

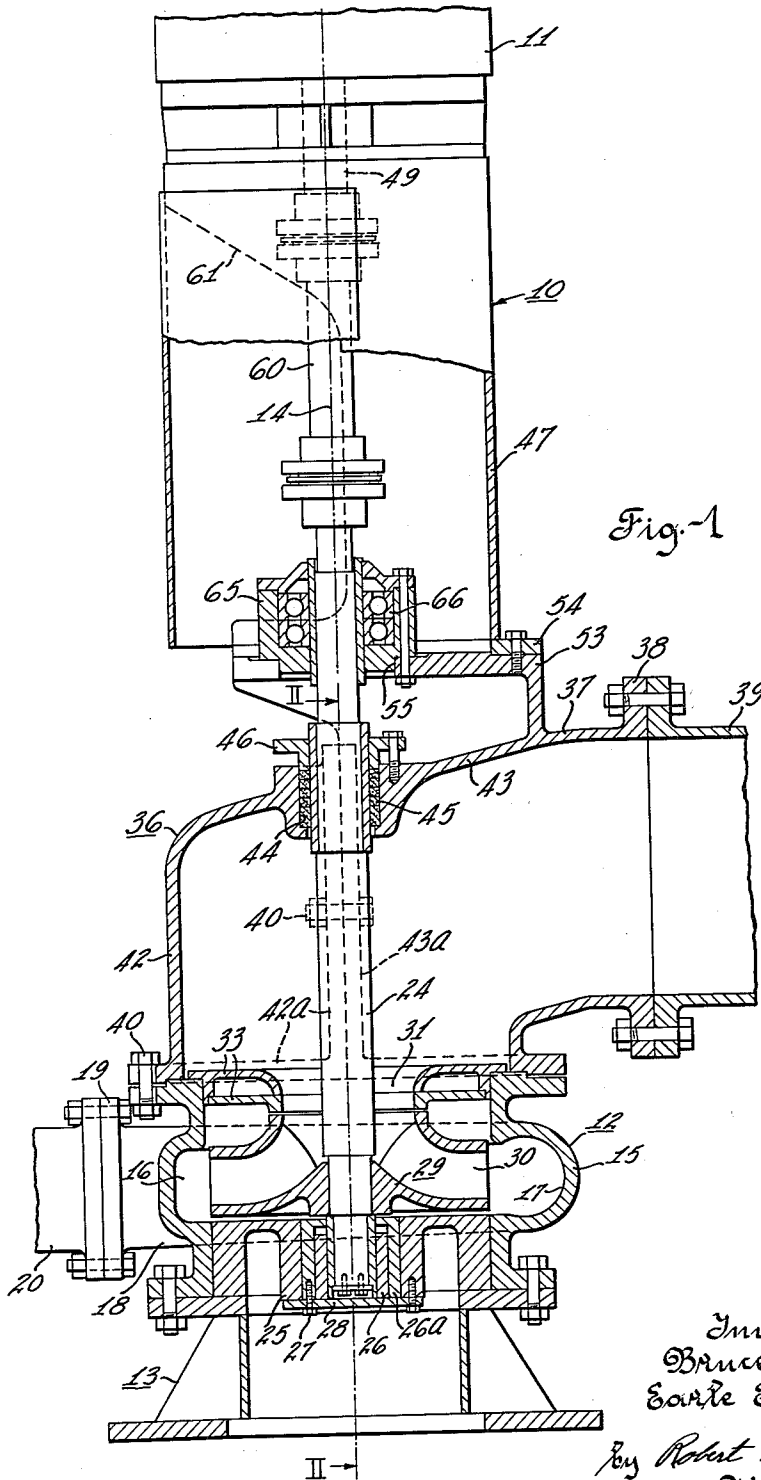
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B. R. LIPE ET AL
VERTICAL PUMP UNIT

3,079,865

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2 Sheets-Sheet 1



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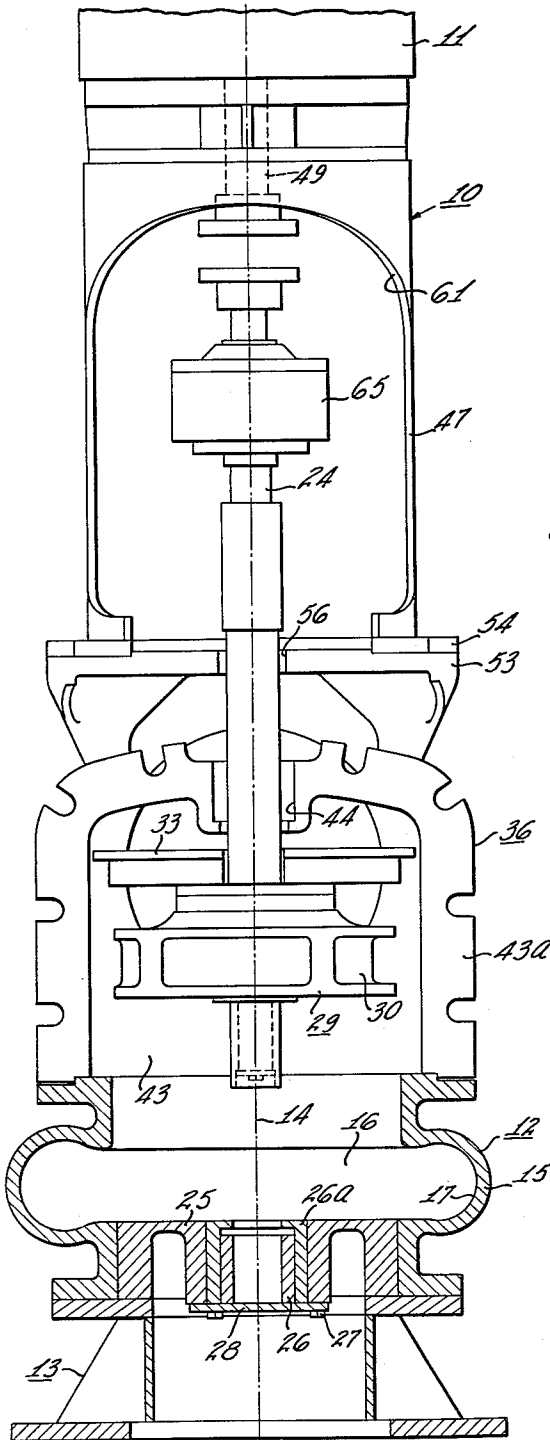


Fig. 2

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VERTICAL PUMP UNIT

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3 Claims. (Cl. 103—87)

This application relates generally to pumping units. More specifically this invention relates to vertically mounted motor pump units.

Vertical pump units comprise a pumping mechanism which is mounted on a base or a pedestal and driving means, usually an electric motor, mounted above the pump in such a manner that the axis of the rotating elements extends in a vertical direction. These units are usually very large, heavy and bulky and are mounted in a vertical direction for the purpose of conserving space. Maintenance of these units is a difficult problem and frequently requires the dismantling of the entire motor pump unit in order to inspect and repair the rotating parts of the pump which are the parts which are most subjected to wear and most frequently in need of inspection, repair and/or replacement. For an example, in the past if an impeller had to be replaced the entire unit had to be removed from its pedestal or base. This means that both the suction and discharge piping had to be disconnected from the unit. This, of course, involved the expenditure of a great deal of time and effort in order to replace the impeller.

The vertical pump unit of this invention provides easy access to the rotating parts of the pump so that they can be simply removed from the unit without removing the pump unit from its base or disconnecting either the inlet or discharge pipes. Specifically this is accomplished by dividing the casing that forms the suction part of the pumping unit along a plane parallel to the shaft so that it can be removed without disconnecting the inlet piping. A removable spacer coupling connects the drive shaft with the impeller shaft of the pump. In this manner when the spacer is removed the rotating elements of the pump can be lifted and removed from the pump casing with a minimum of effort and without removing the unit from its pedestal or disconnecting either the inlet or discharge pipes.

Therefore, it is the object of this invention to provide a new and improved vertically mounted pump unit.

Another object of this invention is to provide a new and improved vertically mounted motor pump unit in which the rotating elements of the pump can be removed without disconnecting the inlet or discharge pipes of the unit.

Another object of this invention is to provide a new and improved vertically mounted motor pump unit that is easier to maintain than similar prior art motor pump units.

Other objects and advantages of this invention will be apparent from the following description when taken in connection with the accompanying drawings, in which:

FIG. 1 is a cross sectional view of the vertical pump unit of this invention; and

FIG. 2 is a partial cross sectional view taken along the line II—II of FIG. 1.

Referring more specifically to the drawings by characters of reference, the pump unit 10 of this invention is illustrated as a motor 11 coupled to a centrifugal pump 12 and both being mounted on a base or pedestal 13 in such a manner that their rotating elements revolve around a vertical axis 14. Although a motor is shown in the drawing any suitable power transmission device may be used.

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The outer casing 15 of the centrifugal pump 12 is mounted directly on the base 13. In pumping units of this type it is desirable to mount the pump casing directly to the base to improve the stability of the unit and simplify the hydraulic connections. The centrifugal pump casing 15 defines an impeller chamber 16 having a discharge volute 17 extending radially therefrom. The discharge volute 17 terminates in an outwardly extending conduit 18 that is provided with a flange portion 19 at its end to provide easy means for connecting it to the discharge pipe 20. A bearing housing 25 is provided within the casing 15 for receiving the shaft 24 of the pump. The bearing housing 25 is provided with a suitable bearing such as the sleeve bearing 26. In this particular arrangement the sleeve bearing is positioned within a cartridge 26a and both the bearing and the cartridge can be removed from the bottom of the unit by withdrawing bolts 27 and removing cover plate 28. The bearing can also be removed from the top after the shaft has been removed from the pump casing.

The pump shaft 24 has an impeller 29 mounted thereon and has one end positioned within the bearing 26 and bearing housing 25. A replaceable wear sleeve may be provided on the shaft adjacent the bearing 26. The impeller 29 is positioned within the impeller chamber 16 and its fluid impelling passages 30 are aligned with the discharge volute 17 within the casing. The section or portion of the impeller immediately surrounding the shaft 24 defines the inlet 31 of the impeller 29. The fluid passageways 30 extend from the inlet 31 to the outer periphery of the impeller in a manner well known in the hydraulic art. Suitable wear plates 33 are attached to the casing 15 and positioned adjacent the inlet portion of the impeller.

A suction elbow casing 36 is mounted on the pump casing 15 and positioned directly above it to direct fluid into the inlet 31 of the impeller 29. The pump casing 15 and the elbow casing 36 can be rotated relative to each other prior to being bolted together to change the relative position of the discharge volute and the suction intake of the pump. The suction casing 36 is divided into two parts. Preferably it is divided along a plane parallel to the axis of shaft 24 and as shown extends through the axis of the pump shaft. One side of this casing 36 defines a conduit 37 for receiving fluid into the inlet of the impeller. This conduit is provided with a flange 38 for connecting to the inlet piping 39 of the hydraulic system. The section 42 of the suction casing 36 opposite the inlet conduit 37 is removably connected to the inlet defining portion 43 of the suction casing to provide a means for easy access to the rotating elements of the pump. Each portion 42, 43 is provided with suitable flanges 42a, 43a along the vertical and lower parting surfaces. These flanges have spaced apart slots for receiving bolts 40 to connect the portions 42, 43 to each other and to casing 15. The two portions 42, 43 of the suction casing are removably connected to the pump casing 15 at the lower end and define an aperture 44 at the upper end through which the pump shaft 24 extends. This aperture 44 serves as a housing means for containing the packing seals 45 to prevent leakage from the pump along the shaft to atmosphere. A gland 46 surrounds the shaft 24 and is connected to the casing portion 43 to hold the packing seals within the aperture 44. The gland is connected to the casing 43 by bolts and may be split to facilitate removal.

A support column 47 is mounted on the elbow suction casing for supporting a power transmission element illustrated as an electric motor 11. The motor 11 can be of any suitable design and is mounted on top of the support column 47. The motor 11 has a drive shaft 49 extending therefrom toward the pump 12.

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The support column 47 can be connected to the suction elbow 36 in any suitable way but for convenience a mounting plate 53 is formed integral with the inlet portion 43 of the suction elbow. As shown in the drawing the support column 47 has a flange 54 that is bolted directly to the top of the mounting plate 53. To facilitate the removal of the pump shaft 24 and impeller 29, the top portion of the mounting plate 53 is provided with an aperture 55 for receiving the shaft 24 and a radial slot 56 that extends inward from the periphery to the aperture 55. If desired, a bearing and bearing housing may be mounted within the aperture 55 in the mounting plate 53. The slot 56 is positioned on the same side of the unit as the removable portion 42 of the suction casing.

The support column 47 surrounds a removable spacer coupling 60 that connects the motor drive shaft 49 to the pump shaft 24 for transmitting torque from the motor to the pump. The support column 47 is provided with an opening 61 for access to and removal of the spacer coupling 60. The length of the coupling 60 is preferably slightly greater than the distance between the end of the pump shaft 24 and the top of the pump casing 15 so that when the pump shaft 24 is raised to the motor drive shaft 49 the bottom of the pump shaft 24 will clear the pump casing 15 and it and the impeller can be moved radially out of the suction casing.

A suitable bearing housing 65 is connected to the top of the mounting plate 53. Bearings 66 are mounted in the bearing housing and journal the pump shaft 24.

In operation, when it is desired to remove the impeller 29 from the pumping unit 10 the spacer coupling 60 is initially removed through the access opening 61 in the support column 47. This opening 61 in the motor support column preferably appears on the same side of the unit 10 as the removable portion 42 of the suction casing 36. The portion 42 of the suction casing is then removed from the inlet defining portion 43 and the pump casing 15. The bearing housing is disconnected from the mounting plate 53 and the flanged ring 46 is disconnected from the casing portion 43 to allow vertical movement of the pump shaft 24. When the spacer coupling 60 and the removable portion 42 of the suction casing are removed, the entire pump shaft 24 may be lifted vertically upward by suitable means such as a small lift crane until the bottom part of the pump shaft clears the upper rim of the pump casing 15. Then the pump shaft and impeller are moved radially outward until they are clear of the casing. The impeller can then be removed from the shaft in the usual manner.

Although but one embodiment has been illustrated and described, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

Having now particularly described and ascertained the nature of our said invention and the manner in which it is to be performed, we declare that what we claim is:

1. A fluid handling device comprising: a motor having

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a shaft extending therefrom, a pump impeller mounted on said shaft and axially spaced from said motor, a portion of said shaft between said motor and said impeller being removable, a first casing portion surrounding said impeller and defining an outlet radially spaced from the impeller, a second casing portion connected to said first casing portion and extending axially from said impeller toward said motor, said second portion of said casing being divided along its longitudinal axis, one side of said divided portion defining an inlet for said pump, the other side of said divided portion being removably mounted to said one side and said first casing portion to provide means for removing said impeller without disconnecting either inlet or outlet piping.

2. A motor-pump unit comprising: a motor having a shaft extending therefrom, a pump axially spaced from said motor, said pump having an impeller and a shaft extending therefrom, a spacer interposed between and connecting said shafts, a first casing portion surrounding said impeller and defining an outlet radially spaced from the impeller, a second casing portion removably connected to said first portion and extending axially from said impeller toward said motor, said second portion of said casing being divided along its longitudinal axis, one side of said divided portion defining an inlet for said pump, the other side of said divided portion being removably mounted to said one side and said first portion to provide means for removing said impeller without disconnecting either inlet or outlet piping.

3. A motor-pump unit comprising: a motor having a shaft extending therefrom, a pump axially spaced from said motor, said pump having an impeller and a shaft extending therefrom, a spacer interposed between and connecting said shafts, a pedestal, a first casing portion mounted on said pedestal and surrounding said impeller and defining an outlet radially spaced from the impeller, a second casing portion connected to said first portion and extending axially from said impeller toward said motor, a support column interposed between said second casing and said motor, said second portion of said casing being divided along its longitudinal axis, one side of said divided portion defining an inlet for said pump, the other side of said divided portion being removably mounted to said one side and said first portion to provide means for removing said impeller without disconnecting either inlet or outlet piping.

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