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K. J. HEINICKE

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SHEET METAL CENTRIFUGAL PUMP

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2 Sheets-Sheet 1

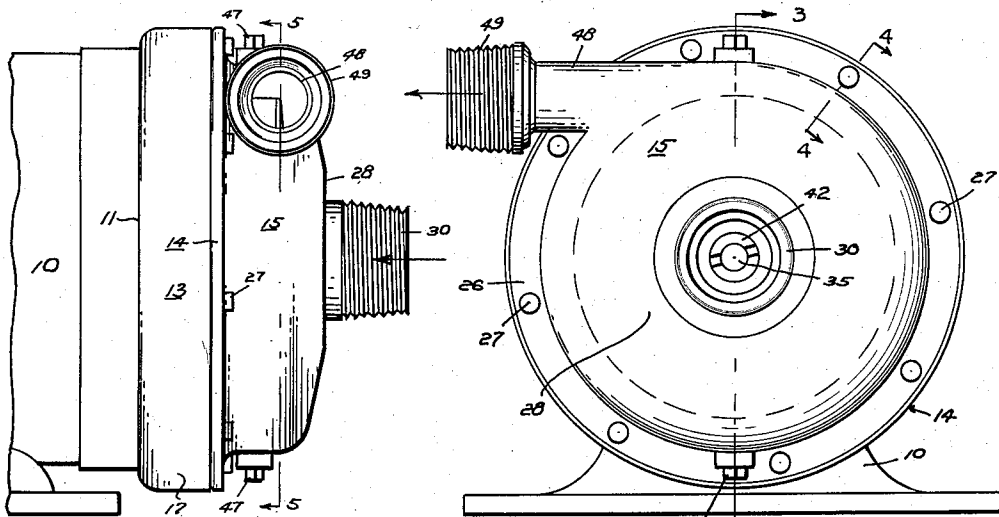


FIG. 1.

FIG. 2.

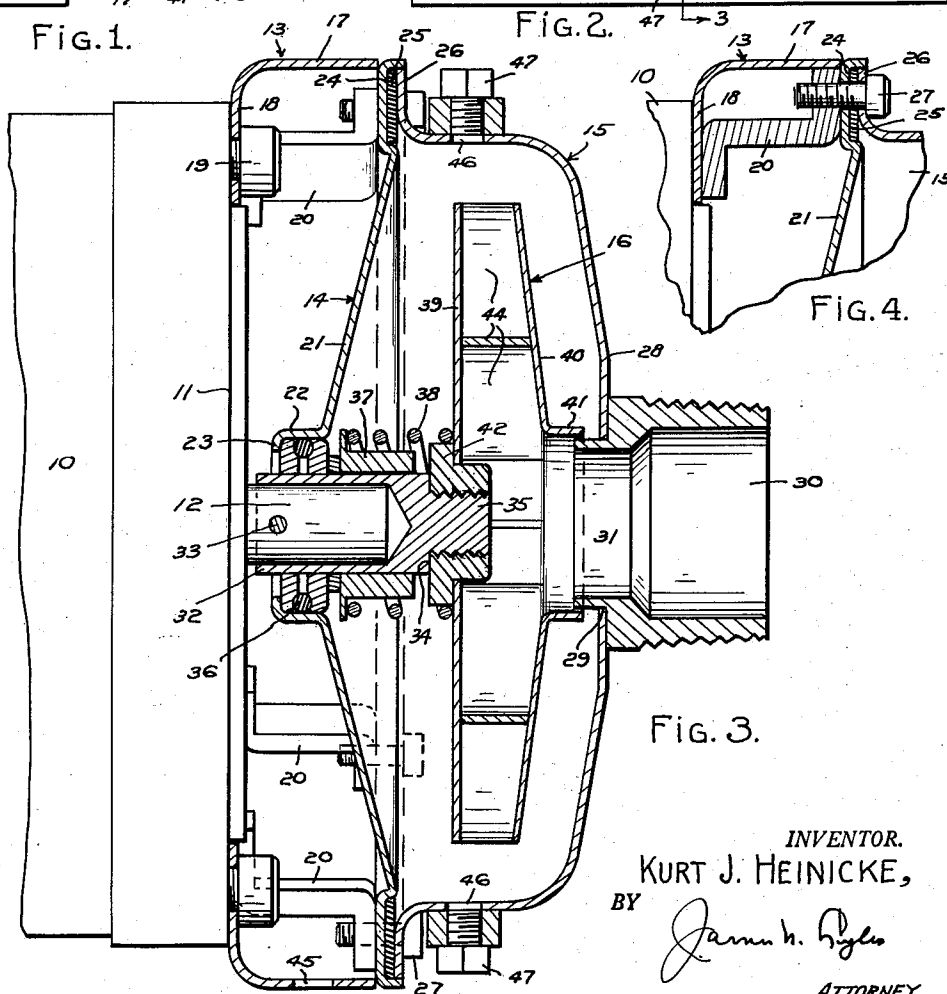


FIG. 4.

FIG. 3.

INVENTOR.
KURT J. HEINICKE,
BY *Jamun h. Byles*
ATTORNEY

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K. J. HEINICKE

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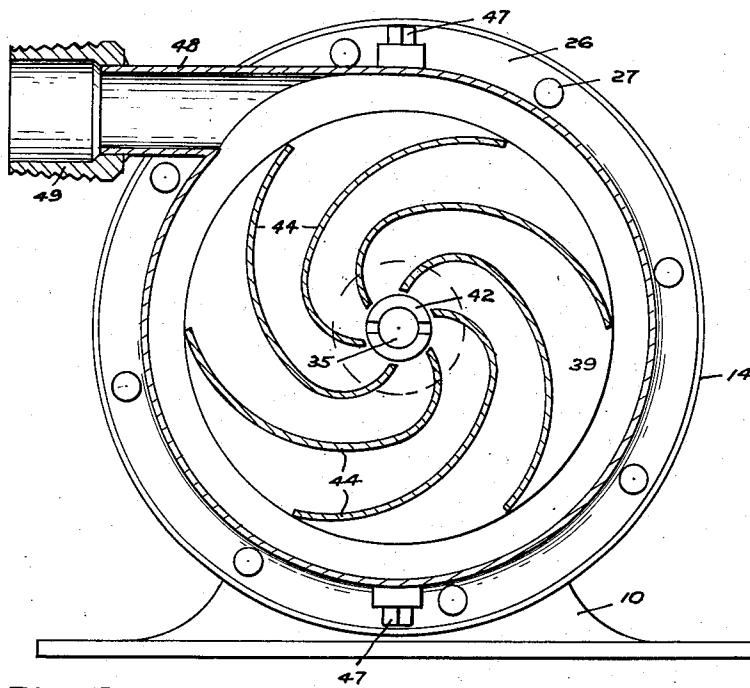


FIG. 5.

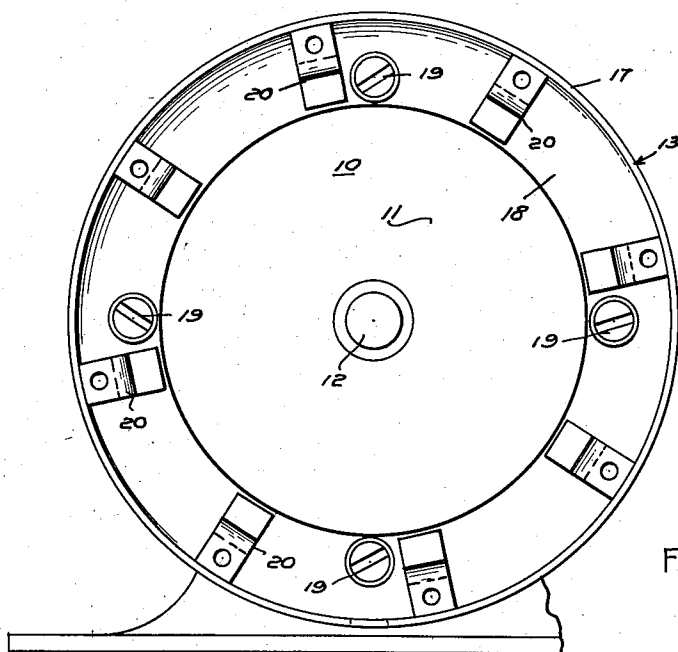


FIG. 6.

INVENTOR.
KURT J. HEINICKE,
BY *James B. Hyle*
ATTORNEY

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SHEET METAL CENTRIFUGAL PUMP

Kurt J. Heinicke, Hollywood, Fla.

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4 Claims. (Cl. 103—87)

This invention relates to improvements in pumps and has particular reference to centrifugal or similar pumps for the pumping and distribution of various fluids.

The prime purpose of this invention resides in forming a pump of centrifugal or other character, wholly of fabricated sheet metal whose surfaces are smooth and free from any of the inherent objectional roughness characterized by pumps heretofore employed.

Pumps currently in use are usually produced by casting. Such casting implies costly patterns having a limited life, shrinkage problems which vary for different metals and alloys and, most important, the very costly polishing to obtain the maximum efficiency. This polishing, while possible to a limited degree within the casing of the pumps and the external surface of the impeller, is practically impossible with respect to the inner surfaces and vanes of the impeller, resulting in a lowered efficiency of the pump, due largely to turbulence of the fluid and friction caused by the normally rough casting of the impeller.

The pump of the present invention as formed substantially of polished sheet metal stampings, welded and connected in a novel manner, results in a pump that is much lighter in weight than conventional cast pumps, cheaper to manufacture and is approximately 25% more efficient in operation.

Various features of novel construction, assembly and operation will be more clearly apparent during the course of the following description, reference being had to the accompanying drawings wherein has been illustrated a preferred embodiment of the device and wherein like characters of reference are employed to denote like parts throughout the several figures.

In the drawings:

Figure 1 is a side elevational view of a pump constructed in accordance with the invention,

Figure 2 is a front elevational view thereof,

Figure 3 is an enlarged central vertical sectional view taken substantially on line 3—3 of Figure 2,

Figure 4 is a fragmentary sectional view illustrating a connecting bracket for a pump cover and a bell housing for the impeller, taken substantially on line 4—4 of Figure 2,

Figure 5 is a sectional view taken substantially on line 5—5 of Figure 1 and,

Figure 6 is a front elevational view of a pump connector and its associated connecting brackets.

Referring specifically to the drawings, the numeral 10 designates a prime mover, here illustrated as an electric motor, having a forward face 11 and an extending shaft 12.

The pump comprises essentially an open cylindrical connector 13, a cover plate 14, a bell housing 15 and an impeller 16, all stamped or otherwise formed of a relatively highly polished sheet metal, such as steel, brass, bronze, copper, stainless steel, Monel, aluminum, titanium, etc.

The connector 13 embodies a band 17 of predetermined width having an inwardly directed circumferential flange

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18 that is at a right angle to the band. The opening of the flange may vary in accordance with the particular type of motor employed and here has been proportioned to engage over a raised end portion of the motor casing.

5 The flange is apertured at equidistantly spaced points for the passage of threaded fastening devices 19, through the medium of which the connector is rigidly connected to the end of the motor concentric thereto. The connector is further provided with a plurality of equidistantly spaced Z-brackets 20, each having an inner leg and an outer leg. The inner leg of each bracket 20 is welded or otherwise fixedly connected to the inner face of the flange 18, while the terminal end of each outer leg is welded or otherwise rigidly connected with the inner surface of the band 17 to be substantially flush with its marginal edge. Each of the forward legs are apertured and threaded for the reception of screw fastening devices, to be described.

The cover 14 is substantially identical in diameter to the connector 13, and comprises a conical wall portion 21 that terminates at its center in an inwardly extending cylindrical hub 22, that is inwardly flanged, as at 23. The cover 14 has been stamped to provide a circumferential and forwardly opening channel 24, for the seating reception of a ring gasket 25. The cover 14, including the hub 22 and the channel 24, is concentric to the connector and the motor shaft.

The bell housing 15 is of a predetermined depth and has been shaped to accommodate a rotary impeller 16. 30 The housing 15 is circumferentially flanged, as at 26 and with the flange 26 and the housing being concentric with the cover 14 and the connector 13. The flange 26 has a diameter that snugly engages within the channel 24 for clamping engagement with the gasket 25. The bottom of the channel 24, the gasket 25 and the flange 26 are identically apertured for alignment with each other and serve to receive screw fastening devices 27 that have threaded engagement with the threaded apertures of the Z-brackets 20. The screw devices 27 thus serve to rigidly clamp the cover 14 to the connector and to simultaneously clamp the flange 26 in sealing engagement with the gasket 25.

The end wall 28 of the bell housing 15 is centrally apertured at 29 and with the aperture 29 being in axial alignment with the motor shaft 12. An externally threaded coupling 30 is welded or otherwise fixedly connected to the housing 15 and serves as the connecting means for the fluid supply. The coupling 30 is tubular, as shown, and is provided with an inward tubular extension 31. 40 The coupling 30 is preferably formed of a material similar to the housing 15.

Disposed upon the motor shaft 12, is a cylindrical adaptor 32, that is keyed or pinned to the motor shaft 12 at assembly, by a taper pin 33. The adaptor at one end has been reduced in diameter to form a shoulder 34. The reduced portion of the adaptor has been threaded to provide a threaded stud 35 for the mounting support of the impeller 16. A conventional seal 36 is slidably supported upon the adaptor 32 and seats within the hub 22 in abutting engagement with the flange 23. A flanged collar 37 is slidably disposed on the adaptor 32 and imparts a compressive action to the seal 36 under the influence of a coiled compression spring 38.

The impeller 16 comprises an inner flat circular disc 39 and an outer conical disc 40, spaced apart a predetermined distance and being of like diameter. The disc 40 has been stamped to provide a forwardly extending cylindrical hub 41 that normally engages over the extension 31 of the coupling 30 concentric thereto and in slightly spaced relation. The disc 39 is centrally apertured for the passage of the threaded stud 35 and a threaded col-

lared coupling nut 42 is welded to the disc 39 concentric to its aperture. The nut 42 serves to threadedly bind the impeller upon the adaptor. The impeller 16 is provided with a plurality of equidistantly spaced curved impeller vanes 44, having their marginal edges welded to the discs 39 and 40 throughout their length. As before pointed out, the several parts have been formed of a similar metal and the impeller discs 39 and 40 and the vanes 44 are formed of a relatively highly polished metal free of imperfections that would cause friction or turbulence in the fluid being pumped. At assembly, the compression spring 38 bears against the impeller disc 39 and the collar 37 to maintain the seal 36 effectively compressed with respect to the hub 22 and the adaptor 32, forming a seal against the leakage of fluid from the pump chamber defined by the cover 14 and the housing 15. Any slight leakage that might occur, will readily drain through the opening 45 of the connector. The housing 15 is provided with diametrically oppositely arranged drain opening 46, normally closed by plugs 47. A discharge pipe 48 is tangentially welded into a suitable opening of the bell housing 15 and is provided at its free end with a tubular and externally threaded connector 49, through the medium of which the pump is connected to a fluid discharge line.

The several parts, including the connector, the cover plate, the bell housing and the impeller are all die stamped in a convenient and economical manner from a polished sheet metal of predetermined gauge and having characteristics that retard corrosion. The impeller vanes are blanked and die formed to their peculiar longitudinal curvature, after which they are welded along their marginal edges to the discs 39 and 40, providing an impeller wherein all exposed surfaces are prefinished and require no further machining. The parts being formed as above, the device is mounted with respect to the pump in the following manner.

The connector 13 is rigidly mounted first upon the end of the motor 10, by first removing the motor end bolts 19, after which the connector is engaged in concentric relation to the motor and the bolts 19 inserted through the apertures of the flange 18 to reenter the threaded openings of the motor. The connector has a predetermined depth that is calculated to dispose the pump in a position for the convenient mounting of the impeller and to provide for an adequate seal between the pump housing and the motor. The connector having been rigidly mounted, the adaptor 32 is then engaged over the shaft 12 and pinned into position by the taper pin 33. It is apparent however, that the adaptor may be engaged with the shaft prior to the mounting of the connector. The cover 14 is next engaged with the connector in concentric relation and the apertures of the channel 24 are aligned with the threaded apertures of the Z-brackets 20. The seal device 36 is then engaged over the adaptor and seated within the hub 22 of the cover to a point where it abuts the flange 23. The collar 37 and spring 38 are then engaged over the adaptor and, if desired, a washer disposed between the end of the collar 37 and the seal 36. The impeller is then connected to the adaptor by a clockwise threaded movement of the nut 42 upon the threaded boss 35. The gasket 25 is then positioned in the channel 24, with its apertures in registry with the apertures of the channel and the bell housing 15 moved into housing position with its flange 26 overlying the gasket and with its apertures in registry for the passage of the fastening devices 27. The fastening devices 27 thus serve to securely mount the cover and the bell housing in a position concentric with the connector and in sealed relation. The usual couplings are then made from the source of fluid supply and a distribution line. The pump functions in a manner common to substantially all centrifugal pumps.

It will be apparent from the foregoing, that the pump of this invention embodies novel features of construction

and assembly, all operating to permit the manufacture thereof in an economical manner and with a major increase in efficiency. The manufacture of the pump from polished sheet metal results in a relatively light weight pump that may be sold at a most very substantially below the cost of pumps whose parts are cast. The use of polished sheet metal avoids any rough or uneven surfaces that create fluid friction and turbulence, such being generally recognized as a major cause of inefficiency in pump volume and pressure. Further, the roughness of the castings creating turbulence and friction creates an additional load upon the prime mover. The forming of the impeller from polished sheet metal throughout, offers much less resistance to rotation in the fluid to be pumped. The pump, while being shown as close coupled with the prime mover, it will be clearly apparent that it may be separately mounted and belt driven.

Basically, the outstanding features of the pump of this invention are as follows:

(1) By making the impeller, and the pump parts of polished sheet metal, friction and turbulence within the pump is reduced to lower levels than is possible with castings, even if these are polished, because the degree of polish obtainable within an enclosed impeller or even on curved surface parts is necessarily less perfect than on a flat sheet. This means higher efficiency in the pump of this invention.

(2) At the present time, titanium, because of its corrosion resistance, strength and light weight, is much sought after as a material for many applications heretofore covered by stainless steel and aluminum. The cost of titanium at present is such that its application to cast pumps makes their price extremely high. Of titanium sheet metal, the price is reduced considerably. This is merely an example of applying the new approach to expensive metals with the inherent weight saving and hence a lower price.

While a preferred embodiment of the invention has been illustrated and described, changes in the method of manufacture, arrangement and assembly of parts, proportions and materials employed, are deemed to be within the scope of the invention, such changes being determined by the scope of the subjoined claims.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A centrifugal pump in combination with an electric motor having an extended drive shaft, the pump comprising a cylindrical and forwardly open sheet metal connector that is fixedly connected to the end of the motor concentric thereto and concentric to the shaft, a cover plate overlying the open side of the connector, a bell housing that is concentric with and that overlies the cover plate in fluid tight engagement therewith, a rotary fluid impeller disposed within the housing in axial alignment with the motor shaft, an adaptor connected with the impeller axially thereof and with the adaptor extending through an opening of the cover plate and having driven connection with the motor shaft, a fluid tight seal between the cover plate and the adaptor, the impeller comprising a pair of spaced apart discs and a plurality of radial vanes that are welded to the discs, an axially disposed threaded inlet connection for the housing and a threaded outlet connection for the housing, the connector, the cover plate, the housing and the impeller and its plates all being formed of a polished sheet metal.

2. The device according to claim 1, wherein the connector is provided with an inwardly directed circumferential flange for bolting engagement with the end of the motor, the said bell housing being cylindrical and open upon one side and with the marginal edge of the open side being circumferentially flanged, the cover plate being conical and with its marginal portion being circumferentially channelled for the reception of an annular gasket and the housing flange, the cover plate being provided with a central hub portion that is open for the passage of

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the motor shaft and the adapter, a compressible seal disposed over the adapter for seating engagement within the hub, the connector provided with a plurality of rigid brackets that threadedly receive clamping screws that are adapted to pass through openings formed in the housing flange, the gasket and the cover plate.

3. The device according to claim 1, wherein the impeller comprises a flat disc and a conical disc that are spaced apart, the conical disc being provided with an outwardly extending and axially arranged cylindrical hub that is concentric with the threaded inlet connection of the housing, the said vanes being radially curved, the said flat disc being apertured for engagement over a threaded stud axially formed upon the adapter, and a clamping nut for retaining the impeller fixed with respect to the adapter.

4. The device according to claim 1, wherein the con-

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connector is provided with a plurality of equidistantly and circumferentially spaced Z-brackets and with the legs of the brackets being welded to the connector, one leg of each bracket being disposed flush with an open side of the connector, the last named legs being each apertured and threaded for the reception of mounting bolts whereby to support the cover plate and the housing in concentric relation to the connector and the motor.

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