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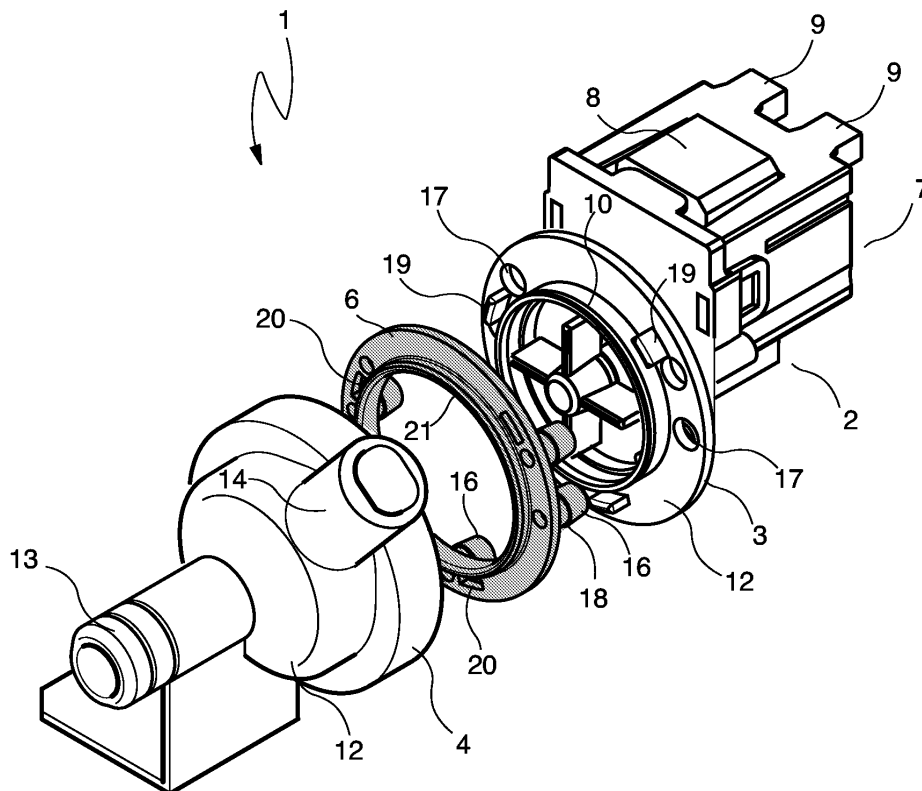
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(54) **Electric motor-driven pump for washing machines and the like**

(57) Electric motor-driven pump for washing machines and the like comprising a rotor housing (2) having a coupling flange (3) connectable to a casing (4) so as to form a fluid chamber for an impeller (5), the pump

comprises at least one vibration-damping spacer (6) arranged between the flange (3) and the casing (4), further the spacer (6) is integrally provided with connection means adapted to associate the flange (3) and the casing (4) to the spacer.



**FIG.1**

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## Description

**[0001]** The present invention refers to an electric motor-driven pump for washing machines and the like.

**[0002]** Pumps driven by a permanent-magnet synchronous or asynchronous motor are commonly installed in these machines for recirculating or draining purpose.

**[0003]** In general pumps of this kind are formed by an electrical part comprising a rotor housing with stator windings that surround a stator pack and an hydraulic part comprising a dome connectable to a flange of the rotor housing to form a chamber in which an impeller rotates, the dome being provided with an intake port and a discharge duct for the liquid to be pumped. The flange of the rotor housing and the dome are sealed by means of an O-ring or the like.

**[0004]** Well-known is the fact that since the dome is rigidly fixed to the basement of the washing machine cabinet vibrations produced by the rotor chamber are transmitted from the pump to the basement and through it to the cabinet of the washing machine.

**[0005]** Generally felt is nowadays the need for reducing such vibration particularly unpleasant for the users because of the generated noise.

**[0006]** The aim of the present invention is therefore to solve the noted problems, eliminating the drawbacks of the cited known art and thus providing a pump adapted to reduce the vibrations generated by the rotor chamber and therefore the consequent noise.

**[0007]** A further object is to provide a pump composed of readily available parts, which are mass producible at reduced costs.

**[0008]** A not least object is to provide a pump, which is capable of offering the most ample guarantees of reliability and safety in use.

**[0009]** According to the present invention, this aim is reached in a pump having the characteristics as recited and defined in the appended claims.

**[0010]** Anyway, features and advantages of the present invention may be more readily understood from the description that is given below by way of a non-limiting example with reference to the accompanying drawings, in which:

- Figure 1 is an exploded perspective view of a pump according to the present invention;
- Figure 2 is an exploded perspective view of the pump shown in Fig. 1 with the coupling flange associated to the spacer;
- Figure 3 is a right perspective view of the pump shown in Fig. 2;
- Figure 4 is an enlarged sectional view of the pump according to the present invention;

- Figure 5 is an exploded perspective view of a pump according to a second embodiment of the present invention;

- 5 - Figure 6 is a perspective view of the pump shown in Fig. 5;

- Figure 7 is a cross-sectional perspective view of the pump shown in Fig. 5;

- 10 - Figure 8 is an enlarged view of the pump shown in Fig. 7.

**[0011]** With reference to the figures 1 to 4, an embodiment of a electric motor-driven pump according to the present invention, generally designated by the reference numerical 1, comprises a rotor housing 2 having a coupling flange 3 connectable to a casing 4 so as to form a chamber for an impeller 5. Expediently the pump comprises at least one vibration-damping spacer 6 arranged between the coupling flange 3 and the casing 4. Further the spacer 6 is integrally provided with connection means adapted to associate said flange and said casing to said spacer.

25 **[0012]** The pump electrical part, which is of a per se known type, comprises stator windings 7 that surround a stator pack 8 and are connected to electrical terminals 9 for supplying them with power. The coupling flange 3 extends from one end of the rotor chamber 2 and perpendicular thereto in correspondence to the coupling area of the impeller 5 with a rotor shaft. An annular raised ridge 10 is provided on a coupling flange side 11 that faces the impeller 5 for centring in the vibration-damping spacer 6.

30 **[0013]** The casing 4, which is adapted to be fixed to the washing machine cabinet, comprises a substantially dome shaped body 12, sealingly and removably associable to the rotor housing 2 to provide in its interior the fluid chamber for the impeller 5. The dome shaped body 12 is suitably provided with an intake duct 13 arranged along the rotational axis of the impeller and a discharge duct 14 arranged sideways with respect to the dome shaped body 12. Further the dome shaped body 12 is provided with an annular base 15 having an internal diameter slightly greater than the outer one of the annular raised ridge 10.

35 **[0014]** The spacer 6 is shaped as an annular ring advantageously made of resilient material adapted to be associated to the coupling flange side 11. For this purpose the spacer 6 is provided with the connection means which comprises a plurality of perforated sections 16 frustum cone shaped and protruding conical axially from the ring and formed integrally in one piece with the spacer 6. Such perforated sections 16 are adapted to be received in matchingly shaped openings 17 formed through the coupling flange 3 so as to engage such openings 17 in correspondence of reduced cross-section portions 18 which the perforated sections 16 are

provided with at the root thereof. Expediently the coupling flange 3 can be provided with positioning lugs 19 protruding from the coupling flange side 13 and adapted to be inserted in corresponding slot 20 provided on the vibration-damping spacer 6 in order to prevent the reciprocal rotation between the latter and the coupling flange 3. The annular ring of the spacer 6 has an axially extending edge 21 suitable to externally lay on the annular raised ridge 10 when the spacer 6 and the coupling flange 3 are associated as it is clearly shown in Figure 4. Cylindrical through cavities are axially provided in the perforated sections 16 to accommodate fastening means 22 adapted to connect the casing 4 to the spacer 6. Accordingly the annular base 15 of the casing 4 is provided with threaded bores 23 to receive the fastening means 22 that being engaged with an abutment formed in the cylindrical through cavities fasten the casing 4 to the spacer 6.

**[0015]** The assembly of the above-described embodiment comprises to forcibly insert the perforated sections 16 through the matchingly shaped openings 17. The inclined walls of the perforated sections 16 due to the resiliency thereof are progressively constrained inward by diameter dimension of the openings 17 up to the reduced cross-section portions 18 come in correspondence to the opening 17 such that the wall of the perforate sections 16 are allowed to snap outward recovering their original shape and causing the reduced cross-section portions 18 to engage to the openings 17. Then the casing 4 is fasten to the spacer 6 by means of the fastening means 22 as described above.

**[0016]** When the pump is assembled the annular base 15 of the casing 4 abuts against the annular portion of the spacer 6 while the annular raised ridge 10 of the coupling flange 3 and the internal portion of the annular base 15 are spaced-in between by the axially extending edge 21 of the spacer 6 that is interposed therebetween.

**[0017]** It is to be noted that, according to the present invention, the assembly of the pump can be also realised by connecting the casing 4 to the spacer 6 first and then the coupling flange 3 to the spacer 6 inverting the operation described above.

**[0018]** With reference to the figures 5 to 8 a second embodiment of the present invention is shown wherein corresponding items and components of the two solutions are indicated with the same reference numerals. Further for sake of clarity the coupling flange 3 is depicted without the rotor housing 2.

**[0019]** The casing 4, which is substantially similar to the one disclosed for the first embodiment is provided with associating element 24 comprising angularly spaced apart arcuate tongues 25 which radially project from the annular base 15 of the casing 4 and are adapted to engage the connection means of the spacer 6.

**[0020]** The spacer 6 comprises an annular ring of resilient material having an axially extending edge 21 suitable to externally lay on the annular raised ridge 10 when the spacer 6 and the coupling flange 3 are asso-

ciated as it is clearly shown in Figure 8. The connection means, which are integrally provided in one piece with the spacer 6 comprise seats 26 formed by means of fins 27 extending from the outer edge of the spacer annular ring along the axially extending edge 21. Such fins 27 form arcuate grooves adapted to accommodate the tongues 25 of the casing 4 in order to connect the latter to the spacer 6. The fins 27 are angularly spaced apart form one another by substantially the same angle that separates the tongues 25 so that a reciprocal rotation between the spacer 6 and the casing 4 allows the tongues 25 to be inserted into the arcuate grooves and locked between the fins 27 and the axially extending edge 21.

**[0021]** The connection means of the spacer 6 are adapted to engage profiles 28 extending from the outer edge of the coupling flange 3 along the annular raised ridge 10 thereof. The profiles 28 form undercuts 29 matchingly shaped and angularly spaced apart to accommodate the fins 27 upon a reciprocal rotation between the spacer 6 and the coupling flange 3.

**[0022]** The assembly of the pump, according to the present invention, is achieved by inserting the annular ring of the spacer 6 between the annular raised ridge 10 and the profiles 28, with the fins 27 positioned in correspondence of the profiles 28. Then a rotational sliding between the spacer 6 and the coupling flange 3 allows the fins 27 to be forced into the undercuts 29 and locked between the profiles 28 and the annular raised ridge 10 due to the elastic deformation of the spacer 6. Therefore, in a similar manner as described above, the annular base 15 of the casing 4 is inserted between the fins 27 and the axially extending edge 21 of the spacer 6 with the tongues 25 positioned in correspondence of the fins 27. Upon a rotational sliding between the spacer 6 and the casing 4 the tongues 25 are forced into the grooves, which the fins 27 form, and locked between the fins 27 themselves and the axially extending edge 21 due to the elastic deformation of the spacer 6.

**[0023]** Even in this embodiment the assembly of the pump can be realised by associating the casing 4 to the spacer 6 first and then by associating the coupling flange 2 to the spacer 6 or it can be realised by simply inverting the just described operation.

**[0024]** Advantageously for both the embodiments described the vibration-damping spacer 6 acting as a seal element ensures a sealed coupling between the coupling flange 3 and the spacer 6 without the need of additional seals such as O-Ring and the like.

**[0025]** The pump according to the present invention prevents vibration to be transmitted from the rotor housing to the casing due to the particular configuration of the vibration-damping spacer that isolate the casing from the rotor.

**[0026]** It is to be noted that the pump according to the present invention provides a simple sealing connection between the casing and the coupling flange.

**[0027]** Conclusively, it can therefore be stated that the

present invention provide an inexpensive vibration damping pump, thereby doing away with the serious drawback shared by prior-art machines.

## Claims

1. Electric motor-driven pump for washing machines and the like comprising a rotor housing (2) having a coupling flange (3) connectable to a casing (4) so as to form a fluid chamber for an impeller (5), **characterized in that** said pump comprises at least one vibration-damping spacer (6) arranged between said flange (3) and said casing (4), said spacer (6) being integrally provided with connection means adapted to associate said flange (3) and said casing (4) to said spacer.
2. Pump according to claim 1, **characterized in that** said connection means comprise at least one seat (26) adapted to accommodate at least one matchingly shaped associating element (24) provided on said casing (4) in order to connect the latter to the spacer (6), said seat (26) being adapted to engage a least one matchingly shaped profile (28) provided on said coupling flange (3) in order to connect the latter to the spacer.
3. Pump according to claim 1 or 2, **characterized in that** said spacer (6) comprises an annular ring having an axially extending edge (21), said at least one seat (26) comprises one or more fins (27) extending from the outer edge of the spacer annular ring along the axially extending edge (21), said fins (27) forms an arcuate grooves adapted to accommodate said associating element (24) which comprises respective tongues (25).
4. Pump according to any one of claims 1-3, **characterized in that** said fins (27) are angularly spaced apart from one another by substantially the same angle that separates the tongues (25) so that a reciprocal rotation between the spacer (6) and the casing (4) allows the tongues (25) to be inserted into the arcuate grooves and locked between the fins (27) and the axially extending edge (21).
5. Pump according to any one of claims 1-4, **characterized in that** said profile (28) extend from an outer edge of said coupling flange (3) along an annular raised ridge (11) thereof, said profile (28) forming one or more undercuts (29) matchingly shaped and angularly spaced apart to accommodate said fins (27) upon a reciprocal rotation between the spacer (6) and the coupling flange (3).
6. Electric motor-driven pump for washing machines and the like comprising a rotor housing (2) having a coupling flange (3) connectable to a casing (4) so as to form a fluid chamber for an impeller (5), **characterized in that** said pump comprises at least one vibration-damping spacer (6) arranged between said flange (3) and said casing (4), said spacer (6) being integrally provided with connection means to associate one between said flange (3) and said casing (4) to said spacer (6), said connection means being adapted to cooperate with fastening means (22) in order to associate the other between said flange (3) and said casing (4) to said spacer (6).
7. Pump according to claim 6, **characterized in that** said connection means comprise at least one perforated section (16) adapted to be received in at least one matchingly shaped opening (17) formed through the coupling flange (3) so as to engage said opening (17).
8. Pump according to claim 6 or 7, **characterized in that** a cylindrical through cavity is provided in said at least one perforated section (16) to accommodate said fastening means (22).
9. Pump according to any one of claims 6-8, **characterized in that** said spacer (6) comprises an annular ring, and said perforated section (16) protruding axially from said ring.
10. Pump according to any of the preceding claims, **characterized in that** said spacer (6) is made of resilient elastic material.
11. Pump according to any of the preceding claims, **characterized in that** said vibration-damping spacer (6) act as a seal element between the coupling flange (3) and the spacer (6).

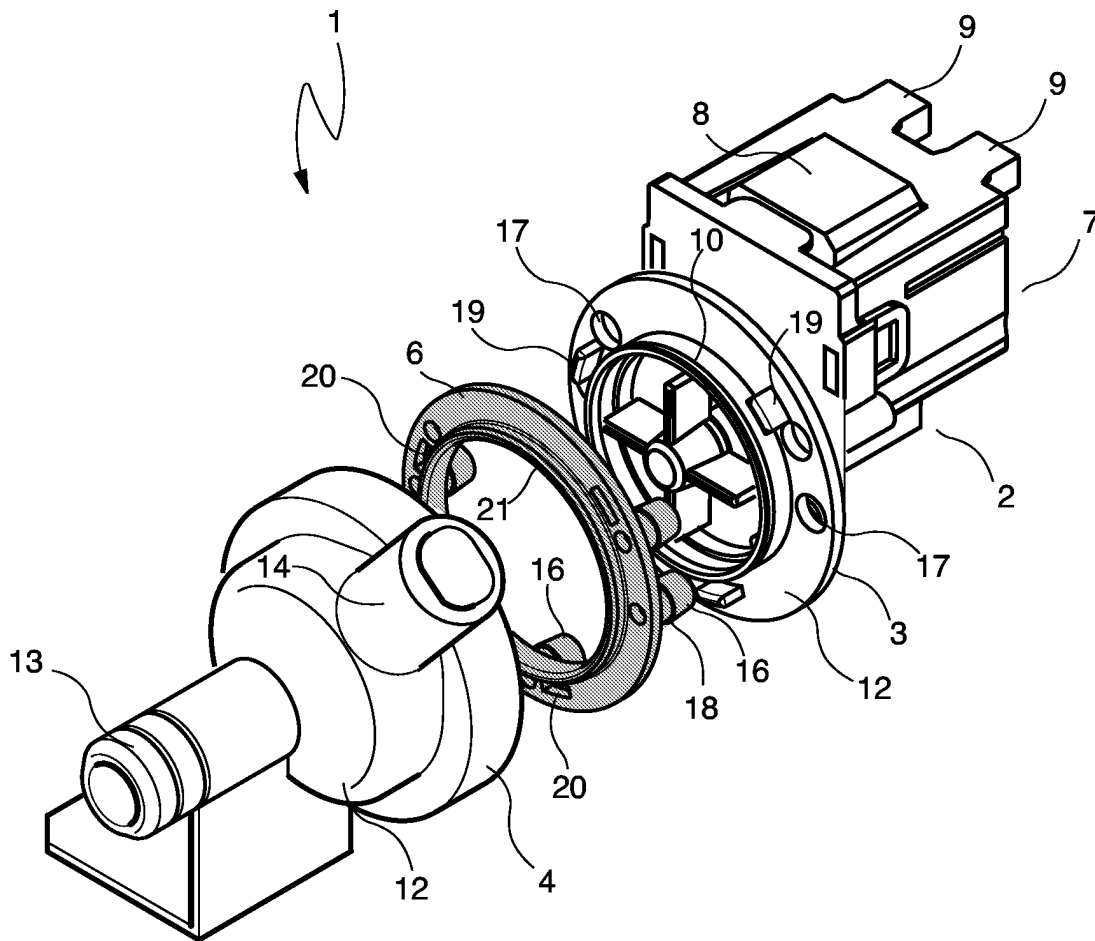


FIG.1

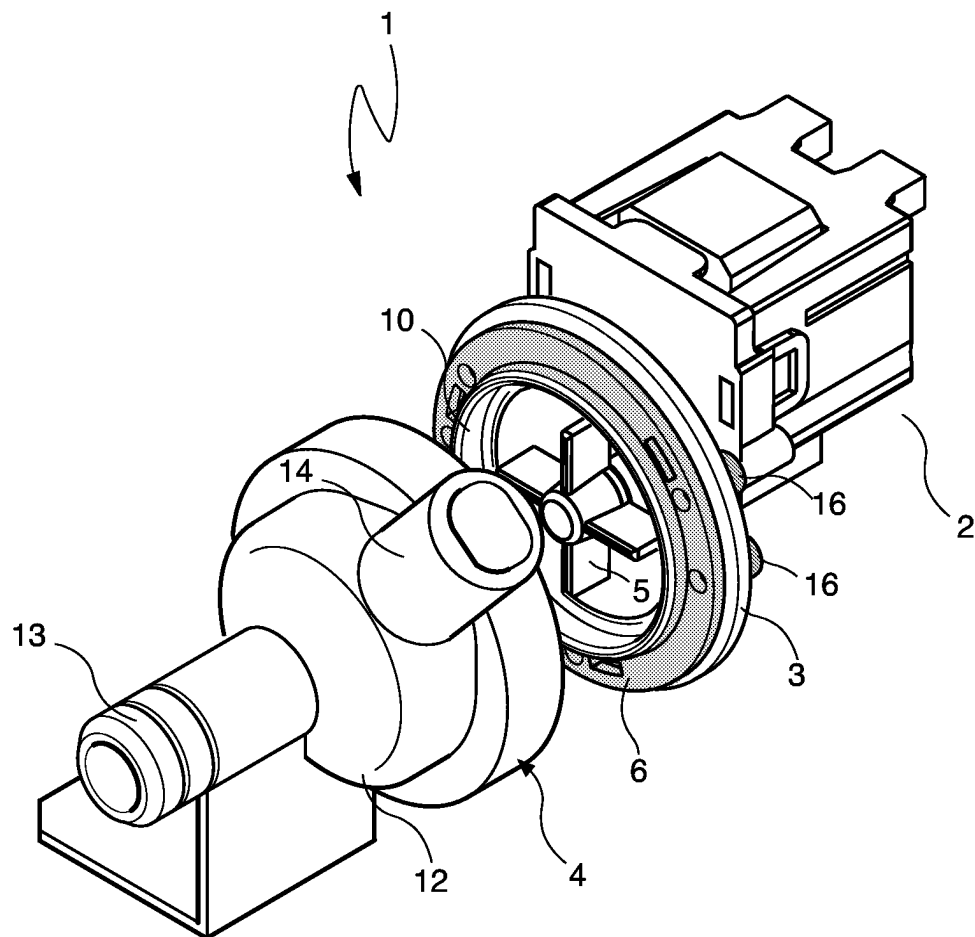


FIG.2

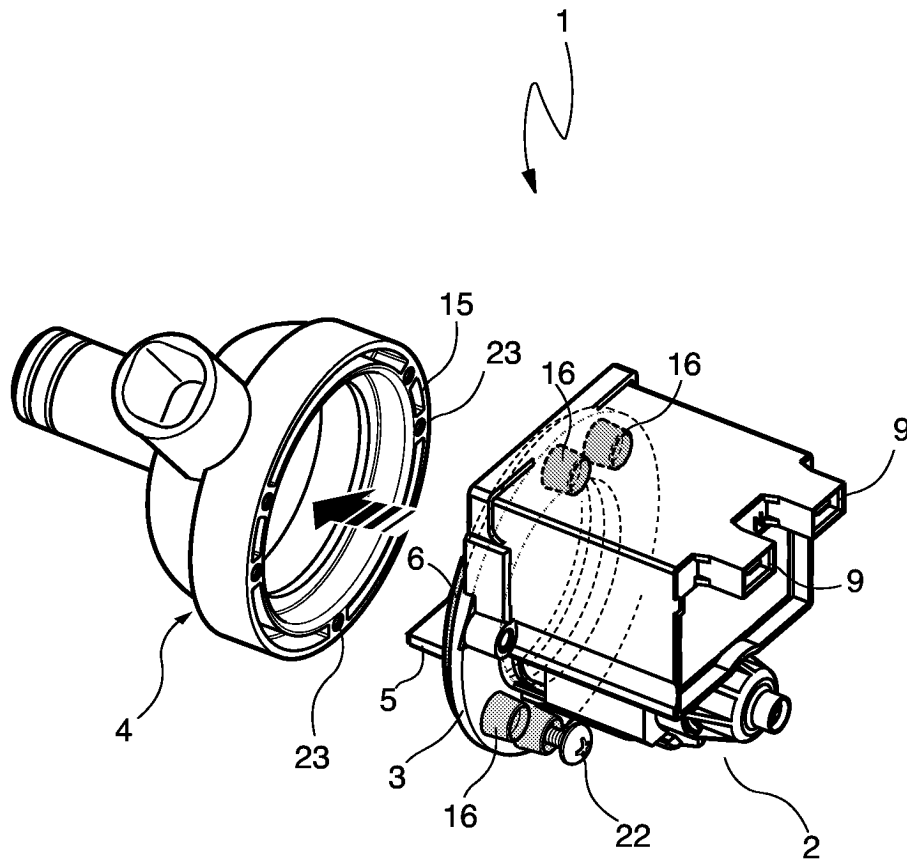


FIG.3

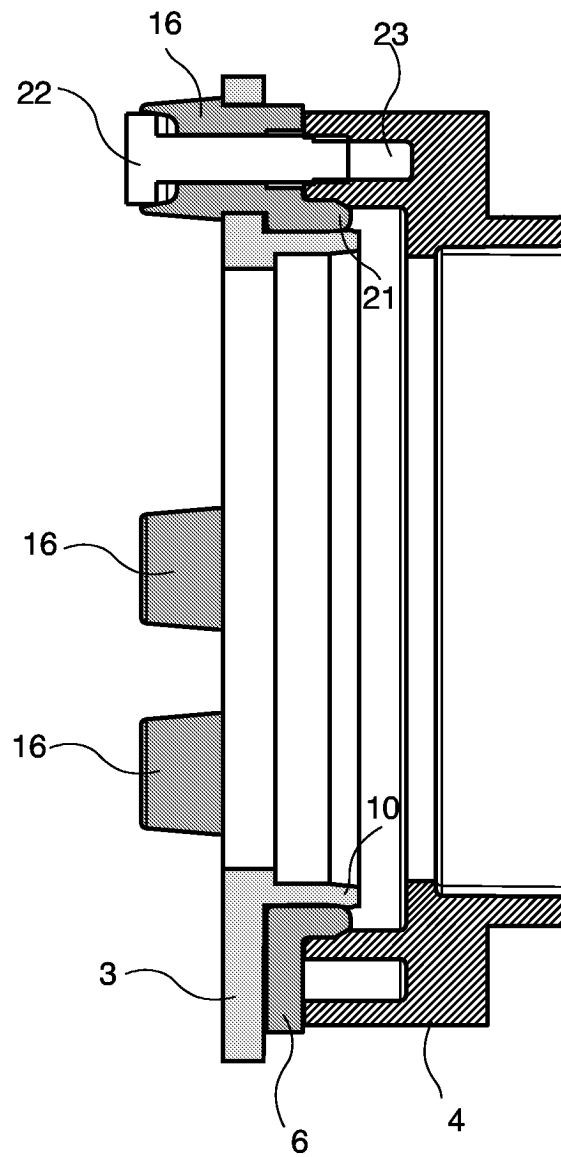


FIG.4

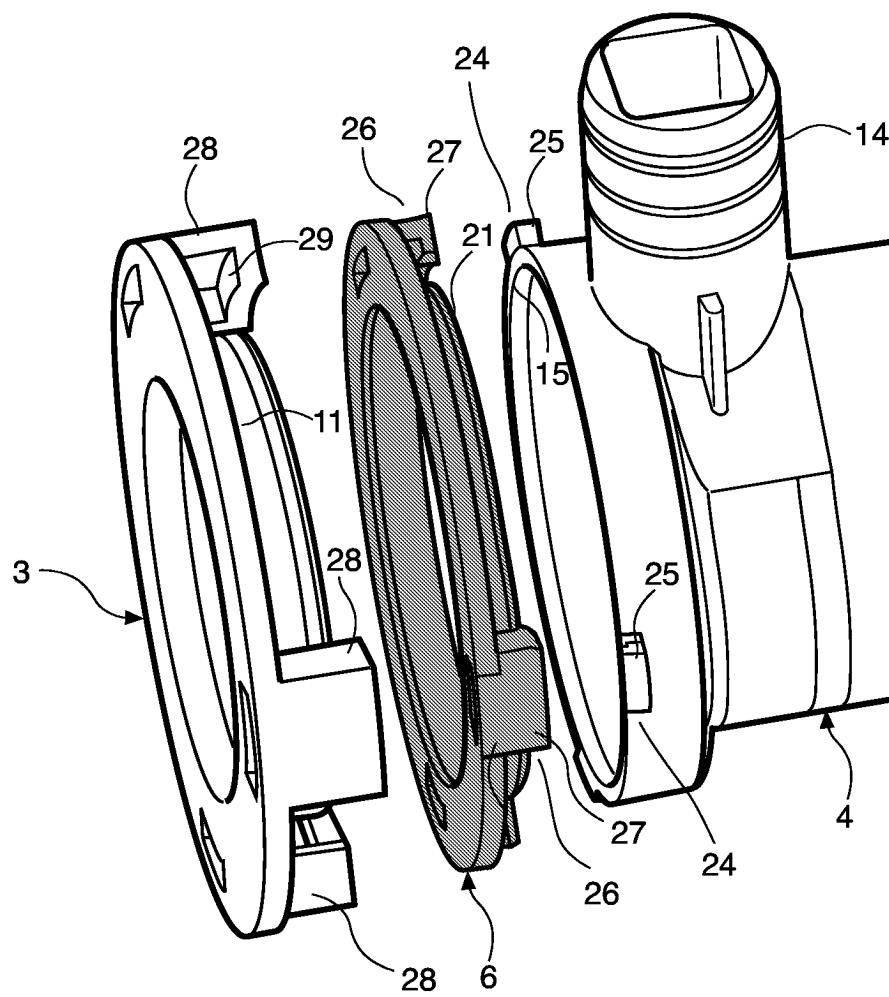


FIG.5

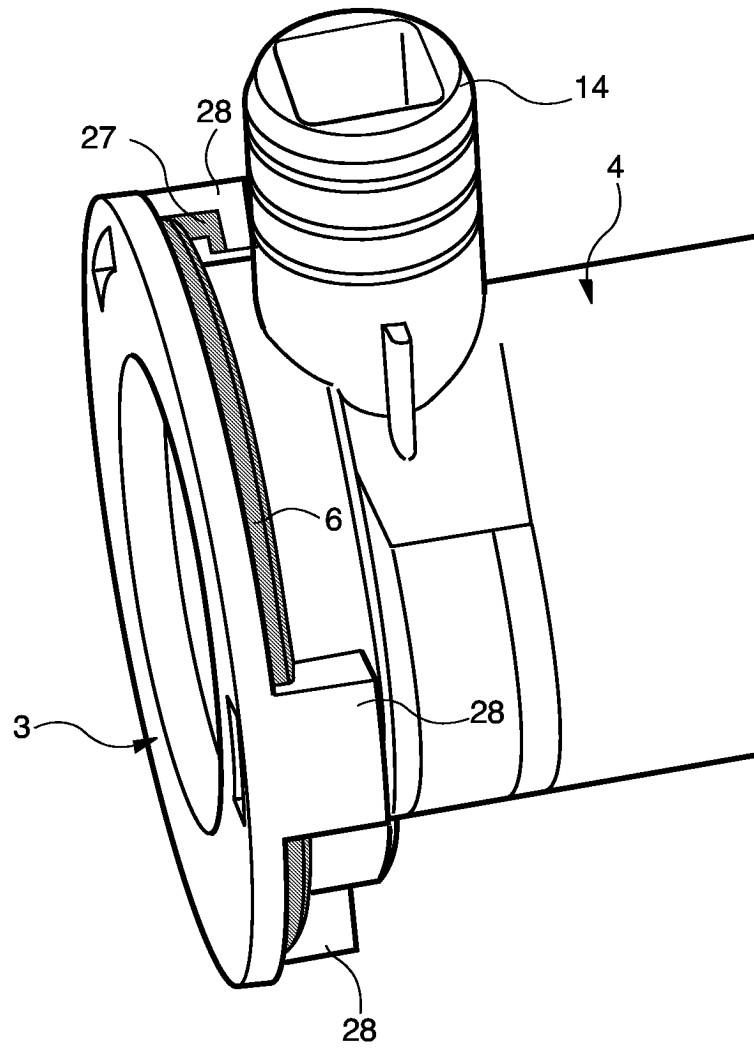


FIG.6

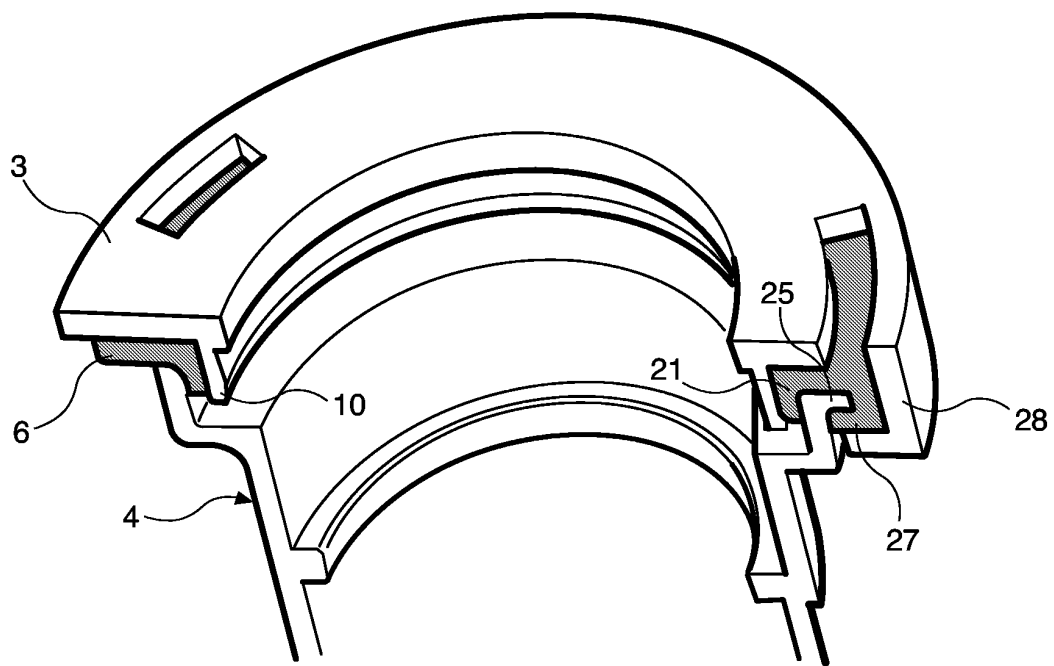


FIG.7

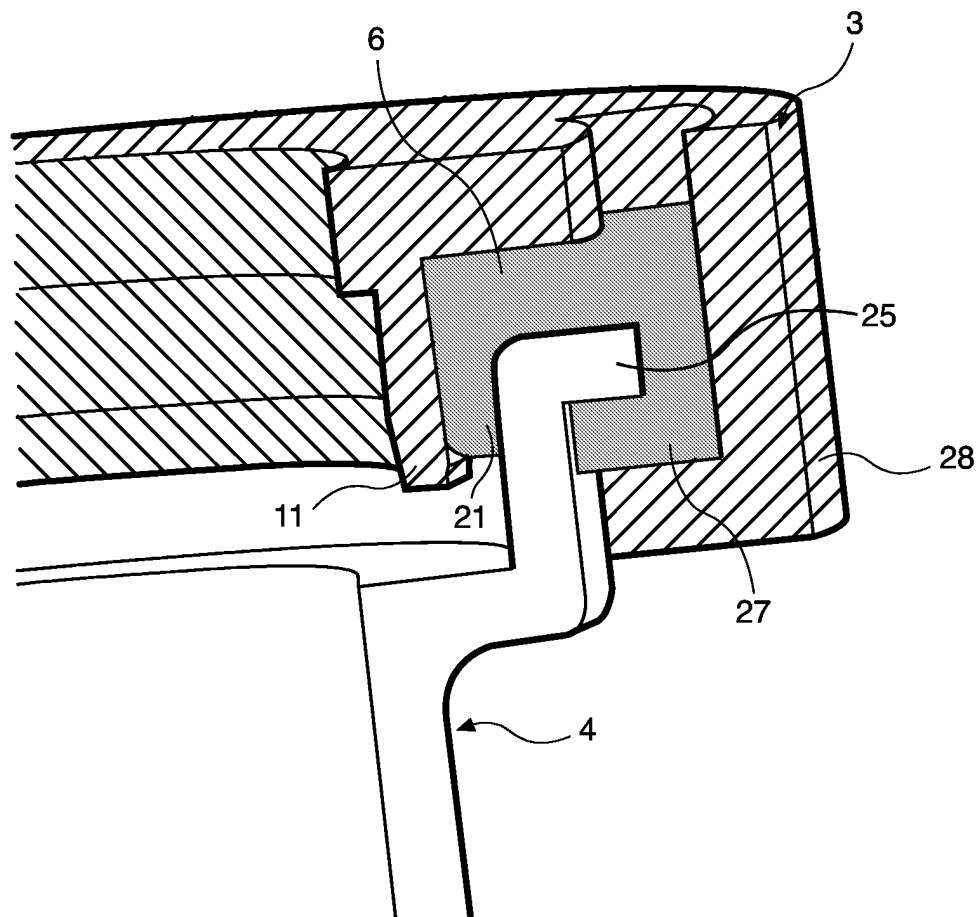


FIG. 8



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Application Number  
EP 04 10 0844

| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                               |                                                         |                                              |
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| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                               |                                                         |                                              |
| Place of search<br><b>Munich</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                               | Date of completion of the search<br><b>19 July 2004</b> | Examiner<br><b>Spitzer, B</b>                |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document<br>T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>& : member of the same patent family, corresponding document |                                                                               |                                                         |                                              |

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The members are as contained in the European Patent Office EDP file on  
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