May 4, 1954 M. B. MacNEILLE ET AL 2,677,327

CENTRIFUGAL PUMP CONSTRUCTION

Filed Feb. 24, 1949

2 Sheets-Sheet 1

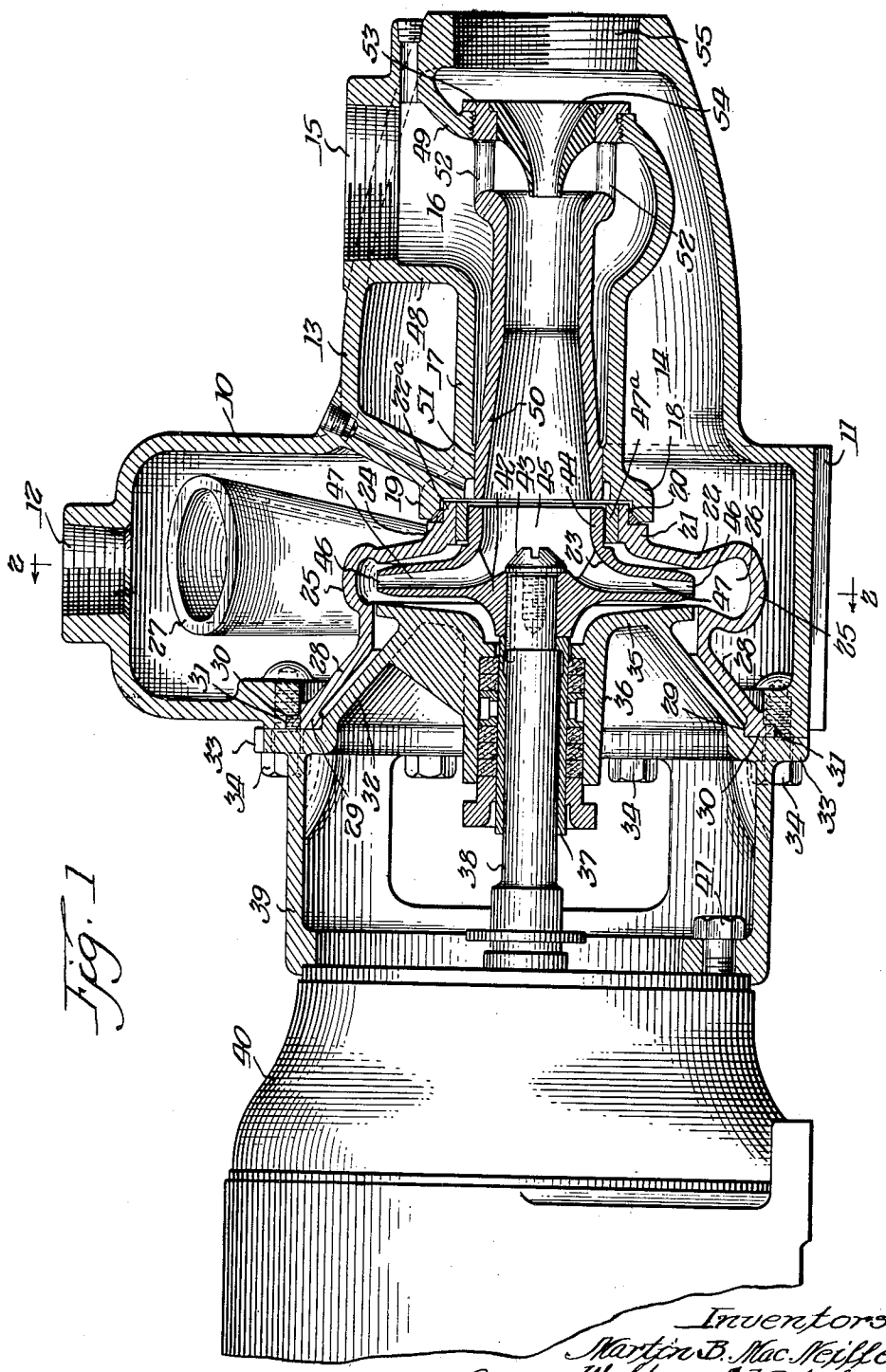

Fig. 1

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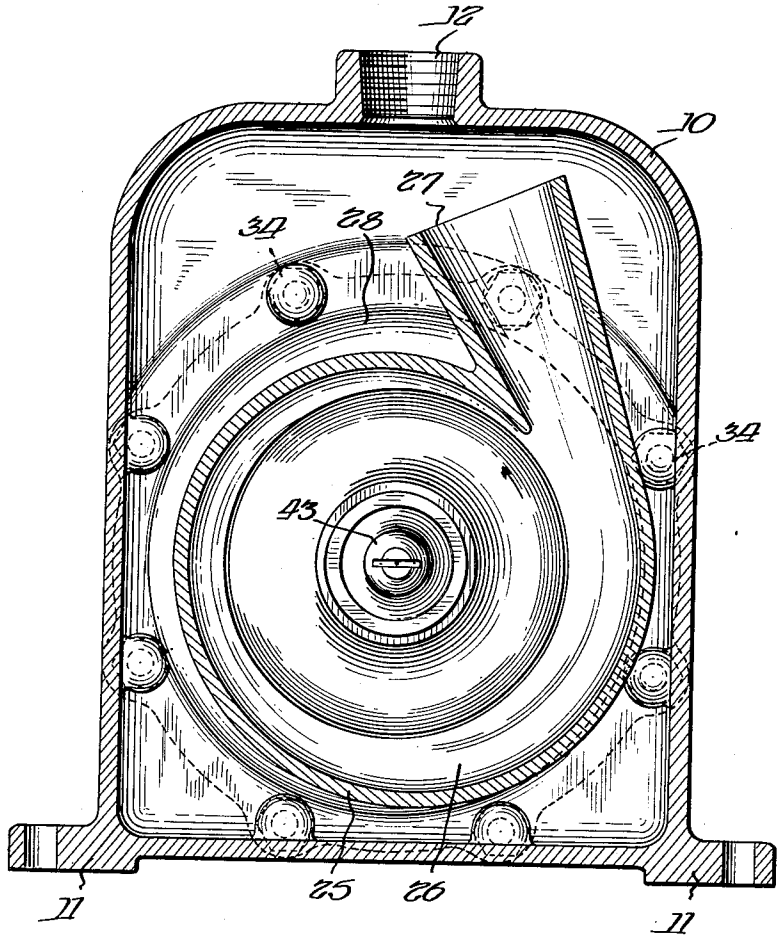
Fig. 2.



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2,677,327

UNITED STATES PATENT OFFICE

2,677,327

CENTRIFUGAL PUMP CONSTRUCTION

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Application February 24, 1949, Serial No. 78,184

4 Claims. (Cl. 103—103)

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Our invention relates to a centrifugal pump construction and has particular reference to a centrifugal pump in which a volute housing for the impeller is formed as a separate unit from the main housing of the pump and has for its primary object the provision of a pump wherein the volute impeller housing is fashioned as a special unit removable from and insertable in the main housing, thus rendering the manufacture of the main housing more simple and less costly because of the difficulties heretofore encountered in the casting of these main housings integrally with the impeller housing.

Another and further object of our invention is the provision of a centrifugal pump construction in which one type of main housing can be provided and used for various sizes and horse power pumps by the fitting into the main housing of an impeller housing proportionate to the size of the motor horse power used as a means of designating the size and capacity of the pump thereby eliminating the necessity for jigs, dies, tools and the like for different main housings which has been the practice heretofore in the manufacture of pumps of this type and character. In the manufacture of centrifugal pumps for domestic purposes such as both shallow and deep well jet pumps, it is the practice to manufacture them in certain size groups measured in terms of motor horse power. One popular group consists of sizes 5, 3, 2 and 1½ horse power respectively, and depends upon the volume of water necessary to be supplied, as well as lift, various conditions and the like. In the manufacture of these pumps it has been the custom to make main housings of different sizes to accommodate each one of the various sized pumps. With our improved structure a main housing for a five horse power size pump can be provided with a smaller impeller mounted therein with a volute of a suitable size therefor for economic operation for a smaller sized pump, say any one of the smaller of the three sizes mentioned above. In this manner the necessity for providing a multitude of main housings of different sizes is avoided, as well as inventory and the like with respect to parts, jigs, patterns and the like for making these main housings.

Another and further object of our invention is the provision of a centrifugal pump structure having a removable volute housing therein which, if the pump needs repair or the like, can be taken apart, the volute housing can be removed from the main housing, access had to the pump body for cleaning, insertion of bearings and repair of the

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pump which simplifies the repair operation and also materially reduces the cost thereof.

Another and further object of my invention is the provision of a pump in which should parts become broken due to freezing or the like the expense of repair would not be so great as where a complete new main housing might be necessary if the impeller volute housing became broken and needed repair or the like, it would be easy to insert a new impeller housing without buying an entirely new pump structure.

These and other objects of our invention will be more fully and better understood by reference to the accompanying drawings and in which:

Figure 1 is a longitudinal, sectional view of a pump embodying our invention; and

Figure 2 is a cross sectional view on line 2—2 of Figure 1.

Referring now specifically to the drawings and in which like reference refer to like parts throughout, a main pump housing is provided comprising a rectangular portion 10 having a base 11 upon which the pump is seated, and having an outlet 12 leading from the central chamber formed by the portion 10 with a bullet-like extension 13 being formed integrally with the portion 10 and which projects from the portion 10 at one side thereof and has a chamber 14 therein which communicates with the chamber formed by the portion 10, with an inlet 15 being provided in the side of the bullet-like extension 13 which leads into an intake chamber 16 formed in the extension 13. A cylindrical wall portion 17 is integrally formed in the extension 13 and which extends longitudinally of the extension 13 and has an outwardly extending end portion 18 which projects into the chamber formed in the portion 10. A flange 19 is formed on the end of the wall portion 17 and has an annular channel 20 therein for the reception and support of a trunnion 21 formed on one side wall 22 of an impeller volute housing 25, the trunnion 21 on the side wall 22 having a flange 22a thereon which extends into the channel 20 on the inner side of the flange 19 with a packing ring 24 being positioned between the trunnion 21 and the edge of the flange 19.

A volute impeller housing 25 is provided having a central portion which is generally semicircular in cross-section and has a volute passage 26 therein which leads into a discharge portion 27 of the volute housing 25 with the cross-sectional area of the passage 26 increasing in a constant ratio towards the discharge end thereof in the portion 27 which terminates adjacent the discharge opening 12 in the housing 10 whereby the

high velocity of water received from the impeller is reduced but substantially high pressure is maintained. The volute impeller housing 25 has an annular web portion 28 angularly extending from one side thereof and terminates in a flange 29 one side 30 of which is fitted into a channel 31, formed around the bore of the main portion 10 of the housing, the annular web portion 28 being generally frusto-conical in shape. The volute housing 25 including the discharge diffuser 27 extends substantially throughout the long diameter of the central chamber formed by the housing 10 and is considerably greater in cross-sectional area at its discharge end 27 than is the discharge opening 21 in the housing 10, as shown particularly in Figure 1 of the drawings.

A frusto-conical cover plate 32 is provided which closes the bore of the main portion 10 of the housing which has a flange 33 therearound through which bolts 34, 34 pass which secures the cover plate 32, to the main housing 10. The flange 33 overlies the flange portion 29, including the rib 30, on the marginal edge of the web portion 28 of the volute impeller housing 23. A wall portion 35 of the cover plate 32 is provided which forms a closure for one side of the volute impeller housing 23 with a trunnion portion 36 being provided to support a renewable shaft sleeve 37 around a motor shaft 38. An extension 39 is provided, to which a motor 40 is secured by means of bolts 41, 41. The impeller 23 has the usual hub portion into which the motor shaft 38 extends with a screw 43 axially threaded into the motor shaft 38 providing the means by which the impeller 23 is held on the motor shaft. The impeller 23 is of the usual form well-known in the art of centrifugal pumps, has a trunnion 44 on the intake side thereof having an intake opening 45 therein with the usual outlet passages 46, 46 between vanes 47, 47 the outlet passages 46, 46 discharging into the volute channel 26. A ring 47*a* is interposed between the outer surface of the trunnion 44 and the inner surface of the flange 22*a* on the impeller housing 25.

Integrally formed with the cylindrical wall portion are other wall portions 48 and 49, these wall portions defining the chamber 16 on their inside portions in normal communication with the intake opening 15 and a portion of the chamber 14 outside thereof. A Venturi tube 50 is provided having an annular flattened support surface 51 thereon in engagement with an annular seat integrally formed on the inner surface of the wall portion 17 forming the chamber within which the Venturi tube 50 is mounted. Spaced legs 52, 52 are formed integrally with the intake end of the tube 50 with an externally threaded ring 53 integrally formed on the legs 52, 52 with a removable jet 54 being inserted in the ring 53 with its discharge end projecting into the intake end of the tube 50 and through which fluid is forced into the tube 50 creating suction which pulls fluid from the chamber 16 into the tube 50 in a manner well understood in the art. An opening 55 is provided in the end of the portion 14 which in normal operation is closed with a plug, but which may have a pipe inserted therethrough for certain kinds of deep well pumping.

From the foregoing description it will be understood that applicant's novel combination resides in the particular construction of the main housing 10, the cover 32 and the removable volute 25 and in the particular details of construction applied to these parts whereby they can be easily assembled and held in operative relation with

each other. It will also be understood that in the making of the main housing 10 and its extension 13 and the making of the volute 25, preferably by casting, that these parts as shown and described can be more easily and quickly cast than when an impeller housing with a volute passage is formed integral with the main housing 10. When these parts are separately cast the volute impeller housing 25 can be threaded into place through the bore of the main housing 10 by placing the end of the discharge portion 27 through the open side of the main housing and by turning the end of the discharge portion 27 into the chamber normally occupied by this member the volute housing 25 is very easily put into place in the main housing. The motor unit including the cover 32 which has been previously assembled is placed in its proper position and the bolts 34 inserted and drawn up when the assembling operation is complete. The tube 50 can be inserted in position through the threaded opening in the wall 49 and threaded into proper position by rotating the ring 53, the jet 54 having been previously inserted by a press fit into the ring 53 and the opening 55 is then closed by means of a threaded plug (not shown) and the complete pump is assembled. Various sizes of impellers 23 are used depending upon the volume of liquid to be handled and the sizes and horse power of the motors used with a corresponding increase or decrease in the sizes of the impeller housing surrounding the impeller with the mounting parts being the same for the various sizes. For instance, we prefer to provide a housing suitable for a five H. P. pump and to use the same housing for the smaller sizes, but with different impellers and volutes, thereby saving in the cost of jigs, dies and the like in the manufacture of the pump housings, but also to provide for the easy removal and replacement of the volute should such removal or replacement become necessary.

While we have described more or less precisely the details of construction, we do not wish to be understood as limiting ourselves thereto, as we contemplate changes in form and the proportion of parts and the substitution of equivalents as circumstances may suggest or render expedient without departing from the spirit or scope of our invention.

What is claimed is:

1. A centrifugal pump comprising in combination a main pump housing having a discharge opening and having a main water chamber therein and an extension at one of its sides with a water conduit therein, a rotatable impeller mounted in the said main pump housing with a central water inlet in alignment with the water conduit in the extension of the main housing, an open-sided volute for the said impeller having a single discharge opening and having an elongated tangential diffuser integrally formed with the said volute whereby a single monoflow passage is formed leading from the volute into the said diffuser, the said diffuser extending towards and terminating adjacent to the discharge opening in the said main housing whereby fluid is discharged from the volute directly into the discharge opening and water turbulence is reduced in the said water chamber but substantially high water pressure is maintained in said chamber, and a closure member for the open side of the said volute and for one side of the main housing.

2. A centrifugal pump comprising in combination a main pump housing having a discharge opening and having a main water chamber

therein and an extension at one of its sides with a water conduit therein, a rotatable impeller mounted in the said main pump housing with a central water inlet in alignment with the water conduit in the said extension of the main housing, an open-sided volute for the said impeller having a single discharge opening and having an elongated tangential diffuser integrally formed with the said volute whereby a single monoflow passage is formed leading from the volute into the said diffuser, the said diffuser extending towards and terminating short of the discharge opening in the said main housing whereby fluid is discharged from the volute directly into the discharge opening and water turbulence is reduced in the said water chamber but substantially high water pressure is maintained in said chamber, and a closure member for the open side of the said volute and for one side of the main housing.

3. A centrifugal pump comprising in combination a main pump housing having a discharge opening and having a main water chamber therein and an extension at one of its sides with a water conduit therein, a rotatable impeller mounted in the said main pump housing with a central water inlet in alignment with the water conduit in the extension of the main housing, an open-sided volute for the said impeller having a single discharge opening and having an elongated tangential diffuser integrally formed with the said volute whereby a single monoflow passage is formed leading from the volute into the said diffuser, the said diffuser extending towards and terminating adjacent to the discharge opening in the said main housing whereby fluid is discharged from the volute directly into the discharge opening in the main housing, the discharge end of the diffuser being larger in cross-sectional area than is the discharge opening in the said main housing whereby water turbulence is reduced in the said water chamber but substantially high water pressure is maintained in said chamber, and a closure member

for the open side of the said volute and for one side of the main housing.

4. A centrifugal pump comprising in combination a main pump housing having a discharge opening and having a main water chamber therein and an extension at one of its sides with a water conduit therein, a rotatable impeller mounted in the said main pump housing with a central water inlet in alignment with the water conduit in the extension of the main housing, an open-sided volute for the said impeller having a single discharge opening and having an elongated tangential diffuser integrally formed with the said volute whereby a single monoflow passage is formed leading from the volute into the said diffuser, the said diffuser extending towards and terminating adjacent to the discharge opening in the said main housing whereby fluid is discharged from the volute directly into the discharge opening and the velocity of the water is reduced but substantially high pressure is maintained in said water chamber, and a closure member for the open side of the said volute and for one side of the main housing.

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