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**(54) PUMP WITH REDUCED NOISE EMISSION**

(57) The invention relates to a pump (10) which comprises a pump casing. The pump casing comprises a casing section (12) which is made of a first material, and

a sound shield (11) which is made of a second material; wherein the second material has higher sound dampening properties than the first material.

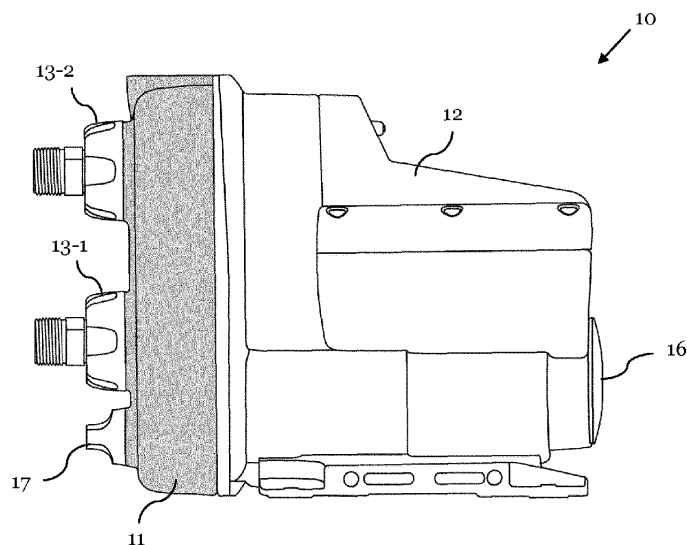


Fig. 1A

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## Description

### TECHNICAL FIELD OF THE INVENTION

**[0001]** The invention relates to a pump, such as a booster pump or a circulator pump, which generates less noise during operation.

### BACKGROUND OF THE INVENTION

**[0002]** Many pumps generate a significant amount of noise when being operated due to vibrations of hydraulic components or of the pump motor. Thereby, a housing of the pump can even increase this noise, because it also starts to vibrate and acts effectively like a loudspeaker. For instance, a conventional booster pump for increasing water pressure can generate noise above 55 dB(A) during operation.

**[0003]** Such a noise level can be perceived as disruptive and can make it difficult to work in the vicinity of the pump for long periods of time.

**[0004]** Thus, it is an objective to reduce the noise generated by a pump during operation.

### SUMMARY OF THE INVENTION

**[0005]** The object of the present invention is achieved by the solution provided in the enclosed independent claims. Advantageous implementations of the present invention are further defined in the dependent claims.

**[0006]** According to a first aspect, the invention relates to a pump, comprising: a pump casing which comprises a casing section which is made of a first material, and a sound shield which is made of a second material; wherein the second material has higher sound dampening properties than the first material.

**[0007]** This achieves the advantage that the pump emits less noise during operation. The sound shield can cover the parts of the pump which generate most of the noise, for instance, the water carrying parts of the pump and/or the pump head.

**[0008]** The sound shield can form a second casing section made from the second material. The sound shield can be a sound dampening element.

**[0009]** In particular, the second material having higher sound dampening properties than the first material means that a component which is made of the second material (such as the sound shield) is less permeable to noise compared to a component which is made of the first material (such as the casing section). This can be due to an enhanced absorption of noise by the second material compared to the first material.

**[0010]** The pump can be a booster pump, a circulator pump, a jet pump or a different type of pump for pumping fluids.

**[0011]** The pump can be a centrifugal pump. For instance, the pump can comprise a rotating impeller to transport the fluid (e.g., water).

**[0012]** In an embodiment, the second material is a thermoplastic elastomer (TPE). For example, the second material is thermoplastic polyurethane (TPU).

**[0013]** The first material can be a plastic, such as polycarbonate (PC), or a composite material, e.g. a composite plastic. For instance, the first material can be a polymer composite. Alternatively, the first material could also be a metal, such as cast iron or aluminum.

**[0014]** In an embodiment, the sound shield is made from one part.

**[0015]** For example, the sound shield is fabricated by injection molding.

**[0016]** In an embodiment, the sound shield is non-planar shaped.

**[0017]** For instance, the sound shield has a three-dimensional and/or warped shape.

**[0018]** In an embodiment, the sound shield is arranged to cover at least one side of the pump, preferably multiple sides of the pump, at least partially.

**[0019]** In an embodiment, the sound shield and the casing section are arranged to cover different sections of the pump.

**[0020]** In an embodiment, the sound shield is arranged above the casing section. For example, the sound shield can surround and/or cover at least a part of the casing section.

**[0021]** In an embodiment, the sound shield is arranged to at least partially cover a pump motor and/or a fluid carrying element of the pump.

**[0022]** For instance, the sound shield is arranged to cover one or more hydraulic components of the pump, i.e., components which have fluid (e.g., water) flowing through them. In this way, the sound shield can block hydraulic noise (which stems from the fluids and/or from pump components which move the fluid). If the sound shield additionally covers the motor, it can block motor generated noise.

**[0023]** In an embodiment, the sound shield comprises at least one opening, wherein an inlet and/or outlet of the pump extend(s) through the at least one opening.

**[0024]** In an embodiment, the sound shield is not in contact with a fluid to be pumped.

**[0025]** In other words, the pump shield may not be part of a fluid enclosure of the pump. However, the sound shield can be arranged above the fluid enclosure, e.g. at least partially covering the fluid enclosure.

**[0026]** In an embodiment, the sound shield is removably attached to the casing section and/or to the pump.

**[0027]** For example, the sound shield can be attached to the casing section at the rim.

**[0028]** In an embodiment, the pump is fully operative if the sound shield is removed.

**[0029]** In an embodiment, the sound shield reduces a noise level of the pump by at least 3 dB(A), preferably by at least 5 dB(A), when mounted to the pump.

**[0030]** According to a second aspect, the invention relates to a use of a sound shield for absorbing noise in a pump according to the first aspect of the invention.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0031]** The invention will be explained in the following together with the figures.

- Figs. 1A-C shows different views of a pump according to an embodiment;
- Figs. 2A-B show schematic diagrams of pumps according to an embodiment; and
- Fig. 3 shows a schematic diagram of a pump according to an embodiment.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

**[0032]** Figs. 1A-C show different views of a pump 10 according to an embodiment.

**[0033]** The pump 10 has a pump casing which comprises a casing section 12 made of a first material, and a sound shield 11 made of a second material; wherein the second material has higher sound dampening properties than the first material.

**[0034]** The exemplary pump 10 shown in Figs. 1A-C is a booster pump. However, such a casing, which comprises the casing section 12 and the sound shield 11, can be used in different types of pumps, e.g. in circulatory pumps or in jet pumps (as shown in Figs. 2A-B and 3).

**[0035]** For example, the pump 10 is a centrifugal pump for pumping water.

**[0036]** For instance, the first material is a plastic material, such as polycarbonate (PC). The first material can also be a composite plastic, e.g. a polymer composite. Alternatively, the first material could be a metal, such as cast iron or aluminum.

**[0037]** The casing section 12, which is made of the first material, can comprise different sub-sections or casing parts which cover different components of the pump. For example, the casing section 12 can comprise an electronics housing/box and/or a stator housing.

**[0038]** The second material can be a thermoplastic elastomer (TPE) material, in particular thermoplastic polyurethane (TPU). For instance, this material is relatively soft (e.g., softer than the first material) which results in improved vibration absorbing properties and, thus, sound dampening. At the same time, TPU has a relatively high mass which further enhances its sound dampening properties.

**[0039]** The sound shield 11 (highlighted in gray in Figs. 1A-C) can have a non-planar shape, in particular a warped and/or 3D shape. When mounted to the pump 10, the sound shield 11 can cover at least one side of the pump 10, preferably multiple sides of the pump 10, at least partially.

**[0040]** The sound shield 11 can further be made from one part and/or can be free standing. This can enhance its stability and further improve its sound-dampening

properties.

**[0041]** For instance, the sound shield 11 is fabricated as a one-piece component from a TPE material (e.g., TPU) via injection molding.

**[0042]** As shown for the exemplary pump 10 in Figs. 1A-C, the sound shield 11 and the casing section 12 can cover different sections of the pump. However, the sound shield 11 and the casing section 12 can be in contact which each other, e.g. at their respective rims where they are mounted to each other and/or to other (internal) pump components.

**[0043]** Preferably, the sound shield 11 is in close proximity to at least one element of the pump 10 which is a source of noise during operation of the pump 10. For instance, this element can be a hydraulic part (i.e., a part through which the fluid flows). In this way, the sound shield 11 can block hydraulic noise caused by the movement of fluids through the pump. Thus, the sound shield 11 can form a cover for the hydraulic components of the pump 10. In contrast, the pump casing 12 can form a cover for the pump motor.

**[0044]** The sound shield 11 may also be arranged to cover the motor of the pump.

**[0045]** The casing can be an external cover or a housing of the pump 10. For instance, the casing, especially the sound shield 11, is not in contact with a fluid (e.g., water) to be pumped. The pump 10 can have one or more fluid enclosures which are covered by the casing and, in particular, by the sound shield 11.

**[0046]** The sound shield 11 can comprise a number of openings to allow access to internal components of the pump, e.g. to the fluid enclosure, and/or to allow connecting external elements, such as hoses or tubes.

**[0047]** For instance, a pump inlet 13-1 and a pump outlet 13-2 can be arranged to pass through two respective openings in the sound shield 11, as shown in Figs. 1A-C. Further openings in the sound shield 11 can be arranged for mounting a valve 14 in the internal fluid enclosure of the pump 10 and/or a drain plug 17.

**[0048]** Also, the casing section 12 may comprise or accommodate further optional elements, such as an interface 15 and a plug 16 for accessing a pump shaft.

**[0049]** The sound shield 11 can further be mounted removably and/or replaceably to the casing section 12 and/or to the pump 10. Thereby, the pump 10 can stay fully operative if the sound shield 11 is removed.

**[0050]** For instance, the sound shield 11 reduces a noise level of the pump 10 by at least 3 dB(A), preferably by at least 5 dB(A), when mounted to the pump 10, e.g. from ca. 50 dB(A) to ca. 45 dB(A). For example, the sound shield 11 reduces the sound energy, which is emitted by the pump, by at least half.

**[0051]** In particular, the sound shield 11 reduces the noise level of the pump 10 by at least 3 dB(A), preferably by at least 5 dB(A), compared to a pump where the entire casing is made from the first material (e.g., where a further casing section made from the first material is mounted in place of the sound shield 11).

**[0052]** Figs. 2A-B show schematic diagrams of pumps 10 according to an embodiment. For instance, the pumps 10 shown in Figs. 2A and 2B are circulator pumps.

**[0053]** In the example shown in Figs. 2A-B, the sound shield 11 is arranged to cover at least a part of a pump motor and/or pump electronics.

**[0054]** For instance, the sound shield 11 can cover a control box of the pump 10 which is mounted on top of and around a pump head (which includes the motor). The sound shield 11 can thereby reduce noise generated by vibrations from the pump head. In this way, noise generated from the motor in the pump head can be efficiently reduced.

**[0055]** Besides the sound shield 11, the casing of these pumps can comprise additional casing sections 12, 21 made from different materials. For instance, a casing section 12 which also covers a part of the pump electronics can be made from polycarbonate (PC) and a further casing section 21, which carries the fluid, can be made from cast iron.

**[0056]** Figs. 3 shows a schematic diagram of a pump 10 according to an embodiment. For instance, the pump 10 shown in Fig. 3 is a jet pump.

**[0057]** In the exemplary pump shown in Fig. 3, the sound shield 11 (indicated by a dashed line) is arranged on top of at least a part of the casing section 12, i.e., it covers and/or surrounds at least a part of the casing section 12. The casing section 12 is thereby, for instance, made of a polymer composite.

**[0058]** The sound shield 11 can comprise several openings to connect further components to the casing section 12 and/or to a fluid carrying element below, for instance, a pressure control unit 32.

**[0059]** The pump motor can be covered by a further casing section 31, which can be made from the same material as the casing section 12.

**[0060]** It is to be noted that the respective arrangements of the casing and, in particular, of the sound shield 11 in the exemplary pumps of Figs. 1A-C, 2A-B and 3 is not limited to the shown pump types, but can be implemented for other pumps and pump types as well.

## Claims

1. A centrifugal pump (10) for pumping water, comprising:

a pump casing which comprises:

- a casing section (12) which is made of a first material, and
- a sound shield (11) which is made of a second material;

wherein the second material has higher sound dampening properties than the first material; wherein the sound shield (11) is arranged to at

least partially cover a water carrying element of the pump (10); and wherein the sound shield (11) is made from one part.

2. The centrifugal pump (10) of claim 1, wherein the second material is a thermoplastic elastomer.
3. The centrifugal pump (10) of any one of the preceding claims, wherein the sound shield (11) is non-planar shaped.
4. The centrifugal pump (10) of any one of the preceding claims, wherein the sound shield (11) is arranged to cover at least one side of the pump (10), preferably to cover multiple sides of the pump (10), at least partially.
5. The centrifugal pump (10) of any one of the preceding claims, wherein the sound shield (11) and the casing section (12) are arranged to cover different sections of the pump (10).
6. The centrifugal pump (10) of any one of claims 1 to 4, wherein the sound shield (11) is arranged above the casing section (12).
7. The centrifugal pump (10) of any one of the preceding claims, wherein the sound shield (11) is further arranged to at least partially cover a pump motor.
8. The centrifugal pump (10) of any one of the preceding claims, wherein the sound shield (11) comprises at least one opening, wherein an inlet (13-1) and/or outlet (13-2) of the pump (10) extend(s) through the at least one opening.
9. The centrifugal pump (10) of any one of the preceding claims, wherein the sound shield (11) is not in contact with the water to be pumped.
10. The centrifugal pump (10) of any one of the preceding claims, wherein the sound shield (11) is removably attached to the casing section (12) and/or to the pump (10).
11. The centrifugal pump (10) of any one of the preceding claims, wherein the centrifugal pump (10) is fully operative if the sound shield (11) is removed.
12. The centrifugal pump (10) of any one of the preceding claims,

wherein the sound shield (11) reduces a noise level of the pump (10) by at least 3 dB(A) , preferably by at least 5 dB(A), when mounted to the pump (10).

13. Use of a sound shield (11) for absorbing noise in a centrifugal pump (10) of any one of the preceding claims. 5

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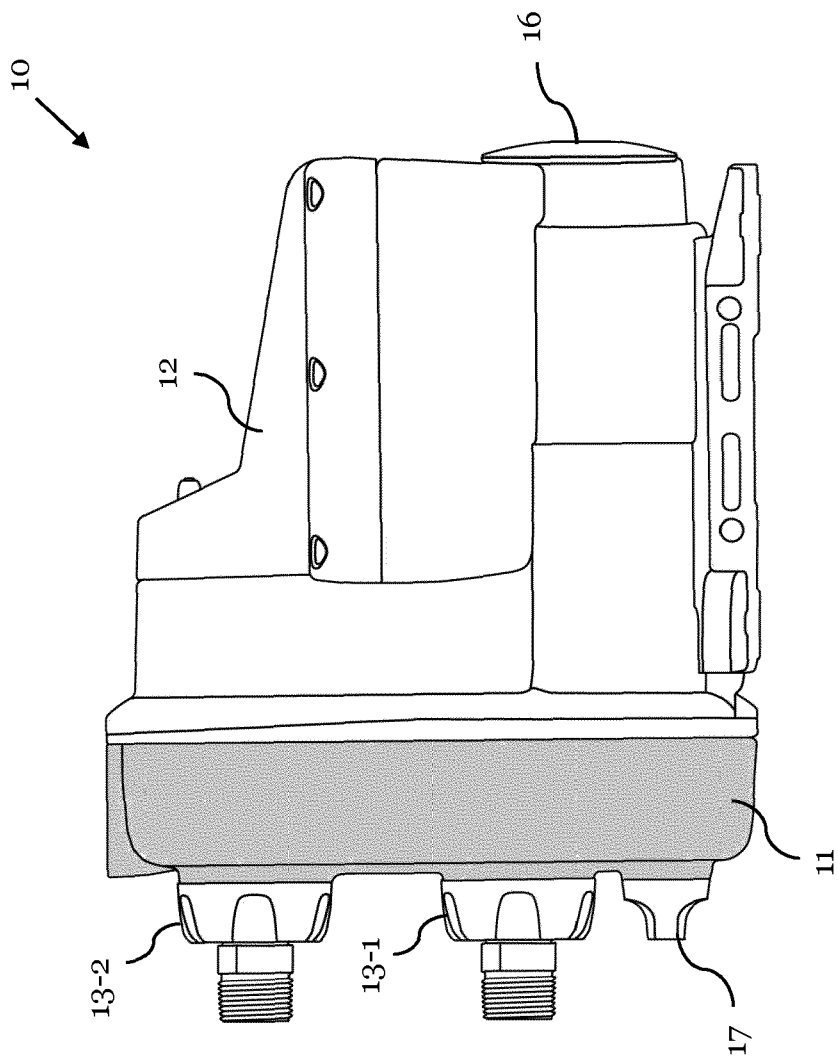


Fig. 1A

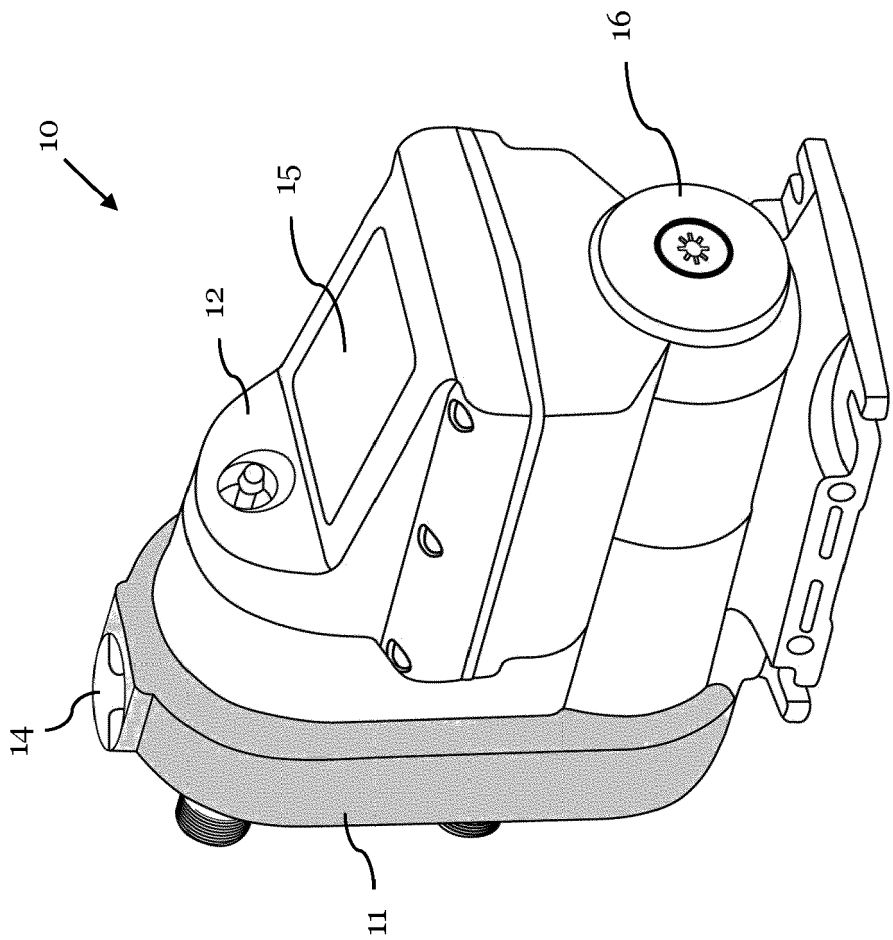


Fig. 1B

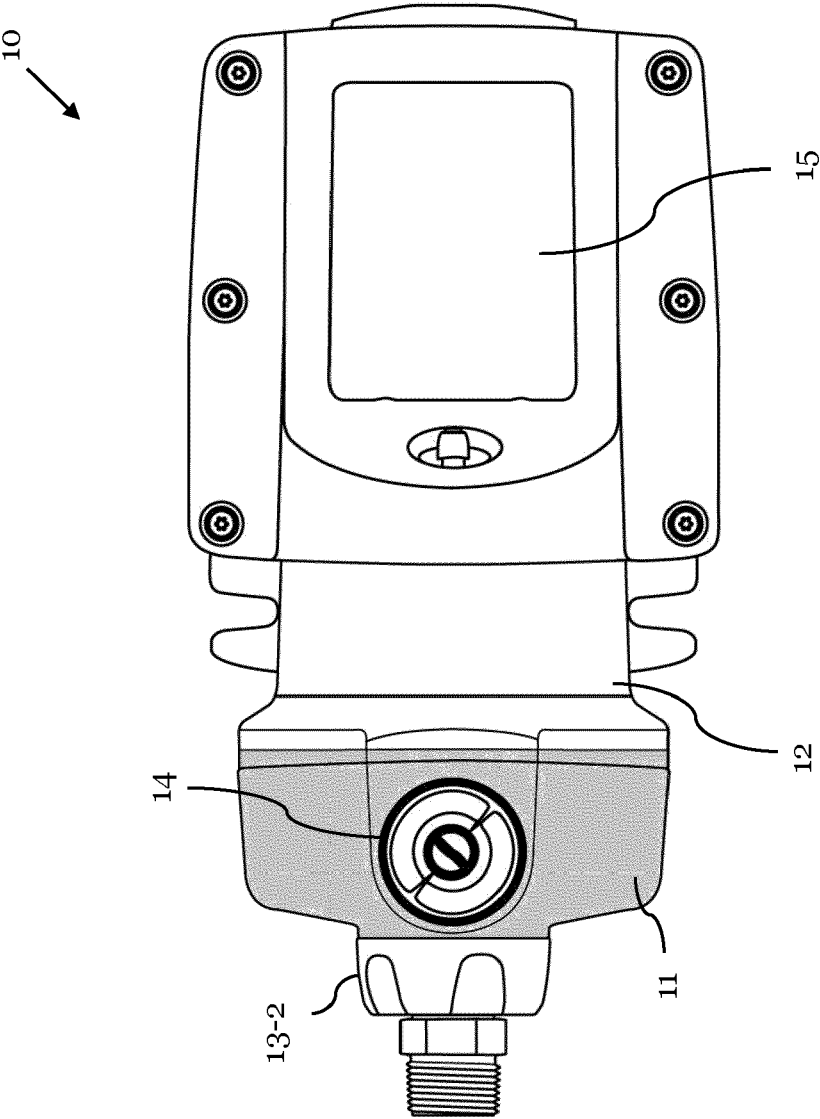


Fig. 1C



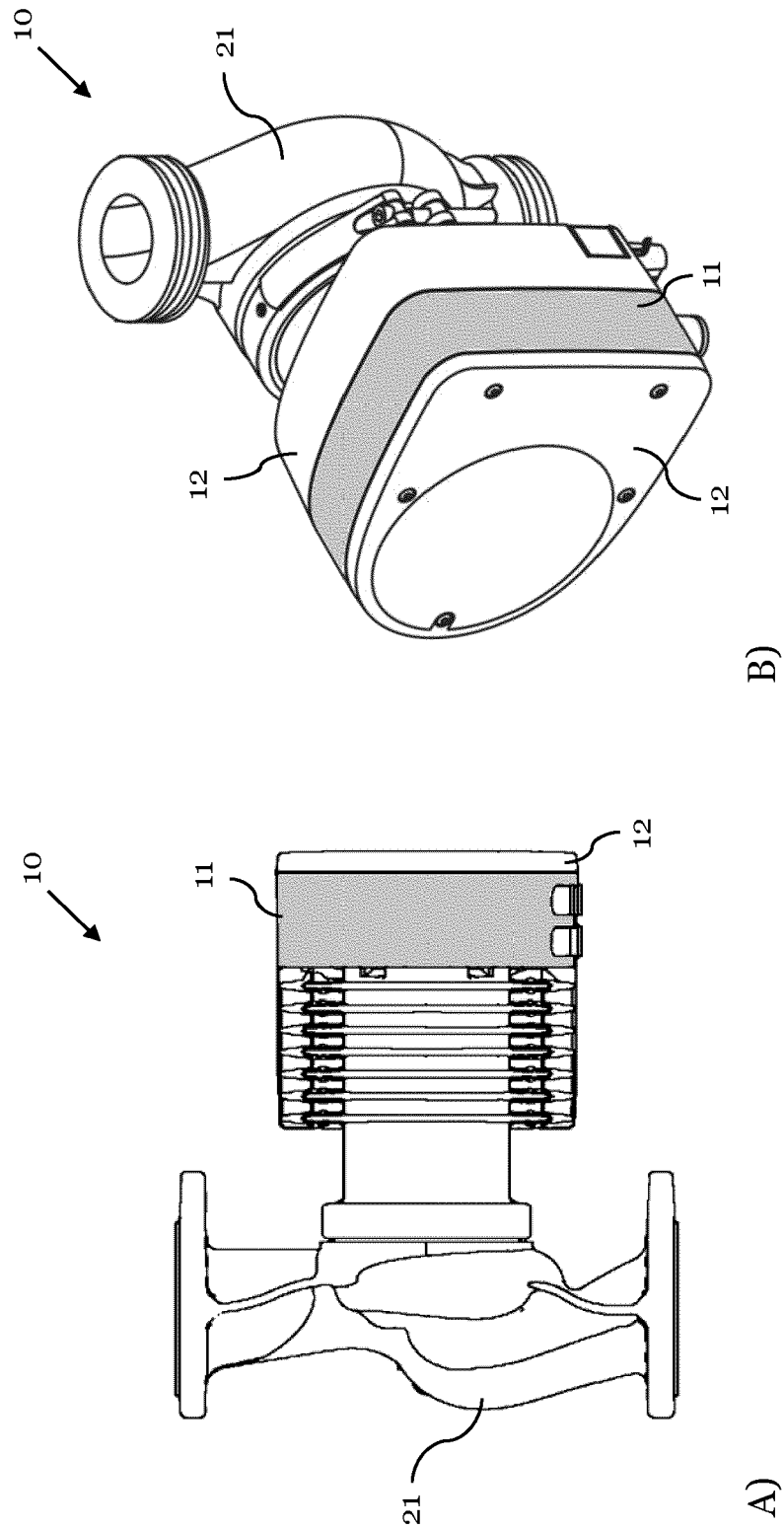


Fig. 2

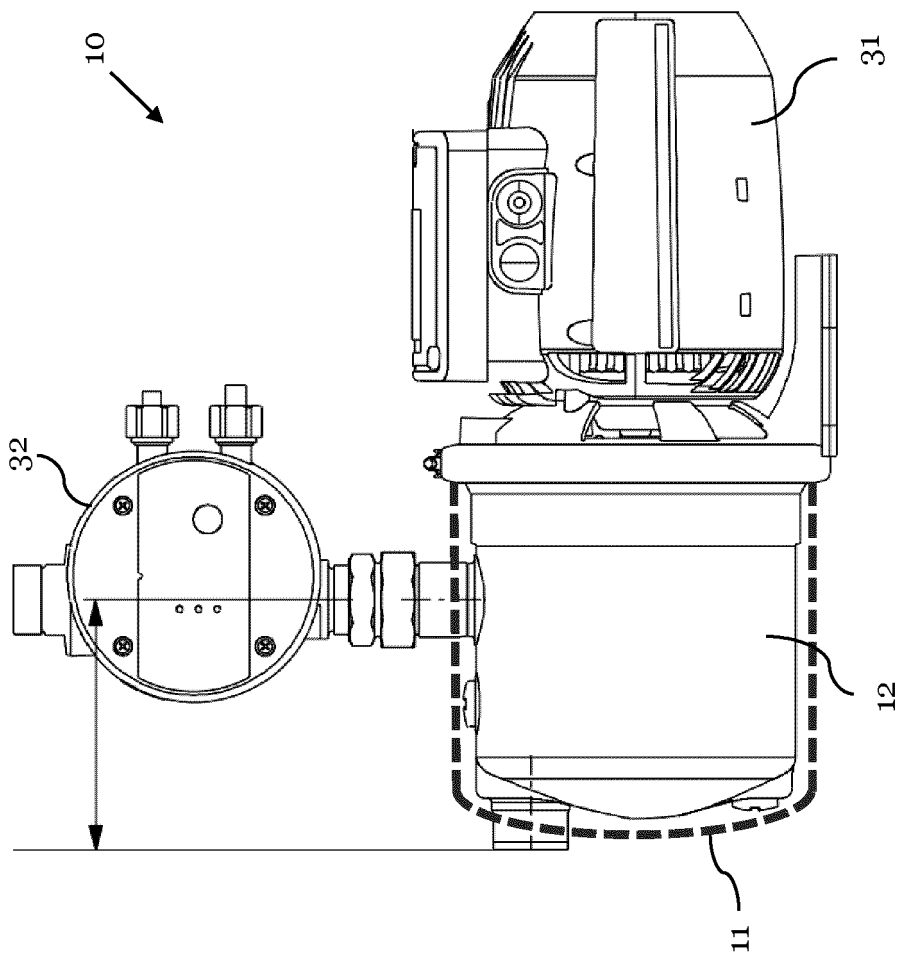


Fig. 3



## EUROPEAN SEARCH REPORT

Application Number

EP 24 18 7588

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A	* page 6, first paragraph - third paragraph *	5	F04D29/02
	* page 7, second paragraph *		F04D29/42
	* page 8, last paragraph - page 9, fourth paragraph *		F04D29/66
	* figures 1-3 *		
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A	* column 2, lines 12-54 *	5	
	* claim 1 *		
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	* abstract *		
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	* figure 1 *		
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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		6 November 2024	Gombert, Ralf
CATEGORY OF CITED DOCUMENTS		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	
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			

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ANNEX TO THE EUROPEAN SEARCH REPORT  
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82