Nov. 14, 1939. E. J. RUTHMAN 2,179,730

PUMP

Filed May 21, 1936 2 Sheets-Sheet 1

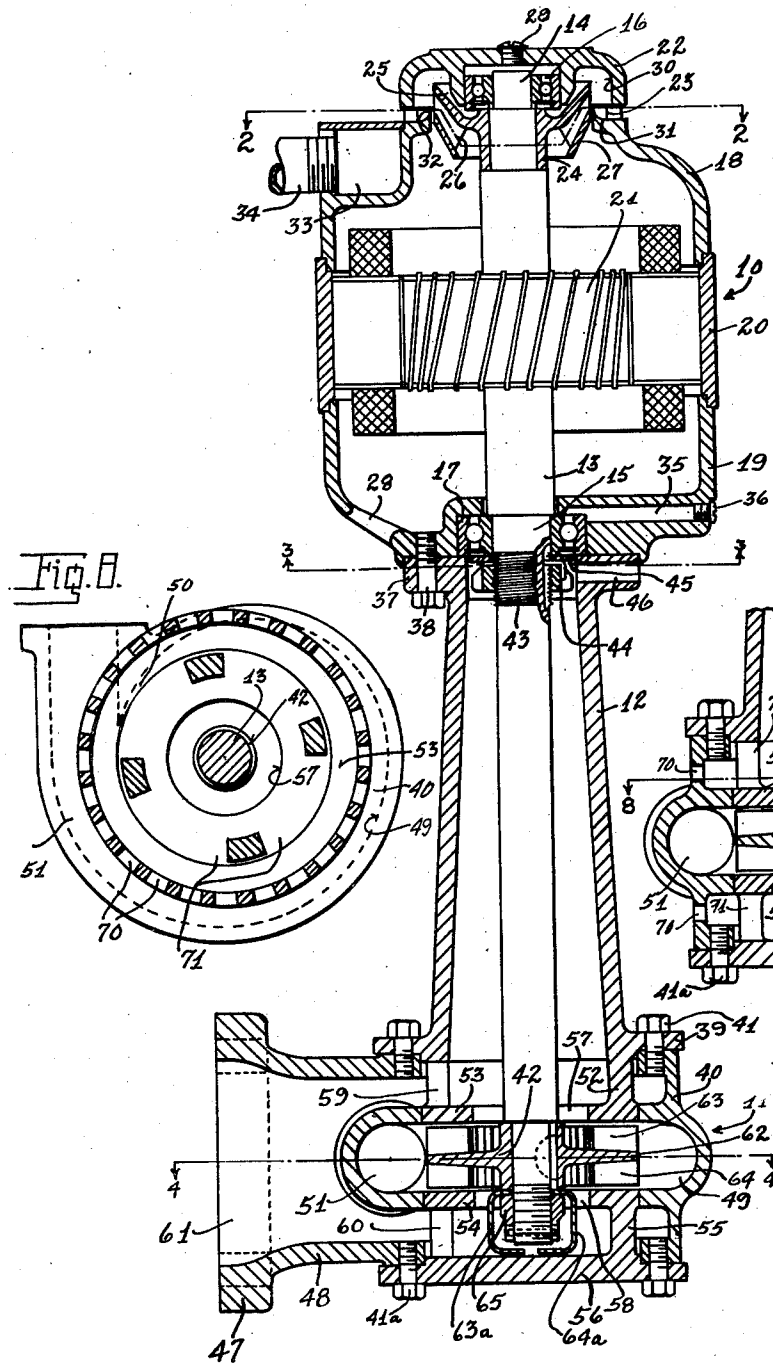


Fig. 1.

Fig. 8.

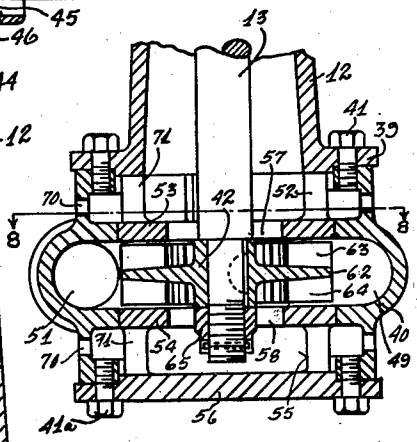


Fig. 7.

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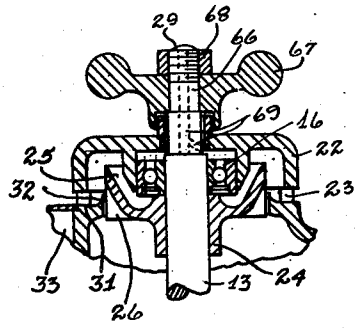


Fig. 6.

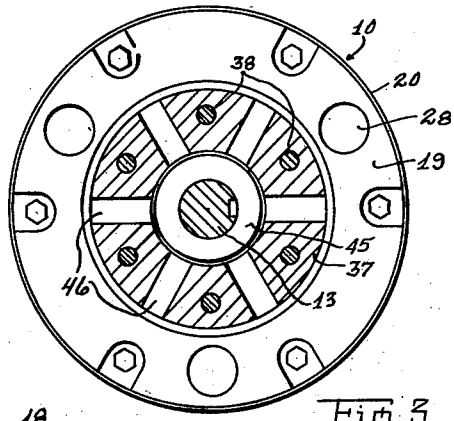


Fig. 3.

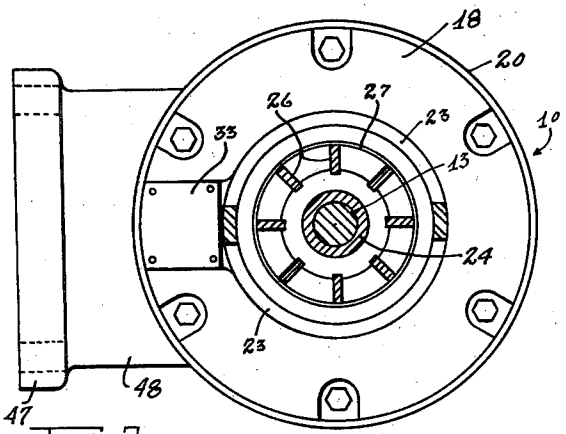


Fig. 2.

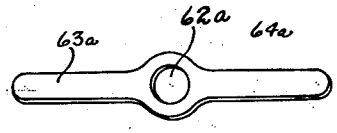


Fig. 5.

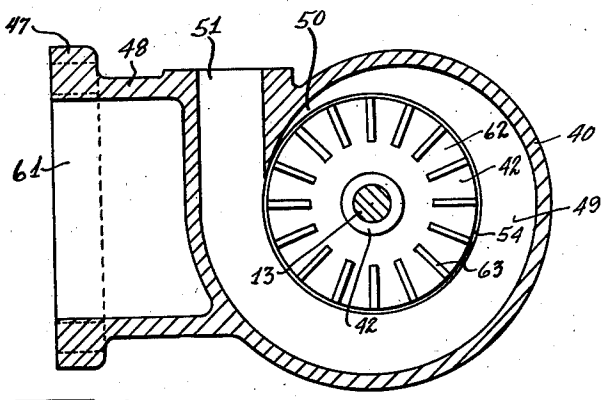


Fig. 4.

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UNITED STATES PATENT OFFICE

2,179,730

PUMP

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Application May 21, 1936, Serial No. 81,043

1 Claim. (Cl. 103—104)

This invention relates to improvements in a circulating pump such as is used for circulating lubricant, cooling medium, cutting compound, and the like, relative to a machine tool assembly.

The principal object of the present invention is the provision of a circulating pump which is relatively simple in construction, requiring a minimum amount of machining, and which can be disassembled for inspection and the like without completely dismantling the pump.

Another object of this invention is the provision of a self-contained pump which can be assembled in a machine tool organization with the piping effectively arranged adjacent the pump to thereby take up a small amount of room.

A further object of this invention is the provision of a self-contained pump of the class above referred to in which the impeller can be readily exposed without removing the pump from its place of mounting.

Another object of the invention is the provision of a self-contained pump in which provision is made to prevent mist, spray, and the like from entering the motor chamber or housing, and whereby the said motor is protected from the said mist, spray, and the like.

A still further object of the invention is the provision of a self-contained pump in which the motor is provided with means to insure the proper lubrication of the moving parts and at the same time prevent the lubricant from contact with the motor parts.

It is also an object of this invention to provide a self-contained circulating pump in which there are no metal-to-metal bearings, but which utilizes merely the bearings of the attached motor, and which bearings are fully protected against mist, spray, and foreign particles stirred up by the pump in its circulation.

Other objects and advantages of the present invention should be readily apparent by reference to the following specification considered in conjunction with the accompanying drawings forming a part thereof, and it is to be understood that any modifications may be made in the exact structural details there shown and described, within the scope of the appended claim, without departing from or exceeding the spirit of the invention.

In the drawings:

Fig. 1 is a vertical, central sectional view through a pump and motor embodying the improvements of this invention;

Fig. 2 is a sectional view as seen from line 2—2 on Fig. 1;

Fig. 3 is a sectional view as seen from line 3—3 on Fig. 1;

Fig. 4 is a further sectional view as seen from line 4—4 on Fig. 1;

Fig. 5 is a perspective view of an agitator associated with the pump and forming a detail of the invention;

Fig. 6 is a fragmentary sectional view of the upper end of Fig. 1 showing a slight modification in the invention;

Fig. 7 is a sectional view of the parts at the lower end of Fig. 1 showing a change in the housing casting whereby the pump may be used as a submerged type; and

Fig. 8 is a horizontal sectional view through the modified structure of Fig. 7 as seen from line 8—8 on said Fig. 7.

Throughout the several views of the drawings similar reference characters are employed to denote the same or similar parts.

The circulating pump of this invention comprises a motor unit 10 mounted above the pump unit 11, and said units being connected to one another by a housing 12. As will be noted from Fig. 1, use is made of a single motor-pump shaft 13 which is provided at one end with a reduced portion 14 and intermediate its ends with a reduced portion 15. The reduced portions 14 and 15 are respectively disposed in antifriction bearings 16 and 17 respectively carried by the upper cap 18 and lower cap 19 of the motor housing or unit. Disposed intermediate the housing caps 18 and 19 is the stator ring 20 which supports the stator parts of the motor.

The shaft 13 has secured to it intermediate the bearings 14 and 15 the motor rotor 21. Integral with the upper motor cap 18 is a dome-like cap 22 in which is formed the seat for the antifriction bearing 16, and through its walls the said dome-like cap 22 is provided with a plurality of apertures 23. Secured to the shaft 13 immediately below the bearing 14 is a fan 24 having its upper end cup-shaped as shown at 25. Projecting from the outer surface of the cup 25 is a plurality of fan blades 26 which may be of the shape illustrated in Fig. 1 and which have their outer edges connected together by a ring 27, or said fan blades 26 may be of the shape illustrated in Fig. 6 and devoid of any lower connecting ring. The fan 24 is utilized during the rotation of the motor for drawing air through apertures 28 formed in the lower wall of the lower cap housing 19 and for ejecting the air through the apertures 23. This circulation of the air through the motor causes a cooling effect on the motor.

The dome-like cap 22 of the motor housing is provided axially thereof with a lubricating or "oiling" fixture 29 whereby lubricant may be supplied to the antifriction bearing 26. This lubricant will, of course, flow through the bearings to the lower side thereof and if unobstructed would saturate the motor parts and thereby cause a short in the windings thereof. By providing the fan 24 with the cup 25 this lubricant is stopped from contact with the motor windings and upon rotation of the motor, and therefore the fan 24, the collected lubricant is centrifugally thrown from the cup against the inner walls 30 of the cap 22. The lubricant flows down the said walls onto a shelf-like projection 31 which is an extension of the lower wall of apertures 23, and the said excess lubricant is thereby directed to the exterior of the motor where it may be conveniently cared for. In the event the bearing 16 is lubricated while the motor is stationary and more lubricant is supplied to the bearing than is necessary, the cup 25 will fill and overflow. This overflow is caught by the upwardly extended lip 32 of the shelf 31 which lies closely adjacent the perimeter of the fan 24, and the said lubricant is again disposed of by being directed through the apertures 23.

In order to conveniently effect a connection of the motor wires with a source of current the upper housing member 18 is provided with a conduit box 33 into which the wire conduit 34 connects and through which the motor wires are connected with the electric current source.

The lower motor housing 19 is provided with a duct 35 closed at its outer end by a lubricating or "oiling" coupling 36 whereby lubricant is supplied to the lower antifriction bearing 17. The said lower motor housing 19 is further provided with a plurality of tapped apertures, each in registry with a plane aperture formed in a flange 37 integral with the upper end of the connecting housing 12 and into which registered apertures pass bolts 38 adapted to connect the housing 12 with the motor unit 10.

The lower end of the connecting housing 12 is provided with a flange 39 through which is formed a plurality of plane apertures in registry with threaded apertures in the upper side of a housing 40 which forms the pump housing of the pump unit 11. In order to connect the lower end of the connecting housing 12 with the pump housing 40 the registered apertures, in their respective flanges, each receive a cap screw or bolt 41. Extending through the connecting housing 12 is the motor-pump shaft 13 which has secured to its lower end the impeller 42. The shaft 13 is provided adjacent its bearing 15 with a threaded portion 43 for the spanner nut 44. This nut 44 is utilized for securing the inner race to the shaft by clamping said inner race between itself and a shoulder on the motor-pump shaft. In addition the spanner nut 44 secures to the shaft just below the antifriction bearing 17 a splash baffle 45. This splash baffle 45 is in the nature of a flat washer which has its outer edge closely adjacent the inner surface of the housing 12 and acts as a centrifugal throw-out for spray, moisture, and the like, rising within the housing 12. In order to dispose of this moisture, spray, and the like, the housing 12 may be provided through its upper flange 37 with one or more apertures 46 through which the said spray, moisture, and the like is discharged.

The pump housing 40 is provided at one end with a flange 47 having suitable bolting apertures therein whereby the unit may be secured in position adjacent a tank from which the fluid is to be discharged or circulated. The flange 47 is connected with the pump housing proper through a connecting sleeve 48 integral at one end with the flange and at other end with the pump housing 40. In addition the pump housing 40 is provided therein with a channel or passage 49, starting from substantially nothing at 50, see Fig. 4, and finishing in the discharge opening 51. This passage 49 is the pressure chamber through which the fluid being circulated by the pump is discharged.

The connecting housing 12 has depending within the pump housing 40 a sleeve 52 which terminates in a radial flange 53, which flange has its lower surface in line with the upper wall of the housing passage 49, see Fig. 1. The upper surface of the radial flange 53 is likewise in line with the upper surface of the discharge pipe 51 and the upper surface of the passage 49, again as shown in Fig. 1. In line with the lower surface of the passage 49 is the upper surface of a second radial flange 54 which is similar to the radial flange 53, carried by a sleeve 55 extending upwardly from an end plate 56. The radial flange 54, similar to the radial flange 53, has its outer surface in line with the outer surface of the discharge pipe 51 and passage 49. From the foregoing it will now be appreciated, particularly as seen in Fig. 1, that the inner surface of the passage 49 and opposed surfaces of radial flanges 53 and 54 form a chamber which may be described as the impeller chamber since the impeller 42 is disposed within this chamber.

Each of the radial flanges 53 and 54 is provided with an enlarged aperture 57 and 58 which form intakes for the impeller chamber. In addition, the flange sleeves 52 and 55 are at their front end cut away as at 59 and 60 whereby communication is had with the connecting sleeve 48 and, therefore, with the intake passage 61 in the housing flange 47.

As will be seen, the impeller 42 is formed of a disk 62 having secured to its upper and lower surface, blades 63 and 64. Each of the sets of blades 63 and 64 pick up the fluid supplied through the intakes 57 and 58 and force same through the passage 49 to and through the discharge pipe 51 where the delivery conduit is connected for delivering the fluid to the point of use.

From the foregoing it will be noted that the pump unit 11 is formed of a cast pump housing receiving on one side the closing cap 56 and on the other side the end of connecting housing 12. The connecting housing 12 and cap 56 have integral therewith the plates which cooperate with the pump housing for forming the compression or pressure chamber through which the fluid is passed and placed under pressure for delivery to the point of use. Should, for any reason, trouble develop in the motor housing 11, it is only necessary to remove the cap screws or bolts 41, whereupon the motor unit 10 and housing 12 may be lifted from the pump housing 40 and carry with it the impeller 62. The impeller is immediately exposed to view and can be readily examined, repaired, or replaced, whereupon the unit is again reassembled. If, however, the trouble is not with the impeller but in the pump housing 40, access is readily had to the interior of the housing through the opening just provided by the removal of the connecting housing 12. It will further be noted that there are no metal-to-metal

bearings within the pump housing or connecting housing, or any other bearings within these parts which may be affected by moisture, grit, foreign materials, or the like, that will naturally find its way to the pump.

These pumps are at times used for circulating fluid in which is suspended grit, emery, and the like, such as when used for circulating the cooling compound of grinding machines and the like. This grit, emery, etc., being heavier than the cooling fluid, will tend to settle on the closing plate 56 within the sleeve 55. In order to keep this material stirred and suspended within the cooling medium, there has been provided an agitator near the lower end of the shaft. This agitator is illustrated in Fig. 5 and comprises a flat stamping having an aperture 62a at the center thereof, and arms 63a and 64a projecting therefrom. The aperture 62a is mounted on the end of the shaft 13 and secured to said shaft by the nut 65 which normally secures the impeller 62 to the shaft. The arms 63a and 64a are then bent downwardly and inwardly to form a material lateral extension of the shaft which, when rotating with the said shaft, effects a stirring up of any collected material within the sleeve 55.

It is frequently desirable to provide means exterior of the motor to visibly advise the operator that the unit is operating. Such a mechanism is illustrated in Fig. 6. As shown in this figure, this mechanism comprises an extension 66 on the motor-pump shaft 13 to which is secured an indicator such as wheel 67, this wheel being secured between a nut 68 threaded on the shaft and a shoulder provided thereon. In this installation the oiling or lubricating coupling 29 is carried by the shaft instead of the dome cap 22, and oiling ducts 69 are provided in the shaft extension for communicating with the antifriction bearing 16.

The foregoing description of the circulating pump related to such a pump when mounted exteriorly of the sump or tank containing the fluid to be circulated. In Figs. 7 and 8 there is illustrated a modified pump body whereby the unit may be adapted for a submerged type of circulating pump; that is, a pump in which the pump body is let down into the fluid to be circulated. The only changes necessary are the elimination of the flange 47 and its connecting sleeve 48, and the supplying of apertures 70 through the pump body housing at points above and below the impeller chamber. In this instance the radial flange sleeves 52 and 55 instead of being supplied at their forward ends with apertures 59 and 60 are supplied with a plurality of circumferentially spaced apertures 71. Otherwise the construction of the submerged type of pump is identical with the exterior type.

It should be noted that the pump can be assembled to discharge from either side, that is it can be made to operate as a right or left pump. After the pump has been assembled it can be changed from one hand to the other by merely reversing the motor rotation and the impeller or pump housing. In the latter instance, if the impeller is provided with curved blades instead of straight, then, it will also be necessary to reverse the impeller relative to the impeller or pump housing. This is possible because the pump housing 40 is provided on opposite sides with threaded apertures for the bolts 41 and 41a which are of the same size and spacing and may be readily interchanged. From this it will follow that the pump housing may have the connecting housing 12 secured to either face thereof and the end plate 56 secured to the remaining face.

What is claimed is:

In a pump of the class described, the combination of a pump housing of substantially circular contour in a horizontal plane and having an upper and a lower face, a pair of internal spaced, parallel flanges intermediate the upper and lower faces of the housing and projecting inwardly thereof, said upper and lower faces of the housing and internal flanges being provided with a similar circular bore, coaxial with one another, the internal flanges increasing in depth spirally from a point at and around the bore therethrough, interchangeable closure means for said upper and lower faces of the housing, an apertured radial flange carried by each of said closures and respectively disposed in alignment with the intermediate flanges, said radial flanges and intermediate flanges forming an impeller chamber and a discharge conduit therefor, an impeller in said chamber, a mounting flange and connecting sleeve projecting from the housing and having a supply passage therethrough in simultaneous communication with the apertured radial flanges for supplying simultaneously the upper and lower sides of the impeller, said internal flanges beyond the point of commencement being connected for forming a discharge port tangentially of the housing and transversely of the supply passage and with its outlet located behind the mounting flange but adjacent thereto, and one of said housing closure means including means for housing a shaft for the impeller and for supporting means for driving this shaft.

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