



(11)

EP 1 650 440 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
26.04.2006 Bulletin 2006/17

(51) Int Cl.:
F04D 29/42 (2006.01)

(21) Application number: **04425788.9**

(22) Date of filing: **20.10.2004**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PL PT RO SE SI SK TR**
Designated Extension States:
AL HR LT LV MK

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Remarks:

Amended claims in accordance with Rule 86 (2) EPC.

(54) Pump casing for centrifugal pump and method for producing said casing

(57) A method for producing the pump casing for peripheral pumps with axial suction, comprising the operating steps of: producing a pump casing (1) outer housing element (17); producing a pump casing (1) insert (18), designed, in practice, to form a pump pumping chamber (7) with a part (5) that connects a pump to a motor; and

attaching the insert (18) inside the outer housing element (17). The claims also cover a pump casing for peripheral pumps with axial suction comprising at least a housing element (17) forming a pump casing outer surface (3), and an insert (18) attached to the inside of the housing element (17) and forming an operating surface (4).

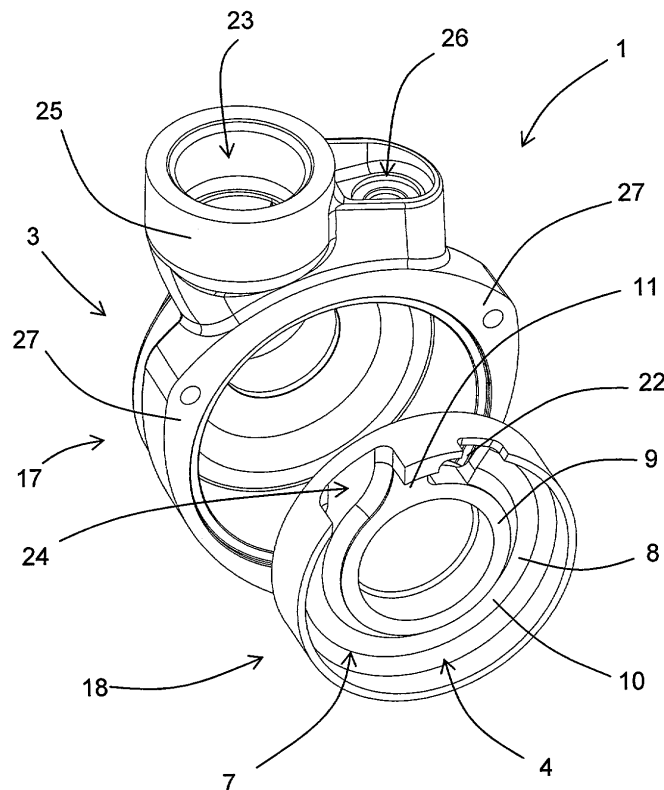


FIG. 2

Description

[0001] The present invention relates to a method for producing the pump casing of peripheral pumps (also known as regenerative pumps) with axial suction and a pump casing produced using this method.

[0002] At present, the pump casings are produced by casting with a disposable inner core.

[0003] The choice of this production method is dictated by the complex shape of the pump casing which has many undercut parts (for example, the pump casing has an inner suction chamber).

[0004] As a result the choice of material used to produce the pump casing is also limited.

[0005] Therefore, in most cases, for economic reasons, the pump casing is made of cast iron.

[0006] However, this first prior art has several disadvantages.

[0007] In peripheral pumps the rotor is located as close as possible to the pump casing in order to limit leaks. However, when the pump casing is made of cast iron, if the pump remains inactive for a certain period, there is the risk that the pump casing may oxidise and develop rust, until the rotor is blocked.

[0008] When this happens the pump has to be disassembled, the pump casing and the rotor cleaned and then reassembled.

[0009] This problem may be overcome by producing the pump casing using materials which do not oxidise, such as brass, stainless steel, or a plastic (for example, a technopolymer).

[0010] However, use of such materials is not compatible with the production of the pump casings currently used by peripheral pumps with axial suction.

[0011] In these pump casings, an inner chamber has to be created, connected to the axial suction hole and to a hole, positioned eccentrically relative to the axis, for supplying liquid to the pumping chamber.

[0012] Said chamber in practice forms undercuts both relative to the suction hole and relative to the supply hole.

[0013] Therefore, at least to keep production costs within limits which although high are acceptable, such pump casings must be produced by casting with a disposable inner core.

[0014] In this situation, the technical need which forms the basis of the present invention is to provide a method for producing the pump casing of peripheral pumps with axial suction which overcomes the above-mentioned disadvantages.

[0015] In particular, the technical need of the present invention is to provide a method for producing the pump casing of peripheral pumps with axial suction which allows pump casings that do not seize up to be obtained with limited production costs.

[0016] A further technical need of the present invention is to provide a method for producing the pump casing of peripheral pumps with axial suction which allows the pump casing to be made using any material suitable for

the purpose.

[0017] Yet another technical need of the present invention is to produce a pump casing which overcomes the above-mentioned disadvantages.

[0018] The technical need specified and the aims indicated are substantially achieved by a method for producing the pump casing of peripheral pumps with axial suction and by a pump casing produced using this method, as described in the claims herein.

[0019] Further features and the advantages of the present invention, are more clearly illustrated in the detailed description which follows, with reference to the accompanying drawings, which illustrate a preferred embodiment of a method for producing the pump casing of peripheral pumps with axial suction and of a pump casing, without limiting the scope of the inventive concept, in which:

- Figure 1 is a side view partly in cross-section of a pump with a pump casing made according to the present invention;
- Figure 2 is an exploded axonometric rear view of the pump casing illustrated in Figure 1;
- Figure 3 is an exploded axonometric front view of the pump casing illustrated in Figure 1;
- Figure 4 is a front view of the pump casing illustrated in Figure 1;
- Figure 5 is a view of the pump casing illustrated in Figure 4 according to the line V - V;
- Figure 6 is a rear view of the pump casing illustrated in Figure 1; and
- Figure 7 is a view of the pump casing illustrated in Figure 6 according to the line VII - VII.

[0020] With reference to the accompanying drawings, the numeral 1 denotes as a whole a pump casing for peripheral pumps 2 with axial suction made according to the present invention.

[0021] Said pump casing 1 has, in general, an outer surface 3 and an operating surface 4.

[0022] When the pump casing 1 is mounted on a pump 2, its outer surface 3 forms a portion of the overall outer surface of the pump. In turn, the operating surface 4 is attached to and forms a pump 2 pumping chamber with the part 5 that connects the pump 2 to the relative motor.

[0023] In practice, the pump 2 rotor 6 rotates along a peripheral circular path where the pumping chamber 7 extends.

[0024] In the embodiment illustrated, at least on the pump casing 1 side, the pumping chamber is delimited by a groove 8 made in the operating surface 4 which extends along most of the circular path of the rotor 6.

[0025] Moreover, the operating surface 4 has a flat sealing surface 9 having a first portion 10 extending in a ring shape coaxially and radially more internally than the groove 8 of the pumping chamber 7, and a second portion 11 extending radially outwards from the first portion 10 and which separates the ends 12, 13 of the groove 8.

[0026] In practice, the second flat portion 11 is placed opposite a similar surface on the connecting part 5 (not visible in the accompanying drawings) and is at a distance from it substantially equal to the thickness of the rotor 6 at that point, to guarantee a predetermined hydraulic seal.

[0027] As illustrated in Figure 1, the rotor 6 is connected, by a driving shaft 14, to the pump 2 motor 15. The driving shaft 14 passes through the connecting part 5 and is supported by special sealing elements 16 (of the conventional type).

[0028] The pump casing 1 made according to the present invention consists of at least two parts, that is to say, a housing element 17 and an insert 18.

[0029] The housing element 17 constitutes the outer part of the pump casing 1 and therefore forms its outer surface 3. In contrast, the insert 18 is attached to the inside of the housing element 17, constitutes the inner part of the pump casing 1 and forms its operating surface 4.

[0030] The insert 18 can be attached to the inside of the housing element 17 in any way suitable for the purpose.

[0031] For example, the insert 18 may be fixed to the housing element 17 by forcing, gluing, or any mechanical connection, or it may be simply rested on it while the pump casing is fixed to the rest of the pump.

[0032] Moreover, depending on requirements, between the insert 18 and the housing element 17 there may or not be a seal (such as an O-ring; solution not illustrated) inserted.

[0033] In the preferred embodiments, the housing element 17 is made of metal, for example cast iron, brass, bronze or stainless steel, or of plastic such as a technopolymer. In turn, the insert 18 is made of metal, preferably brass or stainless steel, or of plastic such as a technopolymer.

[0034] A suction pipe 19 is made through the pump casing 1 and extends between the outer surface 3 and the pumping chamber 7 of the pump.

[0035] In particular, the suction pipe 19 comprises an inlet 20 made through the housing element 17 and axially aligned with the driving shaft 14, a suction chamber 21 made between the housing element 17 and the insert 18, and an outlet 22 consisting of a through-hole made in the insert 18 at a first end 12 of the groove 8, which forms the pumping chamber 7 on the pump casing 1 side. In the accompanying drawings the outlet 22 extends parallel with the axis of the driving shaft 14.

[0036] In the pump casing 1 there is also a delivery pipe 23 extending between the pumping chamber 7 (at the other end 13 of the groove 8, relative to the suction pipe 19) and the outer surface 3 of the pump casing 1.

[0037] In the embodiment illustrated, the delivery pipe 23 comprises a passage 24 made in the side of the insert 18, and an outfeed connector 25 made in the housing element 17.

[0038] In the embodiment illustrated in the accompa-

nying drawings, there is also a filling pipe 26 passing through the pump casing 1, the filling pipe extending in the same way as the delivery pipe 23 and connecting the first end 12 of the groove 8 to the outside of the pump casing 1. In practice, this filling pipe 26 is closed by a removable plug (not illustrated).

[0039] Finally, the pump casing 1 is fitted with a flange 27 with holes made in it (with three holes, although the number may vary according to requirements) which allows it to be fixed to the connecting part 5 using through screws 28.

[0040] The method for producing the pump casing 1 disclosed by the present invention comprises firstly an operating step during which the outer housing element 17 is produced.

[0041] Advantageously, the housing element 17 is made of metal, preferably cast iron, brass, bronze or stainless steel, or of plastic, such as a technopolymer.

[0042] Depending on the material used and the individual production requirements, the housing element 17 may be produced by casting, moulding, mechanical processing, etc.

[0043] Before, after or simultaneously with production of the housing element 17 there is a step for producing the pump casing 1 insert 18.

[0044] Advantageously, the insert 18 is also made of metal, preferably brass or stainless steel, or of plastic, preferably a technopolymer.

[0045] In this case too, depending on the material used and the individual production requirements, the insert 18 may be produced by casting, moulding, mechanical processing, etc.

[0046] Once the housing element 17 and the insert 18 have been produced, the method involves inserting the insert 18 in the outer housing element 17 and fixing it to the latter.

[0047] Generally speaking, the insert 18 may be attached to the housing element 17 in any way.

[0048] As already indicated, by way of example, the insert 18 may be fixed to the housing element 17 by forcing, gluing or any mechanical connection, or it may be simply rested on it.

[0049] According to requirements, before the insert 18 is inserted in the housing element 17 there may be a further operating step of inserting a seal between the insert 18 and the housing element 17.

[0050] The present invention brings important advantages.

[0051] Firstly, thanks to the production method disclosed, it is possible to produce pump casings substantially using any material, in contrast to the situation which existed until now.

[0052] In this way, at least the side facing the rotor can be made of a material which does not oxidise, so that the pump casing does not seize up.

[0053] Moreover, the costs linked to production of the pump casing as disclosed are significantly lower than those of conventional methods.

[0054] Thanks to the separation of the pump casing into two parts, expensive production by casting with a disposable inner core is no longer required. Instead much simpler methods may be used, such as moulding, mechanical processing, or casting without a core.

[0055] Pump casing production according to the present invention is also noticeably less polluting than conventional production methods, since it avoids the use of disposable inner cores, whose disposal is currently a big environmental problem.

[0056] In addition, it should be noticed that a pump casing produced according to the present invention costs much less than a conventional one, and that such a pump casing may, on each occasion, be made of the material which guarantees the best quality/price ratio.

[0057] The invention described may be subject to many modifications and variations, without thereby departing from the scope of the inventive concept.

[0058] All details may be substituted by other technically equivalent elements and all materials used, as well as the shapes and dimensions of the various components, may be any according to requirements.

Claims

1. A method for producing the pump casing for peripheral pumps with axial suction, **characterised in that** it comprises the operating steps of:

- producing a pump casing (1) outer housing element (17) ;
- producing a pump casing (1) insert (18) designed, in practice, to form a pump pumping chamber (7) with a part (5) that connects a pump to a motor;
- attaching the insert (18) inside the housing element (17) .

2. The method according to claim 1, **characterised in that** the insert (18) is fixed to the outer housing element (17) .

3. The method according to claim 2, **characterised in that** said fixing is by forcing, gluing or mechanical connection.

4. The method according to claim 1, **characterised in that** the insert (18) is rested on the outer housing element (17).

5. The method according to any of the foregoing claims, **characterised in that** it also comprises the operating step of inserting a seal between the insert (18) and the housing element (17).

6. The method according to any of the foregoing claims, **characterised in that** the housing element (17) is

made of metal or plastic.

7. The method according to claim 6, **characterised in that** the metal is cast iron, brass, bronze or stainless steel and the plastic is a technopolymer.

8. The method according to any of the foregoing claims, **characterised in that** the insert (18) is made of metal or plastic.

9. The method according to claim 8 **characterised in that** the metal is brass or stainless steel and the plastic is a technopolymer.

10. The method according to any of the foregoing claims, **characterised in that** the housing element (17), the insert (18) or both are obtained by moulding.

11. A pump casing for peripheral pumps with axial suction comprising:

- an outer surface (3);
- an operating surface (4) which can be attached to a part (5) that connects a pump to a motor, so that together with the latter it forms a pumping chamber (7) for the pump;
- a suction pipe (19) made through the pump casing (1) and extending between the outer surface (3) and the pumping chamber (7);
- a delivery pipe (23) made through the pump casing (1) and extending between the pumping chamber (7) and the outer surface (3);

the pump casing being **characterised in that** it comprises at least a housing element (17) forming the outer surface (3) and an insert (18) forming the operating surface (4), the insert (18) being attached to the inside of the housing element (17).

12. The pump casing according to claim 11, **characterised in that** the insert (18) is fixed to the housing element (17).

13. The pump casing according to claim 12, **characterised in that** the insert (18) is fixed to the housing element (17) by forcing, gluing or mechanical connection.

14. The pump casing according to claim 11, **characterised in that** the insert (18) is rested on the housing element (17).

15. The pump casing according to any of the claims from 11 to 14, **characterised in that** the insert (18) and the housing element (17) between them form a suction chamber (21) which is part of the suction pipe (19).

16. The pump casing according to any of the claims from 11 to 15, **characterised in that** the housing element (17) is made of metal or plastic.
17. The pump casing according to claim 16, **characterised in that** the metal is cast iron, brass, bronze or stainless steel and the plastic is a technopolymer. 5
18. The pump casing according to any of the claims from 11 to 17, **characterised in that** the insert (18) is made of metal or plastic. 10
19. The pump casing according to claim 18, **characterised in that** the metal is brass or stainless steel and the plastic is a technopolymer. 15

Amended claims in accordance with Rule 86(2) EPC.

1. A method for producing the pump casing for peripheral pumps with axial suction, **characterised in that** it comprises the operating steps of: 20
- producing a pump casing (1) outer housing element (17); 25
 - producing a pump casing (1) insert (18) designed to form, *in use*, a pump pumping chamber (7) with a part (5) that connects a pump to a motor;
 - attaching the insert (18) inside the housing element (17). 30
2. The method according to claim 1, **characterised in that** the insert (18) is fixed to the outer housing element (17). 35
3. The method according to claim 2, **characterised in that** said fixing is by forcing, gluing or mechanical connection. 40
4. The method according to claim 1, **characterised in that** the insert (18) is rested on the outer housing 45

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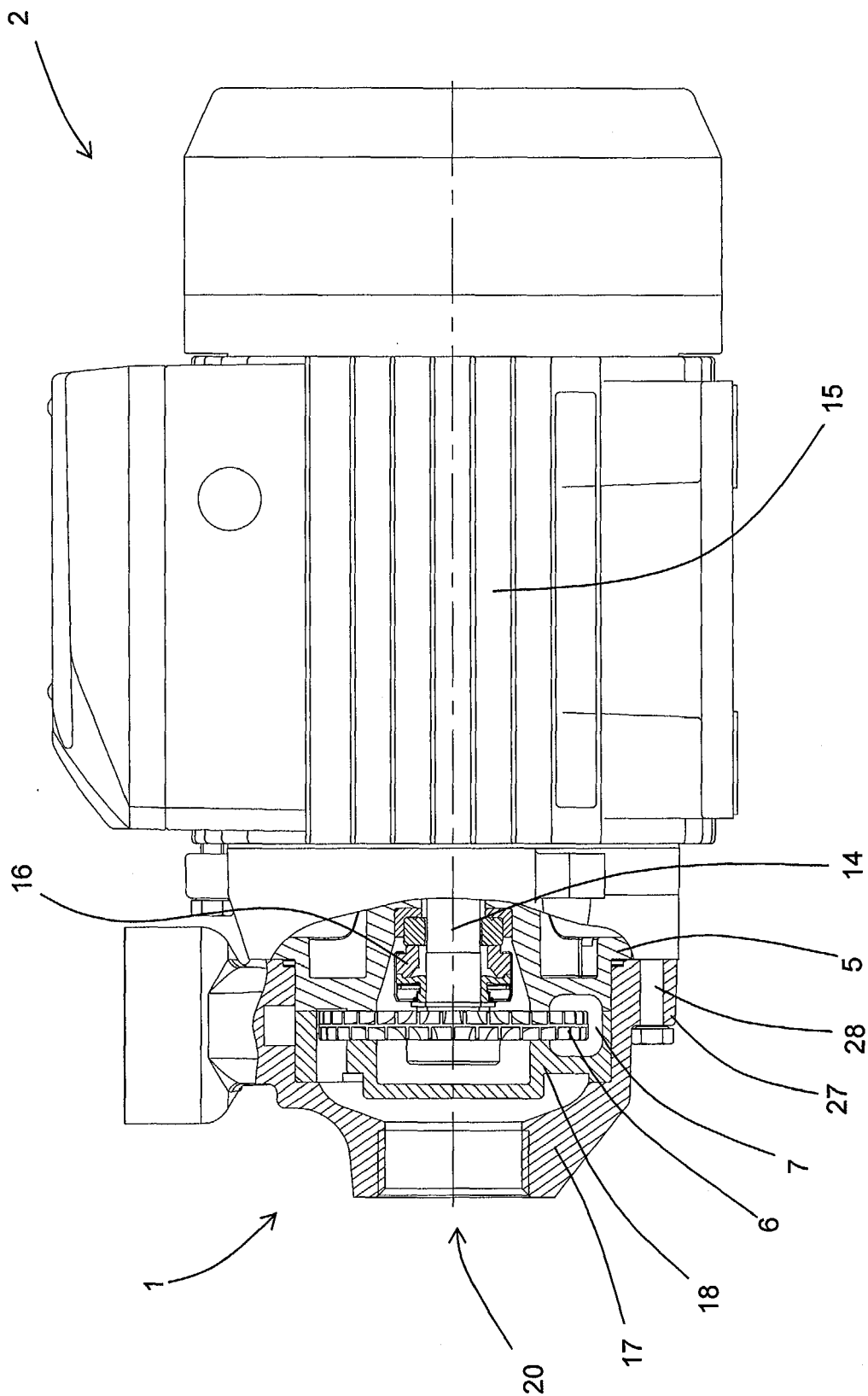
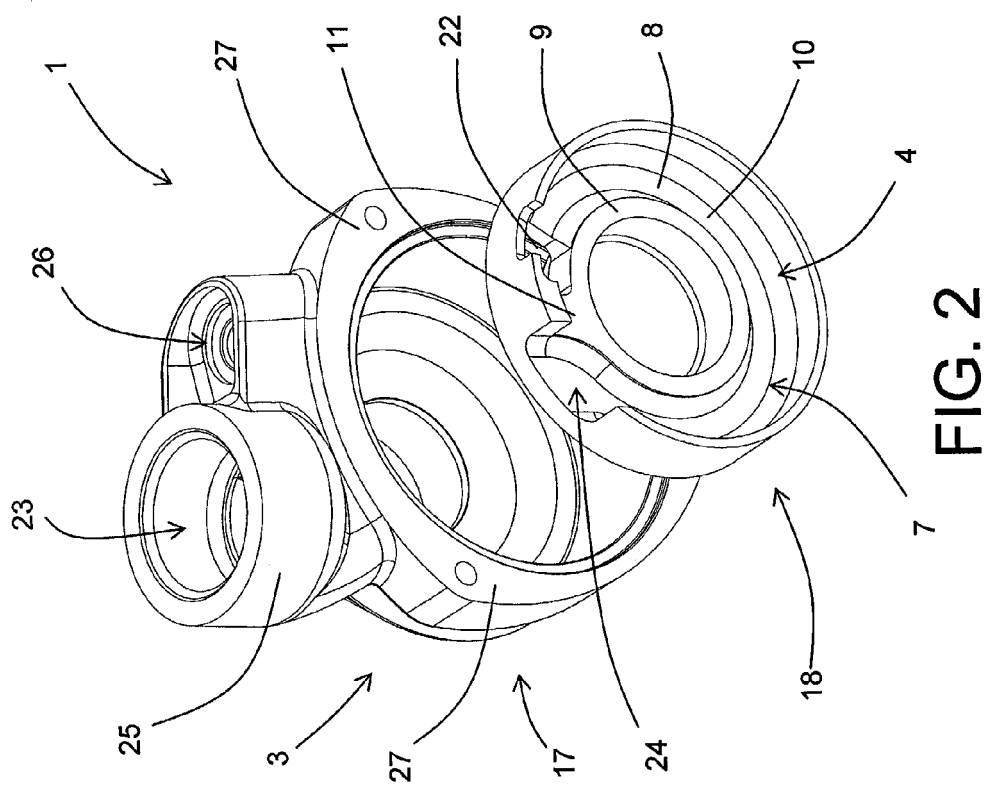
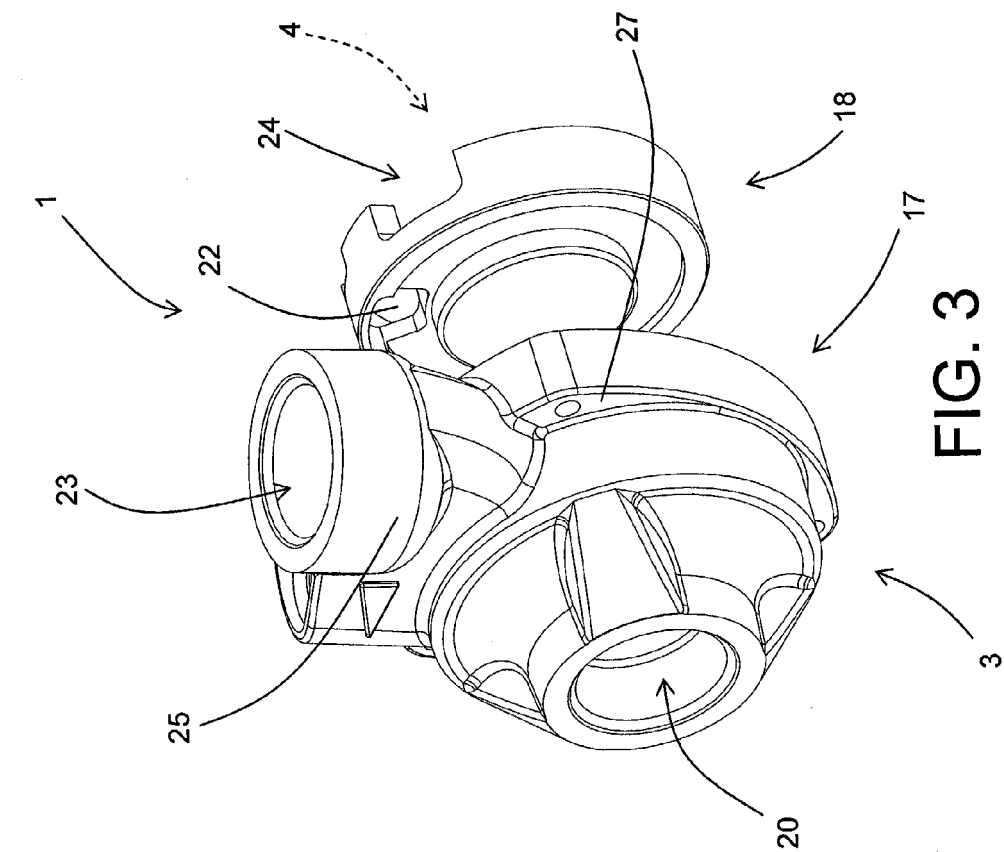


FIG. 1



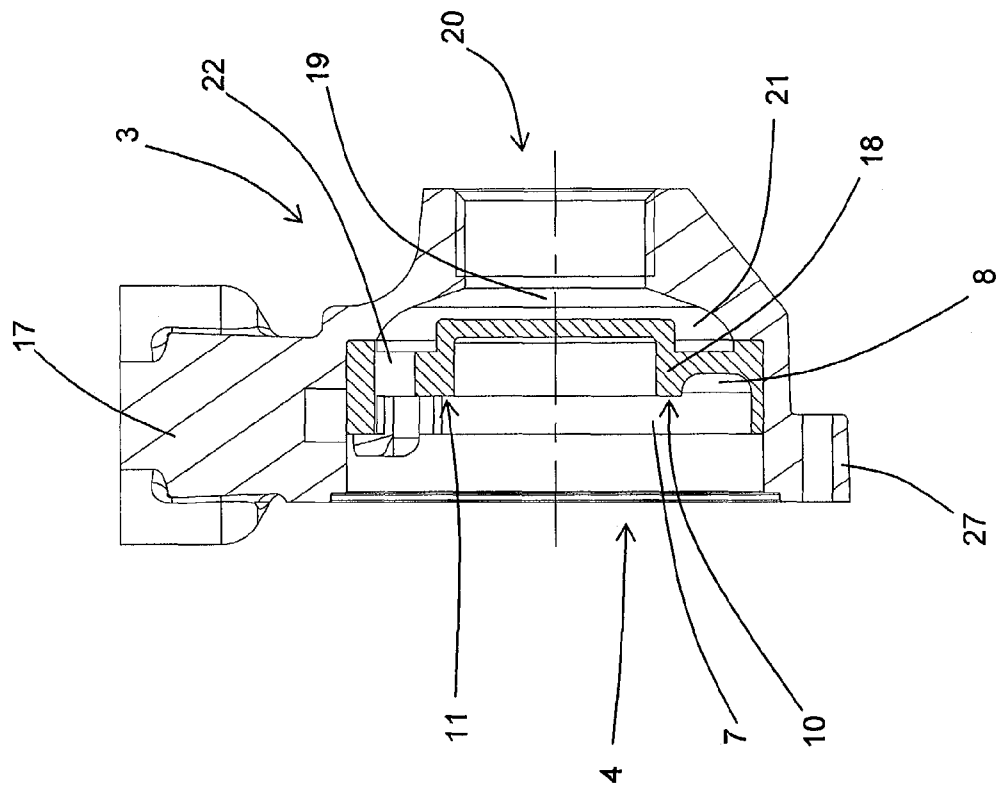


FIG. 5

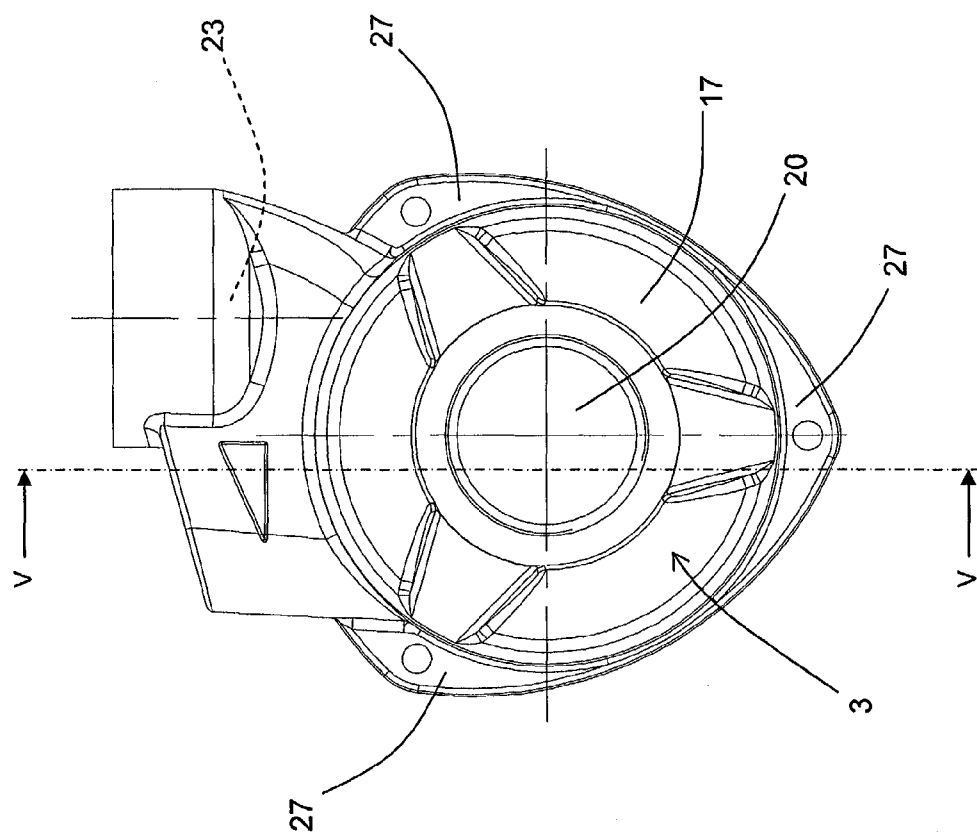
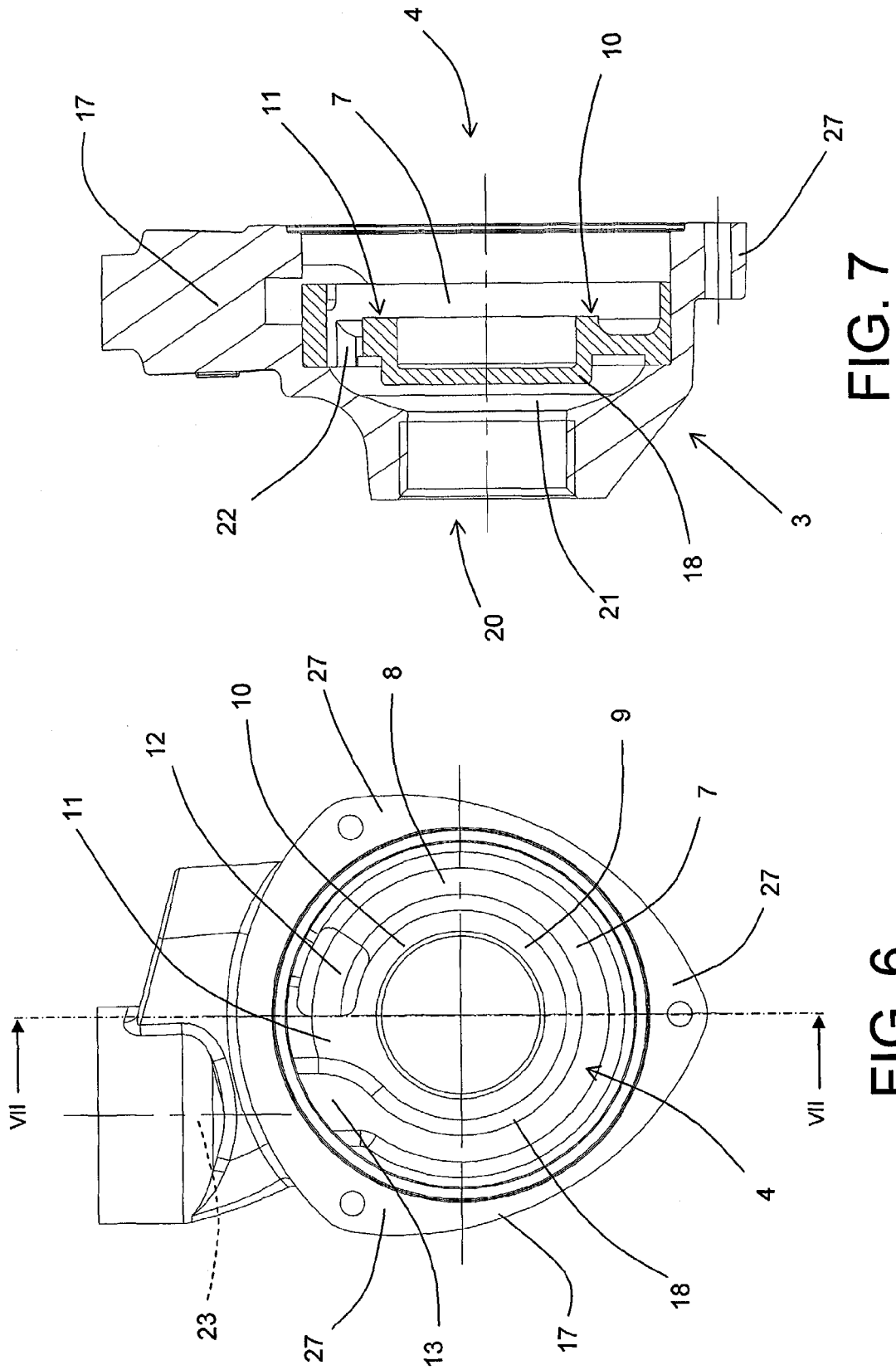


FIG. 4





DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 12 April 2005	Examiner Giorgini, G
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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