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(54) Liquid pump with bayonet coupling of the diffuser/filter

(57) Pump for liquid wherein the diffuser element (6), the filter (6a) and the inlet opening (5) form a diffuser/filter unit (16) releasably mounted from the body (2) by fitting means (11, 12) easily releasable without having the use of tools. The fitting means include a plurality of projections (17) and recesses (19) spaced along the circumference of the pump body (2) and of the diffuser/filter (16) which can be reciprocally engaged with each other following rotation of them. A closure lid (20) may be provided for (20) which can be releasably mounted on the diffuser/filter (16) by second fitting means, which preferably include a plurality of second projections (24) and second recesses (25) spaced along the circumference of the diffuser/filter (16) and on the lid (20) which can be reciprocally engaged with each other following rotation of these parts.

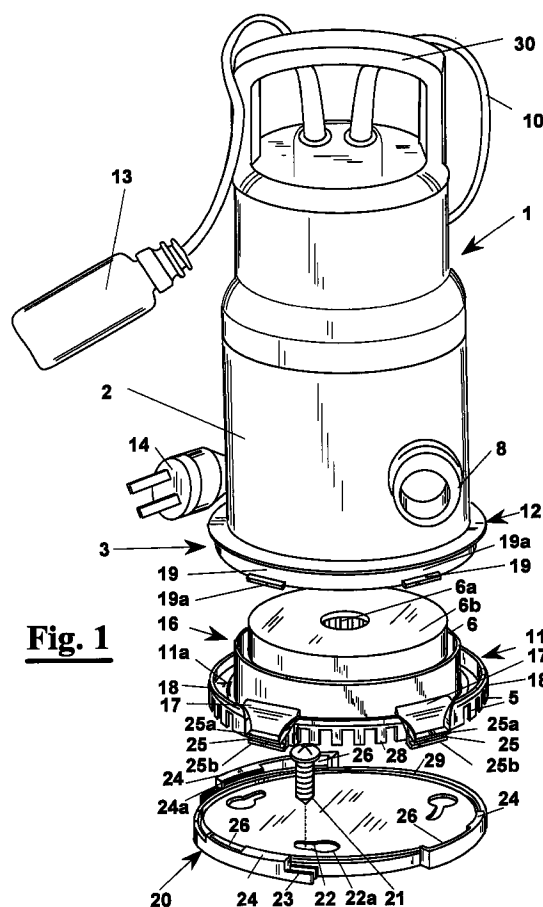


Fig. 1

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Description

This invention concerns the field of pumps and more precisely is referred to a rapidly engageable diffuser/filter for submersible electric pumps.

In a pump for liquid, the filter has the function of preventing solid particles over a certain size from reaching the impeller, thus avoiding either damaging or jamming the impeller. Instead, the diffuser presents many surfaces which deviate the fluid flow and correctly direct it towards the blades of the impeller thus optimizing hydraulic efficiency. Thus, both the diffuser and the filter are located upstream the impeller between the suction and delivery of the pump.

In some types of pumps used for pumping liquid the diffuser and filter are separated, while in other types the diffuser is shaped so as to function as a filter as well. In this second case, the diffuser has some surfaces that deviate the liquid towards the impeller and which are distanced from each other so as to not let anything pass which is over a certain size.

Furthermore, in existing pumps, the diffuser and filter are either made directly in the pump body or mounted on the body of the pump using locking systems that require the use of at least one tool, for example a spanner or a screw driver, in order to gain access to the hydraulic parts and separately disassemble the diffuser and filter, or disassemble the diffuser/filter, from the pump body.

This operation is necessary for inspection and maintenance, both for cleaning the impeller and hydraulic parts and for freeing the filter from residue which prevents the water from flowing correctly.

Furthermore, submerged pumps are subject to particularly damaging environmental conditions, which cause the unlocking devices, for example screws or bolts, to be corroded or be difficult to unscrew from their relative threaded seats. The presence of unlocking devices which require tools such as a screwdriver or a spanner, has then the disadvantage of obliging the user who, for example in an emergency situation, wants to start the pump again or clean it, to use this tool and to have to look for it if it is missing in order to gain access to the diffuser, filter or other hydraulic part.

Instead, the object of this invention is to provide a pump which makes it possible to rapidly gain access to the hydraulic parts, without needing to use tools to unlock the locking devices.

Another object of this invention is to provide a diffuser/filter which can be dismounted as a single part from the body of the pump and in turn be opened quickly without having to use tools.

These and other objects are met by the pump for liquid and the relative diffuser/filter according to this invention, of the type comprising a body in which an impeller is housed, a diffuser element adjacent to the impeller, at least an inlet and an outlet respectively for the suction and delivery of the liquid through the impeller, and at least a filter associated to the diffuser ele-

ment. Its characteristic is that the diffuser element, the filter and the inlet form a diffuser/filter unit, the diffuser/filter unit, as a whole, is releasably fastened to the body through fitting means.

Preferably, the latter comprise a plurality of projections and recesses circumferentially located along the pump body and the diffuser/filter respectively, the projections and recesses reciprocally engaging after rotation of the pump body and the diffuser/filter.

According to an advantageous embodiment, the diffuser/filter unit includes a closure lid releasably mounted on the diffuser/filter by second fitting means, which preferably comprise a plurality of second projections and second recesses spaced along the circumference of the diffuser/filter and the lid, the second projections and second recesses reciprocally engaging after rotation of the diffuser/filter and the lid.

Further characteristics and advantages of the pump and diffuser/filter according to this invention will become clearer with the following description of one among its embodiments, given as an example but not restricted only to this, with reference to the designs attached herewith, in which:

- figure 1 shows an elevational perspective exploded view of a submersible pump with a diffuser/filter separated from the pump body and the diffuser/filter lid separated from the latter;
- figure 2 shows an elevational perspective view of the pump of figure 1 with the diffuser/filter inserted in the body of the pump and closed by the corresponding lid.
- figure 3 shows a partial cross sectional view of the pump of figures 1 and 2 with diffuser/filter and lid inserted.

With reference to the above-mentioned figures, a pump 1, of the submersible type for liquid, includes a body 2, which can be placed on a fixed surface, for example the bottom of a pool or well, on a base 3 and with its longitudinal axis 4 (fig. 3) in a vertical position. Base 3 has inlet openings 5 for the liquid flow which crosses a diffuser 6 and is directed towards an impeller 7, to reach a delivery outlet 8. Impeller 7 is driven by an electrical motor 9 powered through a cable 10.

The operation of the pump is regulated by impeller 7, which has helical blades 7a which transmit centrifugal motion to the liquid coming into contact with them and direct this liquid towards the delivery 8, in the meantime other liquid being sucked which passes through inlet openings 5 guided by diffuser 6.

According to this invention, the diffuser 6 also has the function of filter 6a, forming together inlet openings 5 a unit 16, here called diffuser/filter. As can be seen in fig. 1, the diffuser/filter 16 can be removed as a whole from the pump body 2 and includes fitting means 11 for the engagement with the lower edge 12 of body 2 itself, whereby it is not necessary to use tools to separate it from the pump. Diffuser/filter 16, as is shown in figure 3,

is a single shaped piece with a substantially uniform thickness, having a flat upper wall 6b which, in use, faces impeller 7 getting as close to its blades 7a as possible without touching them.

In more detail, projections 17 made on the internal side of the lower external ring 18 of the diffuser/filter 16, at the level of the pump base 3, are provided for. Projections 17 engage with corresponding recesses 19 defined by edge 12 of pump body 2 and by teeth 19a. Projections 17 and recesses 19 are not placed along the entire circumference of ring 18 and edge 12, but only along spaced portions of their circumferences, whereby a reciprocal engagement is allowed, commonly called bayonet coupling. For example, three projections 17 and three recesses 19 that are equidistant could be used, respectively on diffuser/filter 16 and on pump body 2.

Mounting or removing diffuser/filter 16 from pump body 2, in order to inspect and/or do maintenance work on impeller 7 or other hydraulic parts, take place by simply rotating the diffuser/filter with respect to the pump body 2. Remounting is as simple as removal, and requires simply introducing diffuser/filter 16 into pump body 2 and rotating both of them several degrees, until projections 17 completely engage recesses 19. Teeth 19a compress a seal 11a placed along the circumference under projections 17. The resilient reaction of seal 11a also functions to prevent diffuser/filter 16 from coming unscrewed from pump body 2, as it considerably increases the static friction between projections 17 and teeth 19.

At pump base 3, that is at the base of diffuser/filter 16, a closure lid 20 is provided for which is integral to the diffuser/filter itself in the above described rotation movement. Lid 20 can be removed from diffuser/filter 16, as is shown in figure 1, without using a tool. In fact, removal is possible by means of projections 24, which extend from lid 20 and abut internally, which can slide in corresponding recesses 25 of exterior ring 18 of diffuser/filter 16.

Preferably, as is shown in figure 1, recesses 25 are defined by teeth 25a and 25b which extend from ring 18 of diffuser/filter 16. Projections 24, on the other hand, have advantageous lateral housings 26 which act as guides for teeth 25a in the initial phase of engagement with recesses 25.

In order to further improve the engagement between diffuser/filter 16 and lid 20, the lid has a groove 29 along its circumference to receive teeth 28 which serve to define the inlet openings 5 of ring 18. Furthermore, projections 24 have knurled portions to make a releasable snap fit engagement of the projections with recesses 25.

Thus, in a manner similar to the engagement between diffuser/filter 16 and body 2, the engagement between lid 20 and diffuser/filter 16 also occurs with a bayonet coupling, easy to be removed, because it requires only a relative rotation of a few degrees and the extraction of the lid itself.

Lid 20, preferably, has slotted holes 22, with circular openings 22a, so that it can be fastened to a fixed surface, for example a pool bottom. Removal of lid 20 from the fixed surface is possible by simply loosening screws 21 without removing them completely, so that it is possible for it to slide in slotted holes 22 and then be removed through circular openings 22a. Alternatively, it is possible to fasten lid 20 to a fixed surface using screws 21 by engaging them in open seats 23 placed adjacent to projections 24. Also in this case lid 20 can be removed by simply loosening screws 21 without having to completely remove them.

Finally, to give a complete description, in the above-mentioned figures the following have been indicated: with 30 a handle for the pump body 2, with 13 a floating switch, and with 14 a plug for connecting the pump to the electrical supply using cable 10.

Therefore, according to the invention, the following operations are possible, without having to use any tool and with extreme speed:

- remove the diffuser/filter 16 as a whole from pump body 2;
- remove lid 20 from diffuser/filter 16;
- remove the diffuser/filter joined to the pump body from a fixed surface, leaving the lid held by screws 21 on the surface.

The diffuser/filter as above described is rational and economical to produce, also making high quantity moulded plastic production possible, without greatly increasing the final cost of the pump and at the same time permitting all of the above-mentioned advantages.

The foregoing description of a specific embodiment will so fully reveal the invention according to the conceptual point of view, so that others, by applying current knowledge, will be able to modify and/or adapt for various applications such an embodiment without further research and without parting from the invention, and it is therefore to be understood that such adaptations and modifications will have to be considered as equivalent to the specific embodiment. The means and the materials to realise the different functions described herein could have a different nature without, for this reason, departing from the field of the invention. It is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

Claims

1. A submersible pump for liquid, comprising a body (2) in which an impeller (7) is housed, a diffuser element (6) adjacent to said impeller (7), at least an inlet (5) and outlet (8) respectively for the suction and delivery of said liquid through said impeller (7), and at least a filter (6a) associated to said diffuser element (6), characterised in that said diffuser element (6), said filter (6a) and said inlet (5) form a diffuser/filter unit (16), said diffuser/filter unit (16), as a

whole, being releasably fastened to said body (2) through fitting means (11, 12).

2. Pump according to claim 1, wherein said fitting means (11, 12) comprise a plurality of projections (17) and recesses (19) circumferentially located along said pump body (2) and said diffuser/filter (16) respectively, said projections (17) and recesses (19) reciprocally engaging with each other after rotation of said pump body (2) and said diffuser/filter (16). 5
10

3. Pump according to claims 1 and 2, wherein said diffuser/filter unit (16) includes a closure lid (20), said lid being releasably mounted on said diffuser/filter (16) by second fitting means (24, 25). 15

4. Pump according to claim 3, wherein said second fitting means include a plurality of second projections (24) and second recesses (25) spaced along the circumference of said diffuser/filter (16) and said lid (20), said second projections (24) and second recesses (25) reciprocally engaging with each other after rotation of said diffuser/filter (16) and said lid (20). 20
25

5. Pump according to claim 4, wherein said second recesses (25) are defined by teeth (25a, 25b), radially projecting from said diffuser/filter (16). 30

6. Pump according to claim 5, wherein said second projections (24) of said lid (20) have lateral guide housings (26) for said teeth (25a) in the initial sliding engagement phase with said second recesses (25). 35

7. Pump according to claim 5 or 6, wherein said second projections (24) of said lid (20) have knurled portions (24a) allowing a releasable snap-fit engagement of said second projections (24) with said recesses (25). 40

8. Pump according to claims from 3 to 7, wherein said lid (20) includes a plurality of holes (22) for fastening (21) said lid (20) to an underlying fixed surface, said holes (22) having a slotted shape and an enlarged opening (23). 45

9. Pump according to claims from 3 to 7, wherein said lid (20) comprises a plurality of circumferentially open seats (23) for fastening (21) said lid (20) to an underlying fixed surface. 50

10. Pump according to claims from 3 to 9, wherein said lid comprises a circumferential groove (29) for receiving the teeth (28) which define the inlet openings (5) of said diffuser/filter (16). 55

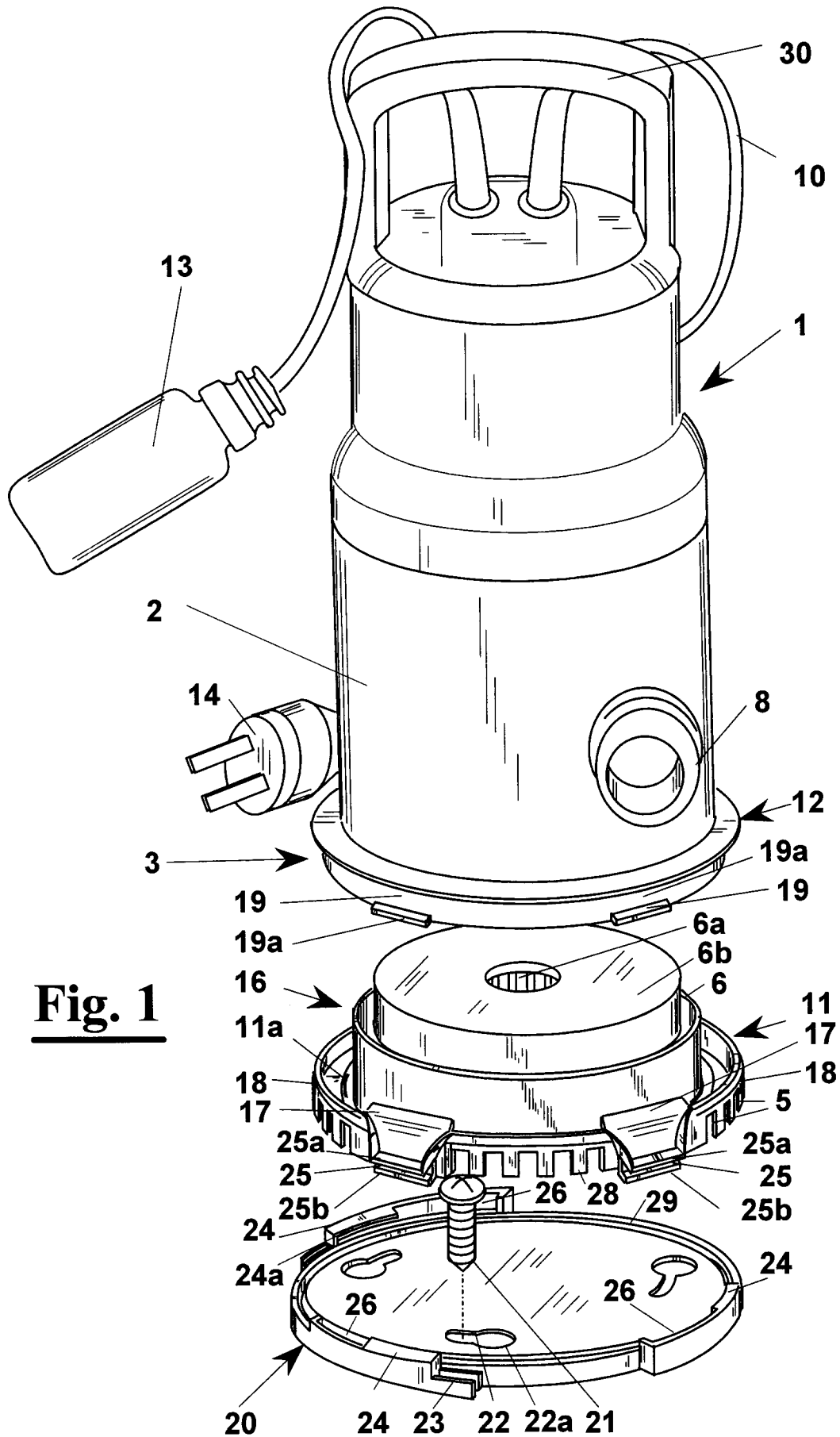


Fig. 1

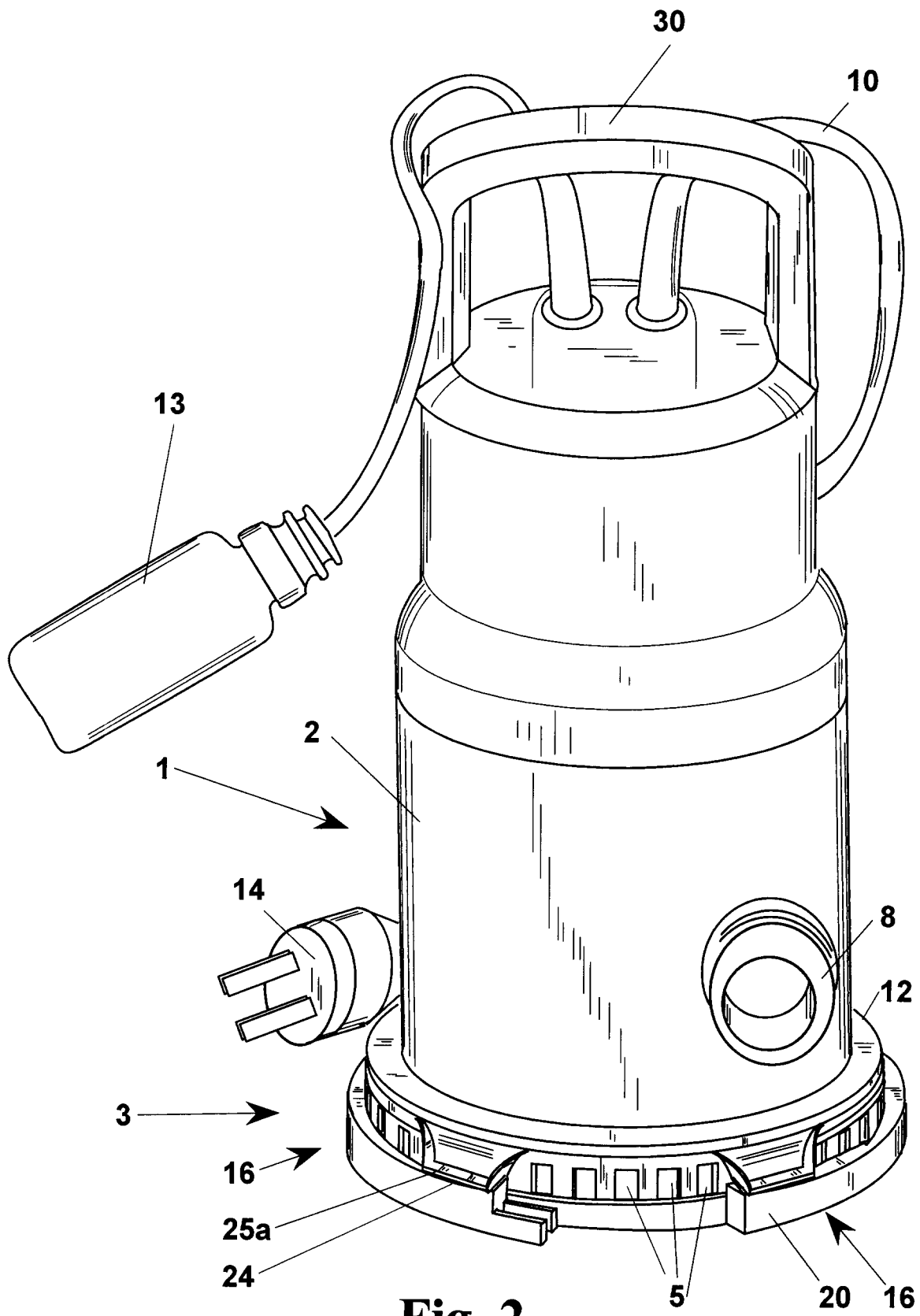


Fig. 2

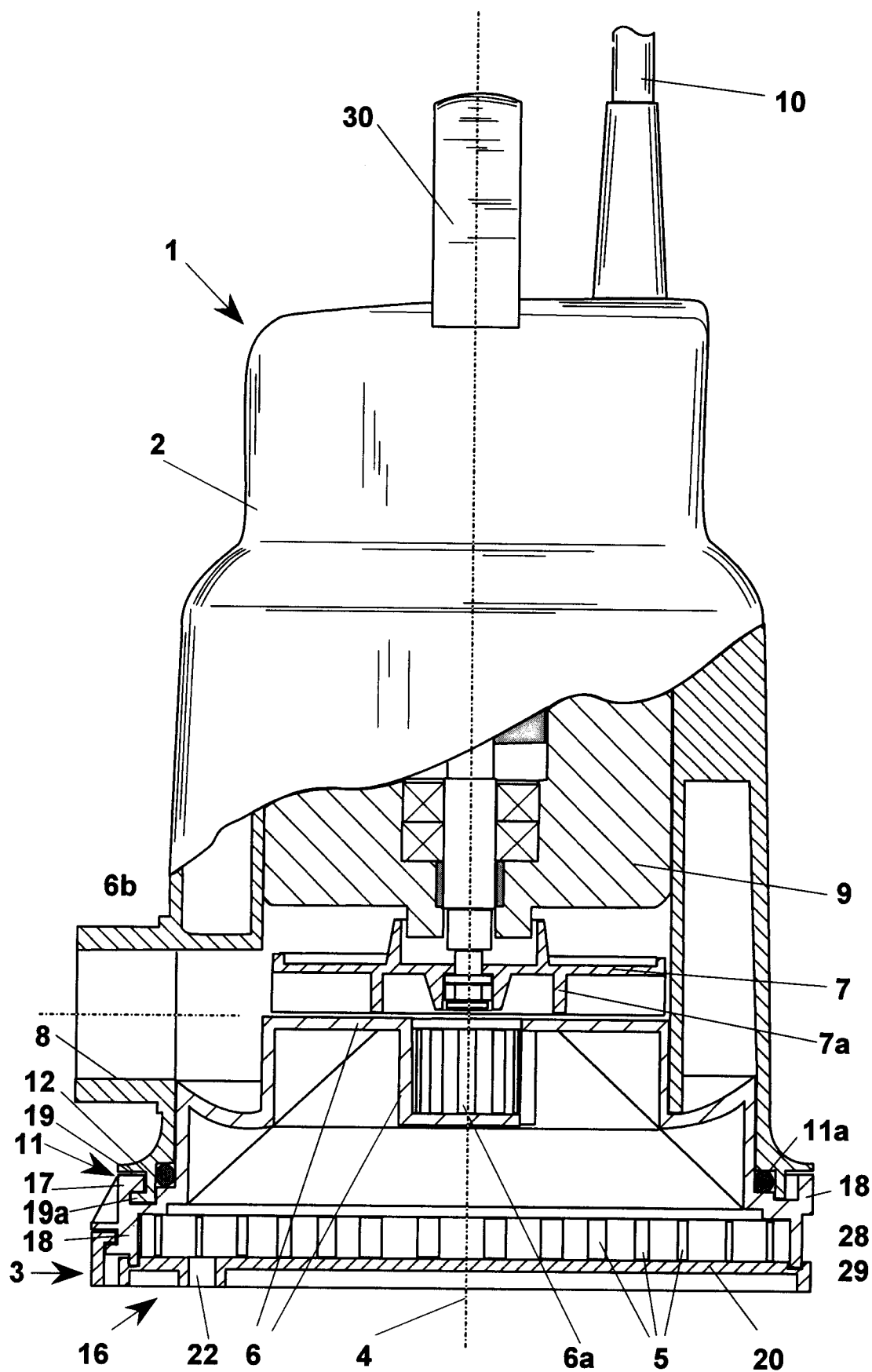


Fig. 3



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EUROPEAN SEARCH REPORT

Application Number
EP 96 11 8163

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.6)
A	US 3 407 739 A (MYERS CHARLES F) * column 2, line 25 - line 59; figures 5,9,15,16 *	1	F04D29/62 F04D13/08
A	FR 1 340 891 A (RENOUARD) * page 2; figures 12-22 *	1	
A	US 4 275 995 A (TAYLOR THOMAS K) * abstract * * column 2, line 66 - column 3, line 6; figures *	3	
A	FR 2 432 106 A (LEROY SOMER MOTEURS)		
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			F04D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 7 February 1997	Examiner Zidi, K
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