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(54) **COMPACT SEALING RING UNIT**

(57) The invention relates to a sealing ring unit (1) for radially sealing the suction mouth (5) of a pump impeller (4), in particular for a multistage pump, the unit comprising a sealing ring (3) and a supporting member (2) removably carrying the sealing ring (3), the supporting member (2) having an annular inner portion (10) defining an opening (22) for receiving the suction mouth (5) of the impeller (4), the sealing ring (3) having a first portion (16) and second portion (17) and an annular back portion (15) to face the suction mouth (5) connecting the first and second portion (16, 17) with each other, the annular inner portion (10) being accommodated between the first and second portion (16, 17). According to the invention the sealing ring (3) being mountable on the supporting member (2) by means of a bayonet fitting (11, 17). Thus, an easy change of the sealing ring is enabled.

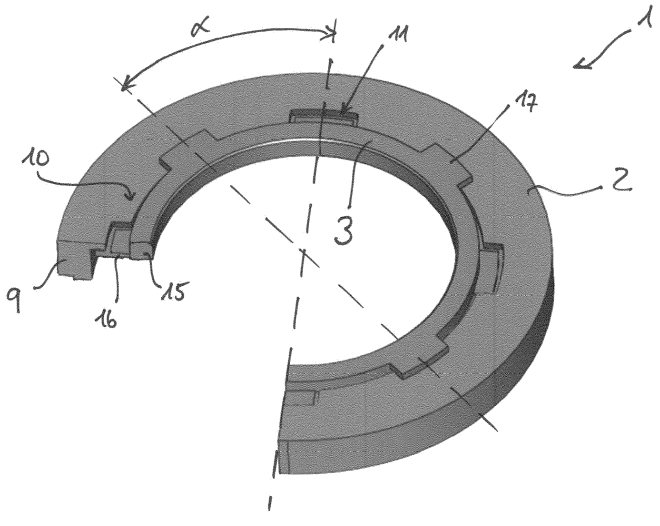

Fig. 1

EP 3 181 909 A1

Description

[0001] The present invention refers to a sealing ring unit for radially sealing the suction mouth of a pump impeller, in particular for a multistage pump, the unit comprising a sealing ring and a supporting member removably carrying the sealing ring, the supporting member having an annular inner portion defining an opening for receiving the suction mouth of the impeller, the sealing ring having a first portion and second portion and an annular back portion to face the suction mouth connecting the first and second portion with each other, the annular inner portion being accommodated between the first and second portion.

[0002] A sealing ring unit of this type is known in the art, for example from European patent application EP 0257 358 A1, teaching a sealing ring being made in a rubber-like material the inner face whereof couples to the outer surface of the inlet of an impeller in single-stage and multistage pumps. The ring has substantially radial openings which connect the inner face to the outer surface to allow a slight injection of liquid bled from the higher-pressure chamber in output from the impeller blades in the shimming region and to allow the creation and the maintenance of an extremely thin layer of liquid adapted to ensure a lubrication of the scraping surfaces with a reduced leakage towards the lower pressure region at the input of the impeller. The sealing ring is provided, on the face opposite to the inner face, with a pair of substantially facing circumferential borders which define between each other a circumferential recess which couples to the complementarily shaped margin of a circular hole provided on a corresponding supporting element connected to the box-like part of the pump. The sealing ring further comprises protruding raised portions evenly distributed on the bottom of said recess and couple to complementarily shaped locator notches provided in said margin to set the angular position of said ring on said supporting element.

[0003] Even if this sealing unit known in the art is comparatively compact, it must be considered that the sealing ring is a wear part and, therefore, possibility must be given to disassemble the sealing ring unit, exchange the old sealing ring and assemble the sealing ring unit again with a new sealing ring.

[0004] Therefore, it is an object of the present invention to provide a sealing ring unit as well as a pump each of which having a sealing ring that can easily be changed for maintenance purpose.

[0005] This object is solved by means of the sealing ring unit according to claim 1, as well as by means of the pump according to claim 17. Beneficial further developments are given in the subclaims.

[0006] According to the present invention it is proposed a sealing ring unit for radially sealing the suction mouth of a pump impeller, in particular for a multistage pump, the unit comprising a sealing ring and a supporting member removably carrying the sealing ring, the supporting member having an annular inner portion defining an opening for receiving the suction mouth of the impeller, the sealing ring having a first portion and second portion and an annular back portion to face the suction mouth connecting the first and second portion with each other, the annular inner portion being accommodated between the first and second portion, wherein the sealing ring being mountable on the supporting member by means of a bayonet fitting.

[0007] The bayonet fitting allows easy change of the sealing ring. The sealing ring advantageously acts as a floating ring facing impeller's suction mouth with a small clearance between them lubricated by the fluid pumped by the pump. The supporting member and the sealing ring are configured in that mounting the sealing ring on the supporting member being performed by axial fitting so that the sealing member's second portion passes the supporting member's inner portion until said inner portion comes into inter-engagement with the first and second portion, and by subsequent rotating the sealing ring relative to the supporting member to block further axial movement. Thus, assembling the sealing ring unit is performed by a two step process, axially fitting supporting member and sealing ring and turning them relative to each other as typically done by means of a bayonet fitting.

[0008] The bayonet fitting can comprise radially extending projections on one of the sealing ring or the supporting member and corresponding notches on the other one of the sealing ring and the supporting member in that aligning the projections and the notches with each other enables axially fitting the sealing ring on the supporting member. Thus, in one embodiment the projections are arranged on the sealing ring and the notches are arranged on the supporting member. In another embodiment the projections are arranged on the supporting member and the notches are arranged on the sealing ring. In a third embodiment supporting member and sealing ring have both projections and notches.

[0009] Preferably, the first portion of the sealing ring may be a flat ring portion extending radially from a first axial end of the annular back portion. In this embodiment, the flat ring portion functions as a stopper for the axial movement of the sealing ring, and it has the effect that the sealing ring when reaching its axial end position abuts one axial face of the supporting member's inner portion along its whole circumference. Thus, the sealing ring is held tight on the supporting layer in the axial direction the sealing ring was moved. Furthermore, the sealing ring is not susceptible for deformation.

[0010] According to a further advantageous embodiment, the second portion of the sealing ring may consist of a number of circumferentially spaced projections extending radially from a second axial end of the annular back portion and forming part of the bayonet fitting. For example, the second portion may consist of three, four or five projections. Said projections, in the rotated end position of the sealing ring, abut the other axial face of the supporting member's inner portion. Thus, the sealing

ring is held tight on the supporting member in the axial opposite direction in which the sealing ring was moved.

[0011] The second axial side is the side opposing the first axial side so that the first and second portion defining between themselves an annular recess extending circumferentially for accommodating the annular inner portion of the supporting member. The recess is especially shaped complementarily to said inner portion for positive engagement.

[0012] According to a further development of the present invention, the supporting member's annular inner portion may have at its inner periphery a number of circumferentially spaced notches to let the projections pass the inner portion when the sealing ring is axially moved into the supporting member with the projections aligned to the notches. Thus, the notches form part of the bayonet fitting as well. The notches are preferably complementary to the projections in shape and size to enable the projections to pass the notches during the step of axially fitting sealing ring and supporting member. This means, the lateral dimension of the notches is bigger than the outer lateral dimension of the projection. It has to be noted that the shape of the projections and notches does not necessarily need to be the same. For example, it is possible that the shape of the notches is basically rectangular whereas the projections are formed of an half circle or half ellipse sized smaller than the notch to enable axial fitting.

[0013] Preferably, the number of projections is equal to the amount of notches so that each projection is associated with a corresponding notch. It is, however, also possible to have more notches than projections. This enables axially fitting sealing ring and supporting member together in more angle positions than projections exist. The number of angle positions is given by the number of notches. Thus, e.g. there may be three, four or five notches provided at the circumference of the inner portion.

[0014] Preferably, the projections are arranged with equal distance to each other. This ensures equally fixed seat of the sealing ring on the supporting member.

[0015] The sealing ring may be made of a polymer, in particular an elastic polymer. Furthermore, the supporting member may be made of metal.

[0016] According to an advantageous further development, the sealing ring may have elevated areas on the flat ring portion extending into the notches to block rotation when the sealing ring is in its rotated end position. Here, the elevated areas engage with the notches. The elevated areas may have a shape complementary to the notches, and the number of elevated areas may be smaller or equal the number of notches.

[0017] Alternatively or in combination with the elevated areas, the sealing ring unit can comprise at least one blocking element extending from the annular inner portion of the supporting member into a recess in the opposing annular back portion. This also blocks further rotation when the sealing ring has reached its rotated end position. Here, the recess in circumferential direction delimiting side wall acts as limit stop for rotational movement.

[0018] Preferably, the blocking element is arranged within one of the notches. Particularly the blocking element extends inwards from an edge of the annular inner portion bordering the notch radially outwards.

[0019] The recess can be arranged centered between two neighbored projections. In this case, the sealing ring has to be rotated 45° until the blocking element inter engages with the recess. The number of recesses can be identical to the number of projections so that the number of possible angle positions for fitting the sealing ring is not limited by the number of blocking elements.

[0020] For example, the blocking element can be formed by a tongue-like portion of the supporting member bent downwards or in the direction of the sealing ring's first portion from the annular inner portion, e.g. from said edge. Thus, no separate component is needed.

[0021] According to one embodiment, the supporting member has an outer annular portion from which the inner annular portion extends radially inwards. In particular, the supporting member consists only of the inner annular portion and the outer annular portion as one unitary part. Here, the supporting member can be mounted on a wall of the pump chamber, especially on a stage casing of the pump. Alternatively, the supporting member can be a stage casing of a pump stage in a multistage pump having an opening for receiving the impeller. This means that the sealing unit is formed by mounting the sealing ring in the stage casing. There is no need for a separate supporting member. Thus, the number of parts to assemble is reduced. The annular inner portion is elevated with respect to the outer annular portion. This has the effect that, in the assembled state the sealing ring does not project from the front face of the stage casing in axial direction. It is rather possible to accommodate the first or second portion of the sealing ring within the axial recess formed due to the elevation of the annular inner portion on the other side.

[0022] The supporting member can be made of a metal sheet, in particular stainless steel. In particular, if the supporting member is a pump stage casing, metal sheet is preferred as it can be easily formed by cold forming. The supporting member, however, can also be made of a plastic material.

[0023] According to the present invention it is further proposed an electrically driven motor pump for pumping liquids having at least one pump stage comprising an impeller rotably mounted in a pump chamber, the impeller having a suction mouth being sealingly encircled by a sealing ring unit according to at least one embodiment described above.

[0024] In Particular, the pump is a multistage pump having two or more pump stages each of which comprising a sealing ring unit according to at least one embodiment described above. In contrast to other sealing ring units generally used in multi stage pumps comprising three or more members, e.g. an elastic ring between two

metal caps, the sealing ring unit according to the invention is especially compact, i.e. the axial length is small in contrast to said three-part sealing unit. This means that the sealing ring unit does not need much space in the pump chamber in axial direction. The impeller can be positioned in that his suction mouth extends more into the opening defined by the supporting member in comparison the three-part sealing unit embodiment. This results in a gain of axial length, for example up to 4 millimeters in a pump stage. The more pump stages the pump has, the more axial length can be reduced.

[0025] In one preferred embodiment, the supporting member may have an annular outer portion from which the annular inner portion extends radially inwards, the outer annular portion being mounted on a stage casing of one of the pump stages that partly delimits the pump chamber.

[0026] In another preferred embodiment the supporting member forms a part of a stage casing that partly delimits the pump chamber of one of the pump stages. In particular, the annular inner portion is part of said stage casing defining the opening through which the impeller extends. Thus, the number of parts of the sealing ring unit is reduced to one part formed by the sealing ring which is directly mounted or is to be mounted on the inner portion of the stage casing.

[0027] Further characteristics and advantages of the invention will become apparent from the following detailed description of embodiments with reference to the accompanying drawings, wherein

Fig. 1: is a perspective view of a first embodiment of a sealing ring unit, wherein a quarter portion of the sealing ring unit is cut-off.

Fig. 2: is a perspective view of a sealing ring of the sealing ring unit in Fig. 1, wherein a quarter portion of the sealing ring is cut-off.

Fig. 3: is a perspective view of the supporting member of the sealing ring unit in Fig. 1, wherein a quarter portion of the supporting member is cut-off.

Fig. 4: is a perspective view into a pump stage of a multistage pump comprising the sealing ring unit according to Fig. 1, wherein a quarter portion of the pump stage is cut-off.

Fig. 5: is a perspective cross section view into a pump stage of a multistage pump of a second embodiment of a sealing ring unit.

Fig. 6: is a perspective view of a pump stage casing forming the supporting member of the sealing ring unit in Fig. 5

Fig. 7 is a perspective view of a sealing ring according to another embodiment, wherein a quarter portion of the sealing ring is cut-off

Fig. 8 is a perspective view of another pump stage casing forming the supporting member of the sealing ring unit in Fig. 7

Fig. 9 is a perspective view on the back of the pump stage casing according to Fig. 8 having the sealing ring according to Fig. 7 mounted on it, wherein a quarter portion is cut-off

[0028] With reference to the above described figures, a sealing ring unit according to the present invention generally indicated by the reference numeral 1, consists of two parts, a sealing ring 3 and a supporting member 2. As shown in Fig. 1 the sealing ring 3 is mounted on the supporting member 2. It can be dismounted if necessary, i.e. if it is worn out due to impeller's the suction mouth sealingly rotating inside the sealing ring 3. Mounting and dismounting is eased by means of a bayonet fitting 11, 17 between the sealing ring 3 and supporting member 2 which is explained hereinafter.

[0029] A single sealing ring 3 is shown in more details in Fig. 2. It has a first portion 16, a second portion 17 and an annular back portion 15 connecting the first and second portion 16, 17 with each other. The first portion 16 of the sealing ring 3 is a flat ring portion 16 extending radially from one axial end of the annular back portion 15. The second portion 17 of the sealing ring 3 consists of a number of four circumferentially equally spaced projections 17 extending radially from the annular back portion 15 on the axial end opposite to the first axial end. Thus, the flat ring portion 16 and the projections 17 extend parallel and define an annular recess between. The back portion 15 is basically rectangular in cross section. First and second portion 16, 17 as well as the back portion 15 together form one unitary part of substantially U shape in sections. It is made of a polymer.

[0030] The supporting member 2 is shown in more details in Fig. 3. It has an annular outer portion 9 and an annular inner 10 portion. The annular outer portion 9 is basically rectangular in cross section. The annular inner portion 10 extends radially inwards from one axial end of the annular outer portion 9 and defines at its inner periphery an opening 22 for receiving the suction mouth 5 of an impeller 4. Outer and inner portions 9, 10 together form a unitary part of substantially L-shape which is made of metal. The annular inner portion 10 has at its inner periphery 12 an amount of four circumferentially equally spaced notches that complement to the projections 17 in shape and size, enabling the projections 17 to pass the inner portion 10 when the sealing ring 3)is axially moved into the supporting member 2 with the projections 17 aligned to the notches 11. As shown in Fig. 1, in the assembled condition of the sealing ring unit 1, the annular inner portion 10 is fixedly seated between the first and second portion 16, 17 in the annular recess.

[0031] Assembling of the sealing ring unit 1 takes place by moving the sealing ring 3 coaxially to the supporting member 2, in particular to the annular inner portion 10, into the supporting member 2 having the projections 17 directed to and aligned with the notches 11. This enables the sealing ring 3 to pass the inner annular portion 10 until an axially inner face 20 of the flat ring portion 16 of the sealing ring 3 gets in contact with an axially outer face 13 of the inner annular portion 10 of the supporting

member 3. This is the axial end position of the sealing ring 3 relative to the supporting ring 2. Here, the flat ring portion 16. blocks further movement.

[0032] Then the sealing ring 3 is turned a specific angle α relative to the supporting ring 2 to the left or right side. This angle may basically lie between 0° and 360°/n where n is the amount of projections 17. In case of the example there are 4 projections, leading to angle between 0-90°. Preferably, a medium angle is chosen, here for example 45°, as can be seen in figure 1. This is the rotated end position of the sealing ring 3.

[0033] As can be seen in figure 2 the sealing ring 3 has elevated areas 18 on the flat ring portion 16 extending into the notches 17. The elevated areas 18 are in the form of a plateau having definite lateral edges. During rotation of the sealing ring 3, the elevated areas 18 reach the notches 17 and snap into engagement. Being engaged with the notches, the elevated areas 18 prevent easy further rotation by the lateral edges in circumferential direction hit the corresponding lateral border of the notches in circumferential direction. However, the elevated areas are not very high, e.g. 10-20% of the thickness of the flat ring portion 16, to maintain rotability if a certain rotating force is applied. The number of elevated areas 18 may be equal or lesser than the number of notches 11. However, at least one elevated area 18 is necessary to reach the effect of rotation blocking.

[0034] Fig. 4 shows the sealing ring unit 1 according to figure 1 mounted within a stage of a electrically motor driven multistage pump radially sealing the suction mouth 5 of the pump impeller 4 of the pump stage. The impeller 4 is rotably mounted in a pump chamber that is at least partly delimited by a stage casing 6 having an opening 21 through which the suction mouth 5 of the impeller 4 extends. The sealing ring unit 1 is fixedly mounted with its annular outer portion 9 on the internal side of the stage casing 6 which is directed to the pump chamber. Here, the annular outer portion 9 has an elevated ring 8 extending axially on the axial end opposite the annular inner portion 10. The elevated ring 8 engages with an annular groove 7 provided in the stage casing 6. The groove 7 has a certain distance to the opening 21 and is coaxially with it. The sealing ring 3 extends radially beyond the opening, and his radial inner face 19 gets in sealing contact with the radial outer surface of the suction mouth 5 letting a lubricated clearance between suction mouth and radial inner face.

[0035] A second embodiment of the present invention is shown in Fig. 5 and 6. Fig. 5 is a perspective cross section view into a pump stage of a multistage pump comprising the sealing ring unit according to the invention. Here, the supporting member 2 is part of a stage casing 6 that at least partly delimits the pump chamber 23 of the pump stage. In Particular, supporting member 2 forms at least a part of the front wall of said stage casing 6 separating the pump chamber 23 from the suction area 24 in front of the impeller 4. This wall is provided with the opening 21 for receiving the suction mouth 5 of the impeller 4.

[0036] Fig. 6 is a perspective view of a pump stage casing 6 comprising the supporting member 2 of the sealing ring unit 1 in Fig. 5. Here, the supporting member 2 is at least formed by a rim portion 25 around the opening 21. Said rim portion 25 is raised so that the sealing ring 3 mounted on the supporting member 2 does not extend beyond the stage casing wall into the suction area 24, see Fig. 6. In particular, the rim portion 25 is raised a value equal to or higher than the thickness of the flat ring portion 16 of the sealing ring 3. The rim portion 25 has a width of approximately 3 to 10 mm. The rim portion 25 comprises a first and second radial section. In the first radial section the rim portion 25 rises and, then, continuously goes over to the second radial section forming a plateau lying in a plane parallel to the separating wall of the stage casing 6. The circumference of the second radial section comprises the notches 11, thus, the second radial section equals the annular inner portion 10 of the supporting member of the first embodiment. The sealing ring 2 for the second embodiment has the same characteristics as that one explained in connection with the first embodiment. Furthermore, the way of assembling and disassembling the sealing ring on/ from the stage casing 6 is the same as given in the first embodiment. Thus, reference is made to the description of the first embodiment.

In Fig. 7 it is shown a sealing ring 3 according to another embodiment, wherein a quarter portion of the sealing ring is cut-off so that the cross section form is also disclosed. This embodiment differs from that in Fig. 2 in that the back portion 15 has recesses 29 for interacting with a blocking element 26. The recesses 29 are arranged at the circumference of the back portion 15 and open radially outwards as well as in one axial direction, here in the direction of the second portion 17. In another embodiment which is not shown, however, the recesses 29 can be open only radially outwards. The recesses 29 are arranged centered between two neighboring projections 17.

[0037] Another difference to the embodiment in Fig. 2 is that all edges of the back portion 15 and second portion 17, i.e. of the projections 17, have a greater radius that eases axial fitting. Another difference is the presence of notches 27 at the outer periphery of the first portion. These further notches may interact with additional blocking element, in particular by coming into positive engagement.

[0038] A perspective view of another pump stage casing forming the supporting member 2 of the sealing ring unit is depicted in Fig. 8. Said supporting member 2 differs from that in Fig. 6 basically in that it additionally comprises at least one blocking member 26 interacting with one of the recesses 29 in the sealing ring 3 by extending inwards into said recesses 29 when the sealing ring 3 has been rotated 45° in its end position. As can be seen in Fig. 8 two blocking elements 26 are present arranged opposing to each other. The blocking members 26 are formed by

tongue-like portions of the supporting member's annular inner portion 10 wherein the portions have been bent downwards in the direction of the first portion 16 of the sealing ring 3. Thus, the blocking elements 26 have a free end and an opposing connected end that joins the annular inner portion 10 as to form one piece with it. With respect to the width of the notches 11, the blocking elements 26 are centered. In said center the edge of the annular inner portion 10 bordering the notches 11 is opened radial outwards. Fig. 8 depicts that the annular inner portion 10 is elevated in comparison to the annular outer portion 9. In the area of the blocking elements 26, the transition area from annular outer portion 9 to annular inner portion 10 forms part of the blocking elements 26 so that the connected end runs out into the annular outer portion 10 without any step or inclination.

[0039] Another difference of the embodiment in Fig. 8 in comparison to that in Fig. 6 is the presence of impressions 28 located in the annular inner portion 10 each of which centered between two adjacent notches 11. The impressions 28 are circular and lead to corresponding embossments on the underside of the annular inner portion 10 facing sealing ring's projections 17 when the sealing ring 3 is in its rotated end position. The embossments has the effect that the projections 17 are slightly bent axially outwards which is a further measure to hold the sealing ring 3 in position.

[0040] Fig. 9 gives a perspective view on the back of the pump stage casing according to Fig. 8 having the sealing ring according to Fig. 7 mounted on it, wherein a quarter portion is cut-off.

[0041] From the foregoing detailed description, it will be seen that the present invention provides a novel hydraulic seal 1 being compact on one hand and providing easy assembling and disassembling on the other hand. Compactness is particularly advantageous in multistage pumps as the overall axial length of every pump stage can be reduced. The sealing ring 3 is mounted on the supporting member 2 by means of a bayonet fitting as described, and when it is desired to replace a worn out sealing ring 3, the sealing ring 3 may be easily separated.

[0042] It is obvious that various changes and modifications may be made in the details of construction and design of the above described sealing ring unit without departing from the scope of the invention, and all of such changes are contemplated as may come within the scope of the claims.

List of Reference Numerals

[0043]

1 Sealing ring unit
2 Supporting Member
3 Sealing Ring
4 Impeller
5 Suction Mouth
6 Stage Casing
7 Annular Groove
8 Elevated Ring
9 Annular Outer Portion of Supporting Member
10 Annular Inner Portion of Supporting Member
11 Notches
12 Inner Periphery
13 Axial inner Face
14 Axial outer Face
15 Annular Back Portion of Sealing Ring
16 Flat Ring Portion of Sealing Ring
17 Projection
18 Elevated Area
19 Radial Inner Face of Sealing Ring
20 Axial Inner Face of Sealing Ring
21 Circular Opening in stage Casing
22 Circular Opening in Sealing Ring Unit
23 Pump Chamber
24 Suction Area
25 Rim Portion
26 Blocking Element
27 Second Notches
28 Impression
29 Recess

Claims

1. Sealing ring unit (1) for radially sealing the suction mouth (5) of a pump impeller (4), in particular for a multistage pump, the unit comprising a sealing ring (3) and a supporting member (2) removably carrying the sealing ring (3), the supporting member (2) having an annular inner portion (10) defining an opening (22) for receiving the suction mouth (5) of the impeller (4), the sealing ring (3) having a first portion (16) and second portion (17) and an annular back portion (15) to face the suction mouth (5) connecting the first and second portion (16, 17) with each other, the annular inner portion (10) being accommodated between the first and second portion (16, 17), **characterized in that** the sealing ring (3) being mountable on the supporting member (2) by means of a bayonet fitting (11, 17).

2. Sealing ring unit (1) according to claim 1, **characterized in that** the bayonet fitting (11, 17) comprises radially extending projections (17) on one of the sealing ring (3) or the supporting member (2) and corresponding notches (11) on the other one of the sealing ring (3) and the supporting member (2) **in that** aligning the projections (17) and the notches (11) with each other enables axially fitting the sealing ring (3) on the supporting member (2).

3. Sealing ring unit (1) according to claim 1 or 2, **characterized in that** the first portion (16) of the sealing ring (3) being a flat ring portion (16) extending radially from a first axial end of the annular back portion (15).

4. Sealing ring unit (1) according to claim 2, **characterized in that** the second portion (17) of the sealing ring (3) being formed by the projections (17) circumferentially spaced and extending radially from a second axial end of the annular back portion (15).

5. Sealing ring unit (1) according to claim 2 or 4, **characterized in that** the supporting member's (2) annular inner portion (10) having at its inner periphery (12) the notches (11) circumferentially spaced to let the projections (17) pass the inner portion (10) when the sealing ring (3) is axially moved into the supporting member (2) with the projections (17) aligned to the notches (11).

6. Sealing ring unit (1) according to claim 2, 4 or 5, **characterized in that** the notches (11) are complementary to the projections (17) in shape and size.

7. Sealing ring unit (1) according to one of the preceding claims, **characterized in that** projections (17) are arranged with equal distance to each other.

8. Sealing ring unit (1) according to one of the preceding claims, **characterized in that** the sealing ring (3) is made of a polymer.

9. Sealing ring unit (1) according to one of the forgoing claims, **characterized in that** the sealing ring (3) has elevated areas (18) on the flat ring portion (16) extending into the notches (17) in assembled state of the sealing ring (3) and the supporting member (2) to block rotation.

10. Sealing ring unit (1) according to one of the forgoing claims, **characterized in that** at least one blocking element (26) extends from the annular inner portion (10) of the supporting member (2) into a recess (29) in the opposing annular back portion (15).

11. Sealing ring unit (1) according to claim 10 depending on one of claim 2, **characterized in that** the blocking element (26) is arranged within one of the notches (11).

12. Sealing ring unit (1) according to claim 10 or 11, **characterized in that** the recess (29) is arranged centered between two neighbored projections (17).

13. Sealing ring unit (1) according to claim 10, 11 or 12, **characterized in that** the blocking element (26) is formed by a tongue-like, in particular resilient, portion of the supporting member (2) bent away from the annular inner portion (2).

14. Sealing ring unit (1) according to one of the foregoing claims, **characterized in that** the supporting member (2) has an outer annular portion (9) from which the annular inner portion (10) extends radially inwards.

15. Sealing ring unit (1) according to claim 14, **characterized in that** the annular inner portion (10) is elevated to the outer annular portion (9).

16. Sealing ring unit (1) according to one of the preceding claims, **characterized in that** the supporting member (2) is made of a metal sheet.

17. Electrically driven motor pump for pumping liquids having at least one pump stage comprising an impeller (4) rotably mounted in a pump chamber, the impeller (4) having a suction mouth (5) being sealingly encircled by a sealing ring unit (1) according to one of claims 1 to 16.

18. Pump according to claim 17, **characterized in that** it is a multistage pump having two or more pump stages each of which comprising a sealing ring unit according to one of claims 1 to 16.

19. Pump according to claims 17 or 18, **characterized in that** the supporting member (2) has an annular outer portion (9) from which the annular inner portion extends radially inwards, the annular outer portion (9) being mounted on a stage casing (6) that partly delimits the pump chamber of one of the pump stages.

20. Pump according to claims 17 or 18, **characterized in that** the supporting member (2) forms a part of a stage casing (6) that partly delimits the pump chamber of one of the pump stages.

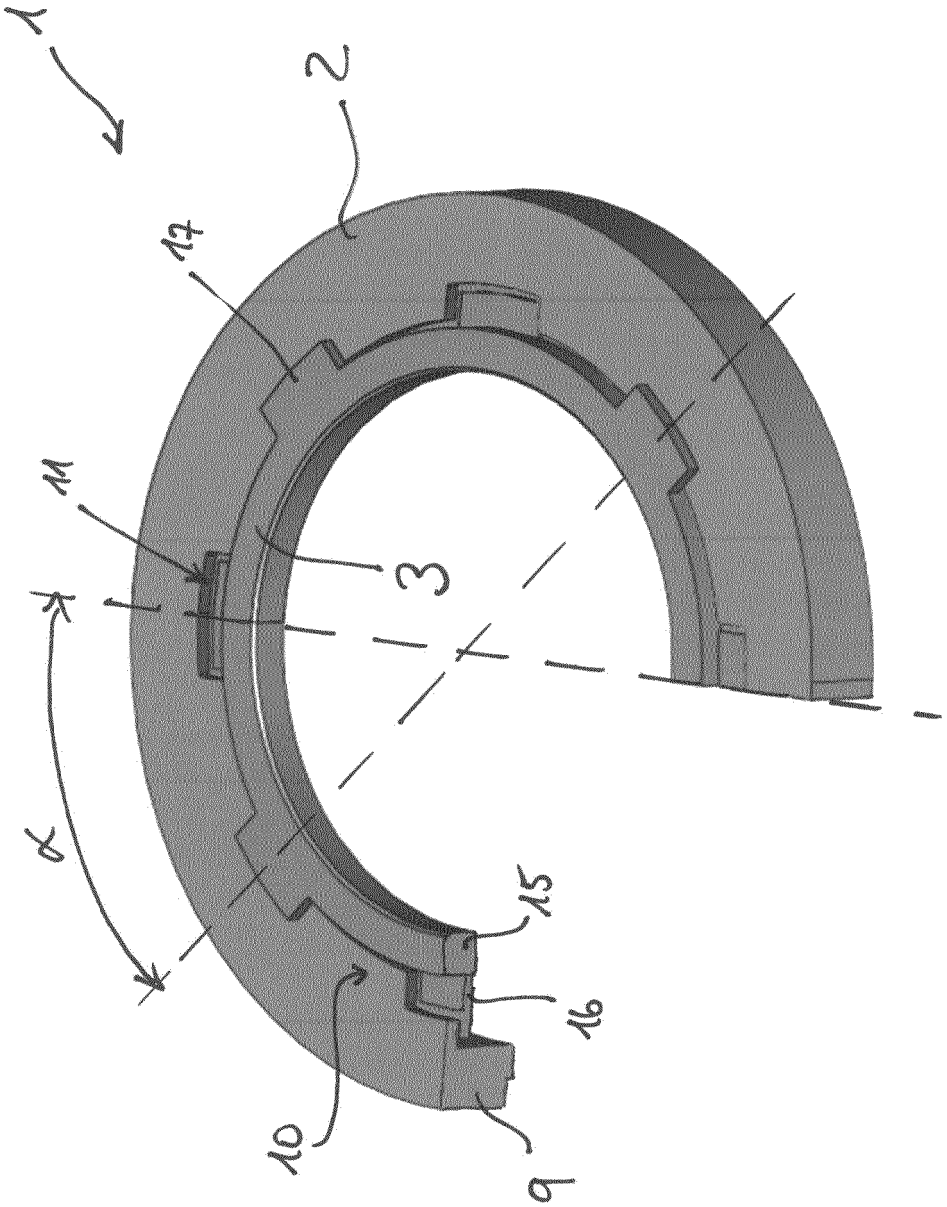

Fig. 1

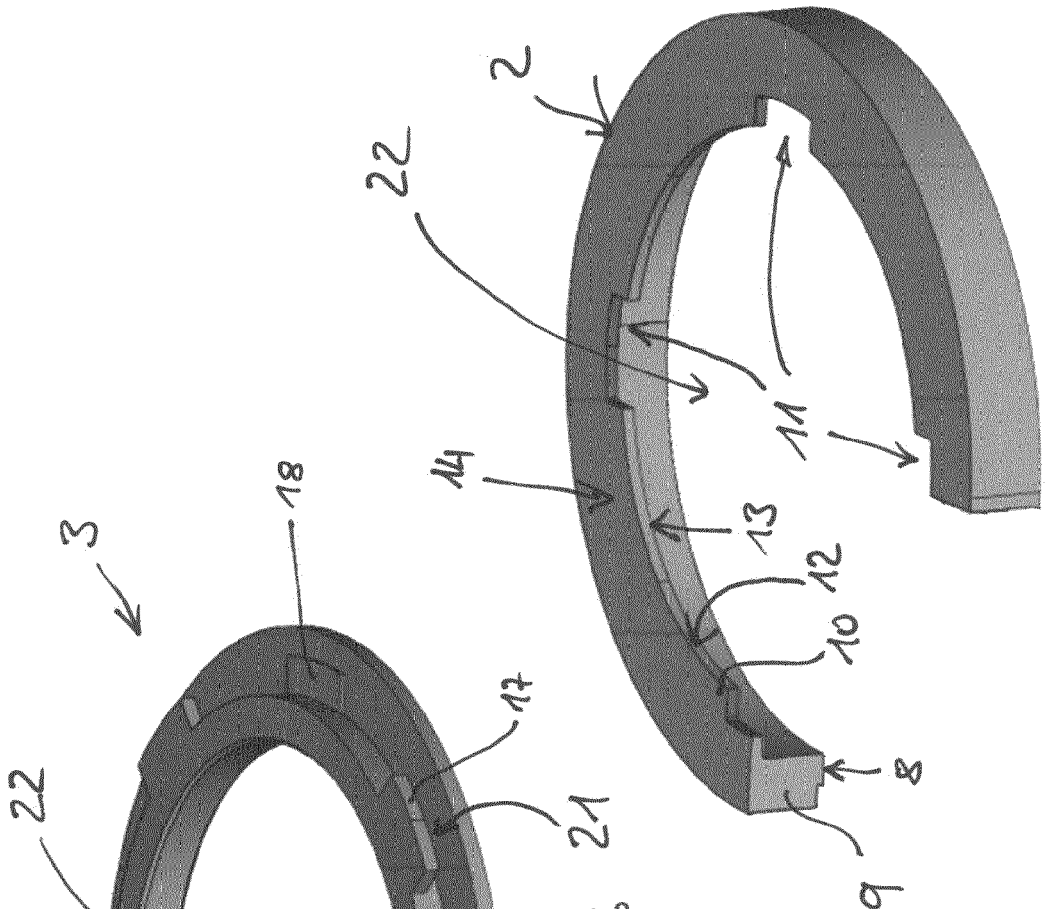

Fig. 3

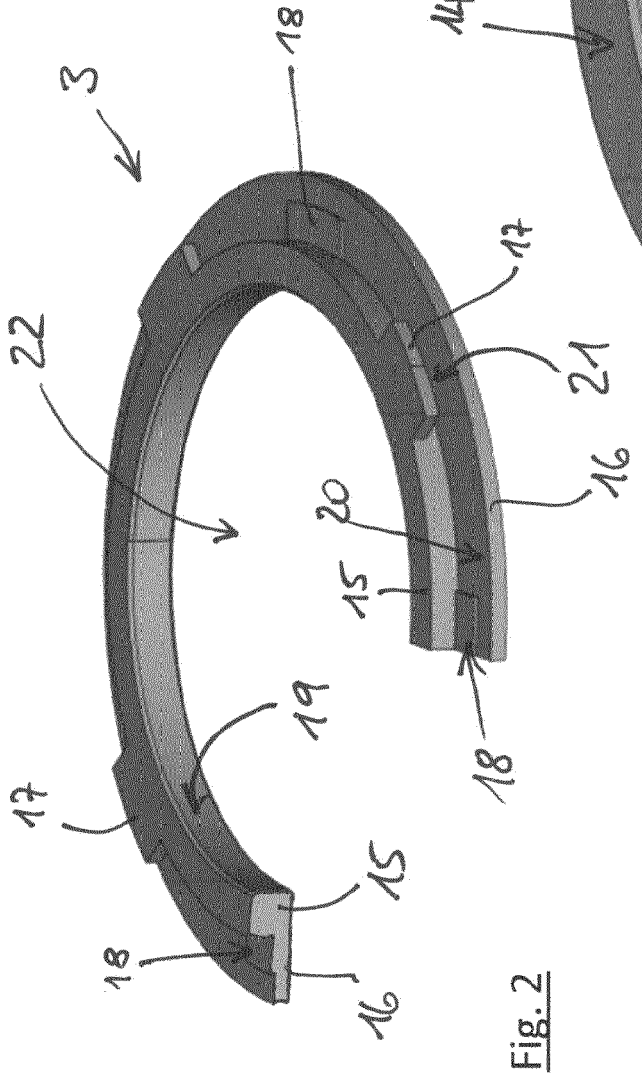

Fig. 2

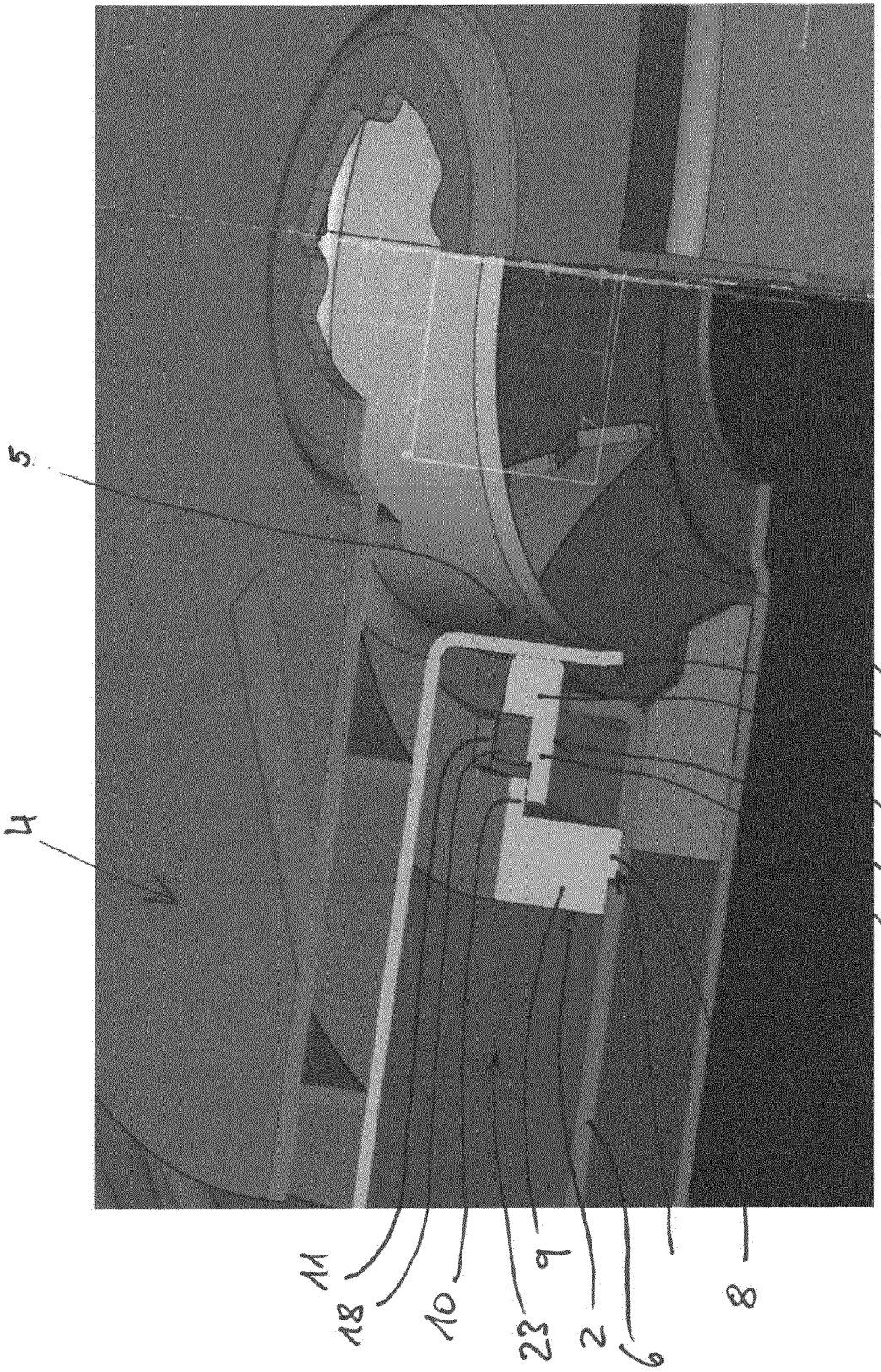

Fig. 4

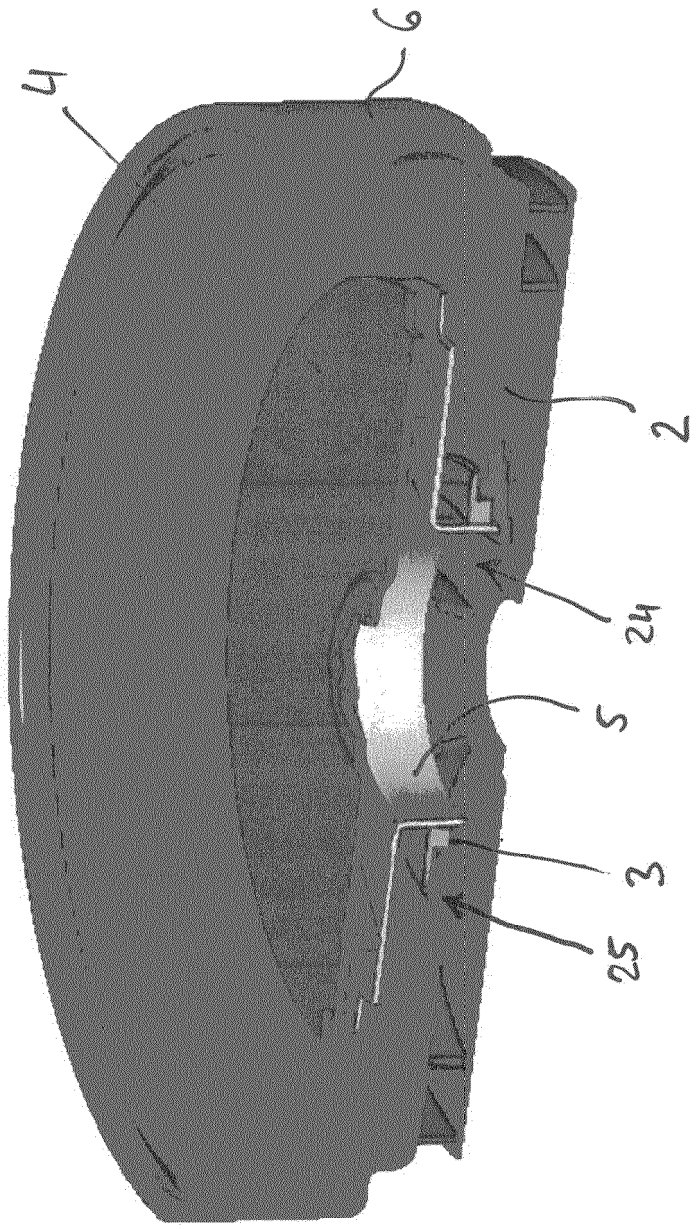

Fig. 5

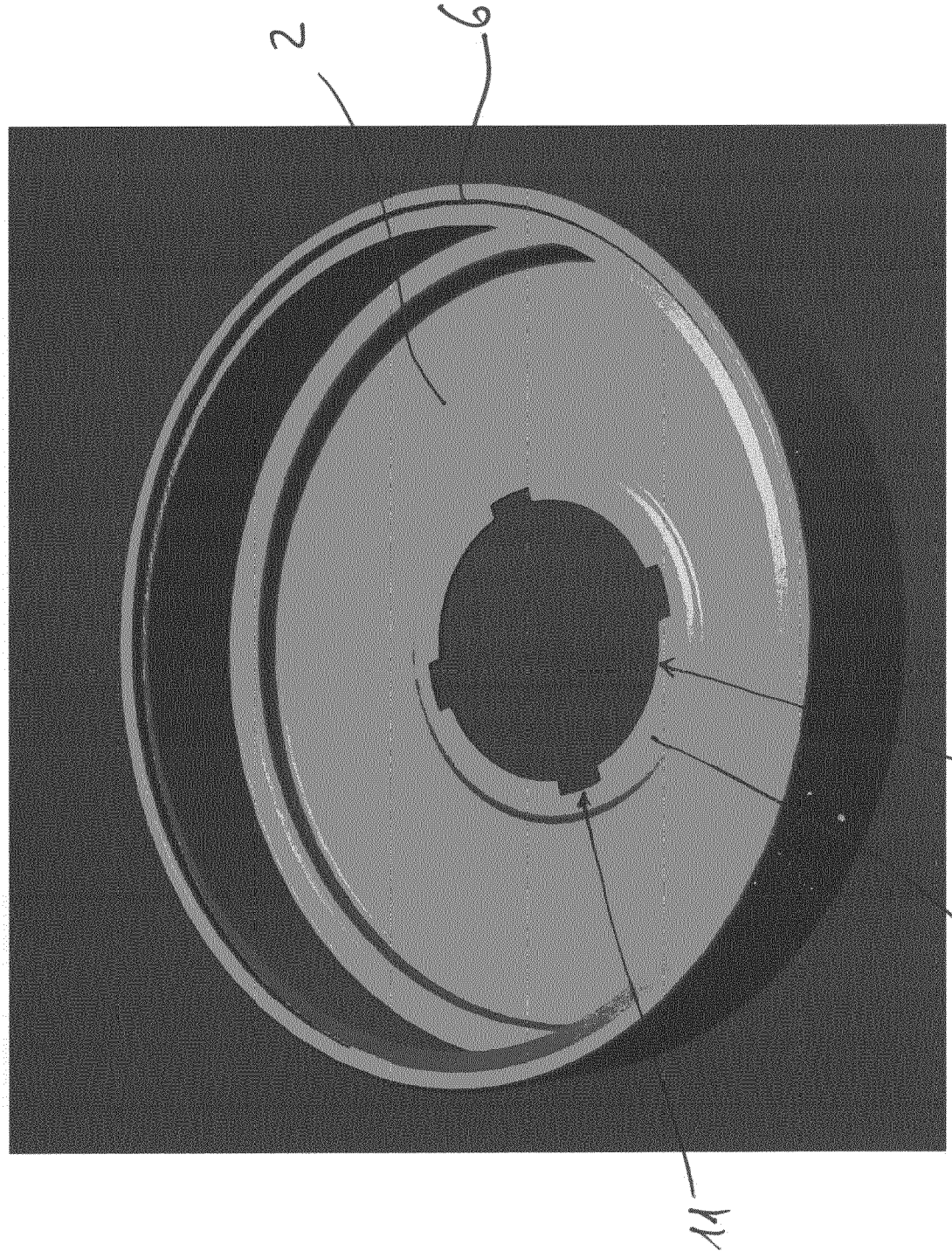

Fig. 6

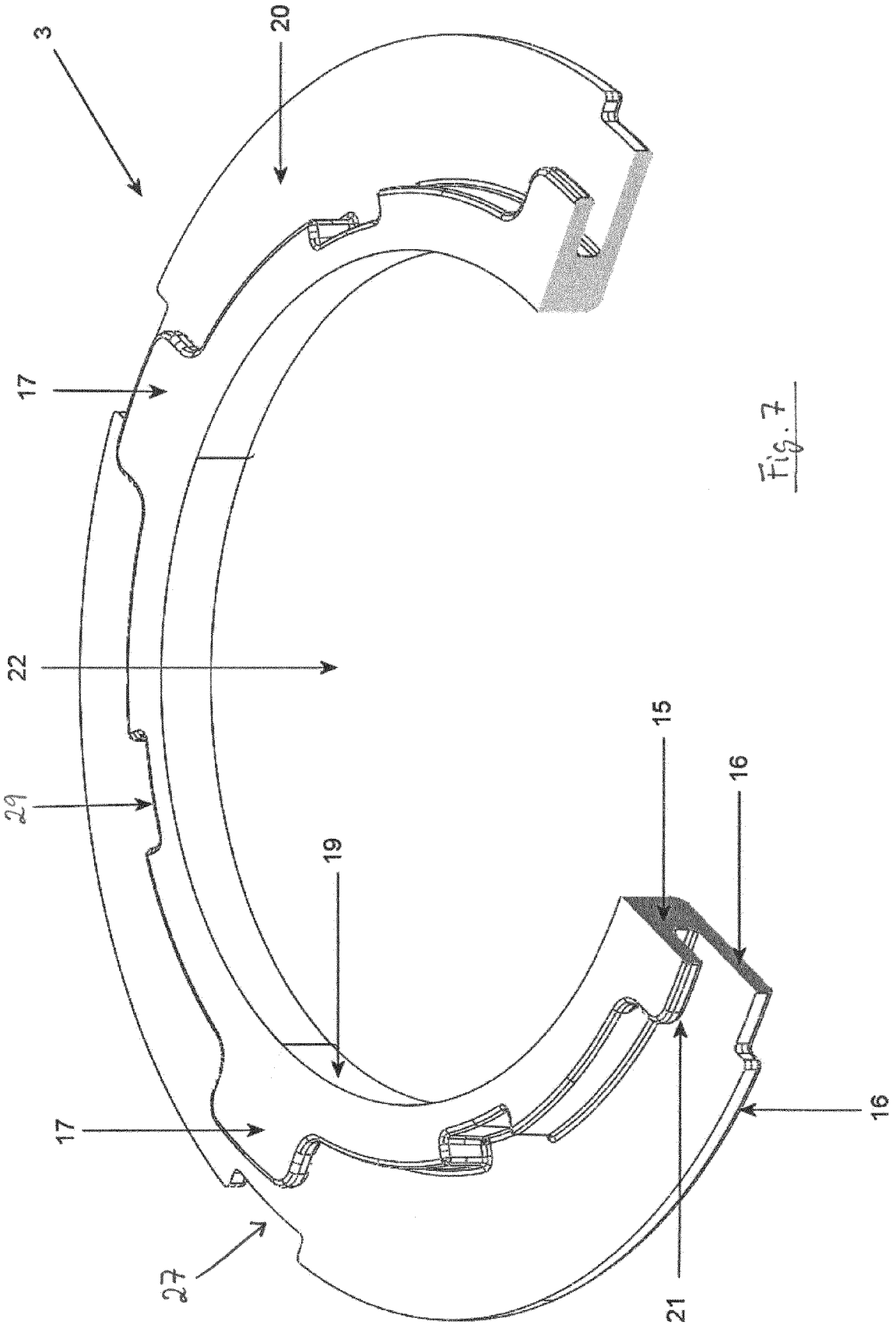

Fig. 7

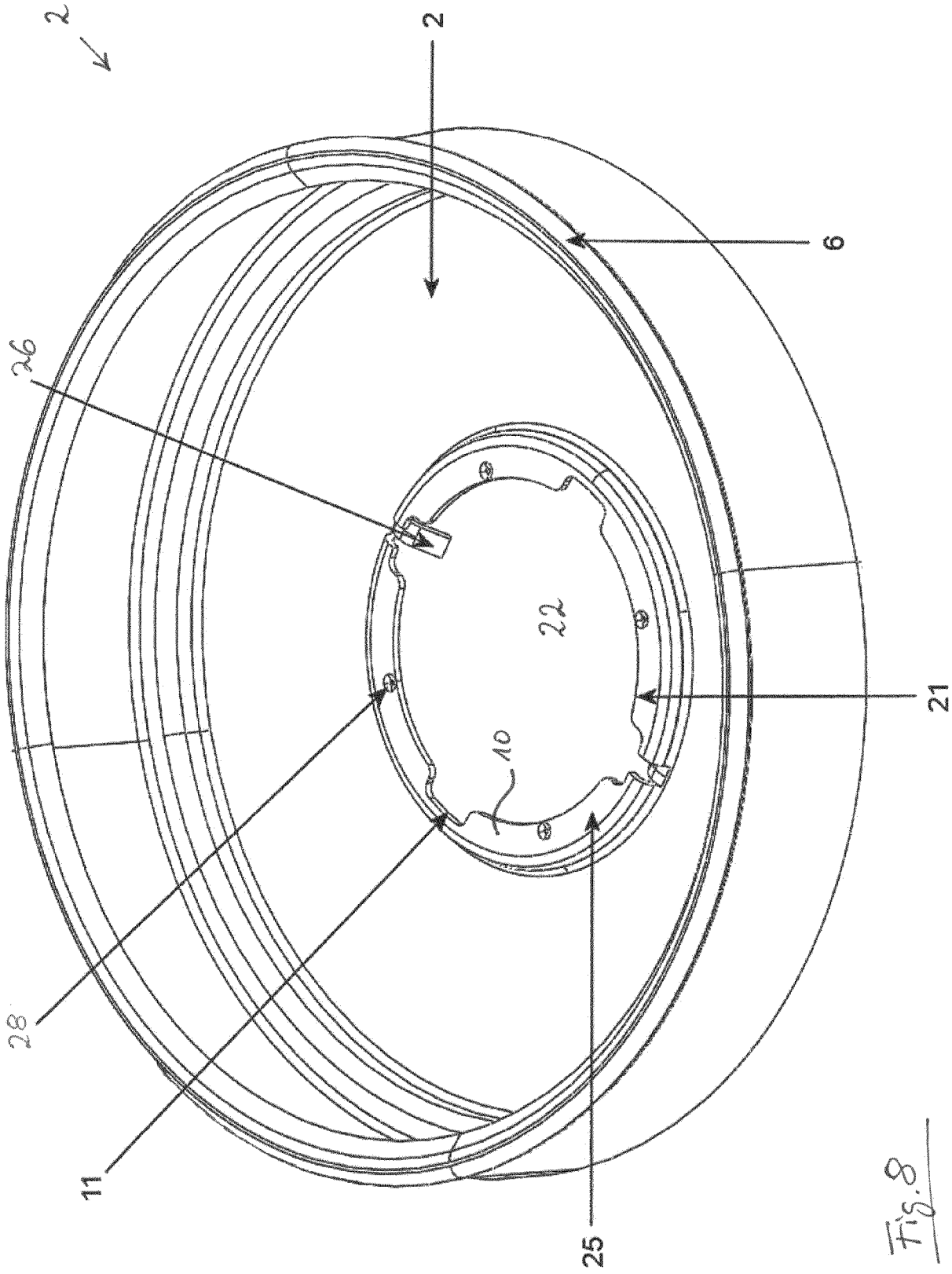

Fig. 8

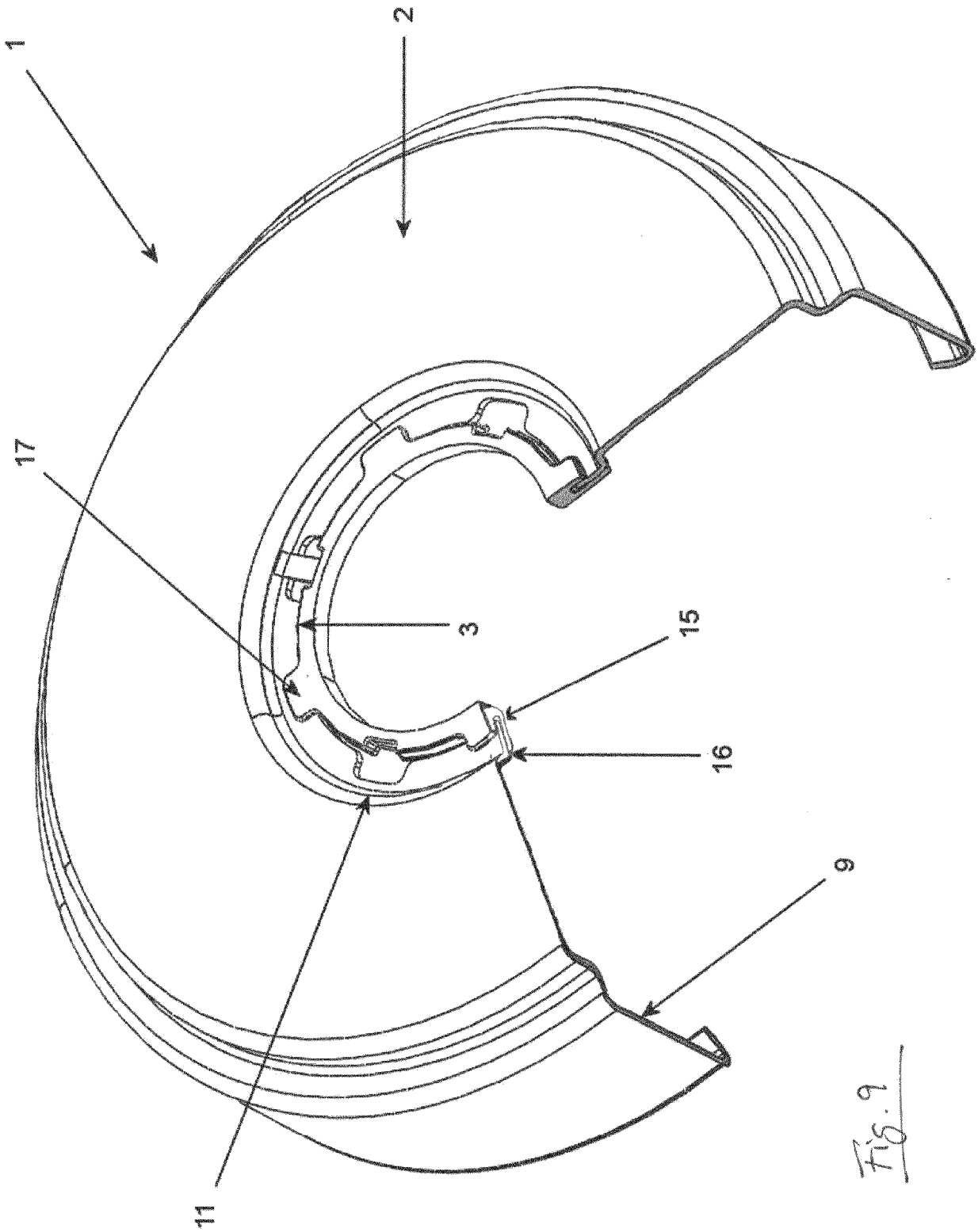

Fig. 9

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EUROPEAN SEARCH REPORT

Application Number
EP 15 00 3549

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)

F04D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	17 May 2016	Ingelbrecht, Peter

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