

DESCRIPTION**CASING FOR USE IN FLUID MACHINERY****Technical Field**

5 The present invention relates to a casing for use in fluid machinery and for containing therein fluid to be handled by the fluid machinery, and more particularly to a casing having means for taking out fluid pressure, i.e., means for mounting a pressure gauge.

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Background Art

 According to the structure of fluid machinery, it is often difficult to provide means for mounting a pressure gauge. There has been proposed an in-line pump in Japanese laid-open patent
15 publication No. 6-88589 by the applicant of the present application. The pumps are usually delivered in such a state that a threaded hole for measuring a discharge pressure is formed in each of the pumps and is closed by a plug.

 However, if the threaded hole for measuring a discharge
20 pressure is formed in the pump disclosed in the Japanese laid-open patent publication No. 6-88589, the following problems will occur:

 (1) It is necessary to provide a socket (a pipe for taking out fluid pressure) to thus enlarge a dimension between a suction
25 flange and a discharge flange.

 (2) It is necessary to form a hole or a seat for mounting the socket in the sheet-metal casing (manufactured by a press forming), and hence a common casing cannot be used in a

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suction-side casing and a discharge-side casing. Therefore, the advantages of the press forming that as the number of the same components increases, the manufacturing cost is reduced cannot be effectively utilized.

5 It is therefore an object of the present invention to provide a casing for use in fluid machinery which has means for taking out fluid pressure without making the outside dimension of the fluid machinery large.

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Disclosure of Invention

 According to a first aspect of the present invention, there is provided a casing for use in fluid machinery and for containing fluid therein, the casing comprising: a nozzle for receiving fluid to be handled by the fluid machinery or discharging the
15 fluid; a flange removably mounted on an outer circumferential portion of the nozzle for fixing the nozzle to an external component; a pipe for taking out fluid pressure, the pipe being attached from an outer circumferential side of the nozzle; and a through-hole or a notch formed in the flange for allowing the
20 pipe to pass therethrough.

 According to a second aspect of the present invention, there is provided a casing for use in fluid machinery and for containing fluid therein, the casing comprising: a nozzle for receiving fluid to be handled by the fluid machinery or
25 discharging the fluid; a flange removably mounted on an outer circumferential portion of the nozzle for fixing the nozzle to an external component; and a pipe for taking out fluid pressure, the pipe being attached from an outer circumferential side of

the nozzle; wherein positioning of the nozzle and the flange is conducted by the pipe.

According to a third aspect of the present invention, there is provided a casing for use in fluid machinery and for containing fluid therein, the casing comprising: a nozzle for receiving
5 fluid to be handled by the fluid machinery or discharging the fluid; a flange removably mounted on an outer circumferential portion of the nozzle for fixing the nozzle to an external component; a pipe for taking out fluid pressure, the pipe being
10 attached from an outer circumferential side of the nozzle; and a casing body provided at an axial end of the nozzle and unremovably fixed to the nozzle; wherein the pipe is attached to an outer circumferential portion of the nozzle.

The present invention is particularly effective for a pump
15 comprising a casing body made of sheet metal of stainless steel, a nozzle manufactured by casting, made of stainless steel for receiving fluid to be handled or discharging the fluid and welded to the casing body, a flange mounted on an outer circumference of the nozzle by screw engagement, and a casing flange manufactured
20 by aluminum die casting and being a loose-type ring for mounting the casing body on a fluid machine body.

The above selection of the material aims at using the right material in the right place. To be more specific, the place (or portion) which contacts liquid is formed by stainless steel,
25 and the place (or portion) which does not contact liquid is formed by cast iron or aluminum die casting which is inexpensive material. Further, by using cast iron as material for the flange, it is possible to ensure high rigidity against piping load.

According to the first aspect of the present invention, the port for taking out fluid pressure can be provided without making the outer dimension of the pump large.

Further, according to the second aspect of the present invention, the flange can be positionally fixed by the pipe for taking out fluid pressure. For example, in FIG. 1 of the present invention, the suction flange provided at the suction-side of the pump is only threaded over the suction nozzle, and the angular positions of the bolt holes can be freely set. In other words, the above positioning is required to be carried out at the time of installation of the pump. In the present invention, after the flange is threaded over the nozzle, positioning of the flange and the nozzle can be conducted by using the pipe for taking out fluid pressure, and hence their positioning is not required at the time of installation.

According to the third aspect of the present invention, it is possible to use a common casing body, and advantages of press forming in productivity can be effectively utilized.

In a preferred aspect of the present invention, since the pipe for taking out fluid pressure is disposed at the position where the portion having the maximum outer diameter in the discharge flange is not located, it is possible to make the pipe short. Since the pipe constitutes a liquid-contacting portion, expensive material such as stainless steel is usually used. Therefore, the shorter the pipe becomes, the better.

In a preferred aspect of the present invention, the leg is provided on the flange. In the case where the leg is provided on the flange, it is effective to position the flange by the

pipe. That is, if there is no means for positioning the flange, the position of the frequency converter cannot be reliably fixed.

In a preferred aspect of the present invention, the loose-type casing flange is provided to fix the casing body to the fluid machine body, and the outer diameter of the flange is larger than the inner diameter of the casing flange. If there is provided the casing flange, the flange is necessarily dismantled or mounted.

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Brief Description of Drawings

FIG. 1 is a cross-sectional view showing a full-circumferential in-line pump having a casing for use in fluid machinery according to an embodiment of the present invention;

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FIG. 2 is a cross-sectional view taken along line II - II of FIG. 1;

FIG. 3 is a side view as viewed from an arrow III;

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FIGS. 4A and 4B are views showing the relationship between a nozzle, a flange and a pipe for taking out fluid pressure in the casing for use in fluid machinery according to an embodiment of the present invention;

FIGS. 5A and 5B are views showing the relationship between a nozzle, a flange and a pipe for taking out fluid pressure in the casing for use in fluid machinery according to another embodiment of the present invention;

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FIGS. 6A and 6B are views showing the relationship between a nozzle, a flange and a pipe for taking out fluid pressure in the casing for use in fluid machinery according to still another embodiment of the present invention; and

FIGS. 7A and 7B are views showing the relationship between a nozzle, a flange and a pipe for taking out fluid pressure in the casing for use in fluid machinery according to still another embodiment of the present invention.

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Best Mode for Carrying Out the Invention

A casing for use in fluid machinery according to an embodiment of the present invention will be described with reference to FIGS. 1 through 4. FIG. 1 is a cross-sectional view showing a full-circumferential in-line pump having a casing for use in fluid machinery according to the present invention, FIG. 3 is a cross-sectional view taken along line II-II of FIG. 1, and FIG. 3 is a view as viewed from an arrow III of FIG. 1.

A full-circumferential-flow pump of this embodiment comprises a pump casing 1, a canned motor 6 housed in the pump casing 1, and an impeller 8 fixedly mounted on a main shaft 7 of the canned motor 6. The pump casing 1 comprises an outer cylinder 2, a suction-side casing 3 connected to an axial end of the outer cylinder 2 by casing flanges 61, 62, and a discharge-side casing 4 connected to an opposite axial end of the outer cylinder 2 by flanges 61, 62. The casing flanges 61 and 62 constitute the loose-type casing flanges for fixing the suction-side casing 3 and the discharge-side casing 4 to the outer cylinder 2. Each of the outer cylinder 2, the suction-side casing 3, and the discharge-side casing 4 is made of a pressed sheet of stainless steel or the like.

A bracket 45 is attached to the outer surface of the outer cylinder 2. A frequency converter assembly 50 is mounted on the

bracket 45. The frequency converter assembly 50 comprises a base 46 attached to the bracket 45, a cover 47 attached to the base 46, and a frequency converter 48 housed in the base 46 and the cover 47.

5 The bracket 45 has a through hole 45a for allowing leads for connecting the canned motor 6 and the frequency converter 48 to pass therethrough. The bracket 45, the base 46 and the cover 47 are composed of thermally good conductor such as aluminum alloy.

10 The canned motor 6 comprises a stator 13, an outer motor frame barrel 14 fixedly fitted over the stator 13, a pair of motor frame side plates 15, 16 welded to respective opposite open ends of the outer motor frame barrel 14, and a can 17 fitted in the stator 13 and welded to the motor frame side plates 15, 16. The
15 canned motor 6 also has a rotor 18 rotatably disposed in the stator 13 and shrink-fitted over the main shaft 7. An annular fluid passage 40 is formed between the outer motor frame barrel 14 and the outer cylinder 2.

20 Further, a guide device 11 for guiding fluid from a radially outer direction toward a radially inner direction is held by the motor frame side plate 16. An inner casing 12 for housing an impeller 8 therein is fixed to the guide device 11. A sealing member 13 is provided on the outer periphery of the guide device 11.

25 A liner ring 51 is mounted on a radially inner end of the guide device 11 and is in slide contact with the forward end (suction mouth) of the impeller 8. The inner casing 12 has a dome-like shape so that it covers the end of the main shaft 7 of the canned motor 6. The inner casing 12 has a guide device

12a comprising a guide vane or a volute for guiding fluid discharged from the impeller 8. The inner casing 12 has a vent hole 12b at the forward end thereof.

A cable housing 20 is welded to the outer motor frame barrel 14. Leads from coils disposed in the outer motor frame barrel 14 are extended through the cable housing 20, the through hole 45a of the bracket 45 and a lead hole 46a of the base 46, and connected to the frequency converter 48 in the base 46 and the cover 47. Further, a cable is introduced into the base 46 and connected to leads of the frequency converter 48 in the base 46 and the cover 47. The outer cylinder 2 has a hole 2a into which the cable housing 20 is inserted.

Next, a bearing assembly at the impeller side will be described. A radial bearing 22 and a stationary thrust bearing 23 are mounted on a bearing bracket 21. The radial bearing 22 has an end which serves as a stationary thrust sliding member. A rotary thrust bearing 24 and a rotary thrust bearing 25 each serving as a rotary thrust sliding member are disposed one on each side of the radial bearing 22 and the stationary thrust bearing 23. The rotary thrust bearing 24 is secured to a thrust disk 26 which is fixed to the main shaft 7 through a key. The rotary shaft bearing 25 is secured to a thrust disk 27 which is fixed to the main shaft 7 through a key.

The bearing bracket 21 is inserted in a socket defined in the motor frame side plate 16 through a resilient O-ring 29. The radial bearing 22 slidably supports a sleeve 31 which is fitted over the main shaft 7.

Next, a bearing assembly at the opposite side of the impeller

will be described. A radial bearing 33 is mounted on a bearing bracket 32, and slidably supports a sleeve 34 which is fitted over the main shaft 7. The sleeve 34 is axially held against a washer 35 which is fixed to the main shaft 7 by a double nut 36 threaded over an externally threaded surface on an end of the main shaft 7. The bearing bracket 32 is inserted in a socket defined in the motor frame side plate 15 through a resilient O-ring 37. Stays 43 are welded to the outer motor frame barrel 14, and the stays 43 and the outer cylinder 2 are welded together. The rotational speed of the canned motor is set to 4,000 rpm or more by the frequency converter 48.

Next, a method for fixing a pipe for taking out fluid pressure will be described with reference to FIGS. 1, 3 and 4. FIGS. 4A and 4B are views showing the relationship between a discharge nozzle, a flange and a pipe for taking out fluid pressure, FIG. 4A is a cross-sectional view, and FIG. 4B is a top plan view. A discharge nozzle 70 is fixed by welding to the discharge-side casing 4 constituting a casing body. The discharge nozzle 70 comprises an annular member having a large diameter and a thick thickness as shown in FIGS. 4A and 4B. The discharge nozzle 70 is made of the same material, such as stainless steel, as the casing body, and has an opening 70a constituting a nozzle port, a male screw 70b and a front surface constituting a sealing surface 70s mating with another flange (not shown). That is, the outer circumferential portion of the discharge nozzle 70 constitutes an outer diameter of the sealing surface. On the other hand, a discharge flange 71 fixed to the discharge nozzle 70 is made of material, such as cast iron (FC), different from the casing body,

and has at its inner end a female screw 71a into which the discharge nozzle 70 is threaded. The discharge nozzle 70 has a flat upper end which is formed by chamfering as shown in FIG. 3. Further, the discharge flange 71 has an integrally formed leg 71L for
5 installation.

The discharge nozzle 70 has a threaded through-hole 70c, and the discharge flange 71 has a through-hole 71b. The pipe 72 for taking out fluid pressure is inserted into the through-hole 71b, and the forward end of the pipe 72 is threaded into the threaded
10 through-hole 70c of the discharge nozzle 70. A plug 73 is removably attached to the pipe 72. The pipe 72 is mounted on the flat upper end of the discharge flange 71 so as to avoid the location of the maximum outer diameter of the discharge flange 71. By removing the plug 73 from the pipe 72 and then attaching a pressure gauge
15 to the pipe 72, a discharge pressure of the pump can be measured.

Further, as shown in FIG. 1, a suction nozzle 74 is fixed to the suction-side casing 3 constituting a casing body, and a suction flange 75 is fixed to the suction nozzle 74. The suction flange 75 has an integrally formed leg 75L. The outer diameters
20 of the discharge flange 71 and the suction flange 75 are larger than the inner diameters of the casing flanges 61 and 62.

Operation of the full-circumferential-flow pump shown in FIG. 1 will be described below.

A fluid drawn into the suction-side casing 3 from the
25 suction nozzle 74 flows into the annular fluid passage 40 defined between the outer cylinder 2 and the outer motor frame barrel 14 through the suction-side casing 3. Then, the fluid is introduced into the impeller 8 through the annular fluid passage

40 and the guide device 11. The fluid discharged from the impeller 8 is discharged through the guide device 12a from the discharge nozzle 70 which is connected to the discharge-side casing 4.

5 The present invention is particularly effective for the pump which comprises the suction-side casing 3 and the discharge-side casing 4 each constituting a casing body, the suction nozzle 74 and the discharge nozzle 70 manufactured by casting, made of stainless steel and welded to the casing body,
10 the suction flange 75 and the discharge flange 71 made of cast iron and fixed to the suction nozzle 74 and the discharge nozzle 70, respectively, by screw engagement, and the casing flanges 61 and 62 manufactured by aluminum die casting and being a loose-type ring for mounting the suction-side casing 3 and the
15 discharge-side casing 4 on the canned motor 6 having the annular fluid passage 40.

 The above selection of the material aims at using the right material in the right place. To be more specific, the place (or portion) which contacts liquid is formed by stainless steel,
20 and the place (or portion) which does not contact liquid is formed by cast iron or aluminum die casting which is inexpensive material. Further, by using cast iron as material for the flange, it is possible to ensure high rigidity against piping load (or piping force).

25 The casing of the present invention includes the discharge nozzle 70 for discharging liquid to be handled by the pump to the exterior of the system, the discharge flange 71 for fixing the discharge nozzle 70 to an external component such as a pipe,

the pipe 72 for taking out fluid pressure which is attached from the outer circumferential side of the discharge nozzle 70, and the through-hole 71b formed in the discharge flange 71 for allowing the pipe 72 to pass therethrough. Thus, it is possible to provide the port for taking out fluid pressure without making the outside dimension of the pump large.

According to the casing of the present invention, positioning of the discharge nozzle 70 and the discharge flange 71 can be made by using the pipe 72 for taking out fluid pressure. For example, in FIG. 1 of the present invention, the suction flange 75 provided at the suction-side of the pump is only threaded over the suction nozzle 74, and the angular positions of the bolt holes can be freely set. In other words, the above positioning is required to be carried out at the time of installation of the pump. In case of the discharge flange 71 at the discharge-side of the pump, after the discharge flange 71 is threaded over the discharge nozzle 70, positioning of the discharge flange 71 and the discharge nozzle 70 can be made by using the pipe 72 for taking out fluid pressure, and hence their positioning is not required at the time of installation of the pump.

The casing of the present invention includes the discharge nozzle 70 for discharging liquid to be handled by the pump to the exterior of the system, the discharge flange 71 removably mounted on the outer circumferential portion of the discharge nozzle 70 for fixing the discharge nozzle 70 to the external component, the pipe 72 for taking out fluid pressure which can be mounted on the discharge nozzle 70 from the outer

circumferential side of the discharge nozzle 70, and the discharge-side casing 4 which constitutes a casing body and is unremovably fixed to the discharge nozzle 70. The pipe 72 for taking out fluid pressure is mounted on the outer circumferential portion of the discharge nozzle 70. Therefore, it is possible to use a common casing for the discharge-side casing 4 and the suction-side casing 3, and hence advantages of the press forming in productivity can be effectively utilized.

According to one aspect of the present invention, since the pipe 72 for taking out fluid pressure is disposed at the position where the portion having the maximum outer diameter in the discharge flange 71 is not located, it is possible to make the pipe 72 short. Since the pipe 72 constitutes a liquid-contacting portion, expensive material such as stainless steel is usually used. Therefore, the shorter the pipe becomes, the better.

According to one aspect of the present invention, in the case where the leg 71L is provided on the discharge flange 71, it is effective to position the discharge flange 71 by the pipe 72. That is, if there is no means for positioning the discharge flange 71, the position of the frequency converter cannot be reliably fixed.

According to one aspect of the present invention, the loose-type casing flanges 61 and 62 are provided to fix the discharge-side casing 4 and the suction-side casing 3 each constituting the casing body to the fluid machine body comprising the canned motor 6, the outer cylinder 2 and the like, and the outer diameters of the discharge flange 71 and the suction flange

75 are larger than the inner diameters of the casing flanges 61 and 62. If there are provided the casing flanges 61 and 62, the discharge flange 71 and the suction flange 75 are necessarily dismounted or mounted. Since the discharge flange 71 and the suction flange 75 are fixed by screw engagement to the discharge nozzle 70 and the suction nozzle 74, respectively, they can be easily dismounted or mounted.

FIGS. 5 through 7 are views showing other embodiments in which the pipe for taking out fluid pressure is attached.

10 In FIGS. 5 through 7, FIGS. 5A, 6A and 7A are a cross-sectional view, respectively, and FIGS. 5B, 6B and 7B are a top plan view, respectively.

In an embodiment shown in FIGS. 5A and 5B, a notch 71c is formed in the discharge flange 71, and the pipe 72 for taking out fluid pressure is inserted into the notch 71c. Other structure of this embodiment is the same as the embodiment shown in FIGS. 1 through 4.

In an embodiment shown in FIGS. 6A and 6B, a notch 71d is formed in the discharge flange 71, and the pipe 72 for taking out fluid pressure is inserted into the notch 71d. The direction of the notch 71d is opposite to that of the notch 71c shown in FIGS. 5A and 5B.

In an embodiment shown in FIGS. 7A and 7B, a fixing band 76 is attached to the discharge flange 71. The pipe 72 for taking out fluid pressure is inserted in the fixing band 76. Other structure of this embodiment is the same as the embodiment shown in FIGS. 1 through 4.

As described above, according to the present invention,

a casing having means for taking out fluid pressure can be provided, without making an outside dimension of a fluid machine large.

Further, according to the present invention, a common
5 casing can be used for a suction-side casing and a discharge-side casing, and hence advantages of press forming in productivity can be effectively utilized.

Industrial Applicability

10 The present invention relates to a casing which is preferably used in a pump. The pump can pump various kinds of liquids including water, and can be utilized in buildings, or the chemical industry and the like.

CLAIMS

1. A casing for use in fluid machinery and for containing fluid therein, the casing comprising:

5 a nozzle for receiving fluid to be handled by said fluid machinery or discharging said fluid;

a flange removably mounted on an outer circumferential portion of said nozzle for fixing said nozzle to an external component;

10 a pipe for taking out fluid pressure, said pipe being attached from an outer circumferential side of said nozzle; and

a through-hole or a notch formed in said flange for allowing said pipe to pass therethrough.

15 2. A casing for use in fluid machinery and for containing fluid therein, the casing comprising:

a nozzle for receiving fluid to be handled by said fluid machinery or discharging said fluid;

20 a flange removably mounted on an outer circumferential portion of said nozzle for fixing said nozzle to an external component; and

a pipe for taking out fluid pressure, said pipe being attached from an outer circumferential side of said nozzle;

25 wherein positioning of said nozzle and said flange is conducted by said pipe.

3. A casing for use in fluid machinery and for containing fluid therein, the casing comprising:



a nozzle for receiving fluid to be handled by said fluid machinery or discharging said fluid;

a flange removably mounted on an outer circumferential portion of said nozzle for fixing said nozzle to an external
5 component;

a pipe for taking out fluid pressure, said pipe being attached from an outer circumferential side of said nozzle; and

a casing body provided at an axial end of said nozzle and unremovably fixed to said nozzle;

10 wherein said pipe is attached to an outer circumferential portion of said nozzle.

4. A casing according to any one of claims 1 to 3, wherein said nozzle and said flange are removable by screws
15 formed on an outer circumference of said nozzle and formed on an inner circumference of said flange.

5. A casing according to any one of claims 1 to 4, wherein said pipe is disposed at a position where a portion having
20 a maximum diameter of said flange is not located.

6. A casing according to any one of claims 1 to 5, wherein said flange has a leg for installation.

25 7. A casing according to any one of claims 3 to 6, further comprising a loose-type casing flange for fixing said casing body to a fluid machine body;

wherein an outer diameter of said flange is larger than



an inner diameter of said casing flange.

8. A pump comprising:

a casing according to anyone of claims 1 to 7;

5 an impeller housed in said casing;

a main shaft for supporting said impeller; and

a motor for rotating said main shaft.



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