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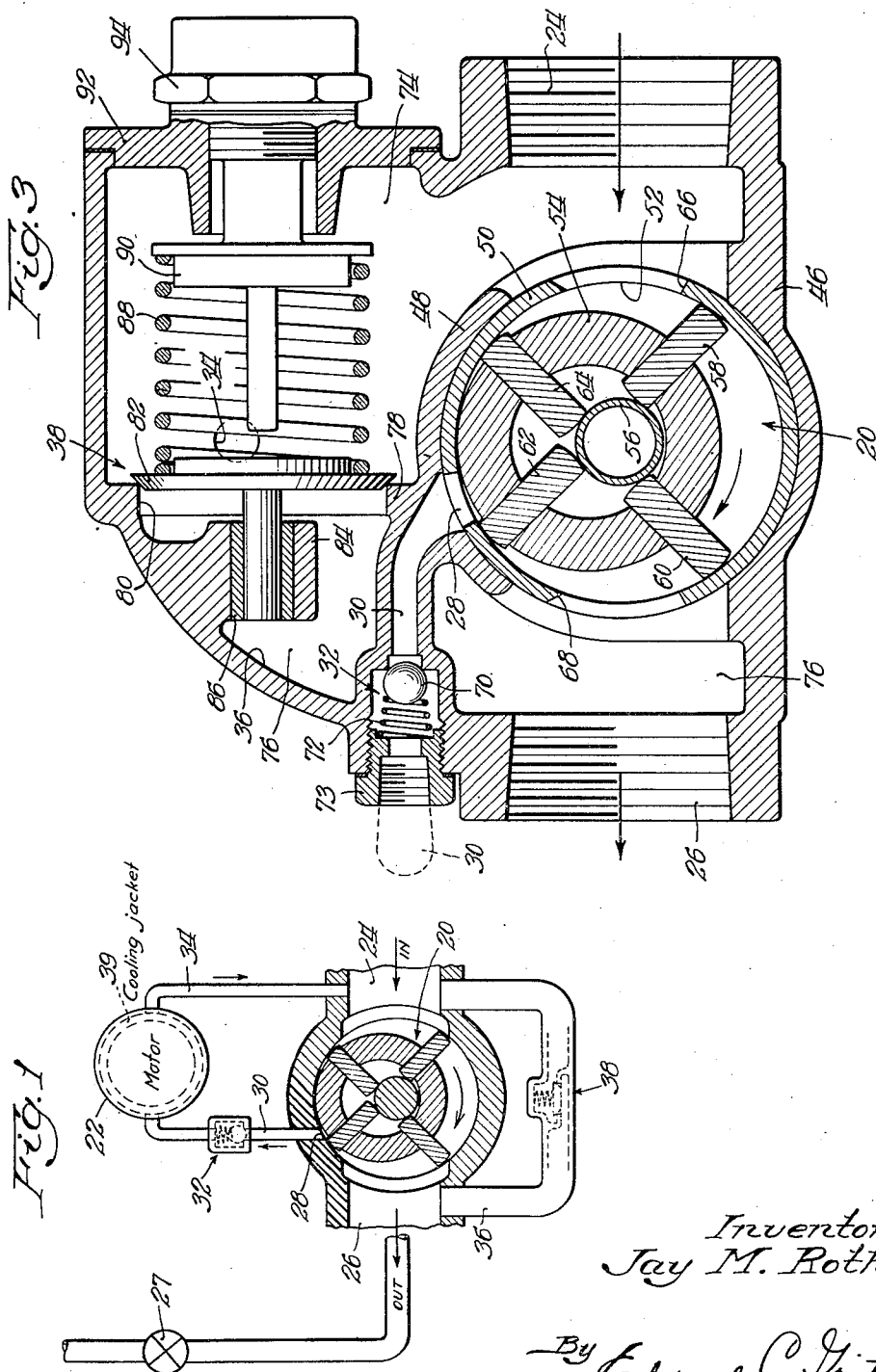
J. M. ROTH

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MULTIPLE DISCHARGE PUMP

Filed Dec. 12, 1942

2 Sheets-Sheet 1



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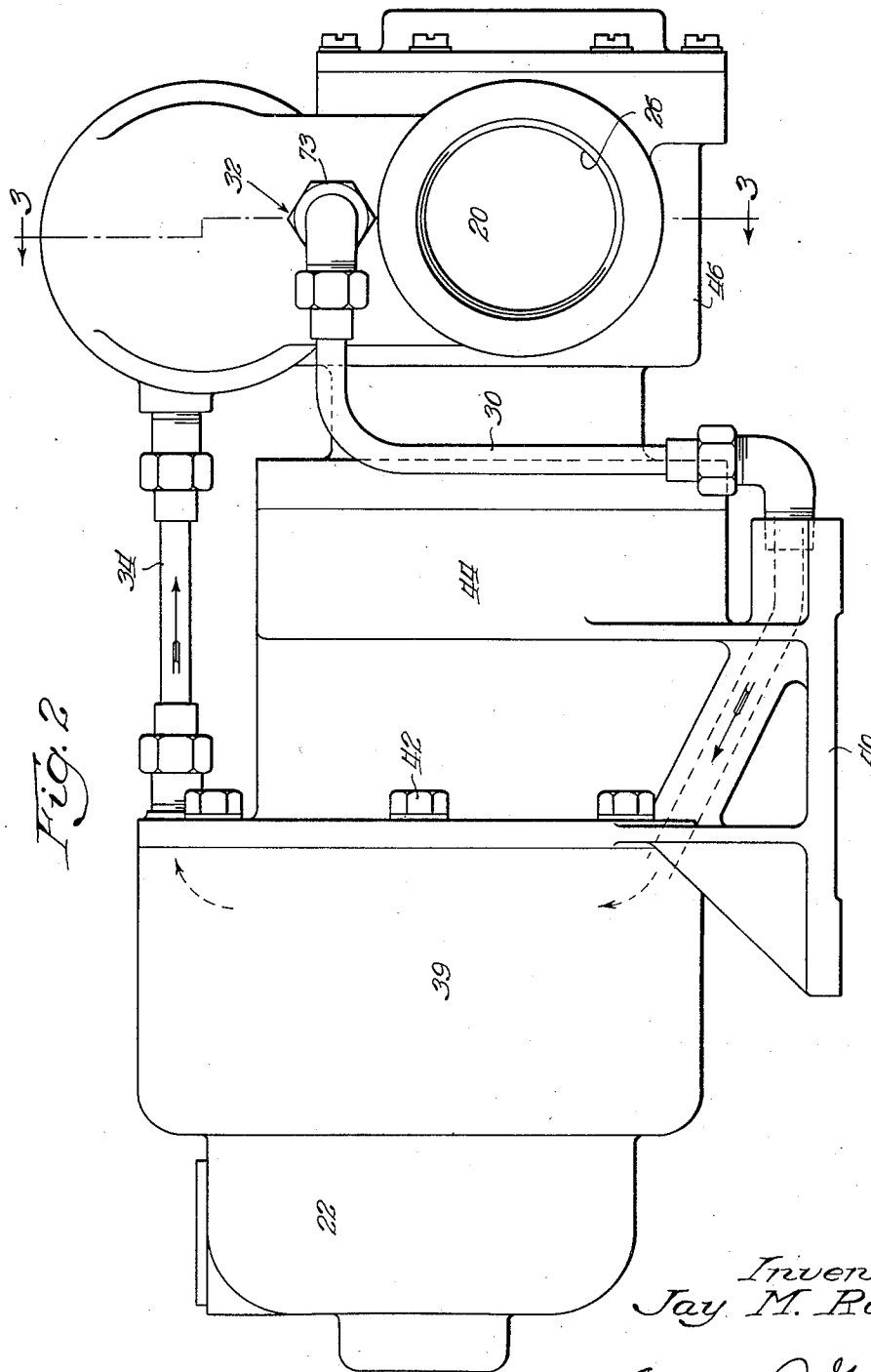
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UNITED STATES PATENT OFFICE

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MULTIPLE DISCHARGE PUMP

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4 Claims. (Cl. 103—2)

This invention relates to pumps and the like. It is primarily directed to the provision of an improved pump of the rotary type, operating on an eccentric and used for pumping fluids of almost any type, for example, such fluids as bilge water and aeroplane fuel.

The principal object of this invention is to provide a pump of the class described having a plurality of pump outlets, one of which will provide a relatively high rate of flow at comparatively low pressure, and the other of which provides a relatively small, definitely metered rate of flow, at the same or slightly higher pressure.

In this connection, it is an object to provide a device which will furnish a metered flow of a limited amount of the outlet flow capacity of the pump, for the purpose of cooling a driving motor or for any other use desired.

In the past, sometimes pumps have been used for cooling motors by pumping a liquid through a cooling jacket of the motor. The prior arrangements, however, have usually provided for the circulation of practically all or all of the fluid through the motor cooling jacket, but this has the disadvantage that it is sometimes necessary to operate the unit with the discharge nozzle closed, and during that time there will be no circulation through the motor cooling jacket. Also, due to the comparatively large volume of flow involved in such a cooling jacket, the jacket would have to be quite large and would make the motor comparatively bulky and heavy as well as expensive, and would thus make such an arrangement undesirable for portable installations. It is an object to provide a device which overcomes these objections.

It is an object to provide a construction in which circulation is so arranged that when it operates with the principal pump discharge closed, there is still circulation of at least a small part of fluid through the motor cooling jacket.

It is an object to disclose a construction in which provision is made for the return of any fluid pumped through the principal discharge outlet which cannot get out through the discharge nozzle, back into the inlet side of the pump, and of using this fluid in cooling the motor by mingling it with the cooling liquid from the liquid jacket so that the heat is dissipated from the whole. In such case all of the liquid in both the pump and motor jacket will have a cooling effect.

Further it is an object to provide an arrangement in which there is a positive displacement forcing fluid through the motor cooling jacket.

It is another object to provide a device in which foreign particles in the liquid being pumped ordinarily will be discharged through the principal discharge of the pump, with the result that the liquid forced through the pump and motor cooling jacket ordinarily will have lost foreign particles having sufficient bulk to interfere with the small passages in the motor cooling system.

It is a further object to provide a device which will have comparatively little bulk, and which may be readily incorporated into a portable arrangement; and a device which is especially adaptable to transfer fuel to aircraft, to pump out bilge water from Navy craft, and for other miscellaneous and multiple purposes.

It is a still further object of the invention to provide a means for regulating the amount of fluid forced through the motor cooling jacket.

Other objects, the advantages and uses of the invention will become more apparent after reading the following specification and claims, and after consideration of the drawings forming a part of the specification, wherein:

Fig. 1 is a sectional side elevational view, schematic in nature, showing the present invention as applied to a rotary type pump;

Fig. 2 is a side elevational view of a motor with a cooling jacket, as applied to a pump of the type described, the view showing, partially by means of dotted lines, the circulation of the liquid from the pump through the motor cooling jacket and back to the pump; and

Fig. 3 is a cross-sectional elevational view taken on the line 3—3 of Fig. 2 looking in the direction of the arrows.

Referring more in detail to the construction shown in the various figures for illustrating this invention, and referring first to the schematic arrangement of Fig. 1, there is provided what may be termed a liquid transfer means comprising the compressor or pump 20, which is of the so-called rotary liquid impeller type.

Drivingly connected to said pump 20 by any convenient means (not shown) is the motor 22. The motor 22 may be of any convenient type, but preferably is an electric motor having a cooling jacket adapted to be cooled by the circulation of a fluid therethrough.

Still referring to Fig. 1, the pump 20 is provided with a source for fluid comprising connection 24 leading to a source of fluid, for example, the bilge of a vessel, and a major outlet 26 having a control valve 27, said major outlet being for discharge of a major portion of the liquid pumped from said inlet 24.

The pump also has what may be termed a second or minor outlet 23, with a connection to a means receiving fluid, especially the cooling jacket of the motor, said connection as illustrated herein comprising a conduit 30 preferably containing the check valve 32. There is a return pipe 34 leading from the outlet side of the cooling jacket back to the inlet side of the pump.

There is also provided a safety bypass 36 leading from the discharge side of the pump 20 to the inlet side, and containing a check valve designated generally as check valve 38.

Referring more to the detailed construction as shown in Figs. 2 and 3, the motor 22 is shown as an electric motor, provided with the cooling jacket 39. This motor assembly is preferably attached to the stand 40 by means of bolts or the like 42.

Likewise supported by said stand 40 is the pump assembly 20, which is drivingly connected to the motor 22 by any convenient means (not shown) within the housing 44.

Referring now to the construction shown in Fig. 3, there is provided a more detailed mechanism for the securing of the objects herein disclosed. Within the pump housing 46 there is located the pump assembly 20, comprising the casing 48 with a subcasing 50 and having the impeller chamber or bore 52 in which is located the rotor 54. This rotor 54 is journaled for rotation at a position above the axial center of the bore 52, that is, it is eccentrically located with respect to the bore 52. The shaft 56 is located substantially in the axial center of the bore 52.

The blades or impellers 58, 60, 62 and 64 extend radially of the bore, and are seated in slots in the rotor 54. These impellers move circumferentially of the bore 52 with the rotation of the rotor 54. As the rotor 54 rotates, its relative position with respect to each blade is shifted longitudinally of the blade. This results in the introduction of liquid to be pumped by the device through the opening 66, in its propulsion in a clockwise direction by means of the impeller blades through the bore and in the discharge of a major portion of said liquid through the discharge opening 68. This operation is commonly known in pumps of this character.

Due to the fact, among others, that the volume of liquid in the bore 52 is comparatively great, some of the liquid will not be discharged through the opening 68. This small portion of the liquid will be trapped between the blades, the rotor 54, and the subcasing 50, as each blade passes the top of the discharge opening 68, and will be squeezed out through the minor outlet 28. The minor outlet 28 leads to the conduit 30 in which is located a check valve such as the check valve 32 having the spring pressed check ball 70, retained in place over the opening in the conduit 30 by means of a spring 72 in the well-known manner of ball check valves. This ball check valve 32 prevents the return of any substantial portion of the fluid to the opening 28. The check valve 32 may be adjusted by any convenient means, such as by manipulating the member 73, so that the ball 70 will exert a selected pressure on the line 30, selectively restricting the pumping of fluid to a desired amount. A relief valve (not shown) may, if desired, be introduced into the line 30 between the minor opening 28 and the check valve 32, and the check valve 32 may then be regulated in conjunction with the

relief valve 35 to meter any desired quantity of fluid (up to the capacity of fluid for the line 30).

The pump housing 46 is provided with the inlet chamber 74, and with the outlet chamber 76. The inlet chamber 74 has connections to or forms a part of the fluid inlet 24 and the inlet of the pump; and the outlet chamber 76 connects to or forms part of the outlet 26 and the outlet of the pump.

Chambers 74 and 76 are separated as by the pump casing 48 and by a wall 78, in which are preferably located one or more ports 80, connecting the two chambers.

The port 80 is normally maintained closed by means of the valve 82, which is arranged to seat on the periphery of said port 80, and which valve is carried by the stud 84 and bearing surface 86 into which latter the valve stem seats, and is movable longitudinally to open the port under excessive pressure in the chamber 76 such as is caused by closing the valve 27. The valve 82 is maintained seated, closing the port 80, by means of the spring 88 which exerts regulable pressure on said valve 82, as is clearly apparent from Fig. 3, said spring being held in place by any convenient means such as by means of the spring seat 90.

Said spring seat 90 is in turn threaded into or otherwise held in the end plate 92, and may be moved longitudinally of its axis by manipulation of the adjusting nut 94 and thus increase or decrease the tension of the spring 88. The end plate 92 is removably attached for the purpose, among others, of securing ease in assembly of the device.

It is understood that the port 80 and valve 82 comprise the equivalent of the safety bypass 36 and safety valve 38 as shown in Fig. 1. Should the outlet 26 be restricted or closed, the pressure in the chamber 76 will force the valve 82 off of its seating position over the port 80, and allow the fluid to return to the inlet chamber 74.

The operation of this device is as follows:

Fluid is introduced to the motor driven pump through the fluid connection 24 and inlet chamber 74. This fluid ordinarily enters the pump through the opening 66 on the inlet side of the pump, and is picked up by the vanes 64, 58, 60 and 62, and carried by the rotor to the discharge opening 68 from where it will normally be carried away under pump pressure by the major outlet 26.

Some of the fluid, however, will not be discharged through this opening 68, but will be lifted by a vane such as 62, past the upper portion of the opening 68, and thus trapped so that it is squeezed out through the minor outlet 28 to the conduit 30. In the conduit 30 the fluid passes the ball check valve 32, and is carried into the cooling jacket 39 (see Fig. 2), where it serves the purpose of cooling the motor. From this position it is returned to the inlet side of the pump, that is, to the inlet chamber 74 through the return pipe 34, as will be apparent from Figs. 2 and 3 in particular.

Should the discharge of the fluid through the major outlet 26 be blocked, as by shutting off a valve on the line, the valve 82 will normally unseat and permit the fluid to return from the outlet chamber 76 through the port 80 to the inlet chamber 74. The fluid is thus in continuous circulation through the pump and the minor outlet 28 will continue to receive circulating fluid. The fluid which passes through the cooling jacket of the motor, will continue to discharge into the inlet chamber 74, and will uti-

lize the cooling effect of the fluid in the pump, regardless of whether the major outlet 26 is blocked. This also results in the use of the radiating effect of the entire pump casing, as well as the cooling jacket of the motor.

As will be apparent from an examination of the figures, the closing pressure on the valve 82 may be controlled by the spring 88 and spring seat 90, which latter may be moved longitudinally of its axis, to increase or decrease the pressure of the spring 88, by turning the adjusting nut 94 in the direction desired.

It will readily be seen that in the event the fluid is carrying trash and foreign matter, which is frequently the case when pumping fluids such as bilge water, the foreign matter will likely be deposited in the major outlet, since the foreign matter will tend to settle to the bottom and will be discharged by the vanes over the lower edge of the discharge outlet 68. With this arrangement it is seldom that there will be any foreign particles entering the minor outlet 28, particularly foreign matter of a size which would normally clog or otherwise interfere with small channels of the water jacket 39. This accomplishes one of the purposes of the invention.

Preferably the inlet and outlet openings 66 and 68 are somewhat in line with a plane passing horizontally through the axis of the bore 52. The minor outlet 28 is preferably located on a plane extending upwardly somewhat at an angle to the horizontal plane of the openings 66 and 68, and in what may be described as the upper part of the second quadrant formed by vertical and horizontal lines passing through the axial center of the bore.

It is understood that the foregoing description is merely illustrative of a preferred embodiment of the invention, and that the scope of the invention is not to be limited thereto, but is to be determined by the appended claims.

I claim:

1. In a multiple discharge pump comprising a fluid connection to a source of fluid to be pumped, a rotor, a pump casing defining an impeller chamber, said rotor being mounted for rotation in said impeller chamber eccentrically of said chamber whereby said rotor closely approaches said chamber on one side thereof, impeller means such as impeller blades carried by said rotor and engaging the surface of said impeller chamber at all times, an inlet opening from said fluid connection to said impeller chamber, a major outlet from said impeller chamber discharging fluid being pumped after said fluid has been carried through said impeller chamber by the impeller blades, a minor outlet separated from said major outlet by a portion of the casing means, said minor outlet being located between said major outlet and the position where said rotor approaches the casing, whereby fluid pumped through said impeller chamber and not discharged through said major outlet is discharged through said minor outlet, conduit means from said minor outlet conducting said fluid from said minor outlet, means in said major outlet blocking the flow of fluid from said major outlet, means defining a bypass receiving fluid from said major outlet and returning said fluid to said inlet fluid connection to the pump.

2. In a liquid transfer pumping arrangement, including means defining a liquid pump having an inlet, an outlet, as impeller chamber therebetween, a rotary liquid impeller in said chamber, means defining an outlet discharge control valve having an on and off position, means defining an electric motor for uninterruptedly driving said impeller, said motor having a liquid cooling jacket thereabout, conduit means for uninterruptedly circulating a fraction only of the liquid output of said pump back through said jacket to said pump inlet and additional relief conduit defining means for selectively circulating the remainder of said pump output liquid back to said inlet, said last named means comprising a spring operated check valve responsive to the pressure developed at said pump outlet upon the closing of major outlet discharge control valve.

3. In a liquid transfer pumping arrangement, including means defining a liquid pump having an inlet, an outlet, an impeller chamber therebetween, a rotary liquid impeller in said chamber, means defining an outlet discharge control valve having an on and off position, means defining an electric motor for uninterruptedly driving said impeller, said motor having a liquid cooling jacket thereabout, conduit means for uninterruptedly circulating a predetermined fraction only of the liquid output of said pump back through said jacket to said pump inlet and additional relief conduit defining means for selectively circulating the remainder of said pump outlet liquid back to said inlet, said last named means comprising a spring operated check valve responsive to the pressure developed at said pump outlet upon the closing of said outlet discharge control valve.

4. A liquid transferring device comprising a pump housing having inlet connections from a source of liquid to be pumped, a discharge connection with means for regulating the quantity of fluid passing therethrough, a rotary impeller means located in an impeller chamber in said housing, an inlet chamber in said housing receiving liquid from said inlet connection, an inlet opening from said inlet chamber to said impeller means, an outlet chamber with an opening to said discharge connection, an outlet opening from said impeller means to said outlet chamber, a second outlet opening from said impeller chamber, said second outlet being circumferentially spaced in said impeller chamber from said first mentioned outlet opening, means in connection with said impeller means carrying liquid trapped in said impeller chamber and not discharged through said first mentioned outlet opening, to said second outlet opening and discharging said trapped liquid therethrough, conduit means conducting liquid from said second outlet opening, a motor cooling jacket connected to said last mentioned conduit means, return means connecting said cooling jacket to said inlet chamber, and pressure operable release means conducting liquid from said discharge chamber to said inlet chamber, whereby substantial blocking of said discharge connection will result in return of liquid pumped to said inlet chamber.

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