

April 3, 1962

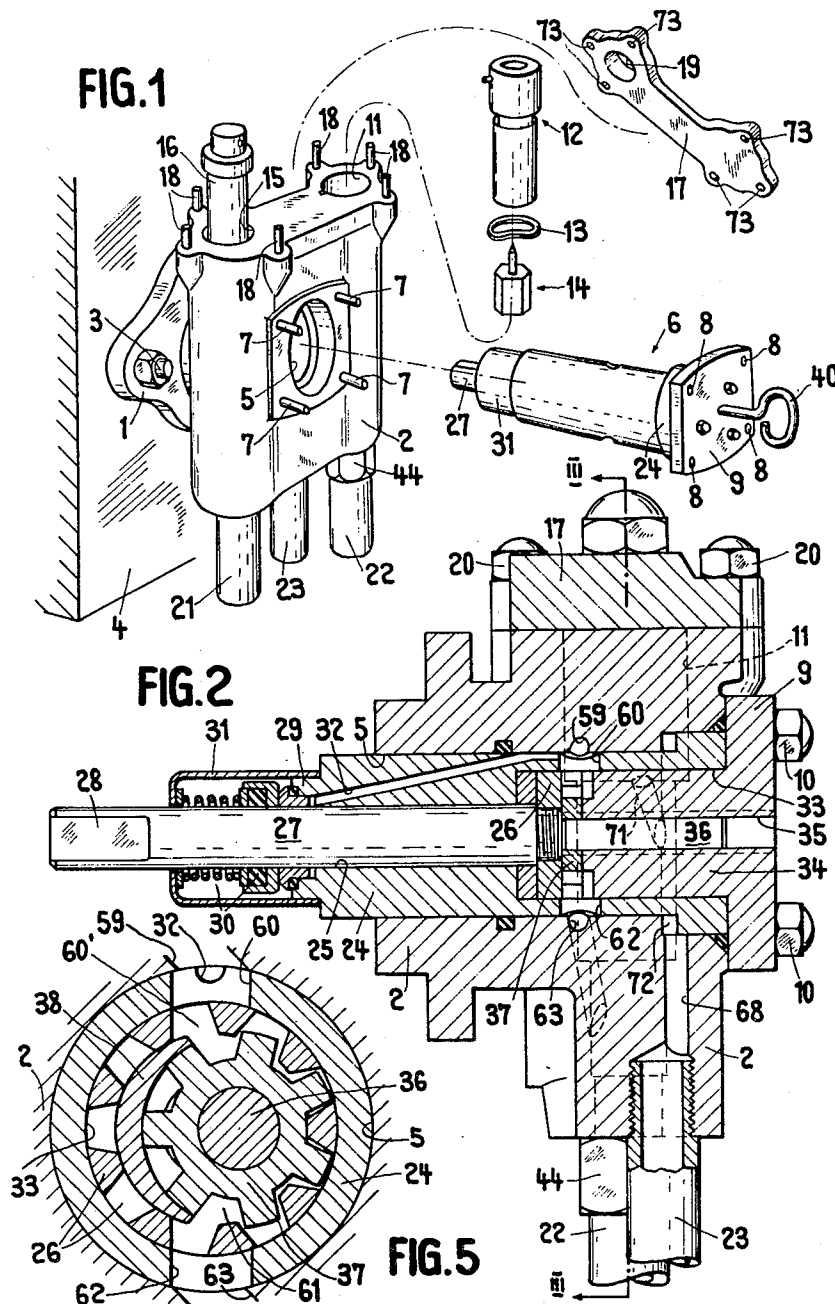
W. SCHINDLER

3,027,846

DISPLACEMENT-TYPE ROTARY PUMP

Filed Dec. 29, 1959

2 Sheets-Sheet 1



INVENTOR
Werner Schindler
BY *Smith & Smiley*
ATTORNEYS

April 3, 1962

W. SCHINDLER

3,027,846

DISPLACEMENT-TYPE ROTARY PUMP

Filed Dec. 29, 1959

2 Sheets-Sheet 2

FIG. 3

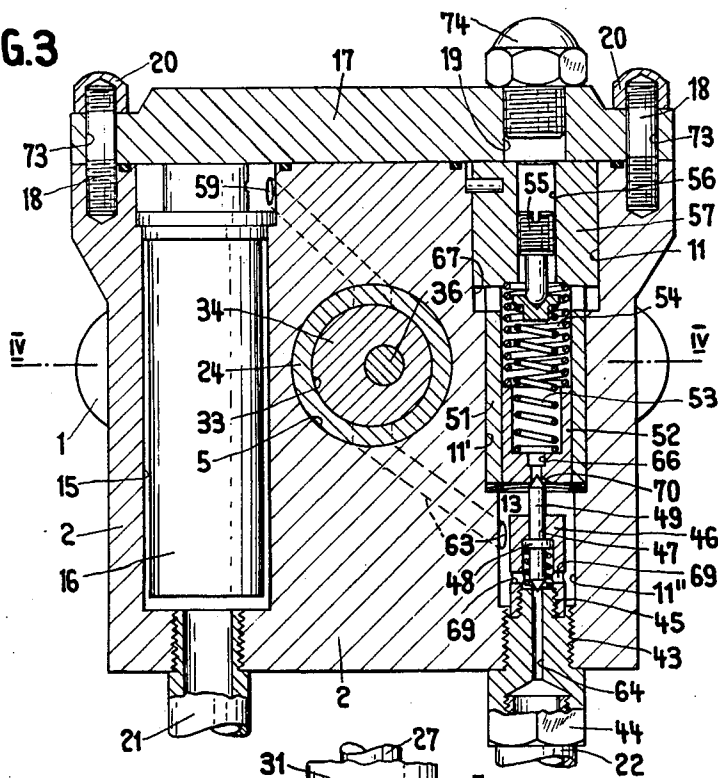
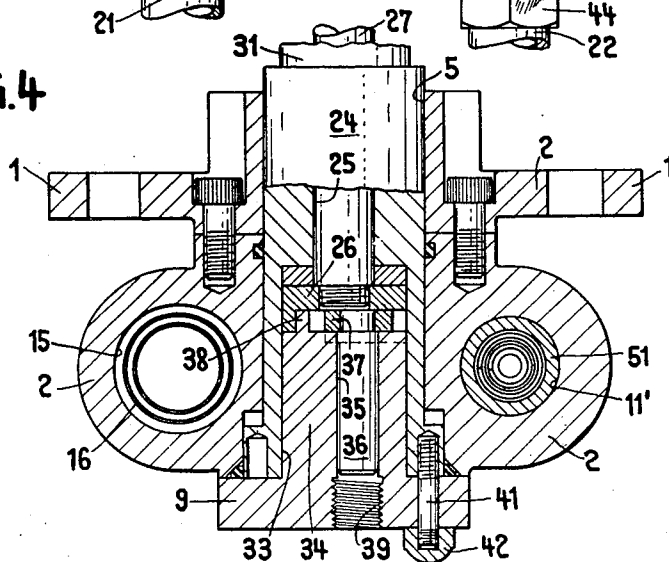


FIG. 4



INVENTOR
Werner Schindler
BY *Imrie & Smiley*
ATTORNEYS

1

3,027,846

DISPLACEMENT-TYPE ROTARY PUMP

Werner Schindler, Berghausweg 5, Biel, Switzerland, assignor of one-half to Ernst Schindler, Biel, Switzerland

Filed Dec. 29, 1959, Ser. No. 862,628

Claims priority, application Switzerland Jan. 27, 1959

3 Claims. (Cl. 103—126)

The present invention relates to displacement-type rotary pumps such as rotating piston pumps, vane-type pumps, screw pumps and particularly gear pumps. Displacement-type rotary pumps are used for various purposes such as, for instance, as feed pumps in oil-burning installations and refrigeration plants, as lubricating oil pumps, in hydraulic drives and hydraulic controls etc.

There exist gear pumps having a driven internally toothed rotor and an externally toothed pinion in driven engagement with the rotor, in which a pump's unit is removably inserted in a casing to be fixed to a support. These prior pumps have the disadvantage that the pump unit can only be removed from the casing towards the side of the support, so that for repair purposes the entire casing must be screwed off the support and the inlet and outlet pipes must be disconnected from the casing whereby the danger of loss in pressure medium and of contamination occurs. Furthermore, in prior pumps the pump unit must be sealed towards the side of the support by means of a packing pressed by a nut requiring a special tool for being screwed and unscrewed. The nut being screwed to the casing the latter must be made of a resistant material such as cast iron or cast steel, a fact which raises the price of the pump. If in the prior pumps the direction of rotation is to be revised and, in consequence, the sickle member, lying between the internally toothed rotor and the externally toothed pinion and separating the suction chamber from the surge chamber, to be turned by 180°, the entire pump must be unscrewed from the support and the pump unit removed from the casing. Moreover, in prior pumps, the entire pump casing must be unscrewed from the support also for replacing the pressure regulating valve and the rapid shutter.

One of the objects of this invention is to provide a displacement-type rotary pump in which the pump unit can be removed without dismounting the casing from the support.

Another object of the invention is to avoid in a displacement-type rotary pump interruption of operation and to facilitate the repair service, in that the damaged pump unit can be overhauled in the factory and afterwards kept in stock for other use.

Another object of the invention is to provide a displacement-type rotary pump in which, for repair or other purposes, the pump unit can be extracted as a complete set after having loosened a screw or screws and can at once be replaced by a spare unit.

Another object of the invention is to avoid in a displacement-type rotary pump disconnection of the inlet and outlet conduits from the casing on removal of the pump unit.

Another object of the invention is to avoid in a displacement-type rotary pump threads on the casing for sealing purposes.

Another object of the invention is to avoid in a displacement-type rotary pump a casing made from cast iron or cast steel and to make the casing from light metal or pressed or molded material, such as plastic material and to obtain thereby simplification in manufacture and to allow bores and the like of the casing of being made while pressing, molding or casting the casing.

Another object of the invention is to provide a displacement-type pump in which the pressure regulating

2

valve is adjustable from the outside and is mounted in the casing in a manner to allow it of being easily removed without interrupting the connection between the casing and the support and between the casing and the pipe connections.

Another object of the invention is to provide a displacement-type rotary pump in which the filter is easily removable without interrupting the connection between the casing and the support and between the casing and the pipe connections.

Another object of the invention is to provide a displacement-type rotary pump comprising a casing to be fixed to a support including the drive shaft for the pump, pipe connections on said casing, said casing receiving three sets constituted by a complete pump unit with a plug shaft to be coupled with said drive shaft, a pressure regulating valve adjustable from the outside, and a filter, these sets being mounted in said casing in a manner to allow each of said sets of being easily removed individually without interrupting the connection between said casing and said support and between said casing and said pipe connections.

Another object of the invention is to provide a displacement-type rotary pump in which the pump unit is surrounded by a capsule insertable into a through-bore of the casing.

Another object of the invention is to provide a displacement-type rotary pump in which the one of the rotating, interengaging parts of the pump unit is mounted directly in the capsule and the other in a sleeve insertable into the capsule from the side away from the plug shaft, the sleeve being preferably mounted rotatably and adjustably in the capsule.

Another object of the invention is to provide a displacement-type rotary pump in which the sickle member, arranged between the two rotating interengaging parts of the pump unit and separating the suction chamber from the surge chamber, is fixed to the rotatable sleeve to allow reversing the direction of rotation of the pump without previously unscrewing the entire pump and the casing from the support.

Other objects, features and advantages will be apparent as the following description proceeds, reference being had to the accompanying drawings, wherein

FIG. 1 is a perspective view of the pump with the pump unit, the cover, the pressure regulating valve and the rapid shutter separated from the casing;

FIG. 2 is a vertical sectional view, on a larger scale, through the axis of the shaft of the internally toothed rotor and the offset axis of the pinion;

FIG. 3 is a section along the line III—III of FIG. 2;

FIG. 4 is a section along the line IV—IV of FIG. 3; and

FIG. 5 is a cross section, on a larger scale, through the rotor, the pinion meshing with the rotor and the sickle member of the pump unit.

Referring now to FIG. 1, the casing 2 of the gear pump has flanges 1 fixed by means of screws 3 to a support 4 such as a wall of an oil-burning installation. The casing 2 has a through-bore 5 into which the pump unit 6, shown in FIG. 1 in removed position, can be inserted from the end of the bore 5 turned away from the support 4. In the inserted position of the pump unit 6 bolts 7 of the casing 2 go through bores 8 of a flange 9 of the pump unit 6, the latter being fixed to the casing 2 by nuts 10 screwed onto the bolts 7 (FIG. 2). The casing 2 also comprises a bore 11 into which can be inserted the pressure regulating valve 12, the leaf spring 13 of the latter and the rapid shutter 14, these means 12, 13 and 14 being shown in FIG. 1 as withdrawn from the casing 2. As will be described later on, the pressure regulating valve 12 consists of several parts removable individually from the

bore 11. An oil filter 16, known per se and shown in FIG. 1 as partially withdrawn, is received in a bore 15 of the casing 2, arranged parallel to the bore 11. After the means 12, 13, 14 and 16 having been inserted in their respective bores 11 and 15, the cover 17 is brought onto the casing 2 in such a manner that bolts 18 of the casing 2 go through bores 73 of the cover 17 and that a hole 19 of the cover 17 is in alignment with the bore 11 and the cover 17 is fixed to the casing 2 by means of nuts 20 screwed to the bolts 18 (FIG. 3). A supply pipe 21 for fuel oil or another medium leads to the filter 16 and a discharge pipe 22 for the medium is connected to the bore 11. Reference numeral 23 designates a return pipe connected to a tank (not shown), for leading back to the tank medium which is not conveyed to the pipe 22 by the gear pump.

Referring now to FIGS. 2 to 4, the pump unit 6 includes a capsule or cylindrical member 24 insertable into the bore 5 from the end away from the support 4. A plug shaft 27 carrying the internally toothed rotor 26 and having a milled surface 28 for coupling it with a drive (not shown) in the support 4 is journaled in a bore 25 of the capsule 24. A cap 31 enclosing a gland or stuffing box 30 is fixed to a shouldered extension 29 of the capsule 24. The diameter of the cap 31 is smaller than the diameter of the casing bore 5 so that the gland 30 may be withdrawn together with the capsule 24 from the bore 5 towards the right in FIG. 2. A bore 32 in the capsule 24 serves the return of flow medium accumulating in the gland 30 to the pump chamber of the pump unit. The internally toothed rotor 26 rotates in a bore 33 of the capsule 24, a sleeve 34 being removably inserted into the bore 33 and having a bore 35 eccentric to the bore 25 (FIG. 4). The pinion 37 meshing with the rotor 26 is rotatably mounted on an axle 36 driven into the bore 35. The sleeve 34 is made in one piece with or rigidly fixed in any other manner to a sickle member 38 lying between rotor 26 and pinion 37 and separating the suction chamber from the surge chamber (FIGS. 4 and 5). The outer end of the bore 35 is provided with an internal thread 39 (FIG. 4) for the transient location of a handle 40 (FIG. 1) for extracting the pump unit 6 from the bore 5. The flange 9 of the sleeve 34 is fixed to the capsule 24 by means of bolts 41 and nuts 42 (FIG. 4).

Referring to FIG. 3, a nipple 44 for connecting the discharge pipe 22 is screwed into a thread 43 of the lower end of the stepped bore 11 receiving the pressure regulating valve and the rapid shutter. A hexagonal sleeve 46 of the rapid shutter 14 is screwed onto a thread 45 of the nipple 44, a rapid shutter pin 49 provided with a collar or piston 48 being mounted in a bore 47 of the sleeve 46 for reciprocating movement. A bushing 51 of the pressure regulating valve 12 is inserted in an enlarged portion 11' of the bore 11, the bushing 51 being pressed against an upper bushing 57 by means of the leaf spring 13. A valve plunger 52 being under the constraint of two springs 53 and 54 is movably mounted in the bushing 51. Adjusting the spring 53 and thereby adjusting the pressure and the quantity delivered of medium is obtained by means of a setscrew 55 engaging an internal thread of the borehole 56 of the bushing 57 inserted into the bore 11. The whole set is held in place in the bore 11 by the cover 17. After removal of the nut 74 a screw driver may be introduced through the hole 19 of the cover 17 for adjusting the setscrew 55.

The general mode of operation of the described and illustrated gear pump is well-known to those skilled in the art and, therefore, will now only be described in an abridged manner: The oil enters through the pipe 21 into the filter 16 and from here through a bore 59 and an aperture 60 of the capsule 24 into the pump chamber between the rotor 26 rotating in anticlockwise direction (FIG. 5) and the pinion 37 and is sucked into the suction chamber 60' and from here conveyed along the sickle member 38 to the surge chamber 61 wherefrom the oil

leaves the pump chamber through the aperture 62 of the capsule 24 and flows through the conduit 63 into the bore portion 11'' of the pressure regulating valve. As long as the pressure of the oil corresponds to the pressure adjusted in the regulating valve the oil is able to keep the piston 52 of the valve in the desired position and to lift the rapid shutter pin 49 as far as allowed by the position of the piston 52 and to reach the pipe 22 through the openings 69 of the sleeve 46 and the bore 64 of the nipple 44. If the manometric pressure of the pump diminishes the piston 52 is moved by the springs 53 and 54 towards the bottom and brings the rapid shutter pin 49 suddenly in engagement with the edge of the bore 64 so that the oil can face 70 and through the bore 66 of the valve piston 52 to the annular space 67 and from here through the conduit 71 (FIG. 2), the annular space 72 and the return bore 68 into the return pipe 23.

If for defect or for any other reason the pump unit is to be removed and replaced by a spare unit, merely the nuts 10 are to be loosened, the handle 40 screwed into the thread 39 and, as illustrated in FIG. 1, the entire unit 6 is afterwards withdrawn from the bore 5 of the casing 2, while immediately afterwards a spare unit 6 may be inserted into the bore 5 and fixed to the casing 2 by means of the nuts 10. If a pump unit 6 hitherto adjusted for a certain direction of rotation is to be adjusted to the reverse direction of rotation, i.e., if the sickle member 38 is to be turned by 180° (FIG. 5), the nuts 42 are loosened, the sleeve 34 is drawn somewhat towards the outside and afterwards turned by 180° and again inserted and, afterwards, the nuts 42 are tightened again. Therefore, it is not necessary to turn the entire unit 6 in the casing.

If the pressure regulating valve with its rapid shutter is to be replaced, the nuts 20 and the cover 17 are removed, whereupon the bushing 57 with the setscrew 55, the bushing 51 with the piston 52 and the springs 53 and 54 and, afterwards, the spring 13 can be extracted by means of a suitable tool. Afterwards, a socket wrench is introduced into the bore portion 11' and engaged with the rapid-shutter sleeve 46 to unscrew the latter from the nipple 44 and to extract the sleeve 46 from the bore portion 11'' by means of the pin 49. Subsequently, the spare parts are introduced in corresponding sequence and the cover 17 is screwed on again. Therefore, also replacing the pressure regulating valve and the rapid shutter takes place without dismantling the casing 2 from the support.

Also the filter 16 can be removed after having removed the cover 17.

Instead of only one pump unit a set of several pumps may be provided in the casing.

While the invention has been described and illustrated with reference to a specific embodiment thereof it will be understood that other embodiments may be resorted to without departing from the invention. Therefore, the performance of the invention set out above should be considered as illustrative and not as limiting the scope of the following claims.

I claim:

1. A fixed and easily maintainable displacement-type rotary pump and control unit comprising a casing having front, rear, upper, lower and side walls, support means on said rear wall for retaining said casing attached to a fixed support, fluid entry and discharge pipe connections on said lower wall, a filter chamber and a pressure regulating valve chamber in said casing, a filter and a pressure regulating valve respectively installed in said chambers and removable without loosening said casing on said fixed support, a pump receiving cavity in said casing having openings through both said front and rear casing walls and above said fluid entry and discharge pipe connections, passages leading from said filter and pressure regulating valve chambers to said pump receiving cavity, and a completely assembled pump detachably received in said cav-

ity and removable therefrom through said opening in the front wall of the casing without disturbing said casing support means or said pipe connections and without substantial loss of fluid through said cavity, said assembled pump carrying a stuffing box at its rear end having a removable cover permitting access to sealing elements within the stuffing box without disassembly of other parts of the pump, said assembled pump being an internal external gear pump of the type having a sickle filler member in the space between the gear teeth separating the inlet and outlet ports, said pump further comprising an outer sleeve and an inner sleeve carrying a flange at its forward end which flange overlaps and closes the pump receiving cavity when the pump assembly is inserted therein, said sickle member being secured to said inner sleeve and flange whereby the direction of rotation of the pump may be readily reversed by turning said flange to rotate the sickle member 180° with respect to said outer sleeve.

2. A fixed and easily maintainable displacement-type rotary pump and control unit comprising a casing having a plurality of enclosing walls, support means on one of said walls for retaining said casing attached to a fixed support, fluid entry and discharge pipe connections on the bottom of said casing, a filter chamber and a pressure regulating valve chamber within said casing, a filter and a pressure regulating valve respectively installed in said chambers and removable without loosening said casing on said fixed support, a pump receiving cavity in said casing above the bottom and having openings through oppositely disposed walls of the casing, passages leading from said filter and pressure regulating valve chambers to said pump receiving cavity, and a completely assembled pump detachably received in said cavity and removable therefrom through one of said cavity openings without disturbing said casing support means or said pipe connections and without substantial loss of fluid through said cavity, said assembled pump carrying a stuffing box at its rear end having a removable cover permitting access to sealing elements within the stuffing box without disassembly of other parts of the pump, said assembled pump being an internal external gear pump of the type having a sickle filler member in the space between the gear teeth separating the inlet and outlet ports, said pump further comprising an outer sleeve and an inner sleeve carrying a flange at its forward end which flange overlaps and closes the pump receiving cavity when the pump assembly is in-

serted therein, said sickle member being secured to said inner sleeve and flange whereby the direction of rotation of the pump may be readily reversed by turning said flange to rotate the sickle member 180° with respect to said outer sleeve.

3. In a fixed and easily maintainable displacement-type rotary pump and control unit having a casing including a plurality of enclosing walls, support means on one of said walls for retaining said casing attached to a fixed support, fluid entry and discharge pipe connections, a pump receiving cavity and passages leading from said cavity to said pipe connections, the provision of a completely assembled pump detachably receivable in said cavity and removable therefrom without disturbing said casing support means or said pipe connections, said assembled pump comprising an outer sleeve, an inner sleeve having a flange at one end which extends outwardly beyond the outer sleeve and overlaps and closes the pump receiving cavity when the pump assembly is inserted therein, said outer sleeve having fluid inlet and outlet ports for communication with said passages, a shaft having an internally toothed rotor near one end journaled in said outer sleeve and having at its other end means for coupling to a drive, said inner sleeve being removably seated within the outer sleeve, a pinion meshing with said rotor and having a shaft eccentrically journaled in said inner sleeve, a sickle member fixedly secured to said inner sleeve and lying between the rotor and pinion and in the space between said ports, and means accessible from the exterior of said flange and extending therethrough for adjustably securing said inner and outer sleeves together whereby the direction of rotation of the pump may be readily reversed without complete removal of the pump assembly from said cavity by loosening said accessible means and rotating the flange to rotate the sickle member 180° with respect to said outer sleeve.

References Cited in the file of this patent

UNITED STATES PATENTS

40	2,032,886	Murphy et al.	Mar. 3, 1936
	2,209,856	Smith et al.	July 30, 1940
	2,229,231	Weyenberg	Jan. 21, 1941
	2,246,610	Wagner	June 24, 1941
45	2,481,560	Bakewell	Sept. 13, 1949
	2,671,410	Wahlmark	Mar. 9, 1954
	2,905,094	Gerteis	Sept. 22, 1959