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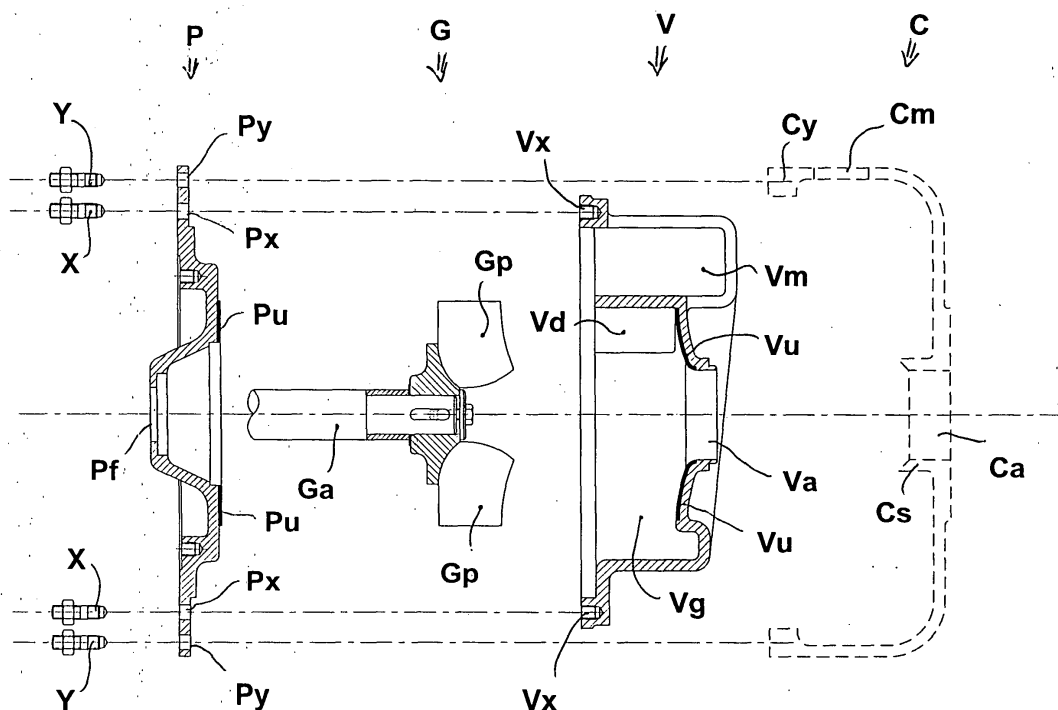
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AL LT LV MK(30) Priority: **23.01.2003 IT PD20030010**(71) Applicant: **Viesse Pompe S.r.l.****35030 Saccolongo (PD) (IT)**(72) Inventor: **Todeschini, Agostino****35030 Saccolongo (PD) (IT)**(74) Representative: **Gustorf, Gerhard, Dipl.-Ing.****Patentanwalt,****Bachstrasse 6 A****84036 Landshut (DE)****(54) Modular centrifugal pump casing**

(57) The invention is a new modular centrifugal pump comprising a disc (P) that joins the various parts and connects them with the motor part, to which a single scroll (V) containing the impeller (G) is applied, and a further external shell (C) having different shapes and characteristics according to the different uses for which

the pump is destined. The connection disc (P), the impeller (G) and the scroll (V) constitute the common hydraulic part for the various types of pumps. The various external shells (C), suitable for being coupled with the scroll (V) and/or the connection disc (P), have different shapes and/or unions (Ca, Cm) according to the final use for which the pump is destined.

**Fig. 1****EP 1 441 130 A2**

Description

[0001] This patent concerns centrifugal pumps.

[0002] The centrifugal single-impeller pumps used at present fundamentally comprise a substantially scroll-shaped casing housing a bladed impeller with substantially radial septa.

[0003] The pump casing is provided with suitable unions for the connection with the suction pipe and with the delivery pipe. In particular, suction takes place axially with respect to the impeller, while delivery is tangential to the impeller.

[0004] Various types of centrifugal pumps are known and used according to the needs and their functional characteristics, for example normalized, self-priming, vacuum-assisted centrifugal pumps, etc.

[0005] Depending on their specific use, these known types of centrifugal pumps have differently shaped inside and outside.

[0006] These constructive differences require the design and production of specific pump casings with differentiated septa, walls, unions, volumes.

[0007] Furthermore, for each type of pump it is necessary to construct integral casings with different materials and/or coverings depending on their specific use, the motor power, the different speed of the impeller or on the specific fluid to be sucked, for example clean liquids, liquids with suspended solid particles, liquids mixed with gases, solvents, acids, bases and various liquids.

[0008] The same type of pump with the same operating characteristics may need specific unions, or unions placed in specific positions, or special seats for accessories or connections on the outer surface.

[0009] These differences make it necessary to produce a plurality of pumps with specific casings for each single need, with consequent problems regarding production plants, storage, transport, and so on.

[0010] To overcome all the drawbacks mentioned above a new type of modular centrifugal pump has been designed and implemented, which comprises an internal hydraulic core that is always the same independently of the specific needs, and an external shell differentiated according to the various application needs. In its turn the internal core is constituted by a connection disc and an internal shell, called scroll, in which the impeller turns.

[0011] The aim of the new pump is to reduce the number of different parts to be produced to construct pumps for different uses and applications.

[0012] Another aim of the new pump is to produce some standard pump parts that can be coupled with different external shells.

[0013] A further aim of the new pump is to reduce the number of different parts to be produced to construct pumps having similar fluid-dynamic characteristics, but different applications.

[0014] Another aim of the new pump is to allow the

use of different materials for different parts of the casings, which may be functional or connection parts.

[0015] A further goal of the invention is the production of a pump having different fluid-dynamic characteristics, though maintaining the positions and dimensions of the unions unchanged and the overall dimensions of the pump substantially identical.

[0016] Another goal of the invention is the production of a pump so that in the same model of self-priming pump it is possible to modify the diameter of the impeller, at the same time maintaining the self-priming characteristics unchanged.

[0017] Another aim of the invention is the production of a pump that can be personalized according to the customer's request, by simply modifying the external shell, with no need to design a new pump.

[0018] A further aim of the new pump is to reduce the external noise levels, since the impeller of this pump will be insulated by two metal shells.

[0019] These and other, direct and complementary aims have been achieved through the implementation of a new modular centrifugal pump, comprising a disc that joins the various parts and connects them to the motor part, to which a single scroll containing the impeller is applied, and a further external shell having different shapes and characteristics according to the different applications and uses of the pump.

[0020] The connection disc, the impeller and the scroll constitute the hydraulic part, which is always the same for the different types of pumps.

[0021] The various external shells, suitable for being coupled with the scroll and/or with the connection disc, have different shapes and/or unions according to the final use for which the pump is destined.

[0022] The characteristics of the new modular centrifugal pump with internal connection disc, impeller and scroll that can be coupled with a differentiated external shell will be highlighted in greater detail by the following description of one among many possible applications of the invention, with reference to the enclosed drawings.

[0023] Figure 1 shows a cross section of the connection disc (P), the impeller (G) and the scroll (V) that constitute the standardized hydraulic part of the new pump.

[0024] The connection disc (P) is provided with a central hole (Pf) and the connection shaft (Ga) between the impeller (G) and the motor part of the pump, typically an electric motor or an internal combustion engine, passes through said central hole.

[0025] The impeller (G) is constituted by a series of radial, generically trapezoidal wings (Gp).

[0026] The scroll (V) is constituted by a generically cylindrical shell suitable for containing the impeller (G) and for being coupled with the connection disc (P).

[0027] In particular, said scroll (V) is provided with a central hole (Va) in correspondence with the axis of the impeller (G) and with a second tangential hole (Vm).

[0028] On the inside circular surface of the scroll (V) there is a tooth (Vd), generically radial and facing to-

wards the centre, in correspondence with the beginning of the scroll (V). The length of this tooth (Vd) is such that it touches/reaches the external diameter of the impeller (G) (Figure 5).

[0029] In this way the impeller (G) is housed into a suitable rotation chamber (Vg) contained between the connection disc (P) and the scroll (V).

[0030] Both the connection disc (P) and the contact surface of the scroll (V) are provided with holes (Px, Vx), if necessary threaded, that ensure the connection between the connection disc (P) and the scroll (V) with screws (X). Along the contact edge between the connection disc (P) and the scroll (V) there are also specific seats for one or more seals.

[0031] It is important to consider that the connection disc (P) has dimensions, that is, diameter or width, exceeding the diameter of the scroll (V), in such a way as to present a further connection edge with the external shell (C, diagrammatically shown in Figure 1).

[0032] The hydraulic part constructed as described above is such as to suck the liquid through the concentric hole (Va) of the scroll (V) as a consequence of the rotation of the impeller (G), and to expel it through the tangential hole (Vm) of the scroll (V).

[0033] It is possible to apply fixed or removable elements (Vu, Pu) to the scroll (V) and/or to the connection disc (P).

[0034] The external shell (C) has the generical shape of a cap or cylinder, so that it can be applied to the connection disc (P) on the same side of the scroll (V) and can contain and cover said scroll (V) leaving an air space between the inner surface of the external shell (C) and the scroll (V).

[0035] Said external shell (C) is provided with holes (Cy), if necessary threaded, aligned with corresponding holes (Py) present on the connection disc (P), in such a way as to ensure the union between the connection disc (P) and the external shell (G) with screws (Y).

[0036] Said external shell (C) may have different shapes, some of which are illustrated in the example of Figure 2, which shows a simple centrifugal pump, in the example of Figure 3, which shows a self-priming pump, in the example of Figure 4, which shows a vacuum-assisted pump, in the example of Figure 6, which shows a vacuum-assisted self-priming pump. Said external shell (C) has septa, partitions (Cs) or similar elements that divide the space included between the external shell (C) and the scroll (V) in two separate chambers (Oa, Om) having various shapes and communicating with the two suction (Va) and delivery (Vm) holes of the scroll (V), respectively.

[0037] Two suitable unions (Ca, Cm) are provided on the outer surface of the external shell (C) and communicate with said chambers (Oa, Om) inside said external shell (C).

[0038] In particular a union (Ca), which can be connected with a fluid suction pipe, communicates with the suction chamber (Oa) that in turn communicates with

the centre suction hole (Va) of the scroll (V), while the other union (Cm), which can be connected with a fluid delivery pipe, communicates with the delivery chamber (Om) that in turn communicates with the tangential delivery hole (Vm) of said scroll (V).

[0039] Other variants of the external shell (C) are possible for other uses.

[0040] Said external shell (C), instead of being fixed to the connection disc (P), may also be fixed directly to the scroll (V), though leaving suitable air spaces and chambers.

[0041] In the case of a self-priming pump, if it is necessary to modify the pump performance while maintaining its self-priming characteristics unchanged, it is possible to use impellers (G) with wider diameter, reducing the length of the tooth (Vd) inside the scroll (V).

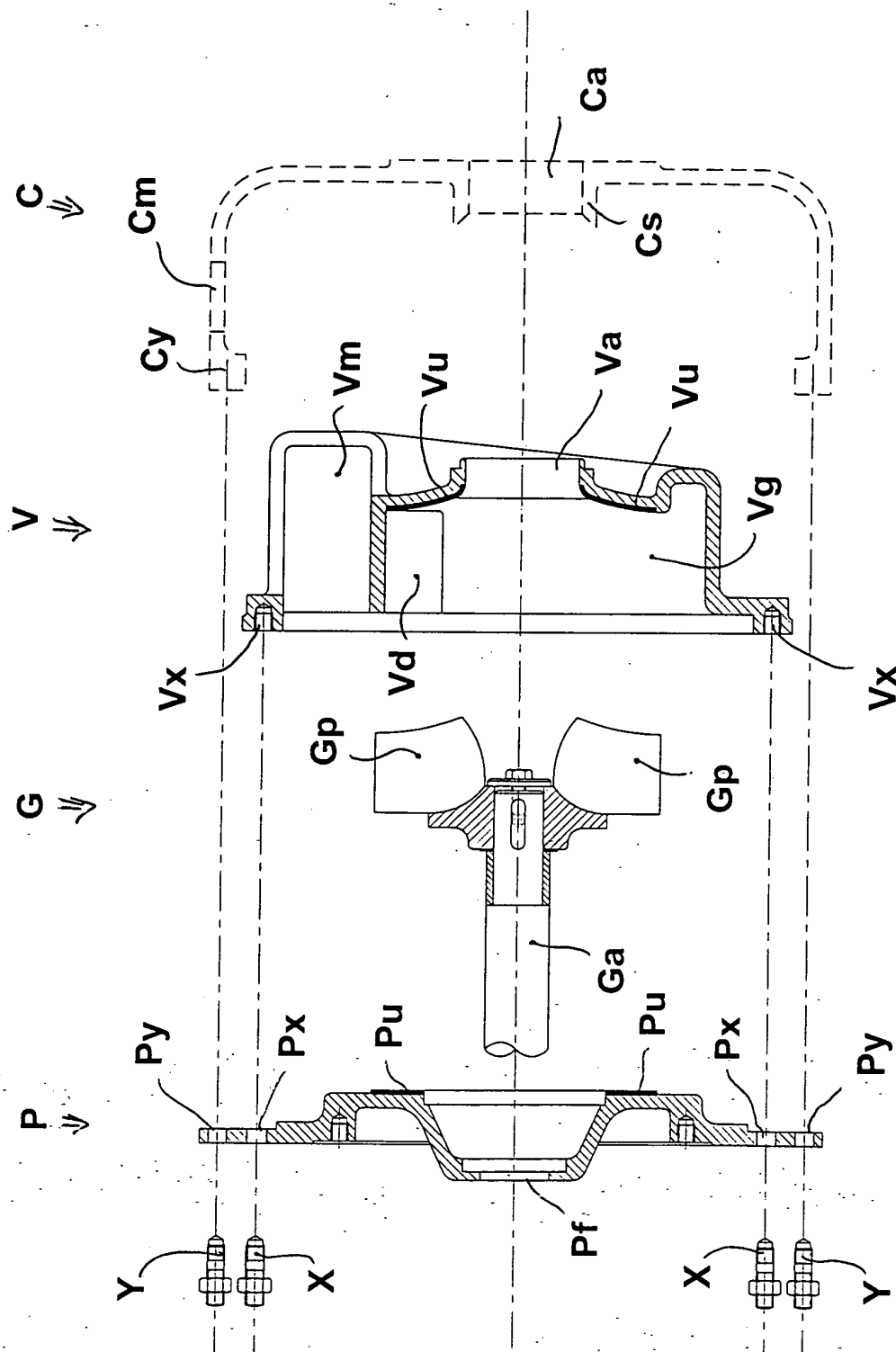
[0042] Therefore, with reference to the above description and the enclosed drawings, the following claims are put forth.

Claims

1. Centrifugal pump, **characterized in that** it is provided with an impeller (G) with radial wings (Gp) enclosed between a disc (P) and a scroll (V) that define its rotation chamber, and wherein said disc (P) is equipped with attachment devices or elements for fixing a further external shell (C).
2. Centrifugal pump, **characterized in that** it is provided with an impeller (G) with radial wings (Gp) enclosed between a disc (P) and a scroll (V) that define its rotation chamber, and wherein an external shell (C) is applied to the scroll (V) in such a way as to contain the scroll (V).
3. Centrifugal pump according to claims 1, 2, **characterized in that** said disc (P), impeller (G) and scroll (V) constitute an hydraulic part to which one or more different external shells (C) can be applied, said external shells having different shapes and/or unions according to the use for which the pump is destined.
4. Centrifugal pump according to claim 3, **characterized in that** said single scroll (V) is provided with a central suction hole (Va) that is concentric with the impeller (G) and a tangential delivery hole (Vm).
5. Centrifugal pump according to claim 4, **characterized in that** the scroll (V) is provided, on its internal circular surface, with a generically radial tooth (Vd) that can be adapted to the diameter of the impeller (G).
6. Centrifugal pump according to claim 5, **characterized in that** it is provided with wear resistant elements (Vu, Pu) applied to the scroll (V) and/or to the

connection disc (P).

7. Centrifugal pump according to claims 5, 6, **characterized in that** said external shell (C) is provided with septa, partitions (Cs) or similar elements, in such a way as to divide the volume included therein into at least two separate chambers (Oa) and (Om) having various shapes and communicating with the suction hole (Va) and the delivery hole (Vm) of the scroll (V), respectively. 5 10
8. Centrifugal pump according to claim 7, **characterized in that** the outer surface of the external shell (C) is provided with suitable unions (Ca) and (Cm) communicating with said chambers (Oa) and (Om), respectively, inside said external shell (C). 15
9. Centrifugal pump according to claim 8, **characterized in that** it allows the use of a single disc (P) and a single shell (C) with different scrolls (V) and/or impellers (G). 20
10. Centrifugal pump according to claims 8, 9, **characterized in that** the external shell (C) has the function of centrifugal pump, that is, the only function to convey the pumped liquid. 25
11. Centrifugal pump according to claim 10, **characterized in that** the external shell (C) has the septa and internal partitions (Cs) and the unions (Ca, Cm) properly arranged on its outer surface, so that the external suction union (Ca) of the shell (C) has the axis (*t1*) coaxial with the axis (*f*) of the suction hole (Va) of the scroll (V) and that the external delivery union (Cm) is radial or tangential to the scroll (V) and orthogonal to the external suction union (Ca). 30 35
12. Centrifugal pump according to claims 8, 9, **characterized in that** the external shell (C) has a self-priming function, that is, the function of container or tank for the liquid for self-priming. 40
13. Centrifugal pump according to claim 12, **characterized in that** the external shell (C) has the septa and internal partitions (Cs) and the unions (Ca, Cm) properly arranged on its outer surface, so that the external delivery union (Cm) of the external shell (C) is radial or tangential to the scroll (V) and that the external suction union (Ca) has the axis (*t2*) parallel to the axis (*f*) of the suction hole (Va) of the scroll (V) and decentered with respect to it towards the external delivery union (Cm), in such a way as to obtain the typical configuration of a self-priming pump. 45 50
14. Centrifugal pump according to claims 8, 9, **characterized in that** the external shell (C) has the function of connecting it with gas suction devices, vacuum devices or vacuum pumps, thus making it a vacuum-assisted pump. 55
15. Centrifugal pump according to claim 14, **characterized in that** the external shell (C) has the septa and internal partitions (Cs) and the unions (Ca, Cm) suitably arranged on its outer surface, so that the external delivery union (Cm) of the external shell (C) is radial or tangential to the scroll (V) and that the external suction union (Ca) has the axis (*t3*) parallel to the axis (*f*) of the suction hole (Va) of the scroll (V), decentered with respect to it towards the external delivery union (Cm) and presents a further union (Cv) for an additional device, in such a way as to obtain the typical configuration of a vacuum-assisted pump.
16. Centrifugal pump according to claims 8, 9, **characterized in that** the external shell (C) has self-priming function, that is, the function of container or tank for the liquid for self-priming and has the function of connecting it with gas suction devices, vacuum devices or vacuum pumps, thus making it a vacuum-assisted self-priming pump. Centrifugal pump according to claim 16, **characterized in that** the external shell (C) has the septa and internal partitions (Cs) and the unions (Ca, Cm) suitable arranged on its outer surface, so that the external delivery union (Cm) of the external shell (C) is radial or tangential to the scroll (V) and that the external suction union (Ca) has the axis (*t4*) parallel to the axis (*f*) of the suction hole (Va) of the scroll (V), decentered with respect to it towards the external delivery union (Cm) and has a further union (Cv) for a suction or vacuum device, in such a way as to obtain the configuration of a self-priming and vacuum-assisted pump.



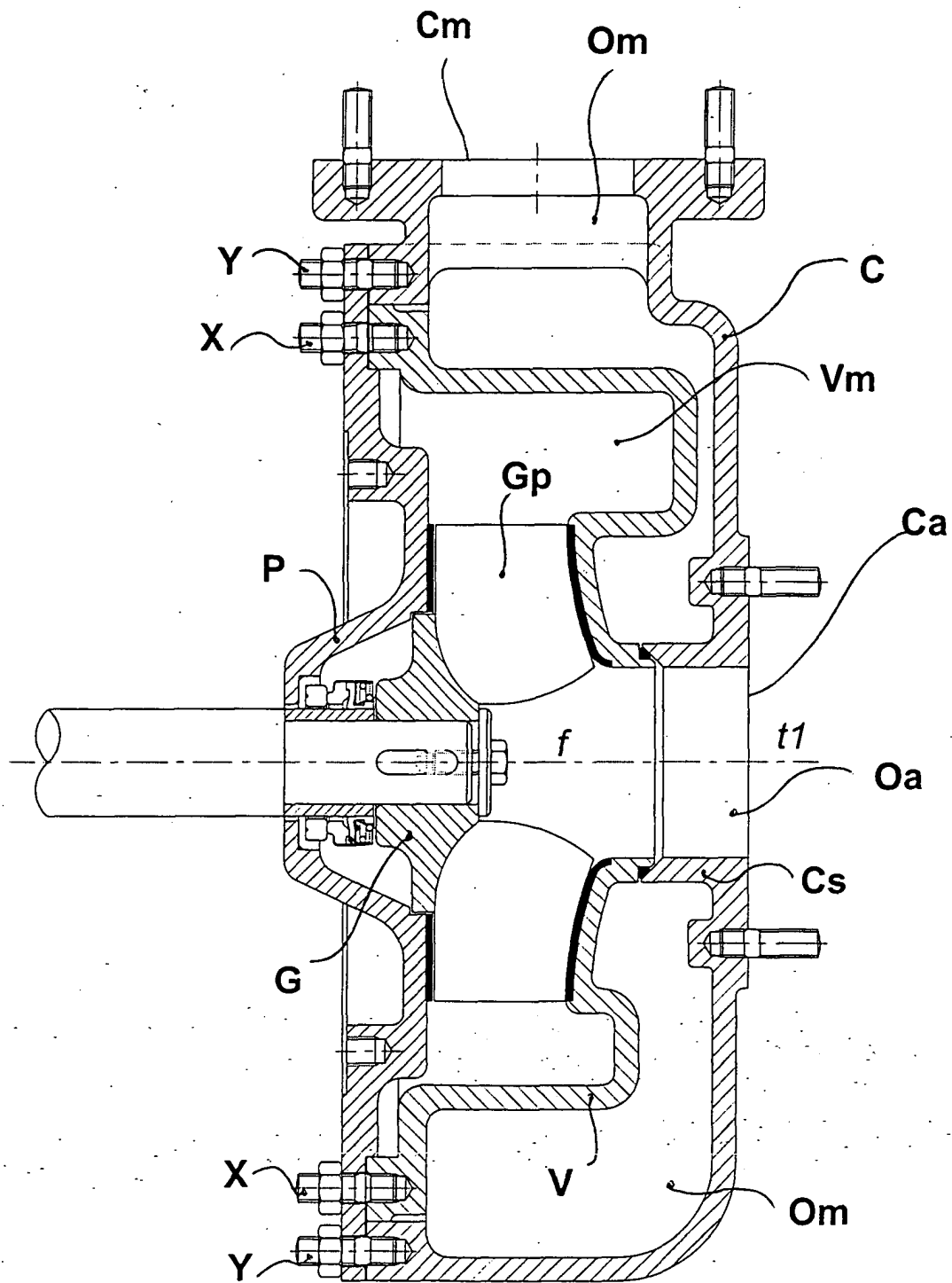


Fig. 2

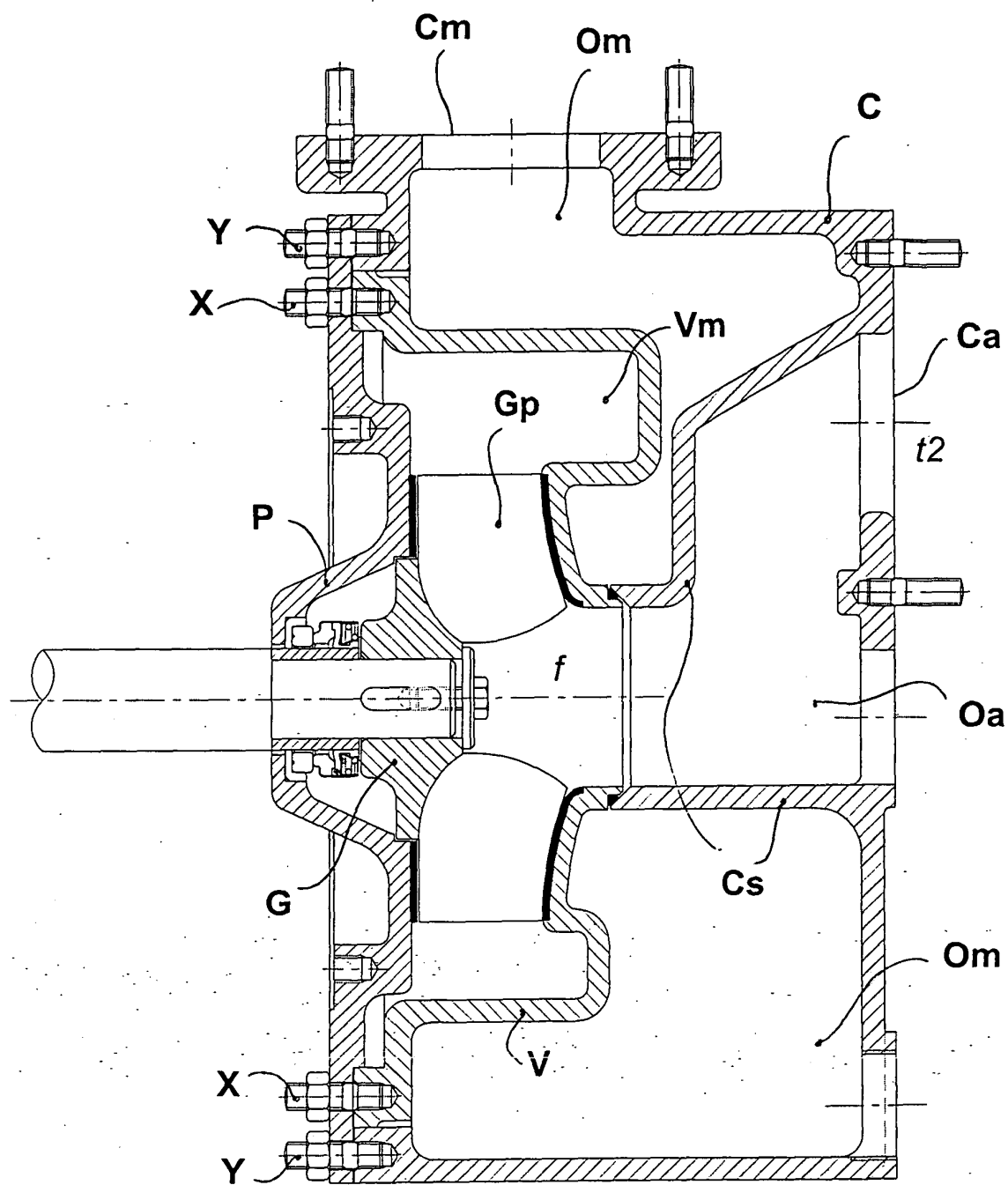


Fig. 3

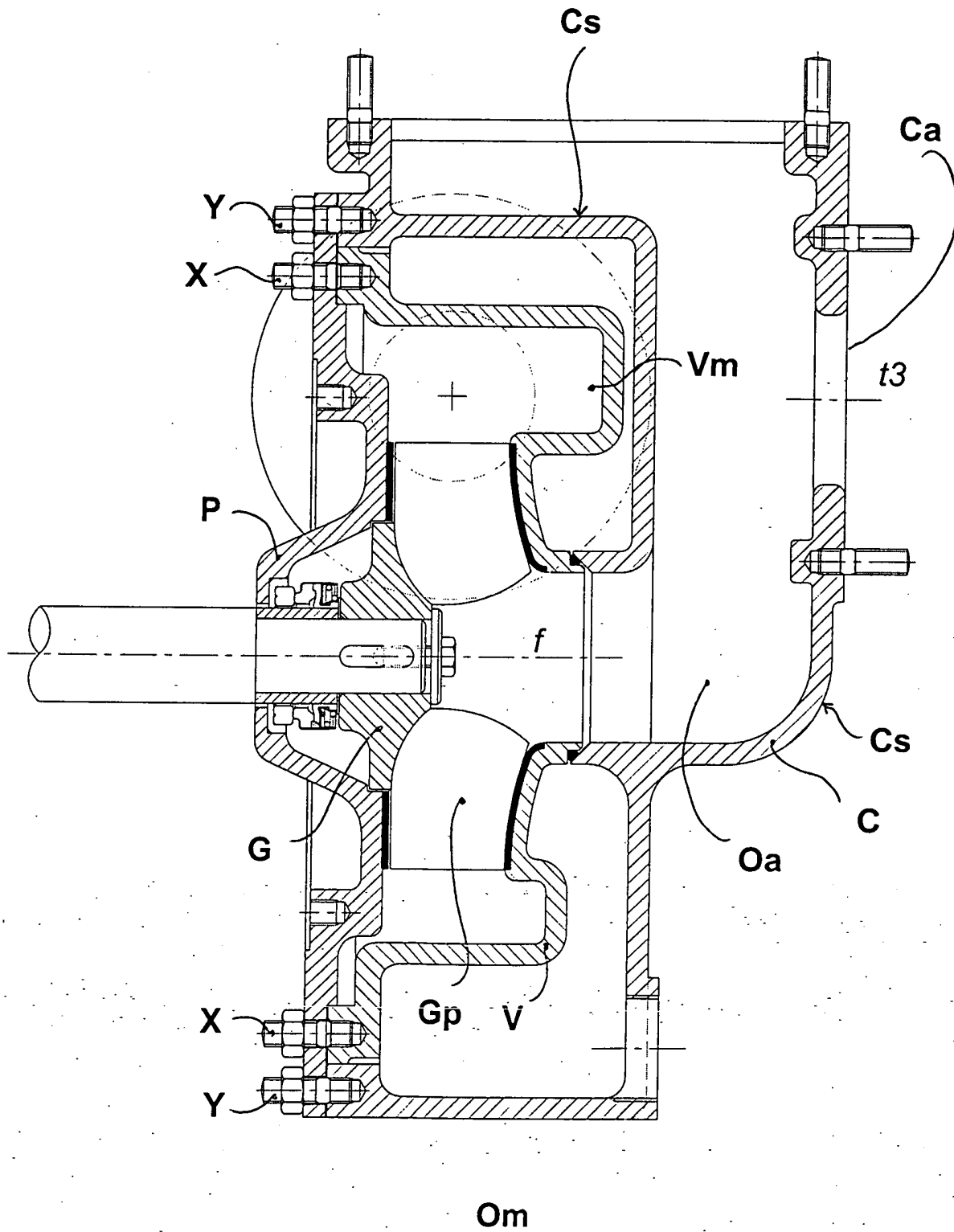


Fig. 4

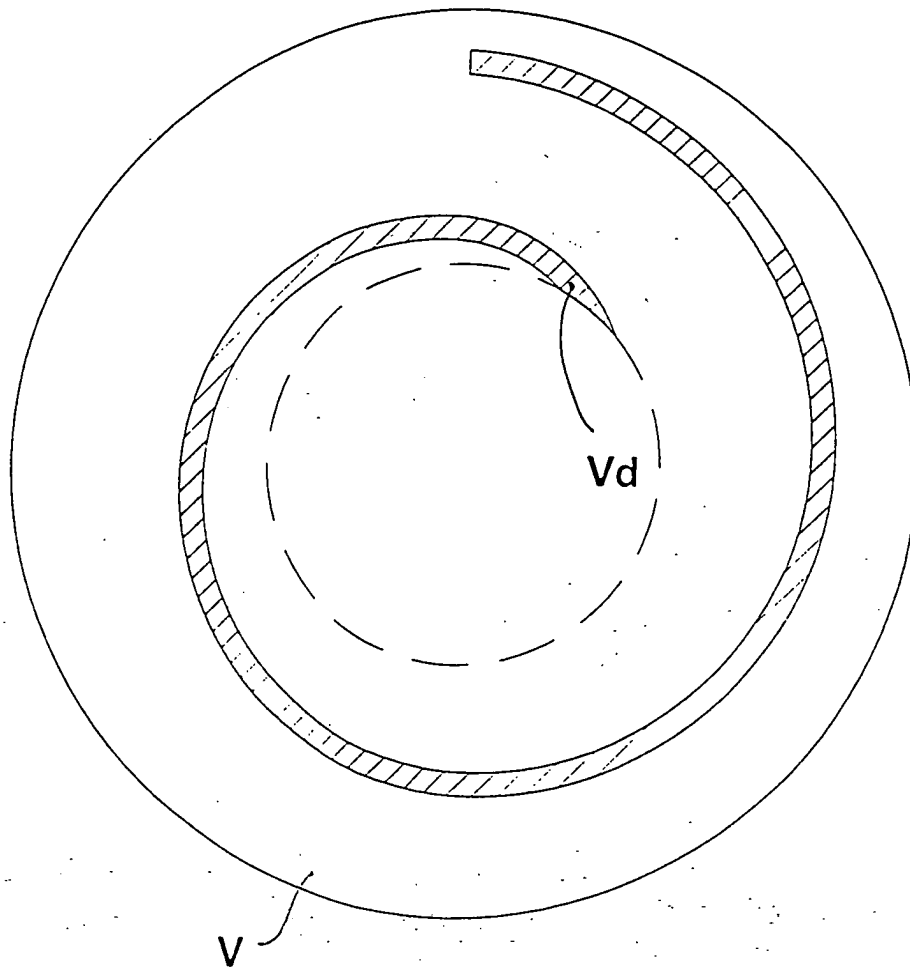


Fig. 5

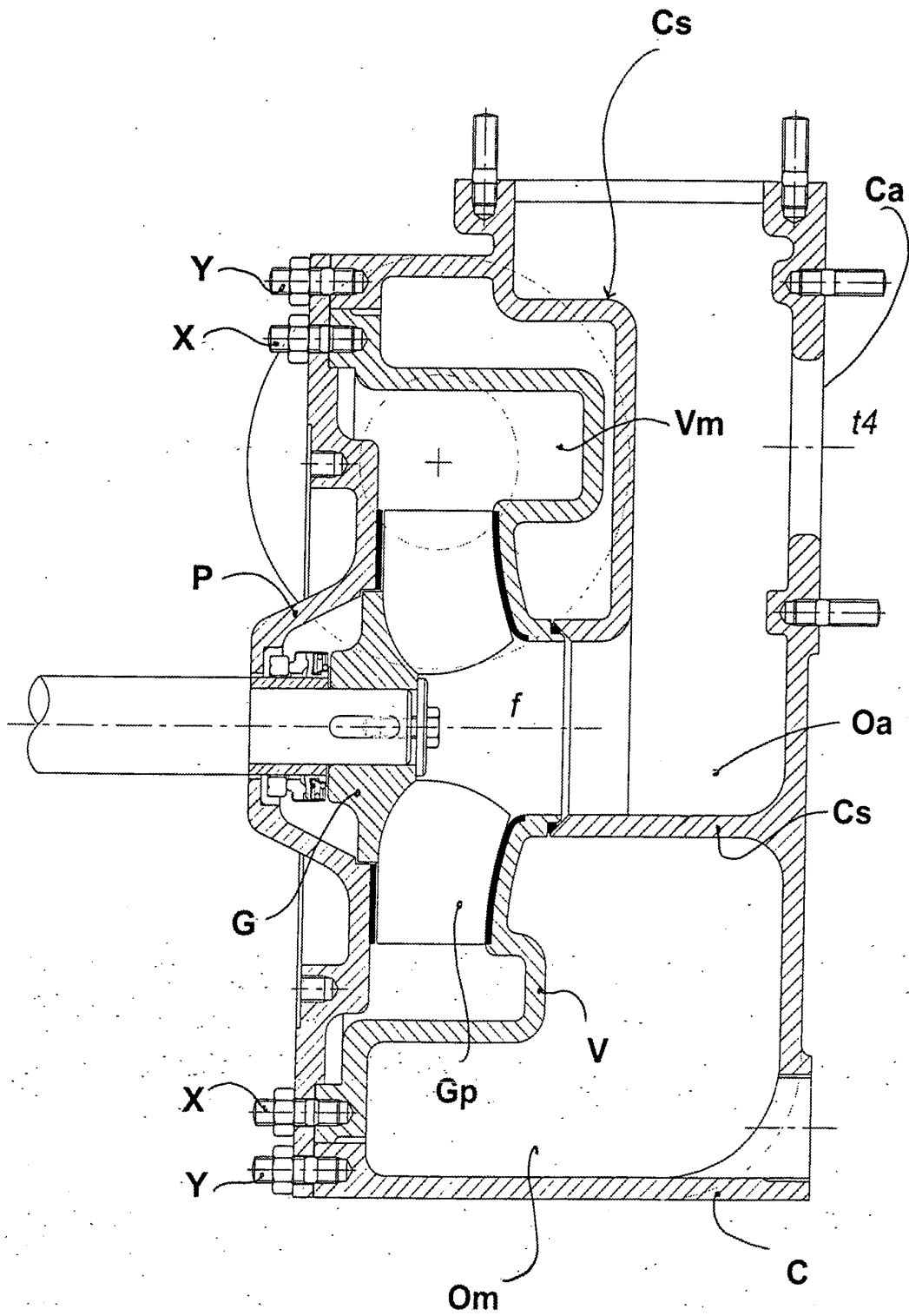


Fig. 6