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MOTOR DRIVEN PUMPS

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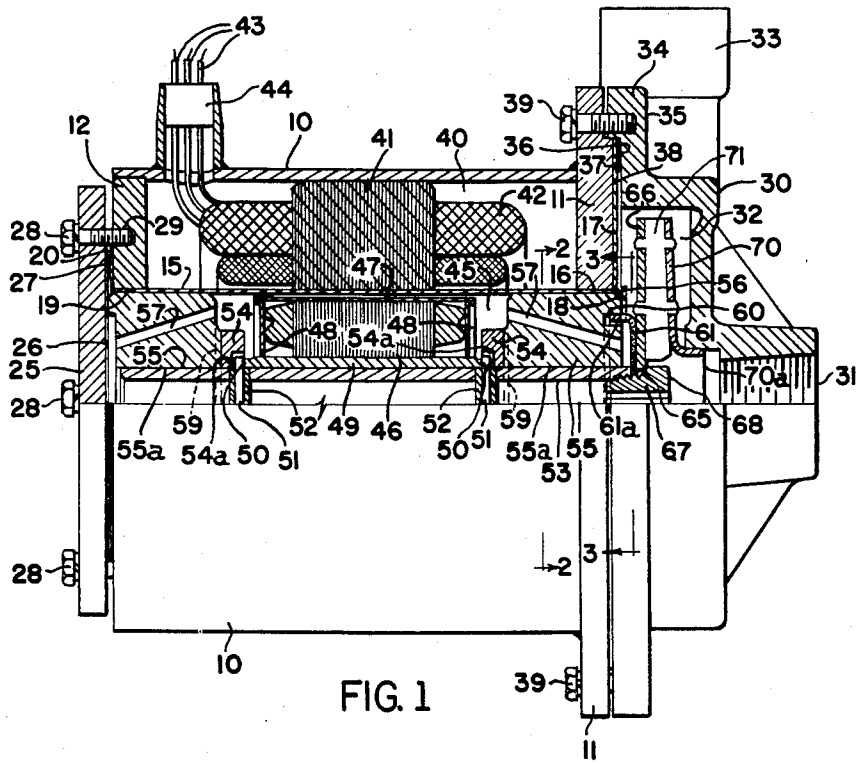

FIG. 1

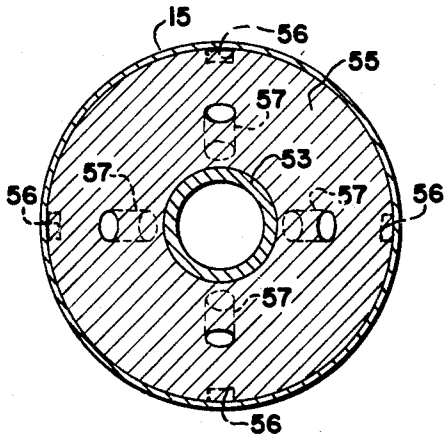

FIG. 2

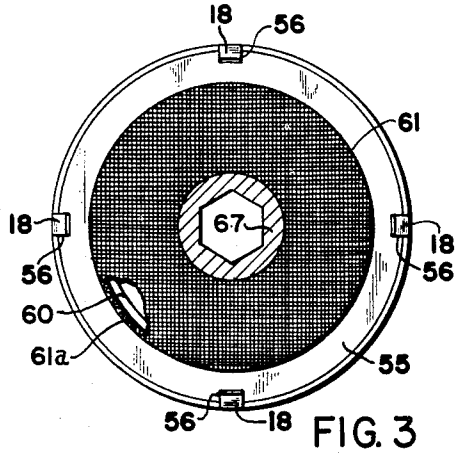

FIG. 3

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MOTOR DRIVEN PUMPS

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5 Claims. (Cl. 103—87)

This invention relates to motor driven pumps and more particularly to a motor driven pump which is particularly suited to the pumping of slurries containing solid, fibrous or other materials having a tendency to abrade, clog, interrupt or divert the flow of cooling lubricating fluid, or otherwise interfere with the proper operation.

It is the principal object of the present invention to provide a motor driven pump having an isolated stator, a rotor chamber through which a portion of the liquid being pumped is circulated for cooling and for lubrication, and which is particularly suitable for pumping liquids having entrained solids.

It is a further object of the present invention to provide a motor driven pump of the character aforesaid in which an improved separating arrangement is employed for preventing access of solids to bearings and locations having close clearances, the separating arrangements being simple, effective and self cleaning.

It is a further object of the present invention to provide a motor driven pump of the character aforesaid in which an improved arrangement is employed for preventing access of solids to bearings and locations having close clearances, the solids separating arrangements being readily accessible with the pump rotor.

Other objects and advantageous features of the invention will be apparent from the description and claims.

The nature and characteristic features of the invention will be more readily understood from the following description, taken in connection with the accompanying drawings forming part thereof, in which:

Figure 1 is a view partly in longitudinal section and partly in elevation of a preferred form of motor driven pump in accordance with the invention;

Fig. 2 is a transverse sectional view, enlarged, taken approximately on the line 2—2 of Fig. 1; and

Fig. 3 is a transverse sectional view, enlarged, taken approximately on the line 3—3 of Fig. 1.

It should, of course, be understood that the description and drawings herein are illustrative merely, and that various modifications and changes can be made in the structure disclosed without departing from the spirit of the invention.

Like numerals refer to like parts throughout the several views.

Referring now more particularly to the drawings, and for the purpose of illustrating the invention, a motor housing is shown having an outer cylindrical casing portion 10 welded or otherwise secured in fluid tight relation at one end to an end plate 11 and at the other end to an inner end plate 12 in spaced parallel relation to the end plate 11.

A hollow cylindrical sleeve 15 is provided, preferably of stainless steel or other non-magnetic metal, which is not subject to corrosion by the liquid to be pumped.

The sleeve 15 extends through an opening 16 in the end plate 11 and preferably has welded or otherwise secured thereto a liner plate 17. The liner plate 17 can be of

any desired material which is resistant to or not subject to corrosion or erosion by the liquid being pumped, stainless steel being suitable for some liquids, and this permits of the end plate 11 being made of less expensive and more easily machined material. The sleeve 15 has tongues 18 extending therefrom for purposes to be explained.

The sleeve 15 also extends through an opening 19 in the end plate 12 and preferably has welded or otherwise secured thereto a liner plate 20 which is similar to but of smaller diameter than the liner plate 17.

The inner end plate 12 has secured thereto an outer end closure plate 25 which closes the outer end of the sleeve 15. The outer end closure plate 25 preferably has disposed on the inner face thereof a liner plate 26 of a material resistant to or not subject to corrosion by the liquid being pumped and permits of the end plate 25 being made of less expensive and more easily machined material.

A sealing gasket 27, of rubber, natural or synthetic, or other like compressible or resilient material, resistant to or not subject to attack by the liquid being pumped, is interposed between the facing surfaces of the liner plates 20 and 26. The end plate 25 is held in position with respect to the plate 12, and with the gasket 27 in compressed and fluid tight relation, by studs 28 which engage in blind threaded holes 29 in the plate 12.

An impeller housing 30 is provided, having an axially disposed fluid inlet 31, an interior impeller chamber 32 of scroll shape, and a fluid delivery connection 33.

The impeller housing 30 can be made of any desired material, resistant to corrosion or erosion by the liquid being pumped, and for this purpose can be made of stainless steel, titanium, or the like. The impeller housing 30 has a flange 34 with an inner cylindrical face 35 adapted to engage with an outer cylindrical face 36 on the end plate 11. A sealing gasket 37, of rubber, natural or synthetic, or other like compressible or resilient material resistant to or not subject to attack by the liquid being pumped, is interposed between the liner plate 17 and an inner face 38 of the housing 30 and is compressed to fluid tight condition by studs 39 extending through the end plate 11 and in threaded engagement in the flange 34.

The space between the casing portion 10, the sleeve 15, the inner end plate 11 and the inner end plate 12 provides a sealed and isolated motor stator chamber 40 and preferably has disposed therein and sealed from contact with the liquid being pumped, the motor field laminations 41 and motor field windings 42.

Conductors 43 for energizing the windings 42 can be provided, extending through a fluid tight seal 44, and connected to any suitable source of alternating current.

The space 45 within the interior of the sleeve 15 provides a motor rotor chamber.

A motor rotor 46 is provided and while it can be of any desired type is preferably of the short circuited type with a fluid tight enclosure to prevent corrosion. For this purpose, an outer and enclosing cylindrical rotor cover 47 is shown with rotor enclosing end plates 48 welded thereto, the inner margins of the plates being secured to a cylindrical sleeve shaft 49 by welding or in any other desired manner to make the enclosure fluid tight. The cover 47, end plates 48 and sleeve shaft 49 are preferably made of a material resistant to or not subject to corrosion by the liquid being pumped, stainless steel being suitable for some purposes.

The sleeve shaft 49 extends outwardly beyond the rotor end plates 48 axially at both ends and has aligned notches 50 for the reception of pins 51 which extend through transverse sleeves 52 welded to a hollow shaft 53. Thrust washers 54 which extend over the pins 51 and have notches 54a for the reception of the pins are

mounted on the shaft 53 and their outer faces engage facing portions of bearings 55.

The bearings 55 are preferably of similar construction with central openings 55*a* for the reception and support for rotation of the shaft 53. The bearings 55 have a plurality of beveled notched portions 56 for engagement by the tongues 18 which prevent rotation and endwise displacement of the bearings 55. The bearings 55 also have a plurality of passageways 57 diagonally therethrough for fluid flow and grooves 59 along their inner end faces to permit fluid flow for lubricating the contacting faces of the bearings 55 and thrust collars 54.

The shaft 53 has an end portion extending into the impeller chamber 32 and has slots which provide dovetails 65 for engagement by complemental slots in a diametrically disposed impeller side plate 66.

The bearing 55 at the impeller end of the motor rotor chamber 45 has a circular groove 60 in the outer end face thereof.

A cup shaped screen 61 of foraminous material is mounted on the shaft 53, and contiguous to the impeller side plate 66, for rotation with the shaft 53 and has a flange portion 61*a* in sliding engagement with the outermost circular cylindrical face of the groove 60.

The screen 61 can be made of any desired material resistant to corrosion by the liquid being pumped, can be woven, knitted, or the like, of metal, such as stainless steel, or of synthetic plastic. The screen 61 has a mesh dependent upon the solids separation desired from the liquid being pumped.

The impeller plate 66 and the screen 61 are held in position by a lock nut 67 which is in threaded engagement on the shaft 53, has a shoulder 68 engaging the impeller plate 66 and has a central opening 69 for fluid flow.

The impeller plate 66 has disposed substantially parallel thereto another impeller plate 70 with an inner cylindrical portion 70*a* extending towards the inlet 31 for directing the entering fluid between the plates 66 and 70.

The plates 66 and 70 can be connected by a plurality of curved vanes 71 which are secured to the plates 66 and 70.

The mode of operation will now be pointed out.

Upon energization of the windings 42, a rotating field is set up in the laminations 41 which is effective on the rotor 46 for rotating the shaft 53.

Fluid to be pumped is supplied to the fluid inlet 31 and enters the space within the impeller portion 70*a* and between impeller plates 66 and 70, being guided by the exterior of the nut 67 and the interior of the impeller portion 70*a*.

A portion of the fluid in the impeller chamber 32, at a pressure elevated above that at the fluid inlet 31, passes through the screen 61, and to and through the passageways 58, a portion of this liquid finding its way between the bearing 55 shown to the right in Fig. 1, and the shaft 53, and to and around the thrust washer 54, shown to the right in Fig. 1.

The screen 61 is effective to prevent solid materials from passing to the bearings 55 and motor rotor chamber 45. At the same time the rotation of the screen 61 makes it self cleaning so that the separated solid material does not tend to lodge or remain thereon. The clean liquid thus delivered to the motor rotor chamber 45 passes through the clearance space between the enclosure 47 and the sleeve 15, to the thrust washer 54 shown to the left in Fig. 1, to and between the bearing 55 and the shaft 53 at the left of Fig. 1, through the passageways 57 in that bearing 55, to the left end of the shaft 53, and then through the interior of the shaft 53 and through the opening 69 at the inlet of the impeller.

The liquid thus passing through the motor rotor chamber 45 is effective for lubricating the thrust washers 54, and the bearings 55, and for cooling the motor rotor and motor stator.

Access to the screen 61 as well as the motor rotor and pump impeller can be readily had, if desired.

I claim:

1. A motor driven pump comprising a pump housing having an impeller therein, a motor housing connected to said pump housing and having end members and an outer housing section extending between said end members, a cylindrical sleeve extending between said end members and providing therewith and with said outer housing an isolated motor stator chamber, a motor stator in said motor stator chamber, the interior of said sleeve providing a motor rotor chamber, bearing members fixedly mounted in said motor rotor chamber, a shaft rotatably journaled in said bearing members, said impeller being mounted on said shaft, motor rotor members on said shaft in said motor rotor chamber axially of said bearing members, and a screen in said pump housing mounted on said shaft for rotation therewith and interposed between said impeller and said bearing members for screening liquid passing to said motor rotor chamber.

2. A motor driven pump comprising a pump housing having an impeller therein, a motor housing connected to said pump housing and having end members and an outer housing section extending between said end members, a cylindrical sleeve extending between said end members and providing therewith and with said outer housing an isolated motor stator chamber, a motor stator in said motor stator chamber, the interior of said sleeve providing a motor rotor chamber, bearing members fixedly mounted in said motor rotor chamber and in engagement with said sleeve, one of said bearing members having an end face disposed towards said impeller with an annular groove therein, a shaft rotatably journaled in said bearing members, said impeller being mounted on said shaft, motor rotor members on said shaft in said motor rotor chamber axially of said bearing members, and a screen in said pump housing interposed between said impeller and said bearing members for screening liquid passing to said motor rotor chamber, said screen being mounted on said shaft for rotation therewith and having a flange extending into said groove in engagement therewith.

3. A motor driven pump comprising a pump housing having an impeller therein, a motor housing connected to said pump housing and having end members and an outer housing section extending between said end members, a cylindrical sleeve extending between said end members and providing therewith and with said outer housing an isolated motor stator chamber, a motor stator in said motor stator chamber, the interior of said sleeve providing a motor rotor chamber, bearing members fixedly mounted in said motor rotor chamber in spaced relation and in engagement with said sleeve, a hollow shaft rotatably journaled in said bearing members, said impeller being mounted on said shaft beyond one of said bearing members, motor rotor members on said shaft in said motor rotor chamber axially of said bearing members, and a screen in said impeller chamber interposed between said impeller and said one of said bearing members for screening liquid passing to said motor rotor chamber, said screen being mounted on said shaft for rotation therewtih, said hollow shaft providing a path for return of fluid to said impeller from the end of said motor housing remote from said impeller.

4. A motor driven pump comprising a pump housing having an impeller therein, a motor housing connected to said pump housing and having end members and an outer housing section extending between said end members, a cylindrical sleeve extending between said end members and providing therewith and with said outer housing an isolated motor stator chamber, a motor stator in said motor stator chamber, the interior of said sleeve providing a motor rotor chamber, bearing members fixedly mounted in said motor rotor chamber in spaced relation and in engagement with said sleeve, a hollow shaft rotat-

ably journaled in said bearing members, said impeller being mounted on said shaft beyond one of said bearing members, said one of said bearing members having an end face disposed towards said impeller with an annular groove therein, motor rotor members on said shaft in said motor rotor chamber axially of said bearing members, and a screen in said impeller chamber interposed between said impeller and said one of said bearing members for screening liquid passing to said motor rotor chamber, said screen being mounted on said shaft for rotation therewith and having a flange extending into said groove in engagement therewith, said hollow shaft providing a path for return of fluid to said impeller from the end of said motor housing remote from said impeller.

5. A motor driven pump comprising a pump housing having an impeller therein, a motor housing connected to said pump housing and having end members and an outer housing section extending between said end members, a cylindrical sleeve extending between said end members and providing therewith and with said outer housing an isolated motor stator chamber, a motor stator in said motor stator chamber, the interior of said sleeve providing a motor rotor chamber, bearing members fixedly mounted in said motor rotor chamber in spaced relation

and in engagement with said sleeve, a hollow shaft rotatably journaled in said bearing members, said impeller being mounted on said shaft beyond one of said bearing members, said one of said bearing members having an end face disposed towards said impeller with an annular groove therein, motor rotor members on said shaft in said motor rotor chamber axially of said bearing members, and a screen in said impeller chamber interposed between said impeller and said one of said bearing members for screening liquid passing to said motor rotor chamber, said screen being mounted on said shaft for rotation therewtih and being cup shaped with a flange, said flange extending into said groove in engagement therewith, said said hollow shaft providing a path for return of fluid to said impeller from the end of said motor housing remote from said impeller.

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