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FLUID OPERATED ROTARY MOTOR AND LUBRICATING MEANS THEREFOR

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Fig. 1.

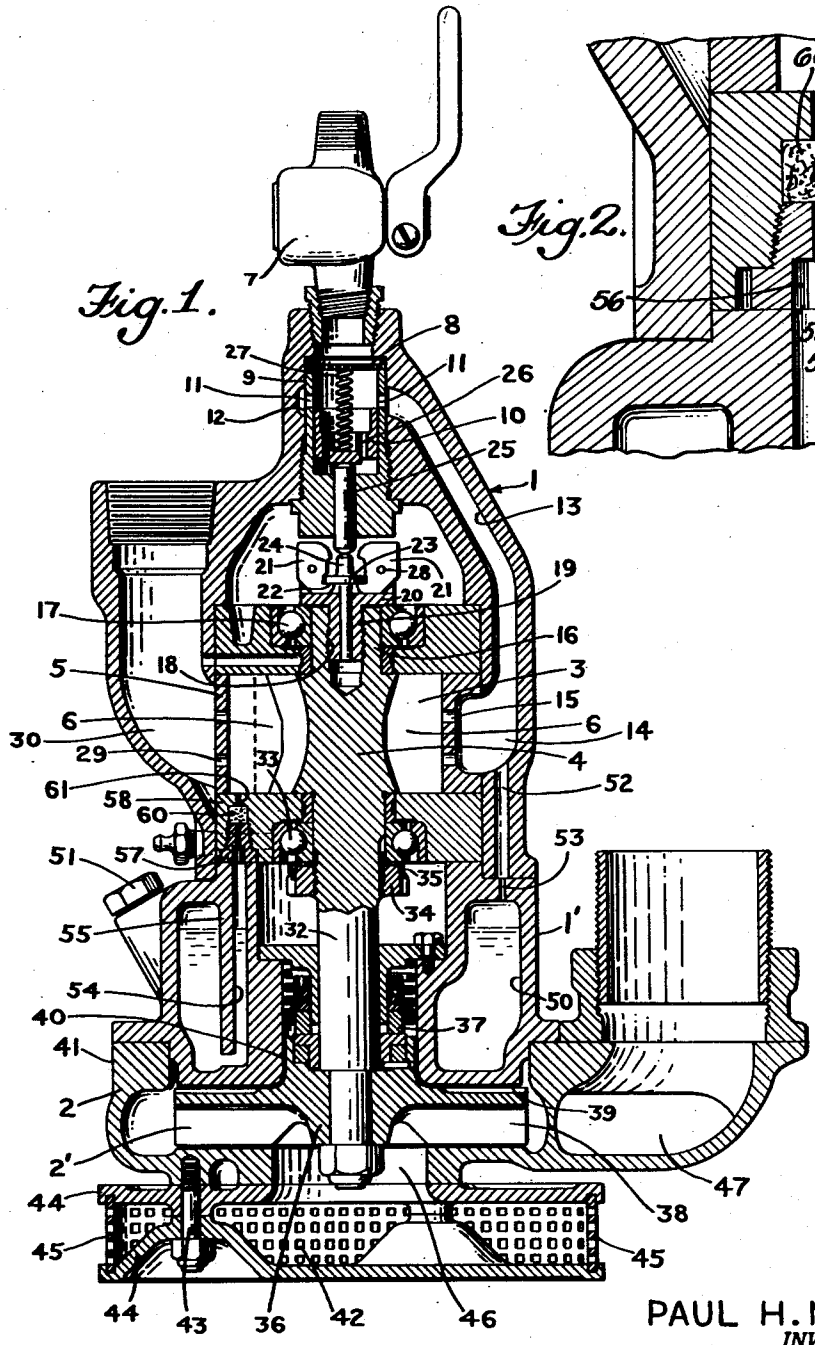
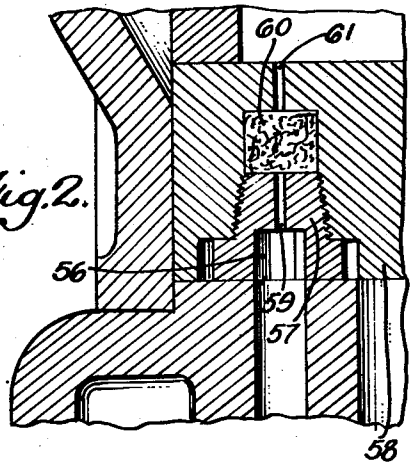


Fig. 2.



PAUL H. NAST
INVENTOR.

BY Robert Meyer
Attorney

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FLUID OPERATED ROTARY MOTOR AND LUBRICATING MEANS THEREFOR

Paul H. Nast, West Springfield, Mass., assignor to Worthington Pump and Machinery Corporation, Harrison, N. J., a corporation of Delaware

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7 Claims. (Cl. 121—67)

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This invention relates to pumps and more particularly to pressure fluid operated centrifugal pumps.

An object of the present invention is to provide means for lubricating the working parts of a centrifugal pump which is operated by an air motor and wherein the pressure of the operating pressure air or other fluid is utilized for distributing lubricant to the working parts of the mechanism.

With these and other objects in view, as may appear from the accompanying specification, the invention consists of various features of construction and combination of parts, which will be first described in connection with the accompanying drawings, showing a fluid operated rotary motor and lubricating means therefor of a preferred form embodying the invention, and the features forming the invention will be specifically pointed out in the claims.

In the drawings:

Figure 1 is a vertical section through the improved pressure fluid operated pump.

Figure 2 is an enlarged section through a part of the lubricant distributing structure of the pump.

The present invention relates primarily to the lubricating means or lubricating pressure fluid operated pumps such as shown, described and claimed in my companion application, Serial No. 744,055, filed April 26, 1947, now abandoned.

Referring more particularly to the drawings, the pressure operated centrifugal pump with which the improved lubricating system is employed includes a motor housing 1 to which is attached in any suitable manner, through the medium of an intermediate casing section 1', the pump casing 2. The motor housing 1 has a rotor 3 therein which comprises a hub 4. The hub 4 carries the vanes 6 of the motor which vanes reciprocate relative to the hub 4 as shown and described in the above identified companion application, and cooperate with the motor liner 5 to provide the motive power for driving the impeller 2' of the centrifugal pump 2.

The rotor 3 is operated by air under pressure taken from any suitable source (not shown) and it enters the pumping unit through a hand operated throttle valve 7. From the throttle valve 7 the air pressure passes through a screen 8 into the valve cylinder 9. The valve cylinder 9 is removably carried by the housing 1 and it has a reciprocating plunger valve 10 mounted therein which by its reciprocating movement controls the radial ports 11 through which the air

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pressure passes from the valve cylinder 9 into the annular passage 12. From the annular passage 12 the air under pressure passes through the motor inlet connection 13 and duct 14 into the bore of the housing 1 in which the rotor 3 is mounted. The incoming air pressure is distributed into the housing 1 for impingement against the blades 6 of the distributing inlet passages 15. The construction of the air motor proper, that is, the rotor and its stator or housing in which it rotates is of approved construction well known in the art.

The hub 4 of the rotor 3 has an axially extending shaft extension 16 thereon which rotates in a suitable bearing 17 carried within the housing 1. The shaft 16 is provided with a longitudinally extending axial bore 18 in which is threaded a sleeve 19. The sleeve 19 has a flanged head 20 on its outer end to which are pivotally connected a plurality of fly weights 21. The fly weights 21 have shoulders 22 formed thereon which engage beneath a collar 23 formed on a pin 24. The pin 24 is slidably carried by the sleeve 19 and its upper end engages against the lower end of an operating pin 25. The operating pin 25 is slidably carried by the inner end of the valve cylinder 9 and extends into the valve cylinder for engagement with the plunger valve 10. The plunger valve 10 is provided with a plurality of openings 26 extending therethrough which permits the air under pressure to pass through the plunger valve and equalize the pressure against each end of the plunger valve. A spring 27 is mounted in the cylinder and engages the plunger valve 10 and is tensioned to move the plunger valve into position to provide complete opening of the radial ports 11.

During rotation of the rotor 3, when the speed of the rotor picks up beyond the desired maximum speed the fly weights 21 will fly outwardly on their pivots 28 which will raise the pin 24 causing the pin 25 to be moved to force the plunger valve 10 outwardly in the cylinder against the tension of the spring 27 and gradually out off the radial ports 11. That is, the plunger valve 10 will move in proportion to the speed of rotation of the rotor 3 to gradually reduce the size of the ports 11 and consequently reduce the quantity flow of pressure fluid to the motor 3 for reducing the speed of rotation of the motor. The air exhaust from the motor through the outlet passages 29, manifold passage 30 and discharge passage 31.

The hub 4 of the rotor 3 has a second shaft extension 32 formed axially thereon and extend-

ing into opposite direction from the shaft extension 16. The shaft extension 32 is rotatably supported by a suitable ball bearing structure 33 which is held in position by means of a nut 34 threaded on the shaft 32 and a lock washer 35.

The shaft 32 has a pump impeller 36 mounted thereon in the usual manner so that the pump impeller 36 is direct connected through the medium of the shaft 32 with the rotor 3 of the air motor 3. A suitable packing structure 37 of any approved form is provided about the shaft 32 between the pump impeller 36 and the motor 3 to prevent leakage of fluid pumped into the motor, the shaft bearings and about the shaft. This packing may be of any approved construction. The impeller 36 is of any approved type of centrifugal impeller having a plurality of vanes 38 which form the normal pumping vanes and auxiliary pumpout vanes 39 on its back which are provided to prevent water or fluid pumped from passing through the clearance spaces indicated at 40 back into the motor structure.

The casing 41 of the pump has an inlet structure 42 attached thereto by suitable bolts 43 and this inlet structure comprises suitable metal discs 44 between which are supported a screening cage 45 to prevent foreign material of such size as to impede or interfere with the operation of the pump from entering the pump. As shown in the drawings, the centrifugal pump is of the usual axial inlet or suction type, the inlet being indicated at 46, while the discharge indicated at 47 is peripheral.

The intermediate casing section 1' is hollow to provide a reservoir 50 which is filled with a suitable lubricant through a filler connection 51. As shown in Figure 1 of the drawings, the supply duct 14 which delivers the operating pressure fluid to the motor structure 3 is connected to the reservoir 50 by a passage 52 which is provided with a restriction 53. The passage 52 permits air under pressure to flow into the reservoir 50 and exert a pressure upon the lubricant contained in the reservoir so as to force the lubricant upwardly through the restricted passageway 54. The passageway 54 is formed in the reservoir 50 by the partition 55 and its upper discharge end opens into the space or recess 56 formed in the plug 57. The plug 57 is removably carried by the motor base plate 58 and it is provided with a relatively small passageway 59 which communicates with the recess 56 and permits the lubricant to pass from the restricted passage 54 through the small passage 59 into and through the padding 60 of felt or other material which acts to restrict the flow of the lubricant. A second passage 61 opens communication between the felt or other restricting pad 60 and the interior of the motor structure 3 so that when pressure operating fluid flows to the motor under control of the reciprocating plunger valve 10, a small quantity of such pressure fluid will, in passing into the lubricant reservoir 50 exert a pressure on the lubricant therein and force it through the restricting means comprising the plug 57, passage 69, pad 60 and small passage 61 into the motor structure for lubricating the moving parts of the motor.

The opening or passage way 61 into the exhaust end of the motor is located so that during rotation of the rotor 3 the blades or vanes 6 pass over the opening of this passage. This condition results in a fluctuation of back pressure, opposing the pressure of the incoming oil. The resultant rapid drop in pressure acts as a check in not permitting a steady free flow of oil into the motor.

It will be understood that the invention is not to be limited to the specific construction or arrangement of parts shown, but that they may be widely modified within the invention defined by the claims.

What is claimed is:

1. In a pressure fluid operated motor having a rotor with sliding vanes the combination of, a housing including a lubricant reservoir therein, a supply duct in said housing for conducting operating fluid to said vanes, an extended portion of said supply duct for delivering operating fluid directly to said lubricant reservoir to allow positive pressure to act therein, a passageway independently communicating between said lubricant reservoir and said motor, outlet means restricting the flow of lubricant through said passageway, said vanes during rotation in operative relation to said outlet means to open and close said outlet means to intermittently check the flow of lubricant therethrough responsive to the fluctuating pressure created, and means for controlling delivery of pressure fluid to said motor and said lubricant reservoir.

2. In a pressure fluid operated motor having a rotor with sliding vanes the combination of, a housing including a lubricant reservoir therein, a supply duct in said housing for conducting operating fluid to said motor, an extended portion of said supply duct for delivering operating fluid directly to said lubricant reservoir to allow positive pressure to act therein, said extended portion of the supply duct having a restricted passageway opening into the lubricant reservoir, a second passageway independently communicating between said lubricant reservoir and said motor, outlet means restricting the flow of lubricant through said second passageway, said outlet means opening into the discharge side of said motor and being so constructed and arranged that rotation of said vanes will open and close said outlet means to intermittently check the flow of lubricant therethrough responsive to the fluctuating pressure created, and means for controlling delivery of pressure fluid to said motor and lubricant reservoir.

3. In a pressure fluid operated motor having a rotor with sliding vanes the combination of, a housing including a lubricant reservoir therein, a supply duct in said housing for conducting operating fluid to said motor, an extended portion of said supply duct for delivering operating fluid directly to said lubricant reservoir to allow positive pressure to act therein, said extended portion of the supply duct having a restricted passageway opening into the lubricant reservoir, a second passageway independently communicating between said lubricant reservoir and said motor, a restricted outlet for said second passageway adjacent the discharge end of said motor, a removable plug in said second passageway having a relatively small bore therein to provide continuous communication between said second passageway and said restricted outlet, a felt padding mounted in said passageway to be held in position between said restricted outlet and said plug by threaded engagement of said plug with said passageway, said restricted outlet being so constructed and arranged with respect to said vanes as to be opened and closed during rotation thereof to intermittently check the flow of lubricant therethrough responsive to the fluctuating pressure created, and means for controlling delivery

of pressure fluid to said motor and said lubricant reservoir.

4. In a pressure fluid operated motor having a rotor with sliding vanes the combination of, a housing including a lubricant reservoir therein, a supply duct in said housing for conducting operating fluid to said motor, an extended portion of said supply duct for delivering operating fluid directly to said lubricant reservoir to allow positive pressure to act on said lubricant, said extended portion of the supply duct having a restricted passageway opening into the lubricant reservoir, a second passageway independently communicating between said lubricant reservoir and said motor to allow said lubricant to be forced out of said lubricant reservoir by the pressure fluid therein, a removable plug having a relatively small bore therethrough in said second passageway, a felt padding across said plug to restrict the flow of lubricant through said plug, an outlet passageway in said plug to allow lubricant to pass through said felt to said motor, said outlet passageway adapted to open into the discharge of said motor and to be opened and closed by said vanes during rotation to intermittently check the flow of lubricant therethrough, and a valve means for controlling delivery of pressure fluid to said motor and to said reservoir.

5. In a pressure fluid operated motor having a rotor with sliding vanes the combination of, a housing including a lubricant reservoir therein, a supply duct in said housing for conducting operating fluid to said vanes, said lubricant reservoir adapted to receive fluid under pressure therein to allow positive pressure to act on said lubricant, a passageway independently communicating between said lubricant reservoir and said motor, outlet means restricting the flow of lubricant through said passageway, said vanes during rotation in operative relation to said outlet means to open and close said outlet means to intermittently check the flow of lubricant therethrough responsive to the fluctuating pressure created, and means for controlling delivery of pressure fluid to said motor.

6. In a pressure fluid operated motor having a rotor with sliding vanes the combination of, a housing including a lubricant reservoir therein, a supply duct in said housing for conducting operating fluid to said vanes, said lubricant reservoir adapted to receive fluid under pressure therein to allow positive pressure to act therein, a passageway independently communicating between said lubricant reservoir and said motor, said passageway having a relatively small cross-sectional area in comparison with the cross-sectional area of said lubricant reservoir, outlet means restricting the flow of lubricant through said passageway, said vanes during rotation in operative relation to said outlet means to open and close said outlet means to intermittently check the flow of lubricant therethrough responsive to the fluctuating pressure created, and means for controlling delivery of pressure fluid to the motor.

7. In the combination with a pressure fluid operated motor as claimed in claim 3 wherein the second passageway is of relatively small cross-sectional area in comparison with the cross-sectional area of said lubricant reservoir whereby back pressure acting in said second passageway will be able to momentarily check the flow of lubricant through said passageway and restricted opening.

PAUL H. NAST.

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