 may be packed by packing 19 positioned on opposite sides of said ring 13. The packing 19 may be held in place by bushings 20 and 21. These bushings may be clamped in position by plates 22, 23 and bolts 24, the latter extending through apertures 25 in the tubular extension 9, as shown in the drawing.

The portion of the barrel section 2 positioned in the chamber 8 may be provided with a plurality of angularly disposed cylinders 26, say, for example, three, as shown in Fig. 3. The several cylinders 26 are connected by a cylindrical flange 27, opposite sides 28 and 29 of which slidably engage annular sections 30 and 31 of the spaced supporting plates 6 and 7, respectively. The wall section 30 is provided at its outer edge with a transversely extending flange 32 which engages an annular recess 33 in the opposite wall section 31. The supporting members 6 and 7 may be clamped in this position by bolts 34 which extend through

complementary flange portions 35 of the supporting plates 6 and 7. The flanges 27—32 and the wall sections 30—31 thus define an annular chamber 36 which may be filled with lubricating material by any known means, say a grease cup (not shown).

Each of the radial cylinders 26 is provided with a plunger 37 comprising an automatically adjustable head part 38 and a body part 39. The head part 38 is positioned in the cylinder 26 in engagement with the wall thereof, and it is provided with a projecting stem 41 which is loosely positioned in a boring 42 formed in the body portion 39 of the plunger 37. The body part 39 also engages the wall of the cylinder 26 and it is spaced from the head part 38 to provide an annular recess 43 adapted to receive packing 44. This packing may be of any suitable material, such, for example, as graphited flax, asbestos, or a rubber composition which may use water as a lubricant. The base of the boring 42 is in communication with the lubricating chamber 36 through an aperture 45 in the body part 39 of the plunger 37, whereby lubricating material may work through the aperture 45 and around the stem 41 to the packing 44.

The plunger 37 may be reciprocated in the cylinder 26 by means of a slipper 46 which is movable over a cam surface 47 formed on an inner side of the flange 32 constituting one wall of the lubricating chamber 36. The slipper 46 may be provided with a recess 48 adapted to receive the outer end of the plunger 37, whereby the same may be held in engagement therewith. The slipper 46 is retained in engagement with the track or cam 47 by the centrifugal force acting on the plunger 37 and the slipper 46, so that for one revolution of the cylinder 26 the piston 37 passes through a suction stroke and a discharge stroke. The cylinder 26 is connected to a longitudinally extending passage 49 having a transverse portion 51 terminating in an opening 52 in the surface of the barrel section 2. The openings 52 of the several cylinders 26 are so positioned with respect to the port openings 14 and 15 in the slotted ring 13, that the suction and discharge strokes of the several plungers 37 are properly timed.

When power is supplied to the driving shaft section 3 of the rotor 1 to cause the rotation of the barrel section 2 and the several cylinders 26, the pistons 37 are reciprocated by the cam 47, causing a substantially continuous passage of fluid from the suction inlet opening 11 of the pump to the discharge outlet 12.

Assuming the plunger 37 shown in Fig. 1 of the drawing to be passing through its discharge stroke, the pressure exerted on the plunger head part 38 reacts on the packing 44, and since said packing presents a smaller area than said head part 38 and since the space occupied by the packing 44 is in communication with the lubricating chamber 36, the plunger parts 38 and 39 tend to move together and thereby press said packing 44 against the cylinder wall with a force sufficient to prevent the passage of water or other fluid from the cylinder chamber to the lubricating chamber 36 around the plunger 37. When the discharge stroke is completed, the pressure on the packing 44 is relieved, so that during the subsequent suction stroke, the packing 44 slides easily in the cylinder 26, moving outwardly under the action of centrifugal force.

While we have shown only one form of embodiment of our invention, for the purpose of describing the same and illustrating its principles of construction and operation, it is apparent that various changes and modifications may be made therein without departing from the spirit of our invention and we desire, therefore, that only such limitations shall be imposed thereon as are indicated in the appended claims or as are indicated by the prior art.

We claim:

1. In combination, a rotary cylinder, a plunger having relatively movable parts and packing, said parts being so movable during the pressure stroke as to cause said packing to engage the cylinder wall with a certain force, said force being decreased during the suction stroke, said plunger being actuated at least in part by centrifugal force during the latter stroke.

2. A cylinder having a piston provided with relatively movable parts, one of said parts having a boring provided with an aperture leading to the outside, the other of said parts having a projecting stem loosely positioned in said boring, and packing in such operative relation to said parts that when force is applied to the apertured part to cause the piston to move inwardly of said cylinder, said packing is pressed into engagement with the cylinder wall.

3. The combination with a rotary pump cylinder, of a piston having a plurality of relatively movable parts, means for causing said piston to reciprocate in said cylinder, and packing so disposed with respect to said relatively movable piston parts as to be pressed into engagement with the cylinder wall during one stroke of said piston.

4. A fluid motor comprising a rotary cylinder having a plunger provided with a plurality of relatively movable parts, means for causing said plunger to reciprocate in said cylinder when the latter is moved, and packing so disposed with relation to said relatively movable parts that said packing is pressed into engagement with the cylinder wall during the discharge stroke with a cer-

tain force and with a decreased force during the suction stroke.

5. A fluid motor comprising a rotary cylinder provided with a plunger, having a plurality of parts, one part having a boring provided with an aperture, another part having a stem positioned in said boring, packing positioned intermediate said parts so as to be pressed into engagement with the cylinder wall upon a relative movement between the parts, and a lubricating compartment for receiving the apertured part of said plunger, whereby lubricating material may work from said compartment to said packing.

6. A fluid motor comprising a rotary cylinder having a plunger provided with a plurality of parts, packing interposed between at least two of said parts so that when one part moves relative to the other said packing may be pressed into engagement with the cylinder wall, and a lubricating compartment for receiving the outer end of said plunger and provided with means for causing the reciprocation of said plunger, said compartment being in communication with said packing, whereby lubricating material may work therefrom to said packing.

7. A rotary cylinder having a plunger, provided with a plurality of parts, one part having a boring and an aperture extending therefrom to the outside of said plunger, another part having a projecting stem positioned in said boring, packing between said parts adapted to be pressed into engagement with the cylinder wall during the discharge stroke, and means forming a lubricating compartment around the outer end of said plunger, whereby lubricating material may work through said aperture and boring to said packing, said means also causing the reciprocation of said plunger in said cylinder.

8. The combination with a barrel provided with a transversely extending cylinder, of a plunger in said cylinder provided with self-tightening and releasing packing, said barrel having a passage extending from said cylinder, and means constituting suction and discharge ports positioned in operative relation to said passage.

9. The combination with a plunger having relatively movable parts and packing positioned therebetween, of means whereby lubricant may be supplied to said packing upon the relative movement of said parts.

10. The combination with a cylinder and a plunger therefor having relatively movable parts and packing positioned between said parts so as to be forced during one stroke of the plunger into engagement with said cylinder, of means whereby said packing may be lubricated, said means being responsive to the relative movement of said plunger parts.

11. In combination, a cylinder, a plunger therefor provided with relatively movable parts, packing between said parts, said parts being so movable during one stroke as to cause said packing to be actuated into engagement with the cylinder wall by a force which is released during another stroke, and means whereby the relative movement of said plunger parts may cause the supply of lubricant to said packing.

12. A cylinder having a plunger provided with relatively movable telescoping portions, said plunger being provided with packing positioned between said portions so as to have a varying effectiveness for different strokes, and means responding to the movement of at least one of said plunger portions, whereby lubricant may be passed between said telescoping portions to said packing.

13. In combination, a rotary pump cylinder, a reciprocatory plunger therefor having relatively movable parts, and packing positioned between said plunger parts so as to have a varying effectiveness.

14. The combination with a pump cylinder, of a plunger having telescoping parts, and packing positioned between said parts so as to have a varying effectiveness depending upon the stroke of said plunger.

15. The combination with a rotary pump cylinder, of a plunger having relatively movable telescoping parts, packing positioned between said parts so as to be actuated into engagement with the cylinder wall with a certain force during the discharge stroke and with a decreased force during the suction stroke, and means whereby lubricant may be supplied to said packing upon the movement of said plunger.

16. The combination with a cylinder provided with a plunger having relatively movable parts, one of said parts being provided with a recess, another of said parts having a stem slidably mounted in said recess, of packing so positioned between said parts that it may be alternately pressed against and released from the cylinder wall when said plunger is reciprocated.

17. The combination with a plunger comprising a body part and an automatically adjustable head part, said body part having a recess, said head part having a stem portion slidably mounted in said recess, of packing positioned around the portion of said stem between said parts and alternately subjected to increasing and decreasing pressures by said automatically adjustable head part.

18. A cylinder provided with a plunger having relatively movable parts positioned to engage the cylinder wall, one part having a projecting stem, the other part having a boring in communication with the outside of said cylinder, and packing so positioned with respect to said plunger parts as to be successively compressed and released.

19. A fluid motor comprising a rotary pump cylinder having a plunger provided

with an automatically adjustable part, means for causing said plunger to reciprocate, and packing positioned to be pressed into engagement with the cylinder wall by said automatically adjustable part during the discharge stroke.

20. Fluid power apparatus comprising a rotary member positioned in said casing, said member and said casing forming a lubricating chamber, said member having a cylinder provided with a plunger extending into said lubricating chamber, said plunger having an automatically adjustable part, and means whereby lubricant may work from said chamber to said part upon a predetermined adjustment thereof.

21. In a pump, a casing, a rotary member positioned in said casing, said member and said casing forming a lubricant chamber, said member having a cylinder provided with a plunger having a plurality of relatively movable parts, said plunger extending into said chamber, a slipper in engagement with one of the walls of said casing and apertured to receive the end of said plunger, and packing so positioned as to be pressed by said parts into engagement with said cylinder wall under predetermined operating conditions, said packing being in communication with said chamber permitting the supply of lubricating material thereto from said chamber.

22. A pump comprising a casing having a lubricating chamber, a rotary member having a cylinder, said cylinder having a plunger provided with telescoping parts, said plunger extending into said chamber, a slipper for engaging the end of said plunger, said casing being formed to constitute a track for said slipper, whereby said plunger may be reciprocated, and packing positioned to be pressed by said parts into engagement with the cylinder wall under predetermined conditions, said packing being in communication with said lubricating chamber.

23. The combination with a cylinder having a plunger provided with a plurality of relatively movable parts, one of the parts being provided with a recess and another part having a stem positioned in said recess, of packing so disposed relative to said parts that said packing may be pressed against the wall of said cylinder with a varying force depending upon the stroke of the plunger, and means whereby lubricant may be supplied to said packing upon the operation of said plunger.

24. The combination with a pump plunger having relatively movable parts, of a pump cylinder for said plunger, and packing positioned between said plunger parts so as to be alternately subjected to and released from pressure due to the relative movement of said plunger parts.

25. The combination with a movable plunger having relatively movable parts, and packing operatively associated with said plunger parts so as to be movable into compressed and expanded positions upon the movement of said plunger, of means whereby lubricant may be supplied to said packing upon the movement of said packing between said positions.

26. The combination with a plunger having packing and means for causing the compression and expansion thereof, of means whereby lubricant may be automatically supplied to said packing upon said compression and expansion.

27. The combination with a plunger having packing and means whereby said packing may be alternately subjected to and released from pressure, of means whereby lubricant may be supplied to said packing upon said pressure variations.

28. In a pump, the combination with a pump plunger having different strokes, said plunger comprising a plurality of parts, and packing positioned in operative relation to said parts, one part being adjustable automatically with respect to another part in accordance with the stroke of said pump plunger, whereby the pressure on the packing may be alternately exerted and released.

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