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(54) DIVERTER SYSTEM FOR A FLUID-BEARING HOUSEHOLD APPLIANCE

(57) The invention relates to a diverter system (2) for a fluid-bearing household appliance (1) comprising a supply path (23), a first discharge path (24), a second discharge path (25), and a fluid diverter (20) with a moveable fluid distribution element (200), wherein the moveable fluid distribution element (200) is moveable for selectively connecting the supply path (23) to one of the first discharge path (24) and the second discharge path (25) in a flow direction, and wherein a low pressure barrier device (21) having an inlet side (210) and an outlet side (212) downstream of the inlet side (210) in the flow direction is provided in the first discharge path (24), which low pressure barrier device (21) is configured to prevent fluid flow from the inlet side (210) to the outlet side (212) when a pressure differential between the inlet side (210) and the outlet side (212) is below a cracking pressure..

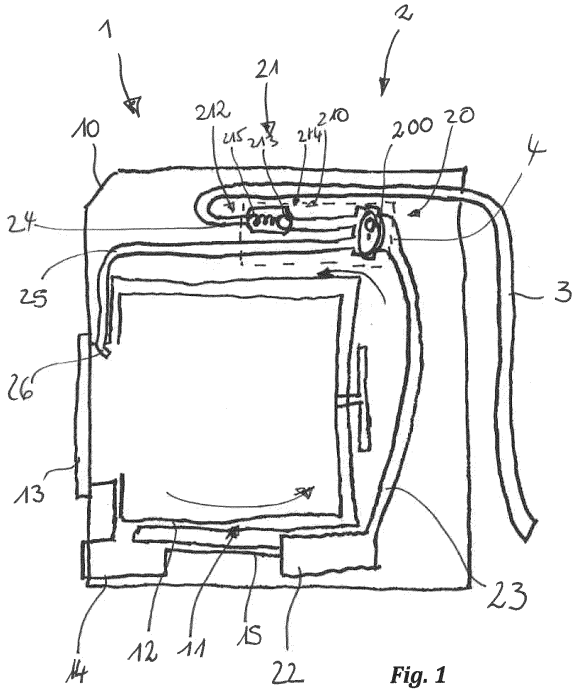

Fig. 1

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Description

TECHNICAL FIELD AND PRIOR ART

[0001] The invention relates to a diverter system for a fluid-bearing household appliance.

[0002] Fluid-bearing household appliances such as dishwashers, washing machines, steam ovens, etc. can be equipped with a fluid circulation system comprising a pump, wherein fluid diverters are provided in order to direct fluid to different elements of the household appliance. For example, in a dishwasher a fluid diverter can be arranged to supply a washing liquid to one or both of a spray arm for an upper rack and a spray arm for a lower rack of the dishwasher. Similar, in a washing machine a fluid diverter can be arranged to supply water to different detergent compartments.

[0003] US 2010/0236588 A1 shows a water-bearing household appliance with a fluid diverter having a fluid distribution element structured as a rotating disc, which includes a plurality of passage openings.

[0004] Fluid diverters need to be resistant to many types of dirt without becoming stuck. For this purpose, parts in the fluid diverters are provided with appropriate clearance. This makes a fluid tight sealing of a discharge path of the fluid diverter impossible. Therefore, such fluid diverters are typically not used to direct fluid towards a drain hose, and an additional system comprising an additional pump is provided in the household appliance in order to direct waste water to a drain hose.

SUMMARY OF THE INVENTION

[0005] It is the object of the invention to provide an improved diverter system and a fluid-bearing household appliance with such a diverter system. These objects are solved by the diverter system with the features of claim 1 and the fluid-bearing household appliance with the features of claim 12. Preferred embodiments are defined in the dependent claims.

[0006] According to a first aspect, a diverter system for a fluid-bearing household appliance comprising a supply path, a first discharge path, a second discharge path, and a fluid diverter with a moveable fluid distribution element, is provided, wherein the moveable fluid distribution element is moveable for selectively connecting the supply path to one of the first discharge path and the second discharge path in a flow direction, and wherein a low pressure barrier device having an inlet side and an outlet side downstream of the inlet side in the flow direction is provided in the first discharge path, which is configured to prevent fluid flow from the inlet side to the outlet side when a pressure differential between the inlet side and the outlet side is below a cracking pressure.

[0007] Throughout this application and the claims the indefinite article "a" or "an" means "one or more". Reference to "a first element" does not mandate presence of "a second element". Further, the expressions "first" and "second" are only used to distinguish one element from another element and not to indicate any order of the elements.

[0008] In the context of the application, the expressions "supply path" and "discharge path" are used to describe a path upstream and downstream of the fluid diverter, respectively. The paths may be formed integrally with a connection piece of a housing of the fluid diverter or comprise one duct element or a series duct elements, such as hose, pipe, channel or tube elements.

[0009] By arranging the low pressure barrier device in the first discharge path, a leakage flow to the first discharge path can be tolerated when disconnecting the first discharge path from the supply path via the flow diverter. This allows for example to connect the first discharge path to a drain hose, wherein during a use of the fluid-bearing household appliance, a fluid loss due to a leakage flow towards the drain hose is avoided. In embodiments of the diverter system, the low pressure barrier device is arranged inside a connecting piece of a housing of the fluid diverter. In other embodiments, the low pressure barrier device is connected to a connecting piece of the fluid diverter, either directly or indirectly via a duct element.

[0010] In embodiments of the flow diverter, the moveable fluid distribution element in addition can be moved to selectively connect the supply path to none and/or to both of the first discharge path and the second discharge path in a flow direction.

[0011] In one embodiment, the diverter system comprises exactly two discharge paths, wherein the first discharge path can be connected to the drain hose and the second discharge path can be connected to an operating chamber of the household appliance. In the context of the application, the expression "operating chamber" of a household appliance, is used to describe a confined space in which the fluid is used to perform an appliance specific task, for example a washing chamber with a washing drum of a washing machine, a dishwashing chamber with one or several racks of a dishwasher, or an oven chamber of a steam oven. Hence, in case the diverter system comprises exactly two discharge paths, the second discharge path for example serves to supply a washing liquid to a washing chamber of a washing machine or to supply a steam towards an oven chamber of a steam oven. In another embodiment, the diverter system comprises more than two discharge paths, wherein the diverter system is further used to direct a fluid to different elements of the household appliance, for example to different detergent compartments of a washing machine and/or to spray arms of an upper and/or a lower rack of a dishwasher.

[0012] In one embodiment, the diverter system comprises only one low pressure barrier device, which is arranged in the first discharge path, wherein a leakage flow through the second discharge path is tolerated when connecting the supply path to the first discharge path. In other embodiments, several or each discharge path of the di-

verter system are/is equipped with a low pressure barrier device.

[0013] In an embodiment, the low pressure barrier device comprises a closing element, a seat, and a return element, in particular a resilient return element, wherein the closing element is arranged displaceable between a closing position, in which the closing element contacts the seat to prevent fluid flow from the inlet side to the outlet side, and an opening position, in which fluid can flow from the inlet side to the outlet side, wherein the closing element is moveable against a force applied by the return element from the closing position into the opening position, and wherein the return element is configured to force the closing element against the seat and to return the closing element into the closing position when a pressure differential between the inlet side and the outlet side is below the cracking pressure.

[0014] The closing element, the seat, and the return element can be structured by the person skilled in the art in order to obtain a suitable cracking pressure and to prevent clocking of the first supply path and/or of the low pressure barrier device due to dirt in the fluid flowing through the low pressure barrier device. For example, in one embodiment, the closing element is a valve head with a flow profile having a low flow resistance and the return element is a spring, in particular a coil spring arranged downstream of the closing element.

[0015] In an advantageous embodiment, the closing element is structured as a sphere, hemisphere, ellipsoid or drop-shaped element. The shape is in particular chosen to avoid edges and corners at which dirt could accumulate. In addition, the shape can be chosen by the person skilled in the art to avoid high pressure resistance.

[0016] In addition or in alternative, the return element in an advantageous embodiment is an elastic band, wherein the elastic band is fixed to the first discharge path at the inlet side of the low pressure barrier device. The elastic band has a smooth surface to prevent an adhesion of dirt.

[0017] In one embodiment, the return element and the closing element are formed as a single piece. For example, the return element and the closing element are formed as a common injection molded part or as a common 3D printed part. The material of the single piece can be chosen by the person skilled in the art to ensure sufficient sealing properties, to ensure sufficient resilient properties, and/or to avoid adhesion of dirt.

[0018] The low pressure barrier device can be mounted in any suitable section of the first discharge path. In one embodiment, the low pressure barrier device is horizontally arranged, i.e. the closing element is moved in a horizontal direction between the closing position and the opening position, in order to prevent a movement of the closing element into the opening position due to gravitational forces.

[0019] In addition or in alternative, in embodiments the low pressure barrier device is arranged adjacent to the fluid diverter. In the context of the application, the expression "adjacent" is not to be interpreted as being limited to a bordering arrangement. For example, in embodiments, a small pipe element can be arranged between an outlet port of the fluid diverter and the low pressure barrier device to allow for a suitable mounting position of the low pressure barrier device within the household appliance. However, a distance between the fluid diverter and the low pressure barrier device is preferably kept small in order to minimize a fluid quantity between the fluid diverter and the low pressure barrier device.

[0020] In one embodiment, the low pressure barrier device and the fluid diverter are housed in a common housing. The housing allows for a simple installation and/or an installation in a limited space.

[0021] In one embodiment of the flow diverter, the moveable fluid distribution element is a slider. In advantageous embodiments of the flow diverter, the moveable fluid distribution element is a rotatable disc with a passage channel, wherein by rotating the rotatable disc the passage channel can be selectively arranged upfront of one of the first discharge path and the second discharge path. A flow diverter with a rotatable disc is shown for example in US 2010/0236588 A1, which is herein incorporated by reference. In an embodiment, the passage channel is arranged such that a flow through the passage channel is in parallel to an axial direction of the rotating disc. The passage channel can be arranged by rotating the rotatable disc to partly or fully expose the first or the second discharge path, in order to allow a reduced flow or a maximum flow through the discharge path. In an embodiment of the rotatable disc, a number of passage channels are provided. When no passage channel is arranged upfront the first discharge path, the first discharge path is closed by the rotating disc, wherein leakage fluid may enter the first discharge path due to clearance. However, a pressure of the fluid entering the first discharge path is below the cracking pressure, and the low pressure barrier device prevents a flow through the first discharge path for example towards a drain hose.

[0022] In one embodiment, the second discharge path is fluidly connectable via an operating chamber of the household appliance to the supply path. In the context of the application, the expression "fluidly connected" is used to describe that fluid is able to flow from the second discharge path to the supply path for a circulation. Paths or elements fluidly connected are not necessarily directly or indirectly mechanically connected. For example, the second discharge path may be fluidly connected to a spray arm, which supplies a washing liquid into the operating chamber of the dishwasher, wherein the supply path of the diverter system is mechanically connected to the sump of the dishwasher.

[0023] In an embodiment, a pump is provided, which is arranged in or upstream of the supply path. In an advantageous embodiment, exactly one pump is provided, which is used to circulate the fluid for a washing task in a washing machine or a dishwasher or for a cooking task in a steam oven, and also used to convey the fluid to the

drain hose.

[0024] According to a second aspect, a fluid-bearing household appliance comprising the diverter system is provided.

[0025] In an advantageous embodiment, the first discharge path is connected to a drain hose. Due to the low pressure barrier device, a leakage flow of the fluid during an operation of the household appliance can be avoided.

[0026] The fluid-bearing household appliance in embodiments further comprises an operating chamber, wherein the second discharge path is fluidly connected via the operating chamber to the supply path. The fluid connection allows for a circulation of the fluid during an operation, wherein a fluid loss due to a leakage flow via the first discharge path is avoided.

[0027] Generally, any fluid-bearing household appliance could be equipped with the diverter system. The use of the diverter system is in particular advantageous in a household appliance having a circulating fluid, which is recurringly discarded, for example after each operation or after several operations, for example a dishwasher, a washing machine or a steam oven.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] In the following, embodiments of the invention will be described in detail with reference to the drawings. Throughout the drawings, the same elements will be denoted by the same reference numerals.

Fig. 1 shows in a schematic view a washing machine with an embodiment of a diverter system.

Fig. 2 shows in a schematic sectional view an embodiment of a low pressure barrier device for a diverter system in a closing position.

Fig. 3 shows in a schematic sectional view an embodiment the low pressure barrier device of Fig. 2 in an opening position.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0029] Fig. 1 shows in a schematic view a fluid-bearing household appliance 1 structured as a washing machine, which is equipped with a diverter system 2.

[0030] As generally known, the washing machine has a housing 10 with an operating chamber 11, in which a washing drum 12 is provided. The operating chamber 11 is accessible via a door 13. At a sump of the operating chamber 11, a filter 14 is provided.

[0031] The diverter system 2 shown in Fig. 1 comprises a fluid diverter 20, a low pressure barrier device 21, a pump 22, a supply path 23, a first discharge path 24, and a second discharge path 25.

[0032] A sump of the operating chamber 11 is connected via the filter 14 and a pipe element 15 to the pump 22. The pump 22 is connected via the supply path 23 to the fluid diverter 20.

[0033] The first discharge path 24 is equipped with the low pressure barrier device 21 having an inlet side 210 and an outlet side 212. At the outlet side 212, the discharge path 24 is connected to a drain hose 3. The low pressure barrier device 21 is configured to prevent fluid flow from the inlet side 210 to the outlet side 212 when a pressure differential between the inlet side 210 and the outlet side 212 is below a cracking pressure.

[0034] The second discharge path 25 is connected to a nozzle 26 to supply fluid to the operating chamber.

[0035] In one embodiment, as schematically indicated by a broken line in Fig. 1, the fluid diverter 20 and the low pressure barrier device 21 are housed in a common housing 4.

[0036] The fluid diverter 20 comprises a moveable fluid distribution element 200, which is moveable for selectively connecting the supply path 23 to one of the first discharge path 24 and the second discharge path 25 in a flow direction indicated by arrows in Fig. 1.

[0037] The moveable fluid distribution element 200 in short is also referred to as moveable element. In the embodiment shown, the moveable fluid distribution element 200 is a rotatable disc with one passage channel, wherein by rotating the rotatable disc the passage channel can be selectively arranged upfront of one of the first discharge path 24 and the second discharge path 25. However, the invention is not limited to such a design.

[0038] When the moveable fluid distribution element 200 is in a position to connect the supply path 23 to the second discharge path 25, the pump 22 can be operated to circulate a fluid, in particular a washing liquid, wherein the fluid is supplied from the supply path 23 to the second discharge path 25 and via the second discharge path 25 and the nozzle 26 to the operating chamber 11, and the fluid removed via the filter 14 and the pump 22 from the sump of the operating chamber 11 and conveyed back to the supply path 23.

[0039] During this operation, a leakage flow through the flow diverter 20 to the first discharge path 24 may occur due to clearance in the flow diverter 20. However, a pressure differential between the inlet side 210 and the outlet side 212 of the low pressure barrier device 21 remains below the cracking pressure of the low pressure barrier device 21, and the low pressure barrier device 21 prevents fluid flow to the drain hose 3. The low pressure barrier device 21 thus prevents a fluid loss during the circulation of the fluid through the operating chamber 11.

[0040] When the moveable fluid distribution element 200 is in a position to connect the supply path 23 to the first discharge path 24, the pump 22 can be operated to convey the fluid, in particular the washing liquid, towards the low pressure barrier device 21, wherein the pressure differential between the inlet side 210 and the outlet side 212 reaches or exceeds the cracking pressure of the low pressure barrier device 21, and the low pressure barrier device 21 is opened to allow a fluid flow to the drain hose

3.

[0041] As schematically shown in Fig. 1, the low pressure barrier device 21 may comprise a closing element 213, a seat 214, and a return element 215 in the form of a coil spring, which is arranged downstream of the closing element and forces the closing element against the seat as long as the pressure differential between the inlet side 210 and the outlet side 212 remains below the cracking pressure of the low pressure barrier device 21,

[0042] As shown in Fig. 1, the low pressure barrier device 21 is horizontally arranged, i.e. a movement direction of the closing element 213 is in a horizontal direction, in order to prevent a movement of the closing element into the opening position due to gravitational forces.

[0043] Fig. 2 and 3 schematically show an alternative embodiment of a low pressure barrier device 21 in a closing position and an opening position, respectively. The low pressure barrier device 21 has an inlet side 210 and an outlet side 212 and comprises a closing element 213, a seat 214, and a return element 215, which in the embodiment of Fig. 2 is in the form of an elastic band, which is arranged upstream of the closing element 213 in a flow direction indicated by an arrow. A distal end of the elastic band is fixed to a wall of the first discharge path 24 at the inlet side 210 of the low pressure barrier device 21. Structuring the return element 215 as an elastic band is advantageous in order to avoid that dirt adheres to the return element 215.

[0044] The closing element 213 shown in Fig. 2 and 3 is structured as a sphere and the return element 215 and the closing element 213 are formed as a single piece.

[0045] The closing element 213 is arranged displaceable between the closing position shown in Fig. 2, in which the closing element 213 contacts the seat 214 to prevent fluid flow from the inlet side 210 to the outlet side 212, and the opening position shown in Fig. 3, in which fluid can flow from the inlet side 210 to the outlet side 212.

[0046] The return element 215 is configured to force the closing element 213 against the seat 214 and when the pressure differential exceeds the cracking pressure, the closing element 213 is moveable against a force applied by the return element 215 from the closing position shown in Fig. 2 into the opening position shown in Fig. 3. When the pressure differential drops below the cracking pressure, the resilient force of the return element 215 forces the closing element 213 to return into the closing position.

[0047] The supply path 24 in one embodiment is formed as a single piece together with a connecting piece of the fluid diverter 21 (see Fig. 1), wherein at an outer periphery of the supply path 24 an external thread could be provided for connecting the drain hose 3 (see Fig. 1) to the supply path.

[0048] It will be understood by the person skilled in the art, that the washing machine is only shown in Fig. 1 by way of example. The invention is neither limited to the use of the diverter system 2 with a washing machine, nor to the design of the washing machine shown and/or the shown arrangement of the diverter system 2 in washing machine.

Claims

1. A diverter system for a fluid-bearing household appliance (1) comprising a supply path (23), a first discharge path (24), a second discharge path (25), and a fluid diverter (20) with a moveable fluid distribution element (200), wherein the moveable fluid distribution element (200) is moveable for selectively connecting the supply path (23) to one of the first discharge path (24) and the second discharge path (25) in a flow direction, **characterized in that** a low pressure barrier device (21) having an inlet side (210) and an outlet side (212) downstream of the inlet side (210) in the flow direction is provided in the first discharge path (24), which is configured to prevent fluid flow from the inlet side (210) to the outlet side (212) when a pressure differential between the inlet side (210) and the outlet side (212) is below a cracking pressure.

2. The diverter system according to claim 1, **characterized in that** the low pressure barrier device (21) comprises a closing element (213), a seat (214), and a return element (215), in particular a resilient return element, wherein the closing element (213) is arranged displaceable between a closing position, in which the closing element (213) contacts the seat (214) to prevent fluid flow from the inlet side (210) to the outlet side (212), and an opening position, in which fluid can flow from the inlet side (210) to the outlet side (212), wherein the closing element (213) is moveable against a force applied by the return element (215) from the closing position into the opening position, and wherein the return element (215) is configured to force the closing element (213) against the seat (214) and to return the closing element (213) into the closing position when a pressure differential between the inlet side (210) and the outlet side (212) is below the cracking pressure.

3. The diverter system according to claim 2, **characterized in that** the closing element (213) is structured as a sphere, hemisphere or drop-shaped element.

4. The diverter system according to claim 2 or 3, **characterized in that** the return element (215) is an elastic band, wherein the elastic band is fixed to the first discharge path (24) at the inlet side (210) of the low pressure barrier device (21).

5. The diverter system according to any one of claims 2 to 4, **characterized in that** the return element (215) and the closing element (213) are formed as a single

piece.

6. The diverter system according to any one of claims 2 to 5, **characterized in that** the low pressure barrier device (21) is horizontally arranged in order to prevent a movement of the closing element (213) into the opening position due to gravitational forces.

7. The diverter system according to any one of claims 1 to 6, **characterized in that** the low pressure barrier device (21) is arranged adjacent to the fluid diverter (20).

8. The diverter system according to any one of claims 1 to 7, **characterized in that** the low pressure barrier device (21) and the fluid diverter (20) are housed in a common housing (4).

9. The diverter system according to any one of claims 1 to 8, **characterized in that** the moveable fluid distribution element (200) is a rotatable disc with a passage channel, wherein by rotating the rotatable disc the passage channel can be selectively arranged upfront of one of first discharge path (24) and the second discharge path (25).

10. The diverter system according to any one of claims 1 to 9, **characterized in that** the second discharge path (25) is fluidly connectable via an operating chamber (11) of the household appliance (1) to the supply path (23).

11. The diverter system according to any one of claims 1 to 10, **characterized in that** the diverter system (2) further comprises a pump (22), which pump is arranged in or upstream of the supply path (23).

12. A fluid-bearing household appliance comprising the diverter system (2) according to any one of claims 1 to 11.

13. The fluid-bearing household appliance according to claim 12, **characterized in that** the first discharge path (23) is connected to a drain hose (3).

14. The fluid-bearing household appliance according to claim 12 or 13 further comprising an operating chamber (11), wherein the second discharge path (25) is fluidly connected via the operating chamber (11) to the supply path (23).

15. The fluid-bearing household appliance according to any one of claims 11 to 14, wherein the fluid-bearing household appliance is a dishwasher, a washing machine or a steam oven.

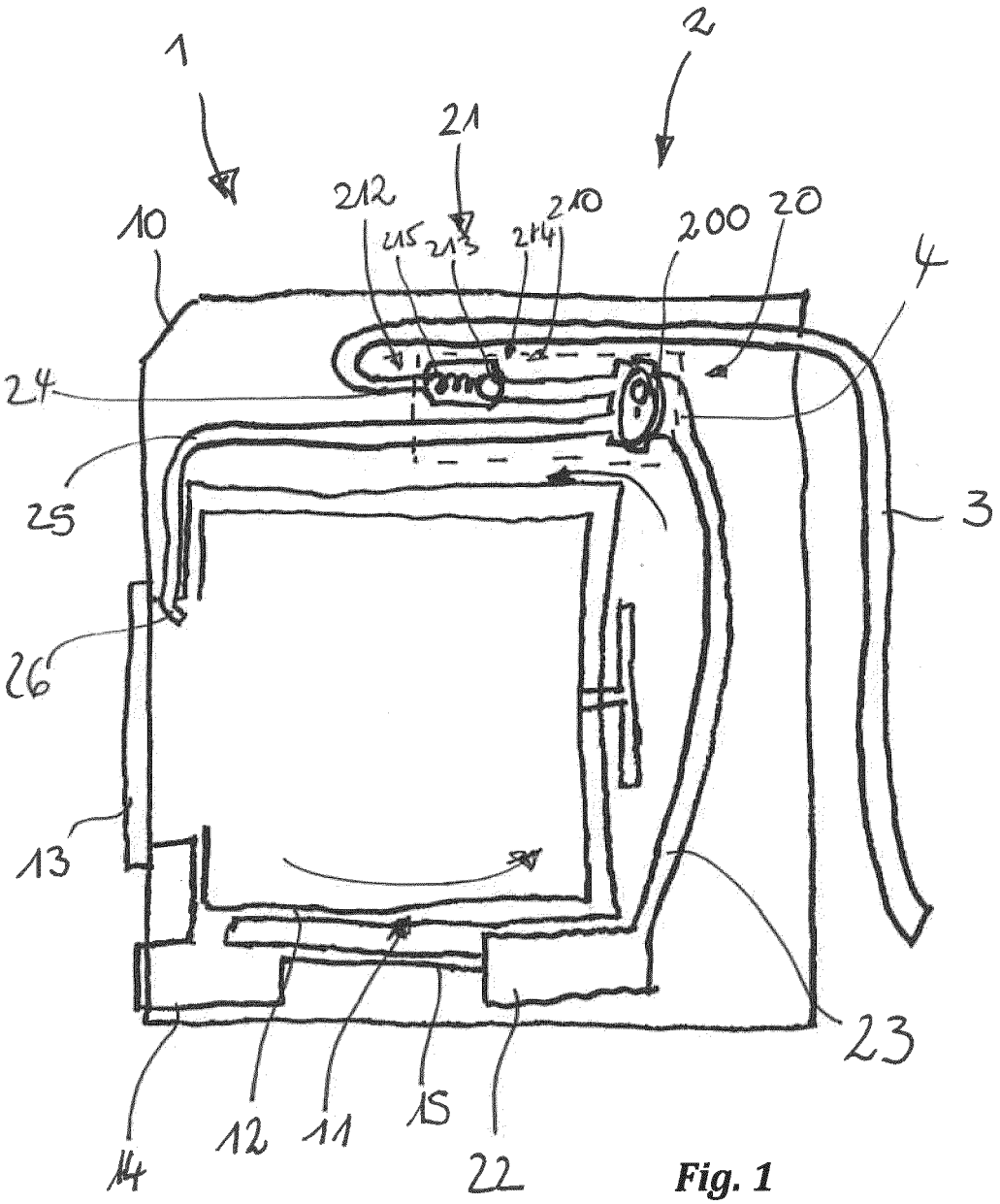

Fig. 1

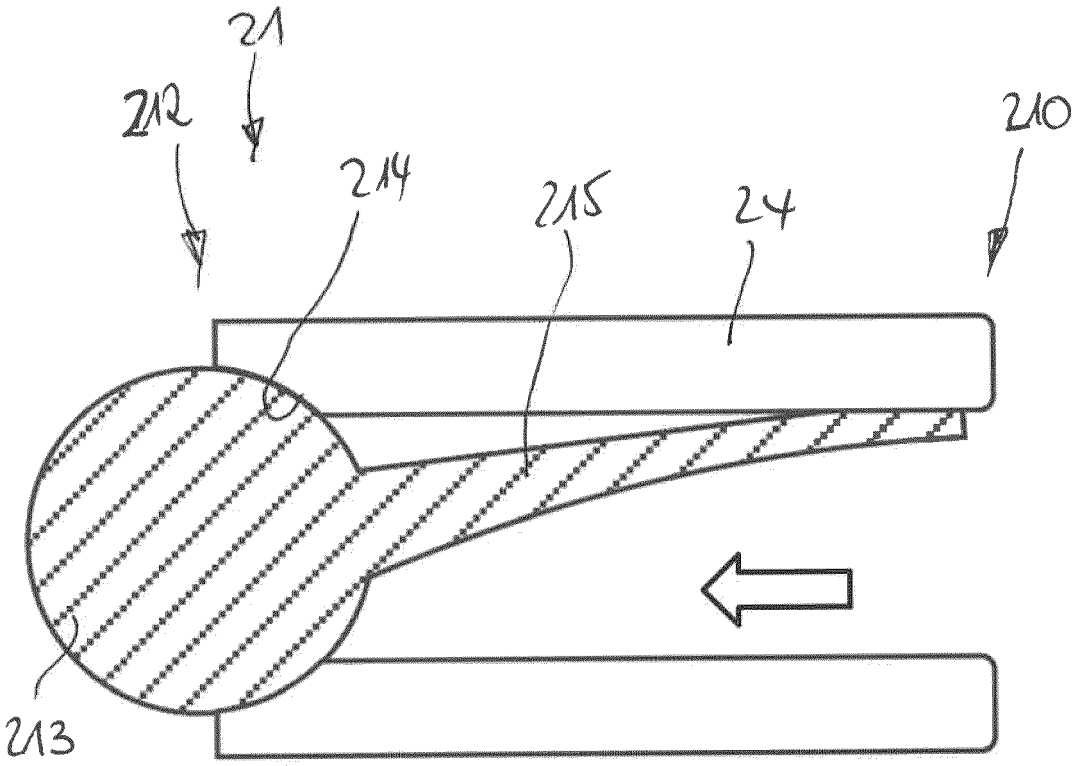

Fig. 2

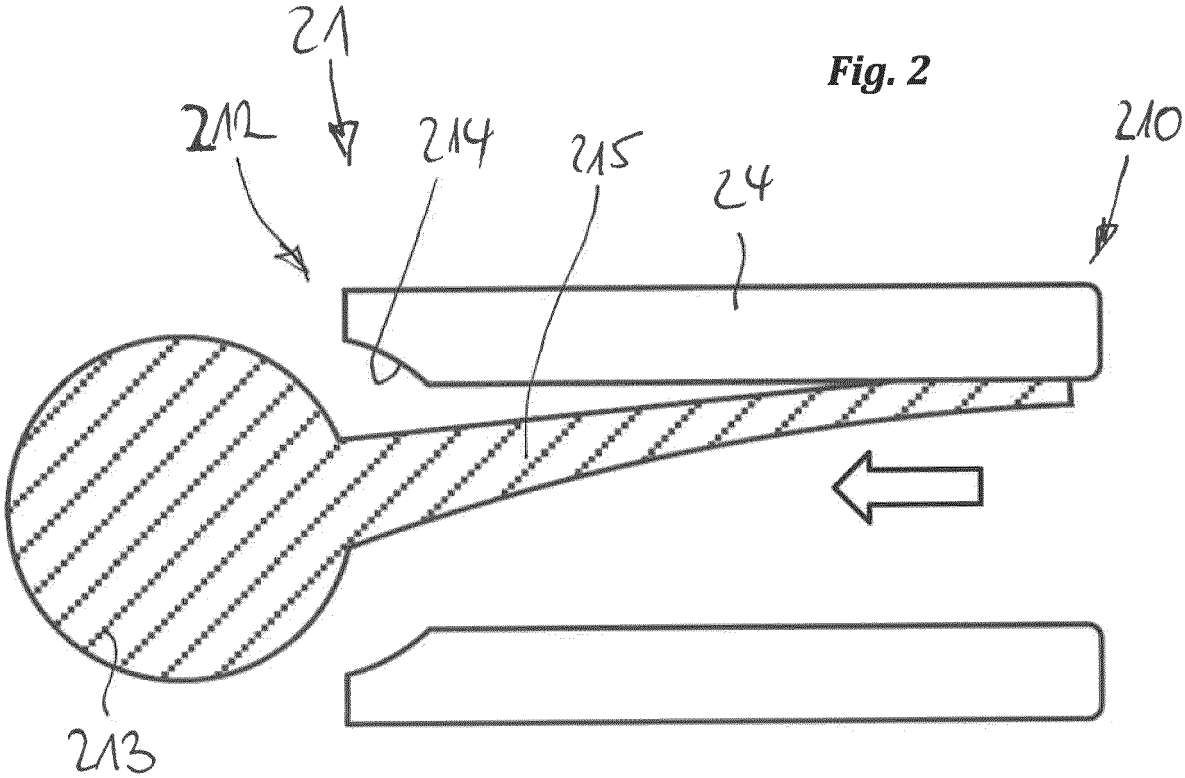

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 20 20 5746

DOCUMENTS CONSIDERED TO BE RELEVANT

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)

D06F
A47L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	20 April 2021	Stroppa, Giovanni

CATEGORY OF CITED DOCUMENTS

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20-04-2021

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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