Sept. 11, 1934. G. L. HESS ET AL 1,973,070

PUMP

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Fig. 1,

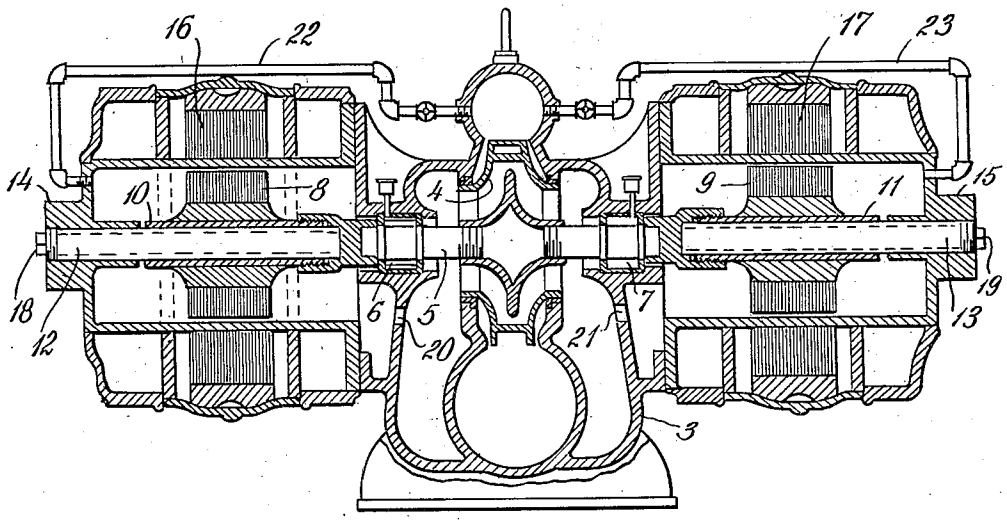
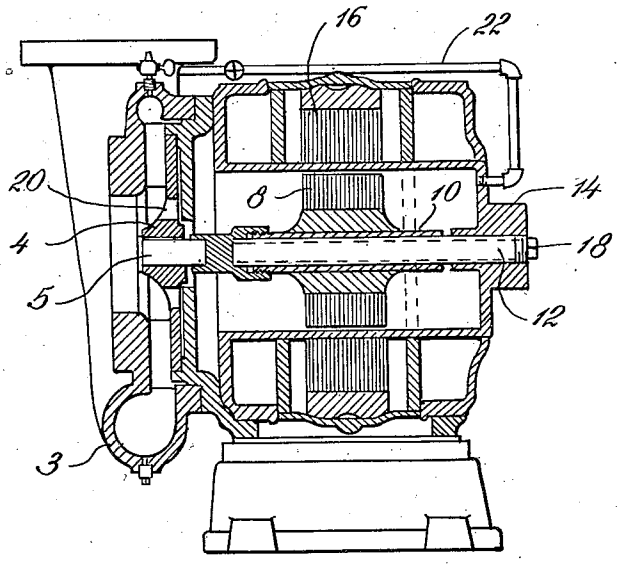


Fig. 2,



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PUMP

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3 Claims. (Cl. 103—87)

This invention relates to improvements in motor driven rotary pumps. The invention provides a new pump improved particularly in that its operation is not dependent in any respect upon packing or packing glands. The new pump of the invention, however, has several further important advantages.

The improved pump of this invention comprises a pump chamber enclosing a forcing means, an operating shaft extending from the pump chamber, a rotor of induction motor type attached thereto, a housing of material of low magnetic permeability enclosing this rotor and all moving parts, the operating shaft and the connections between the operating shaft and the rotor, connecting this rotor with the forcing means outside of the pump chamber, and a stator of induction motor type arranged externally of this housing but in operative relation to the rotor enclosed in the housing. In this arrangement, the boundary of that part of the pump in communication with the interior of the pump chamber is a solid wall through which the operating force is transmitted to the moving parts of the pump as the lines of force in a magnetic field instead of being a gland on a shaft through which this operating force is transmitted. Connections may, with advantage, be provided for circulating the fluid being pumped, where this fluid is at a temperature lower than the normal operating temperature of the motor mechanism, through the housing enclosing the rotor of the motor.

The invention will be further described in connection with the two forms of pumps embodying the invention illustrated in the accompanying drawing.

In the accompanying drawing Figs. 1 and 2 show similar sections, respectively, of a double-suction centrifugal pump powered with two motor mechanisms and a single-suction centrifugal pump powered with one motor mechanism. It is intended and will be understood that the invention is not limited to the pumps illustrated in some detail in the accompanying drawing; these particular forms of pumps are intended merely to illustrate the invention. The invention is applicable, for example, to centrifugal pumps, to lobe pumps, to gear pumps, to screw pumps, and to rotary pumps generally, whether the pump shaft is operated on a horizontal or a vertical axis.

Referring to the accompanying drawing, and particularly to Fig. 1, the pump proper comprises a chamber 3 enclosing an impeller or a forcing means 4. The pump chamber and the impeller may be of conventional design. The impeller 4 is mounted on a shaft 5 carried in bearings 6 and 7 and coupled at opposite ends to the rotors 8 and 9. The coupling illustrated is a screw coupling; flange couplings or other suitable couplings may be used. The rotors 8 and 9 are mounted on hollow shafts 10 and 11 carried by hollow spindles 12 and 13 supported in the ends of the housings 14 and 15. Lubricant for the rotor shafts may be supplied through the hollow spindles 12 and 13. The housings 14 and 15 enclose the rotors 8 and 9, the extensions of the shaft 5 outside of the pump chamber 3 and the connections between the rotors 8 and 9 and the pump shaft 5; these housings enclose the rotors 8 and 9 and all moving parts connecting these rotors with the impeller or forcing means 4 that are outside of the pump chamber 3. Stators 16 and 17 are arranged externally of the housings 14 and 15 but in operative relation to the rotors 8 and 9. The housings 14 and 15, or that part of these housings positioned between the rotors 8 and 9 and the stators 16 and 17, are of material of low magnetic permeability, for example, of brass, bronze or copper, or of other metals or alloys of low magnetic permeability. Where the pump chamber is of special material for handling some particular fluid, the housings 14 and 15 may be of the same material if it is of low magnetic permeability. The housings 14 and 15, for example, may be made of hard rubber or phenolic condensation products or may be lined with hard rubber or phenolic condensation products. The bearings 6 and 7 may be of roller type, ball type, babbitt type or other suitable type. Clearances on opposite sides of the impeller 4 may be adjusted by means of the screw plugs 18 and 19 through the spindles 12 and 13. Ports 20 and 21 connecting the interior of the housings 14 and 15 with the pump chamber 3 are provided for discharging from these housings any of the fluid being pumped circulated therethrough or escaping thereinto along the shaft 5. Connections 22 and 23 connecting the discharge of the pump with the interior of the housings 14 and 15 are provided for circulated fluid being pumped through these housings.

In rotor mechanisms of induction motor type, external connections to the rotor are unnecessary and any winding on the rotor may easily be protected against the fluid being pumped or winding on the rotor may be eliminated. Since any possibility of contact between the fluid being pumped and the stator is eliminated, so far as the pump is concerned, the winding on the stator need not be

protected against the fluid being pumped. The winding on the stator may be protected against other conditions of service, exposure to the weather or to excessive humidity or to corrosive atmosphere, for example, in conventional ways.

Referring particularly to Fig. 2 of the accompanying drawing, the same or corresponding parts are designated by the same reference numerals as in Fig. 1. The mechanism and operation of this pump are in general the same as that of the pump illustrated in Fig. 1, except that this pump is a single-suction type powered with but one motor mechanism.

As previously stated, the improved pump of the invention has several important advantages. Packing or packing glands are unnecessary. Any loss involved by leakage through such packing or packing glands is thus avoided. Power losses involved in packing friction are avoided. Fire hazards involved in gland leakage or failure where inflammable fluids are being pumped are avoided. Hazards of suffocation or poisoning through gland leakage or failure where suffocating or poisonous fluids are being pumped are avoided. Damage to the motor mechanism through escape of the fluid being pumped through vulnerable parts of the motor mechanism is avoided. The complete pump of the invention is more compact than comparable pumps of comparable capacity if the driving mechanism be included. Exposed moving parts are completely eliminated. The number of parts may actually be reduced.

We claim:

1. An improved pump comprising a pump chamber, a forcing means arranged therein and dividing said pump chamber to form a high pressure portion and a low pressure portion, a housing located at one side of said pump chamber, a partition for separating the pump chamber from the space enclosed by said housing, said partition having an opening therein for forming a direct connection from the space enclosed by said housing to the low pressure portion of the pump chamber, an operating shaft in said pump chamber on which the forcing means is mounted, said shaft extending from the pump chamber into said housing, a rotor of induction motor type in said housing and attached to the extending portion of said shaft, and a stator of induction motor type arranged externally of said housing but in operative relation to said rotor, that part of said housing positioned between the rotor and the stator being of material of low magnetic permeability.

2. An improved pump comprising a pump chamber, a forcing means arranged therein and dividing said pump chamber to form a high pressure portion and a low pressure portion, a housing located at one side of said pump chamber, a partition for separating the pump chamber from the space enclosed by said housing, said partition having an opening therein for forming a direct connection from the space enclosed by said housing to the low pressure portion of the pump chamber, an operating shaft in said pump chamber on which the forcing means is mounted, said shaft extending from the pump chamber into said housing, a rotor of induction motor type attached to the extending portion of said shaft, said housing enclosing the rotor and all moving parts connecting the rotor to the operating shaft on which the forcing means is mounted, and a stator of induction motor type arranged externally of said housing but in operative relation to said rotor, that part of said housing positioned between the rotor and the stator being of material of low magnetic permeability.

3. An improved pump comprising a pump chamber, a forcing means arranged therein and dividing said pump chamber to form a high pressure portion and a low pressure portion, a housing located at one side of said pump chamber, a partition for separating the pump chamber from the space enclosed by said housing, said partition having an opening therein for forming a direct connection from the space enclosed by said housing to the low pressure portion of the pump chamber, an operating shaft in said pump chamber on which the forcing means is mounted, said shaft extending from the pump chamber into said housing, connections arranged outside of said housing for passing a portion of the fluid being pumped from the high pressure portion of said pump chamber into said housing, whereby there is a circulation of a portion of the fluid being pumped from the high pressure portion of the chamber through the space enclosed by said housing and the opening in said partition to the low pressure portion of the pump chamber, a rotor of induction motor type in said housing and attached to the extending portion of said shaft, and a stator of induction motor type arranged externally of said housing but in operative relation to said rotor, that part of said housing positioned between the rotor and the stator being of material of low magnetic permeability.

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