Aug. 28, 1934. H. F. SCHMIDT 1,971,386

PROPELLER TYPE FLUID TRANSLATING APPARATUS

Filed Sept. 30, 1930 4 Sheets-Sheet 1

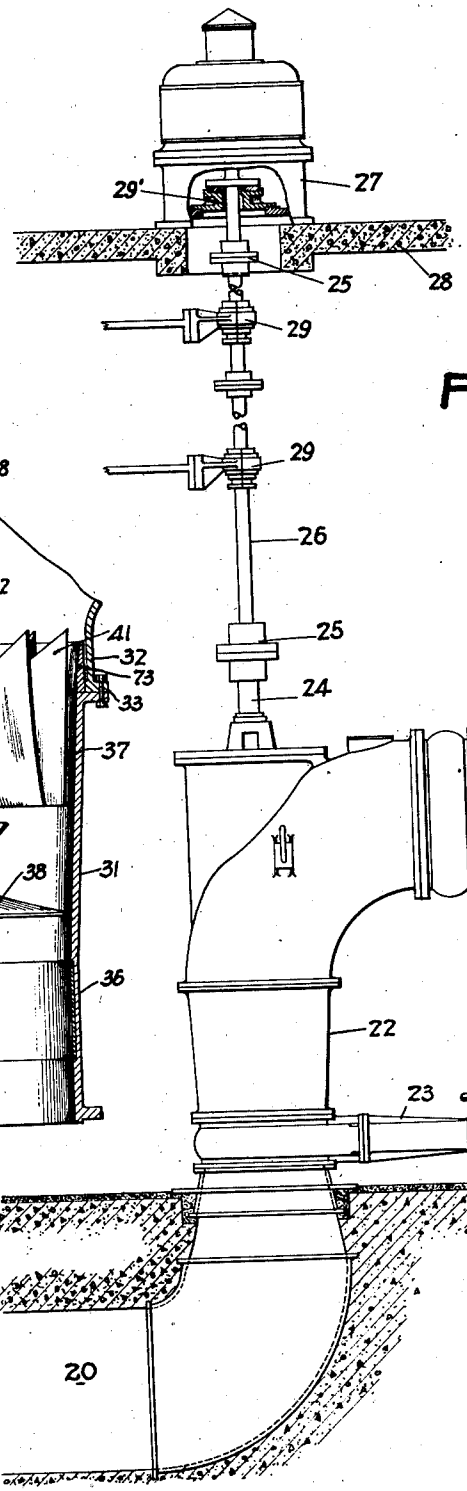


FIG. I.

FIG. II.

WITNESS

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Aug. 28, 1934. H. F. SCHMIDT 1,971,386

PROPELLER TYPE FLUID TRANSLATING APPARATUS

Filed Sept. 30, 1930 4 Sheets-Sheet 2

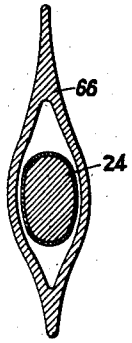


FIG. 3.

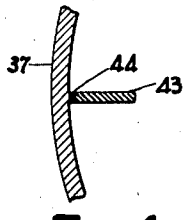


FIG. 4.

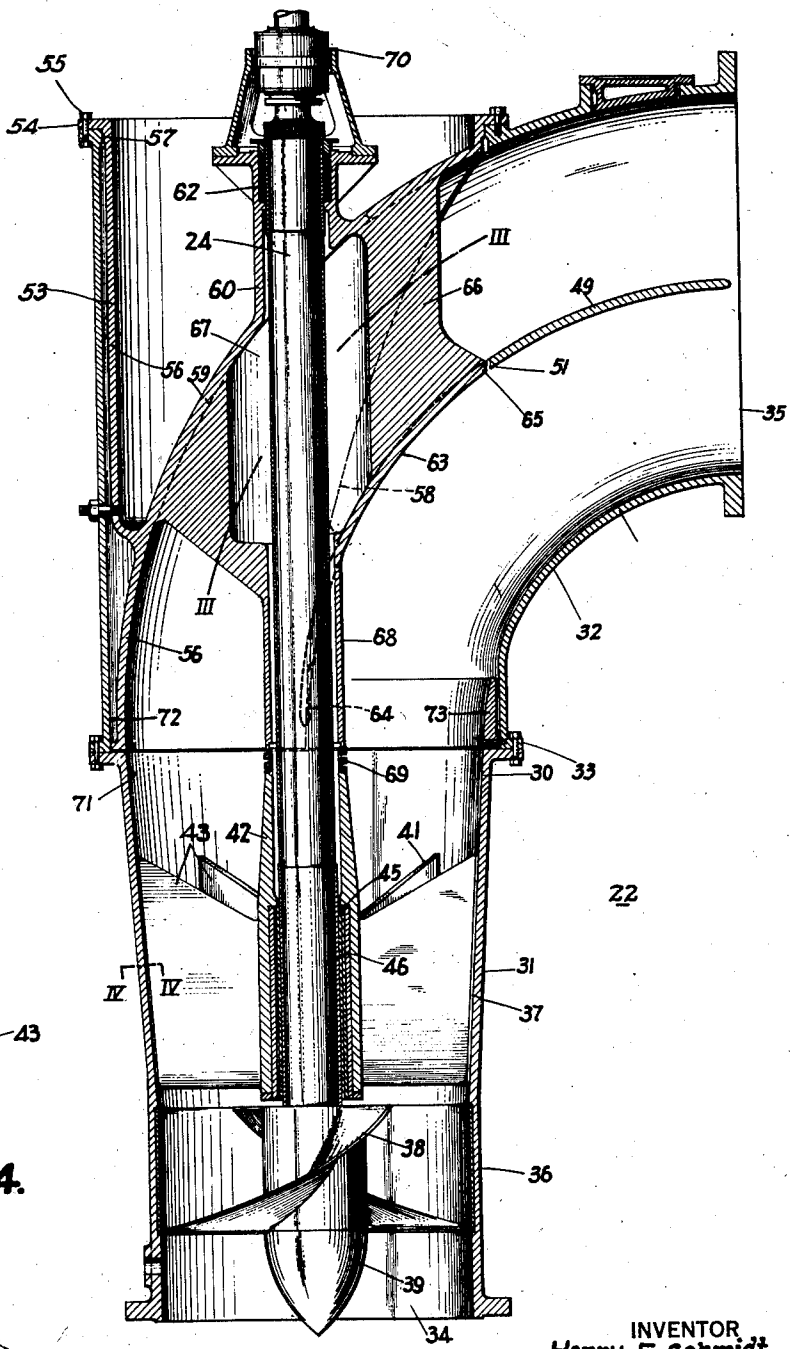


FIG. 2.

WITNESS
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Aug. 28, 1934. H. F. SCHMIDT 1,971,386

PROPELLER TYPE FLUID TRANSLATING APPARATUS

Filed Sept. 30, 1930 4 Sheets-Sheet 3

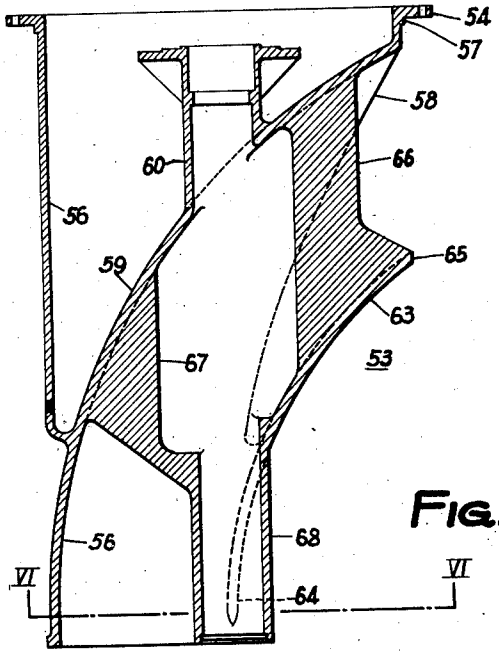


FIG. 5.

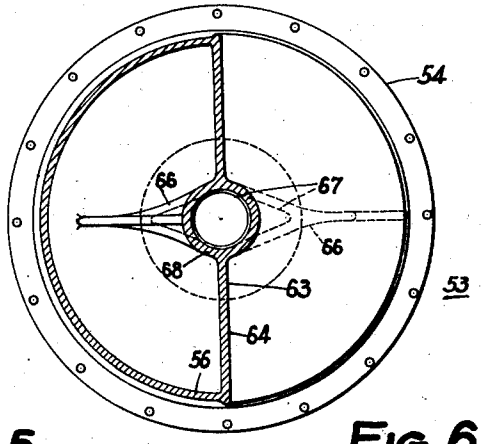


FIG. 6.

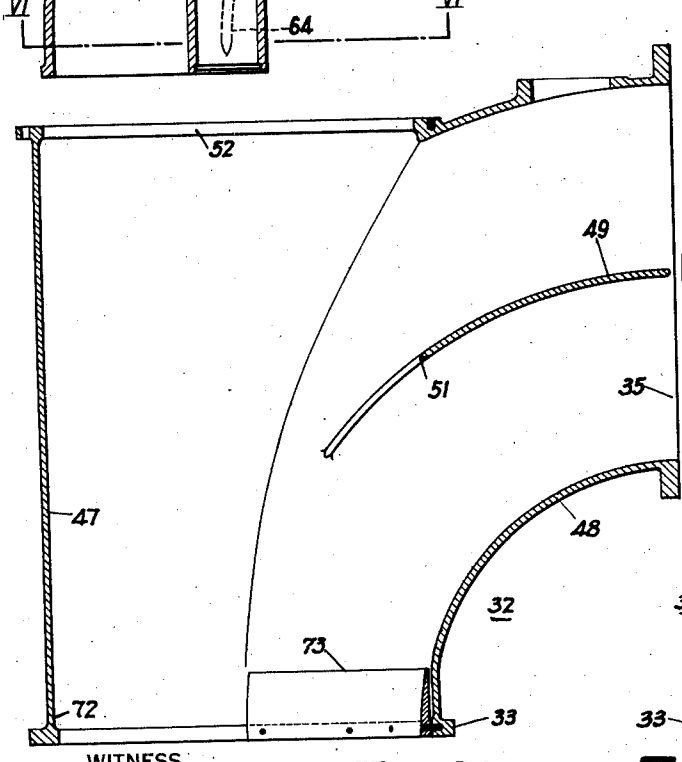


FIG. 7.

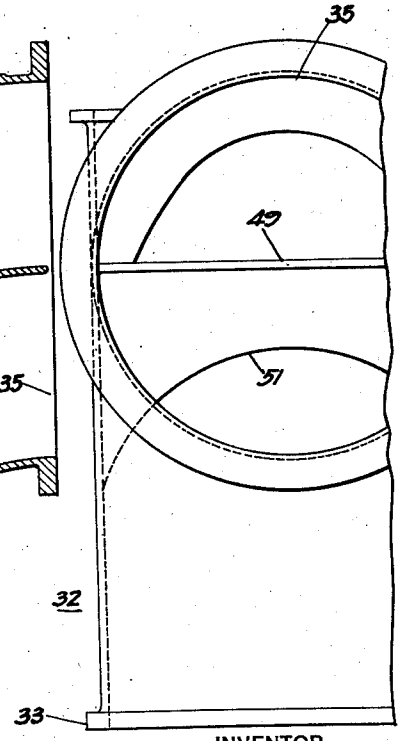


FIG. 8.

WITNESS

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Aug. 28, 1934. H. F. SCHMIDT 1,971,386

PROPELLER TYPE FLUID TRANSLATING APPARATUS

Filed Sept. 30, 1930 4 Sheets-Sheet 4

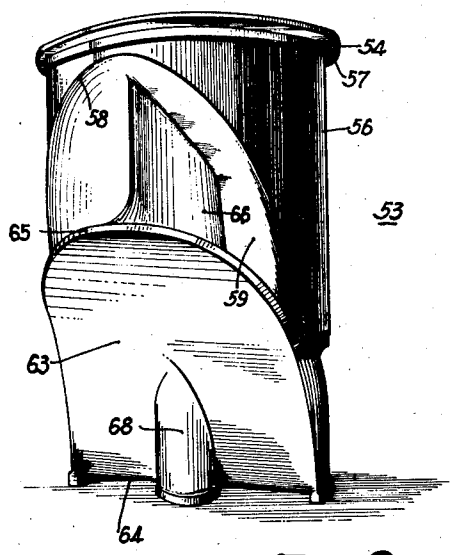


FIG. 9.

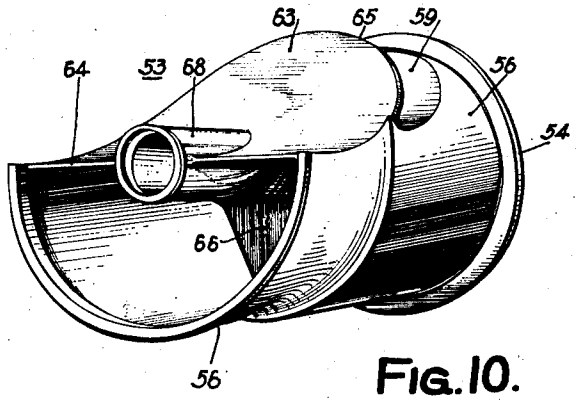


FIG. 10.

WITNESS

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Patented Aug. 28, 1934 1,971,386

UNITED STATES PATENT OFFICE

1,971,386

PROPELLER TYPE FLUID TRANSLATING APPARATUS

Henry F. Schmidt, Lansdowne, Pa., assignor to Westinghouse Electric & Manufacturing Company, a corporation of Pennsylvania

Application September 30, 1930, Serial No. 485,457

20 Claims. (Cl. 103—89)

My invention relates to propeller type fluid translating apparatus, such as, for example, pumps and blowers and it has for an object to provide apparatus of the character designated which shall operate more effectively, reliably and efficiently than apparatus of this character heretofore provided.

More particularly, my invention relates to propeller type fluid translating apparatus of the type embodying a casing providing a passage having straight and curved portions with a propeller and guide vane structure arranged in the straight portion, and it has for an object to provide the curved portion with a splitter guide vane and to arrange the latter so that the propeller and its guide vane may be readily removed.

In the present application, I provide an improved structure for supporting the guide vane structure in the casing whereby, not only may the same be removed from the casing without involving access to the interior of the latter but, when assembled in the casing, it is so fastened therein that the movement of the fluid through the casing is ineffective to displace the guide vane structure axially of the casing.

It is, therefore, a more particular object of my invention to provide an improved form of securing means for the propeller guide vane structure, which supporting means shall afford ready removal of the guide vane structure from the casing without involving access to the interior of the casing.

In my aforesaid copending application, I also provide, in the discharge or elbow portion of the casing, a splitter guide vane in order that the fluid may circulate through the elbow portion of the casing with a minimum amount of resistance and without the creation of turbulence or eddy currents. In my prior application, the splitter guide vane extends through only part of the elbow portion of the casing in order not to interfere with the removal of the propeller and the splitter guide vane structure.

In the present application, I disclose a form of splitter guide vane structure which may extend throughout the entire elbow portion of the casing and which, at the same time, does not interfere with the removal of the propeller and the propeller guide vane structure. In accordance with the present invention, I provide a fixed splitter guide vane in the discharge end of the elbow portion of the casing, and I further provide a second and complementary splitter guide vane in the remainder of the elbow portion, the latter splitter guide vane being carried by the plug so that, when the plug is removed, that portiton of the splitter guide vane structure in the way of the propeller guide vane structure and the propeller is also removed.

It is, therefore, a more particular object of my invention to provide an improved form of splitter guide vane structure in the elbow or discharge portion of the casing in order to decrease the resistance to the flow of the fluid through the casing and in order to avoid the creation of turbulence or eddy currents.

These and other objects are effected by my invention, as will be apparent from the following description and claims taken in connection with the accompanying drawings, forming a part of this application, in which:

Fig. 1 is an assembly view of one form of fluid translating apparatus or pump arranged in accordance with my invention together with its driving motor;

Fig. 2 is a view, in sectional elevation, of the pump shown in Fig. 1;

Figs. 3 and 4 are partial, sectional views taken on the lines III—III and IV—IV of Fig. 2, respectively;

Fig. 5 is a detail view, in cross section, of the removable plug which is fitted in the pump body;

Fig. 6 is a cross sectional view of the pump plug shown in Fig. 5 and is taken on the line VI—VI of the latter figure;

Fig. 7 is a detail view, in cross section, of the discharge portion of the pump body;

Fig. 8 is a view, in side elevation, of the portion of the pump body shown in Fig. 7;

Fig. 9 is a perspective view of the pump plug looking at the side thereof which forms the fluid passageway through the pump;

Fig. 10 is a perspective view looking at the under side of the plug; and,

Fig. 11 is a view, partly in section and partly in elevation, showing the pump in the process of removal of the internal parts from the pump body.

Referring to Fig. 1, I show an intake tunnel 20, a discharge tunnel 21 and, located between the tunnels, a pump 22. Connected between the intake tunnel 20 and the pump 22 is a valve 23 for isolating the pump from the intake tunnel. Projecting upwardly from the pump is a pump drive shaft 24 which is connected, by means of suitable couplings 25 and a motor drive shaft 26 to a suitable driving motor 27. The latter may be supported upon a foundation separate from the pump, as shown at 28. In order to

support the drive shaft radially, suitable steady bearings 29 are provided while a suitable thrust bearing 29', is embodied in the motor 27 in order to properly support the drive shaft structure in an axial direction.

Referring now to Fig. 2, the pump 22 embodies a casing 30 composed of an inlet section 31 and a discharge section 32 suitably connected together by a circumferentially-extending joint 33. An inlet 34 for the admission of fluid is provided at the lower end of the inlet section 31 while a laterally-projecting outlet 35 is provided in the end of the discharge section 32.

The inlet section 31 of the pump casing embodies a cylindrical inlet portion 36 of uniform bore and a diverging portion 37. The pump drive shaft 24 extends axially through the casing and has connected thereto, in the portion 36 of the casing, a propeller 38. The latter is fixedly secured to the drive shaft 24 by means of a faired nut 39 in a manner well known in the art.

Disposed adjacent to the propeller and on the discharge side thereof is a propeller guide vane structure 41. The latter is composed of an annular hub 42 from which a plurality of circumferentially - spaced, outwardly - extending guide vanes 43 project. As shown in Fig. 11, the latter are so formed that, as the fluid traverses them in a direction from their entrant edges, that is, the edges adjacent the propeller to their discharge edges, that is, the edges remote from the propeller, it is so guided that the twist or swirl imparted to the water by the propeller is removed. For a detailed description of the form of these guide vanes, reference may be had to my copending application, Serial No. 277,650, filed May 14, 1928, entitled Propeller blower and assigned to the Westinghouse Electric and Manufacturing Company.

The outer or circumferential edges of each of the guide vanes 43 are so inclined with respect to the axis of the drive shaft, as to conform with the divergence of the portion 37 of the casing as these edges bear against the inner surface of the casing. I prefer to form the guide vanes 43 and the annular hub 42 as a single or unitary structure composed of some relatively inexpensive metal, such as, for example, cast iron. However, as the edges of the guide vanes bear against the casing, they are equipped, as shown in Fig. 4, with bearing strips 44 of some non-rusting metal, such as, for example, bronze. The bronze strips 44 may be secured to the guide vanes 43 in any approved manner, such as, for example, by welding. Because of the bronze strips 44, the guide vane structure 43 is prevented from adhering to or "freezing" in the casing and, hence, is always readily removable.

The annular hub 42 of the propeller guide vane structure 41 has fitted therein a bearing 45 which coacts with a suitable sleeve 46 provided on the drive shaft 24 to support the latter. It will, therefore, be apparent that, when the guide vane structure 41 is assembled within the casing, it cooperates with the bearing 45 to support the pump shaft in the pump casing, the guide vane structure being peculiarly suitable for this purpose because of the inherent structural rigidity afforded by the vanes and the taper seating fit of the structure with respect to the casing.

As shown particularly in Figs. 7 and 8, the discharge section 32 of the pump casing embodies an axially-extending portion 47 disposed in alignment with the inlet section 31 of the pump casing and an elbow or discharge portion 48 which projects laterally from the axially-extending portion. Fixed in the outlet end of the elbow portion 48 is a curved guide vane 49 which extends, longitudinally, in the direction of the flow of the fluid through the casing, and, transversely, across the diameter of the pump outlet. The entrant end 51 of the guide vane 49 is made arcuate in shape and substantially conforms with the circumference of the cylinder defined by the axially-extending portion of the pump casing. As a result, the guide vane 49 does not obstruct the passage or withdrawal of the propeller guide vane structure 41 and the propeller 38 through the axial bore of the pump body and through the flanged open end 52 of the casing section 32.

Fitted within the open end 52 of the discharge section 32 of the pump casing is a pump plug 53. The latter, as shown particularly in Figs. 2 and 5, is provided with a supporting flange 54 detachably supported upon the flanged opening 52 of the pump casing by some means, such as, for example, bolts 55. The plug 53 embodies an outer cylindrical wall 56 telescopically disposed within the axially-extending portion 47 of the discharge section of the pump casing. The wall 56 is disposed in closely spaced relation with the wall of the pump casing and it is provided with an enlarged diametral portion 57 which closely fits the bore of the pump casing.

The wall 56 extends, in an axial direction, from the upper supporting flange 52 to the intermediate flange 33. Near the upper supporting flange 52, the wall 56 of the plug forms a complete circle while, near the intermediate flange 33, it forms a semi-circle, see Fig. 10. In other words, the wall 56 may be said to be truncated or cut away, as indicated by the line 58 in Fig. 2. In order to close off the open end of the plug 53, the latter is provided with a closure wall 59. This closure wall is so inclined as well as recessed, that its inner surface closes the axially-extending portion of the casing and joins the elbow portion to the axially-extending portion. In other words, the wall 59 is so formed as to maintain a continuity of surface of the elbow portion with the axial portion. The closure wall 59 extends, transversely, between the truncated edges of the annular wall 56 and it is so recessed that, at its central axis, it assumes the position of the line indicated by the reference character 59 in Fig. 2. The plug 53, therefore, cooperates with the casing to provide, in effect, a single, continuous conduit or passage which extends in an axial direction and which then gently curves or bends outward in a lateral or radial direction. In order to accommodate the drive shaft 24, the plug 53 is provided with an axially-extending opening surrounded by an inner, annular wall 60 which joins with the closure wall 59 and which projects outwardly therefrom.

Fitted between the pump shaft 24 and the inner annular wall 60 of the plug 53 is a stuffing box or gland member 62 for preventing leakage of fluid outwardly of the pump casing. Supported upon the inner wall 60 of the plug is an outboard steady bearing 70 for the pump shaft 24.

Supported from the under side of the wall 59 of the plug 53 is a curved splitter guide vane 63. The latter is so positioned and arranged that it cooperates with the splitter guide vane 49 to provide, in effect, a single continuous splitter guide vane extending throughout the entire length of the elbow portion of the casing. As particularly shown in Figs. 6 and 10, the entrant portion 64

of the splitter guide vane 63 extends diametrically across the plug and joins the semi-annular ends of the wall 56.

The discharge edge portion 65 of the splitter guide vane 63 is convex and is made to conform with the concave entrant edge of the guide vane 49. The splitter guide vane 63 is supported from the wall 59 of the plug by means of a boss 66 which is provided with a hollow interior 67 in order to permit passage of the pump drive shaft therethrough. The boss 66, as shown particularly in Fig. 3 is ichthyoidal in cross-section, the major axis extending in the direction of the flow of the fluid so that it offers a minimum amount of resistance to the passage of the fluid. Inasmuch as the boss 66 surrounds the pump drive shaft 24, it serves as a protective casing for the latter.

As shown particularly in Fig. 10, there is formed about the inlet portion of the guide vane 63 an annular projection 68 of the boss 66. The annular projection 68 extends toward the annular hub 42 of the guide vane structure 41 and is disposed in spaced relation with respect thereto. Interposed between the projecting boss 68 and the upper lateral face of the hub member 42 of the guide vane structure is a spring 69 which surrounds the shaft and is so arranged that, when the plug 53 is assembled in the pump casing, it is under compression and, therefore, serves to thrust the guide vane structure 41 into the bore of the diverging portion of the casing.

From the foregoing, it will be apparent that the plug 53 embodies a wall 59 which provides a closure for the casing and which cooperates to form the elbow portion of the casing. The plug 53 also embodies the splitter guide vane 63, which splitter guide vane cooperates to direct the passage of the fluid through the elbow portion. In addition, the plug 53 provides a protective casing for the pump drive shaft 24, which protective casing extends from outside of the wall 59 of the plug to the vicinity of the hub of the propeller guide vane structure 41.

In view of the fact that the inner surface of the annular wall 56 of the plug conforms with the bore 71 of the pump body, the bore 72 of the lower end of the discharge section of the pump casing is necessarily of larger diameter than the bore 71. As stated heretofore, the wall 56 is semi-circular in shape at its end adjacent the intermediate joint 33. I, therefore, provide a semi-circular filler piece 73 having a tapered bore, one end of which conforms with the casing section 31 and the other end of which approaches the bore of the casing section 32. The filler piece 73 serves to avoid any sudden enlargement of the flow passage of the pump and any resultant eddying of the fluid passing through the pump.

The operation of my apparatus will be apparent from the foregoing description. Upon the motor 27 being energized, the motor shaft 26 and the pump shaft 24 is rotated. Rotation of this shafting structure effects rotation of the propeller 38 and the fluid is circulated from the inlet 34 toward the outlet 35. As shown, the elbow portion of the pump body is fitted with a stationary splitter guide vane structure which extends substantially throughout the entire length of the elbow portion in order that the fluid may pass through the latter portion with little disturbance and without eddy or shock losses. The propeller guide vane structure 41 serves to remove the twist or swirl from the water as it is discharged from the propeller and before it reaches the elbow portion of the casing. Leakage of water out of the pump casing around the drive shaft 24 is prevented by the gland 62.

The drive shaft structure embodying the pump shaft 24 and the motor shaft 26 is very effectively supported by the thrust bearing 29' embodied in the motor 27 and by the steady bearings 29 located between the pump and the motor and by the bearings 45 and 70 in the pump. The guide vane structure 41 is fitted within the portion 37 of the pump casing and, as the latter portion diverges in the direction of flow, the velocity of the fluid discharged by the propeller and passing through this portion is reduced and some of the velocity energy of the water is converted into energy in the form of increased static pressure.

In order to effect disassembly of the pump, the coupling 25 is disconnected and the motor shaft 26 removed. The bolts 55 may then be disconnected and the tension on the spring 69 may, in some instances, raise the plug a slight distance. After removal of the plug, the drive shaft 24 together with the propeller guide vane structure 41 and the propeller 38 assembled thereon may be withdrawn, as a single assembly, through the opening 52 of the pump casing (see Fig. 11). My arrangement is such that, even though I provide a guide vane extending throughout the elbow portion of the casing, nevertheless, a portion of this guide vane structure is removable with the plug so that the guide vane structure does not, in any way, interfere with the removal of the propeller guide vane structure and the propeller. Furthermore, inasmuch as the propeller guide vane structure 41 is freely supported in the casing, it may be removed without involving access to the interior of the casing. However, the arrangement is such that, when the pump is assembled, the spring 69 serves to retain the propeller guide vane structure 41 on its seat as provided by the diverging portion 37 of the casing so that the energy of the fluid flowing through the pump casing is unable to dislocate the propeller guide vane structure.

While I have disclosed the present embodiment of my invention with particular reference to its application as a pump, it is to be understood that apparatus of the foregoing character is equally well adapted for translating gaseous media as well as liquid media, and, while I have shown the axial portion of the pump as disposed in a vertical position, it will be apparent that the form of pumping apparatus disclosed is equally effective in other positions.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications, without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

What I claim is:

1. In fluid translating apparatus, the combination of a casing having an axially-extending portion and an intersecting elbow portion projecting laterally from the axially-extending portion and forming with one end of the latter a fluid passageway, a removable closure member provided in the other end of the axially-extending portion of the casing, a propeller for circulating fluid through the passageway, and a sectional, curved guide vane structure disposed in the elbow portion of the passageway and extending in the direction of fluid flow, one section of said guide vane structure being fixed in the casing and the other

section of said guide vane structure being removable through the end of the casing provided with the removable closure member.

2. In fluid translating apparatus, the combination of a casing having an axially-extending portion and an intersecting elbow portion projecting laterally from the axially-extending portion and forming with one end of the latter a fluid passageway, a removable closure member provided in the other end of the axially-extending portion of the casing, said removable closure member embodying a semi-annular wall telescopically disposed within the axially-extending portion of the casing and located adjacent to the inner surface thereof, a guide vane disposed diametrically across part of the elbow portion of the fluid passageway, said guide vane being curved in the direction of the passage and said guide vane joining, at one end portion thereof, the marginal end portions of the semi-annular wall, and a propeller disposed in the casing for circulating fluid through the passageway.

3. In fluid translating apparatus, the combination of a casing having an axially-extending portion and an intersecting elbow portion projecting laterally from the axially-extending portion and forming with one end of the latter a fluid passageway, a removable closure member provided in the other end of the axially-extending portion of the casing, a propeller disposed in the casing for circulating fluid through the passageway, said removable closure member embodying a truncated, annular wall telescopically disposed within the axially-extending portion of the casing and a transversely-disposed wall joining the truncated marginal portions of the annular wall, said transverse wall being so inclined and so recessed as to define a portion of the elbow portion of the fluid passageway, a curved guide vane disposed in the elbow portion of the fluid passageway, said guide vane extending diametrically across the passageway and joining, at one end thereof, opposite sides of the truncated annular wall, and a boss disposed centrally of the fluid passageway and extending between the transverse wall and the guide vane for supporting the latter.

4. In fluid translating apparatus, the combination of a casing, a removable closure member provided in the casing, a propeller for circulating fluid through the casing, a guide vane structure disposed adjacent to the propeller for removing the twist or swirl from the fluid circulated thereby, a seat for the propeller guide vane structure formed in the casing, and means responsive to assembly of the removable closure member in the casing for retaining the propeller guide vane structure in fixed position upon its seat.

5. In fluid translating apparatus, the combination of a casing, a removable closure member provided in the casing, a propeller for circulating fluid through the casing, a guide vane structure disposed adjacent to the propeller for removing the twist or swirl of the fluid circulated thereby, a seat for the propeller guide vane structure formed in the casing, and flexible means interposed between the removable closure member and the propeller guide vane structure for retaining the latter in fixed axial position upon its seat.

6. In fluid translating apparatus, the combination of a casing forming a fluid passageway, a removable closure member provided in the casing, a propeller disposed in the casing for circulating fluid through the passageway, a drive shaft projecting through the removable closure member and secured to the propeller, a guide vane structure freely assembled upon the drive shaft, seating means for the guide vane structure embodied in the casing, and resilient means interposed between the removable closure member and the guide vane structure for retaining the latter in position upon its seating means.

7. In fluid translating apparatus, the combination of a casing forming a fluid passageway, a removable closure member provided in the casing, a propeller disposed in the casing for circulating fluid through the passageway, a shaft projecting through the removable closure member and connecting with the propeller, a guide vane structure disposed adjacent to the propeller, said guide vane structure embodying a central annulus member surrounding the drive shaft and a plurality of circumferentially-spaced, radially-extending guide vanes, means providing a seat for the guide vane structure in the casing, and means responsive, upon assembly of the removable closure member in the casing, for retaining the guide vane structure in fixed axial position upon its seat.

8. In fluid translating apparatus, the combination of a casing forming a fluid passageway, a removable closure member provided in the casing, a propeller disposed in the casing for circulating fluid through the passageway, a drive shaft projecting through the removable closure member and secured to the propeller, a guide vane structure disposed adjacent to the propeller, said guide vane structure embodying a central annulus member surrounding the drive shaft and a plurality of circumferentially-spaced, radially-projecting guide vanes, a bearing for the drive shaft disposed in the central annulus member of the guide vane structure, a seat embodied in the casing for the guide vane structure, and a compression spring surrounding the drive shaft and interposed between the removable closure member and the guide vane structure for retaining the latter in position upon its seat.

9. In fluid translating apparatus, the combination of a casing having an opening for facilitating assembly and disassembly of the apparatus, said casing embodying a cylindrical, divergent wall portion, a detachable closure for the opening in the casing, a propeller disposed within the casing for circulating fluid therethrough, a drive shaft for the propeller extending through the detachable closure into the casing, means for fixedly securing the propeller to the drive shaft, a guide vane structure for removing the twist or swirl from the fluid circulated by the propeller, said guide vane structure embodying a central hub portion encompassing the drive shaft and a plurality of circumferentially-spaced guide vanes having their outer tip portions directly engaging the diverging wall portion of the casing and means for axially biasing the guide vane structure to maintain said outer tip portions in engagement with the diverging wall portion against the force of fluid flow, said drive shaft, propeller and guide vane structure being removable with the detachable closure as a single assembly.

10. In fluid translating apparatus, the combination of a casing having an axially-extending portion and an intersecting elbow portion projecting laterally from the axially-extending portion and forming with one end of the latter a fluid passageway, a removable closure member pro-

vided in the other end of the axially-extending portion of the casing, a propeller in the passageway for circulating fluid therethrough, a drive shaft for the propeller extending through the removable closure member into the casing, a removable guide vane structure disposed in the passageway adjacent to the propeller, the portion of the casing surrounding the guide vane structure being of divergent form, said guide vane structure embodying a central hub member and a plurality of circumferentially-spaced guide vanes projecting radially from the hub member and having their tip portions bearing directly against the divergent portion of the casing, said guide vane structure being freely assembled on the drive shaft adjacent to the propeller and being disposed in and freely supported by the divergent portion of the casing, and means for applying force axially against the guide vane structure to maintain the tip portions thereof firmly in said divergent portion against the force of the flow of fluid through the passageway.

11. In fluid translating apparatus, a casing providing a passage having straight and curved portions and having an opening extending through the wall thereof, said opening being axially alined with the straight portion of the passage, a removable closure member closing the opening and connected to the casing, said closure member having an inner curved surface which, when the closure member is in place, forms an element of the curved surface of the curved portion of the passage, a drive shaft extending through said closure member into the straight portion of the passage, a propeller connected to the drive shaft and insertable and removable through said opening, and means for reducing turning losses in the curved portion of the passage including a splitter vane carried by the closure member and curved correspondingly to the curvature of the passage, said splitter vane being constructed and arranged to pass through said opening incident to removal or assembly of the closure member.

12. In fluid translating apparatus, a casing providing a passage having straight and curved portions; means carried by the casing and defining a socket which opens into said passage and which is axially alined with the straight portion of the latter; said socket including internal guiding and positioning surfaces; a plug having external guiding and positioning surfaces cooperating with the internal guiding and positioning surfaces of the socket and having an inner curved surface which forms an element of the curved surface of the curved portion of the passage; a drive shaft extending through the plug; a propeller connected to the drive shaft and disposed in the straight portion of said passage; said propeller being insertable into and removable from the passage through said socket; and means for reducing turning losses in the curved portion of the passage including a splitter vane carried by the plug; said splitter vane having its boundaries within the projected area of the socket opening to provide for insertion and removal thereof through the latter.

13. In fluid translating apparatus, a casing providing a passage having straight and curved portions and having an opening extending through the wall thereof, said opening being axially alined with the straight portion of the passage, a removable closure member for said opening, a propeller in the straight portion of said passage, and a sectional, curved splitter guide vane structure disposed in the curved portion of the passage and extending in the direction of fluid flow, one section of said splitter guide vane structure being fixed in the casing and the other section of said guide vane structure being carried by the closure member and being removable and insertable therewith through said opening.

14. The combination as claimed in claim 13 wherein the splitter guide vane sections are disposed in end-to-end relation and together extend for substantially the full length of the curved portion of the passage.

15. The combination as claimed in claim 13 wherein the adjacent ends of the splitter guide vane sections are interfitted, the removable section having a convex end fitting a concave end of the fixed section.

16. In fluid translating apparatus, a casing providing a passage having straight and curved portions and having an opening extending through the wall thereof; said opening being axially aligned with the straight portion of the passage and extending through the curved-passage-defining portion of the wall; a closure member for said opening having an inner curved surface which is an element of the surface defining the curved passage; an extension springing from the curved surface of the closure member; a splitter vane carried by the extension; said splitter vane extending diametrically of the passage and normally with respect to the plane of the curved axis of the passage and being curved lengthwise conformably to the curvature of the latter; said closure member, the extension, and the splitter vane having an opening extending therethrough and co-axial with the straight portion of the passage; a shaft extending through the last-named opening; a propeller disposed in the straight portion of said passage and connected to the shaft; a guide vane structure peripherally fitting interiorly of the straight portion of said passage and disposed between the propeller and the splitter vane; and bearings for the drive shaft carried by the guide vane structure and by said cover member; said propeller, the guide vane structure, and the splitter vane being insertable and removable through the opening in said casing wall.

17. The combination as claimed in claim 16 wherein the extension for supporting the splitter vane is streamlined in the plane of the curved axis.

18. In fluid translating apparatus, a casing having an opening for facilitating assembly and disassembly of the apparatus; said casing embodying a cylindrical wall portion which diverges toward said opening; a detachable closure for the opening in the casing; a propeller disposed within the casing for circulating fluid therethrough; a drive shaft for the propeller extending through the detachable closure into the casing; means for fixedly securing the propeller to the drive shaft; a structurally rigid guide vane structure having a central hub and peripherally fitting said divergent wall portion and centered by the latter, the guide vane structure being disposed adjacent to the propeller for removing the twist or swirl from the fluid circulated by the latter; and bearing means for said drive shaft including a bearing provided by the hub of said guide vane structure; said drive shaft, propeller, and guide vane structure comprising an aggregate removable and insertable through said opening.

19. In fluid translating apparatus, a casing providing a passage having straight and curved portions and having an opening extending

through the wall thereof; said opening being axially aligned with the straight portion of the passage and the straight portion of the passage diverging toward the opening; a removable closure member closing the opening and connected to the casing; said closure member having an opening axially aligned with the straight portion of said passage; a drive shaft extending through said closure member opening; a peripherally divergent and structurally rigid guide vane structure seated interiorly of the divergent portion of the passage; a propeller connected to the drive shaft at the side of the guide vane structure remote from said closure member; a splitter vane carried by the closure member and curved correspondingly to the curved passage portion; and bearing means for the drive shaft including a bearing carried by the guide vane structure; said splitter vane, the guide vane structure, the propeller, the closure member and the drive shaft comprising an aggregate insertable in and removable from the casing wall opening.

20. In fluid translating apparatus, a casing providing a passage having a lower vertical straight portion and an upper curved portion and having an opening through the wall thereof, said vertical portion of the passage having at least a part thereof which diverges upwardly and said opening being axially aligned therewith, a removable closure member closing the opening and connected to the casing and having an inner surface which is an element of the wall surface of said curved portion of the passages, said closure member having a vertical opening axially aligned with the vertical portion of the passage, a vertical shaft extending through said opening, a structurally rigid guide vane structure fitting the divergent part of said passage and centered by the latter, a propeller connected to the lower end of the shaft below the guide vane structure, and bearing means for the drive shaft including a bearing carried by said guide vane structure, said guide vane structure and the propeller being insertable and removable through said casing wall opening, and a removable splitter guide vane disposed in the curved portion of the passage and supported from the closure member and having its boundary within the projected area of said opening.

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