March 27, 1962 S. IMMOVILLI 3,026,808

ELECTRICALLY OPERATED PUMP ASSEMBLY

Filed Feb. 18, 1960 2 Sheets-Sheet 1

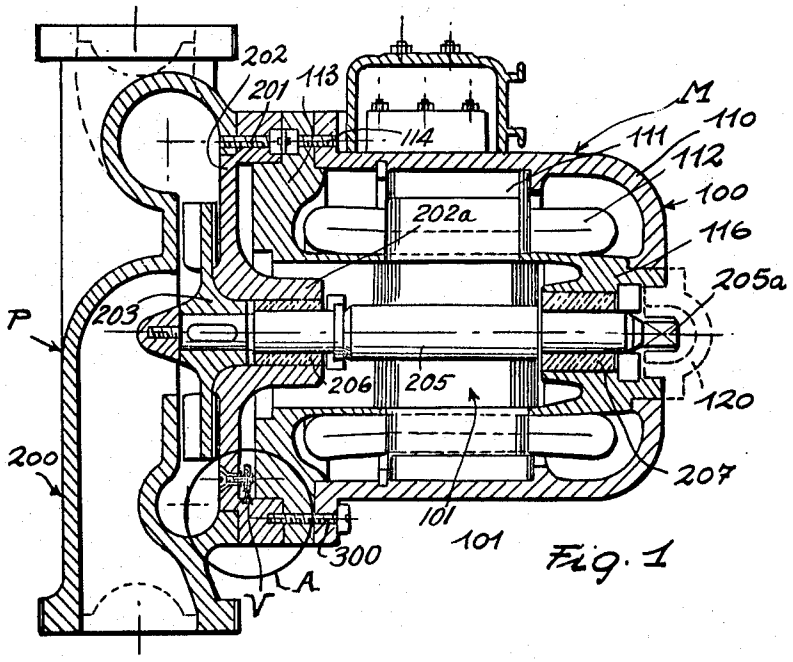


Fig. 1

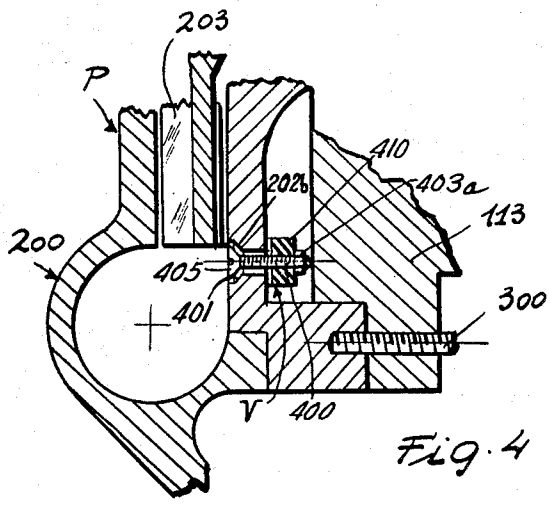


Fig. 4

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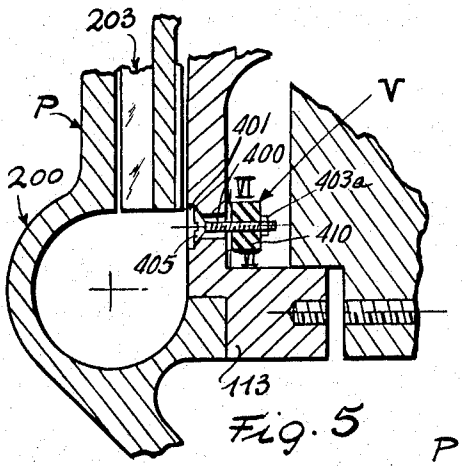


Fig. 5

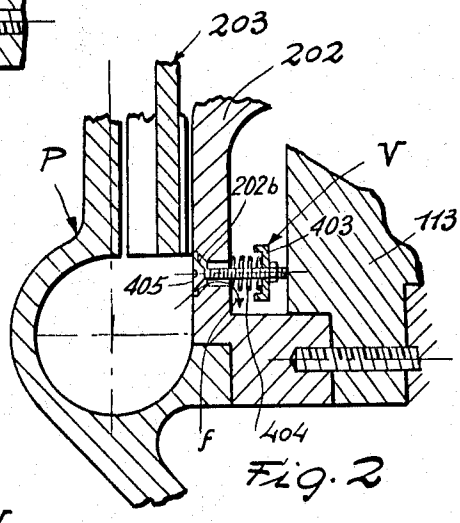


Fig. 2

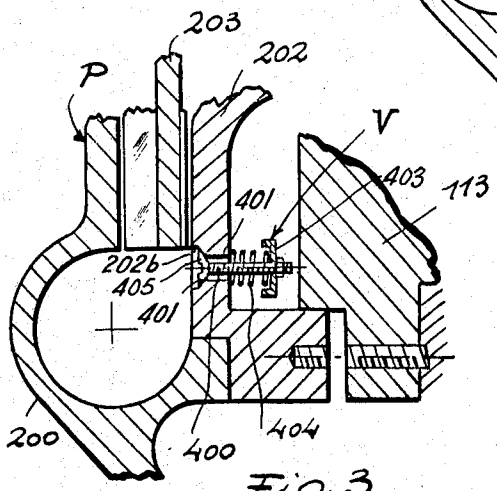


Fig. 3

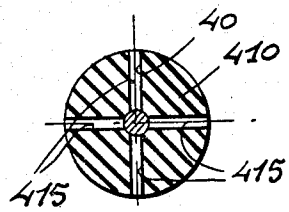


Fig. 6

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United States Patent Office 3,026,808
Patented Mar. 27, 1962

3,026,808

ELECTRICALLY OPERATED PUMP ASSEMBLY

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Filed Feb. 18, 1960, Ser. No. 10,836
3 Claims. (Cl. 103—87)

This invention relates to electrically-operated pump assemblies such as may be employed, for example, in forced circulation systems of hydraulic or thermal installations. The object of the present invention is to avoid certain disadvantages arising from the construction of known forms of electrically-operated pump assemblies. One of these disadvantages is the use of a stuffing box to provide a fluid-tight connection between the shaft of the pump impeller and the shaft of the driving motor. The stuffing box represents a source of losses of a hydraulic character when the motor is disconnected from the pump. Also by using a stuffing box the expeditious replacement of the driving motor of the assembly is rendered extremely difficult and, therefore, in order to change the motor a lengthy suspension of operation is required.

An electrically-operated pump assembly according to the present invention comprises in combination a pump impeller, a casing within which the pump impeller is housed, an electric motor disposed rearwardly of the pump casing and having a rotor assembly and a stator assembly disposed within a casing frame, a plate member secured to the forward end of the casing frame of the stator, securing means for attachment of the casing frame at the forward end thereof to the casing of the pump, a shaft mounted wthin bearings respectively provided on the pump casing and the casing frame of the stator assembly and extending within the stator assembly, the shaft removably carrying the pump impeller at a forward end thereof and the rotor assembly on an intermediate part thereof, and a valve mechanism adapted to open upon mounting of the casing frame of the motor on the pump casing to permit passage of liquid from the pump casing to the interior of the casing frame and further adapted to close and thereby inhibit flow of liquid from the pump casing detachment of the motor casing frame from the pump casing.

Thus by use of the present invention the working liquid of the pump is used to lubricate the motor and the need for a stuffing box is avoided. Also the ready removability of the motor stator casing and parts therein from the pump casing enables the motor to be expeditiously replaced thereby reducing loss of operating time to a minimum.

The invention will now be described, by way of example, with reference to the accompanying drawings, in which:

FIGURE 1 illustrates a longitudinal section elevation of an electrically-operated pump assembly according to the invention;

FIGURES 2 and 3 which are drawn to a larger scale than FIGURE 1 illustrate in greater detail the part of FIGURE 1 marked with the reference "A" which includes a valve mechanism, FIGURE 3 showing the valve mechanism in the open position and FIGURE 4 showing the valve mechanism in the closed position;

FIGURES 4 and 5 are views similar to FIGURES 3 and 4 but illustrating a further embodiment of the invention; and

FIGURE 6 is a view taken on the line VI—VI of FIGURE 5 and drawn to a larger scale than FIGURE 5.

Referring first to FIGURES 1 to 3 of the drawings, an electrically operated pump assembly comprises an electric motor generally indicated by the reference M

and a pump generally indicated by the reference P. The motor M includes a stator assembly **100** and a rotor assembly **101** whilst the pump P includes a casing or body part **200** (connected to a cover plate **202** by screws **201**) and an impeller **203**.

As shown in FIGURE 1, there is provided a shaft **205** on a forward end of which is mounted the impeller **203** whilst on an intermediate portion of the shaft **205** the rotor assembly **101** is secured. The shaft **205** is rotatable in bearings **206** and **207** of which the bearing **206** is mounted in a rearwardly projecting annular boss **202***a* disposed rearwardly of the impeller **203**, whilst the bearing **207** is accommodated in a forwardly extending annular part **116** secured to and forming part of the stator assembly **100**.

The stator assembly comprises a casing frame **110** within which are secured magnetic pole elements such as element **111** and mounted on the pole elements are field windings **112** which are retained in position at the rear thereof by a forward extension of the annular part **116** and at the front thereof by central rearwardly extending annular boss provided on a plate member **113** secured by screws **114** to the frame **110**. At the rear end of the part **116** there can be provided a transparent cover **120** through which it is possible to see whether the shaft **205** is rotating.

The shaft **205** at the rear end thereof is formed with flats **205***a* to permit manual rotation of the shaft for disengaging it from any build up of corrosion which may take place in the course of time.

Screws **300** are provided for securing together the frame **110**, the plate member **113** and the cover plate **202**. Thus the entire stator assembly, consisting of plate member **113**, magnetic pole elements **111**, field windings **112**, annular part **116**, frame **110** and cover **120**, can be detached as a unit merely by unscrewing the screws **300**. The stator assembly can therefore be replaced with minimum loss of operating time in the event of damage thereto or a fault arising.

The valve mechanism V illustrated in greater detail in FIGURES 2 and 3 will now be described. When the stator assembly is mounted on the rotor the valve mechanism V opens to permit passage of water for purposes of lubrication from the pump as indicated by the arrow *f* to the interior of the motor M. The valve mechanism is automatically shut when the stator assembly **100** is removed from the pump P. As shown in FIGURES 1, 2 and 3 the valve mechanism V includes a screw threaded stem **400** freely passing through an aperture **401** formed in the cover plate **202**. A helical biassing spring **404** is mounted on the stem **400** and acts between the plate **202** and a spring anchor part **403**, this latter part being screwed onto the rear end of the stem **400** and secured thereto by a nut. The aperture **401** includes at its forward end a frusto-conical section **202***b* and at its rear end a section of uniform diameter. The frusto-conical section **202***b* of the aperture **401** provides a seating for a complementary shaped head part **405** at the forward end of the stem **400**.

When the stator **100** is removed, the spring **404** so biasses the stem **400** of the valve mechanism that the head **405** engages the seating **202***b* and flow of water from the pump through aperture **401** is prevented. On mounting the stator on the pump, the stem **400** is moved axially against the action of the spring **404** and the head **405** of the stem is disengaged from its seating **202***b* to permit passage of water from the pump P, through the aperture **401** and into the interior of motor M.

Referring now to FIGURES 4, 5 and 6 the valve mechanism V instead of utilising the spring **404** may include a block **410** of rubber or the like resilient material mounter on the stem **400** and secured thereto against

rearward movement by means of a nut 403*a*. In the surface of the block 410 adjacent the cover plate 202 are formed radially extending channels 415 through which can flow water from the aperture 401 to the interior of the motor M. When the stator is not mounted on the pump, the block 410 urges the stem to the right as shown in FIGURE 5 so that the stem head 405 engages the seating 202*b* and the valve mechanism is closed. When the stator is mounted on the pump, however, the stem is forced to the right as seen in FIGURE 4 and the stem head 405 is displaced from the seating 202*b*. In this position water can flow from the pump by way of the aperture 401 and the channels 415 to the interior of the motor.

It will be apparent that as the connection of the pump to the interior of the motor by way of aperture 401 is automatic upon mounting of the stator, the danger of water from the pump squirting onto the maintenance operator of the apparatus is avoided.

The electrically-operated pump assembly according to the invention by utilising the working liquid of the pump for lubrication of the motor avoids the use of a stuffing box for providing the connection between the impeller and the motor shaft and the hydraulic losses occasioned thereby when the motor is disconnected from the pump. Also the ready replaceability of the motor part of the assembly ensures that loss of operating time is minimised.

What I claim is:

1. An electrically-operated pump assembly comprising in combination a pump impeller, a casing within which the pump impeller is housed, an electric motor disposed rearwardly of the pump casing and having a rotor assembly and a stator assembly disposed within a casing frame, a plate member secured to the forward end of the casing frame of the stator, securing means for attachment of the casing frame at the forward end thereof to the casing of the pump, a first bearing provided on the pump casing and a second bearing provided on the casing frame of the stator assembly, a shaft mounted within the said first and second bearing and extending within the stator assembly, the shaft removably carrying the pump impeller at a forward end thereof and the rotor assembly on an intermediate part thereof, and a valve mechanism located in the pump casing and adapted to open upon mounting of the casing frame of the motor on the pump casing to permit passage of liquid from the pump casing to the interior of the casing frame and further adapted to close and thereby inhibit flow of liquid from the pump casing upon detachment of the motor casing frame from the pump casing.

2. An electrically operated pump assembly as claimed in claim 1, wherein the valve mechanism includes a valve stem extending within an aperture formed in the pump casing and projecting rearwardly from the pump casing a complementary valve seating formed from the said aperture, a valve head provided on the forward end of the stem and adapted to co-operate with the said complementary valve seating provided in the aperture and a biassing spring acting between the pump casing and the valve stem and serving to bias the valve stem to a position in which the valve head is engaged on its seating.

3. An electrically-operated pump assembly as claimed in claim 1, wherein the valve mechanism includes a valve stem extending within an aperture formed in the pump casing and projecting rearwardly from the pump casing a complementary valve seating formed from said apertures, a valve head provided on the forward end of the stem and adapted to co-operate with the said complementary valve seating provided in the aperture, and a block of resilient material mounted on the stem and acting between the stem and the pump casing to urge the stem to a position in which the valve head is engaged on its seating, the resilient block being formed on the surface thereof adjacent the pump casing with radial channels adapted, when the valve mechanism is opened by compressing of the resilient block against the pump casing, to permit flow of liquid out of the pump casing by way of the aperture.

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