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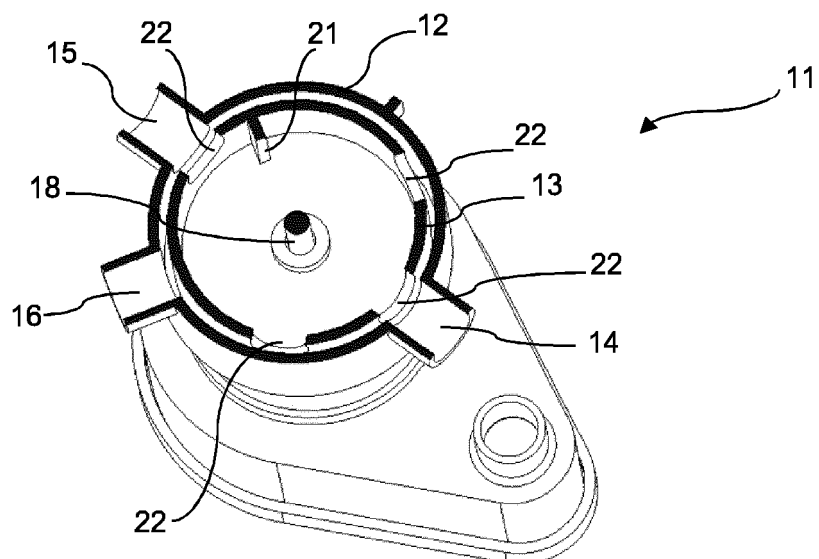
(54) **HOUSEHOLD APPLIANCE WITH A PUMP-VALVE ASSEMBLY**

(57) A household appliance with a pump-valve assembly comprising a first body, a second body creating a chamber and having an inlet, a first outlet, a second outlet and an impeller for transporting fluid, wherein the pump-valve assembly is driven by a motor, wherein the impeller has a shaft and a first set of blades and a second

set of blades placed coaxially on the shaft.

The present invention enables a household appliance in which the operation is controlled by a pump-valve assembly driven by a BLDC or DC motor in easy, automatic, and reliable way.

Fig. 4



Description

[0001] The invention relates to a household appliance, especially a dryer with a pump-valve assembly comprising a first body and a second body which creates a chamber. The pump-valve assembly has an inlet, a first outlet, a second outlet and an impeller for transporting fluid, wherein the pump-valve assembly is driven by a motor.

[0002] The household appliances like dryers or washing machines or dishwashers with centrifugal pump and integrated valve are known in the state of the art. Dryer is a device designed to remove moisture from clothing after washing in a washing machine. The heated air circulates among clothes in a drum which rotates and assures better air circulation. The water is transferred into a condensate container or redirected to the external drain. For transferring the water, a pump-valve assembly is provided.

[0003] The patent application WO 2017 097 641 A1 discloses a switching-valve arrangement for a water-channeling domestic appliance comprises a valve chamber, a valve-closing body, which is arranged in the valve chamber, a first outlet, a second outlet) and a first inlet, wherein the first outlet, the second outlet and the first inlet are assigned to the valve chamber. In an operating position, the first outlet and the second outlet are arranged in an upper region of the valve chamber. Also provided is a second inlet, which is assigned to the valve chamber. In the operating position, the first inlet and the second inlet are arranged in a lower region of the valve chamber. The valve-closing body here is configured in the form of a buoyant valve-closing body. Additionally provided is a delivery device, which, in order for liquid to be introduced into the valve chamber, guides the liquid into the valve chamber via both the first inlet and the second inlet.

[0004] The patent document EP 0 271 318 A2 discloses a valve arrangement for a rotary bidirectional pump comprises a valve chamber, two substantially tangentially but oppositely arranged outlets from the pump chamber of the pump forming two inlets to the valve chamber, two outlets from the valve chamber each associated with a respective one of the inlets and a valve member in the valve chamber with an obturating part and an actuating part, the valve member being movable between a first stable position in which the obturating part closes a first of the outlets from the valve chamber and a second stable position in which the obturating part closes the second of the outlets from the valve chamber, the actuating part being subject to the pressures of the inlets to move the obturating part between the said two positions in dependence on the relative inlet pressures of the two inlets.

[0005] WO 99/ 27 836 A1 discloses a dishwasher which has a nozzle for jetting water into a washing tub and a sump case for storing water to be jetted into the washing tub and for receiving water jetted into the washing tub. the dishwasher has further a supply pipe for supplying the water in the sump case into the nozzle and a

discharge pipe for discharging the water in the sump case. The water in the sump case is selectively pumped into the supply pipe or the discharge pipe by a pump. Thus, both the jetting operation of water for washing dishes and discharging operation of water after the dishes have been washed can be performed with a single motor, whereby the number of components decreases and the manufacturing cost and the size of the dishwasher are reduced.

[0006] It is the object of the present invention to provide a household appliance with pump-valve assembly where the pump is able to control the position of the valve and therefore is able to control the household appliance operation.

[0007] This object is solved by a household appliance with a pump-valve assembly in which the impeller has a shaft and a first set of blades and a second set of blades placed coaxially on the shaft and the second set of blades is placed above the first set of blades. The pump-valve assembly has a first body and a second body. The pump-valve assembly has an inlet, a first outlet and a second outlet. The first body and the second body create a chamber in which an impeller is located. The impeller has a shaft with a first set of blades and a second set of blades which are placed coaxially on the shaft. Coaxial set of blades are a pair of blades mounted one above the other on concentric shafts, with the same axis of rotation, but able to turn in opposite directions. The first set of blades and the second set of blades rotates independently in a clockwise and/or counterclockwise direction. The first set of blades and the second set of blades rotate independently what means that it is possible that during rotation of the first set of blades clockwise the second set of blades rotates clockwise or counterclockwise direction. The pump is pumping the water, the first set of blades and the second set of blades are responsible for transferring water into the drain hose or to the condensate container depending of the drying process phase.

[0008] The pump is a rotary centrifugal pump used in laundry dryers for draining of condensate water. The impeller has a shaft with a first set of blades and a second set of blades placed coaxially on the shaft and the second set of blades is placed above the first set of blades.

[0009] In another embodiment of the invention the pump-valve assembly is driven by a BLDC or DC motor. Thanks to the BLDC or DC motor the rotation of the first set of blades and the second set of blades in different directions is possible. The BLDC motor is a brushless motor which reacts much faster to changing load conditions and has a better performance in comparison to the standard AC motors.

[0010] In the preferred embodiment of the invention the second body is provided with at least one rib and the second set of blades are hydrokinetically connected with the rib. The second body of the pump-valve assembly is a part which can rotate in respect to the first body of the pump-valve assembly. The second body is provided with at least one rib. The water flows and hits the first set of blades and next to the second set of blades which is

hydrokinetically connected with the rib and results in rotation of the second body in relation to the first body of the pump-valve assembly. Thanks to the fact that the second set of blades can rotate in both directions it is also possible for the second body to rotate in both directions. By the changing the direction of rotation of the first set of blades and the second set of blades the closing and opening of the respective outlets can be achieved in easy and reliable way.

[0011] In another embodiment of the invention, the pump-valve assembly has two working positions which are set by the rotation of the second body with respect to the first body. The first working position is setup when the second set of blades turns counterclockwise and rotates the second body into its extreme left position. The second working position is respectively setup when the second set of blades turns clockwise and rotates the second body into its extreme right position.

[0012] In a preferred embodiment of the invention the inlet, the first outlet and the second outlet are placed on the first body. The second body has at least four openings which after rotation of the second body in relation to the first body create inlet and outlet paths. In the first working position of the pump-valve assembly the first outlet is created and the water is transferred outside the household appliance into the drain. In the second working position the second outlet is opened and the water is transferred into the condensate container. The positive effect is that the opening of the respective outlet of the pump-valve assembly is provided by changing the direction of rotation of the first and the second set of blades of the pump-valve assembly.

[0013] The second set of blades also transfers water and also is able to change the working position of the pump-valve assembly.

[0014] The invention may be used in numerous household appliances containing a centrifugal pump impeller. The household appliance is preferably embodied as a laundry dryer for pieces of laundry, and a washer-dryer which combines the function of washing laundry with the function of drying.

[0015] The present invention enables a household appliance in which the operation is controlled by a pump-valve assembly driven by a BLDC or DC motor in easy, automatic, and reliable way.

[0016] In the drawing:

- Fig. 1 shows a laundry dryer isometric view,
- Fig. 2 shows a pump-valve assembly isometric view,
- Fig. 3 shows a cross section of the pump-valve assembly,
- Fig. 4 shows a top view of the pump-valve assembly in a first working position,
- Fig. 5 shows a top view of the pump-valve assembly in a second working position.

[0017] In cooperation with attached drawing, the technical contents and detailed description of the present in-

vention are described thereafter according to a preferable embodiment being not used to limit its executing scope. Any equivalent variation and modification made according to appended claims is all covered by the claims claimed by the present invention.

[0018] In the following description of the preferred embodiments of the present invention, similar identical reference numbers designate identical or comparable components.

[0019] Fig. 1 shows a household appliance 10 in isometric view. The household appliance 10 is a laundry dryer for eliminate moisture from clothes. The water collected through the drying process is collected in the condensate container (not shown on the figure) and after the drying process the water is transferred outside the household appliance 10 by the drain hose (not shown on the figure) which is connected with sewage system of a house.

[0020] Fig. 2 shows a pump-valve assembly 11 in isometric view. The pump-valve assembly 11 has a first body 12 in which an inlet 14, a first outlet 15 and a second outlet 16 are placed. The water is pumped by the pump-valve assembly 11. The pumped water leaves the pump-valve assembly 11 by the first outlet 15 or the second outlet 16 depending on the operation phase of the dryer. The first outlet 15 is used to transfer the water outside the appliance and the second outlet 16 is used to transfer the water into the condensate container.

[0021] Fig. 3 shows a pump-valve assembly 11 cross section. The pump-valve assembly 11 comprises a first body 12 and the second body 13 which are connected rotatably to each other and which create a chamber 23 in which an impeller 17 is placed. The impeller 17 consist of a shaft 18 with the first set of blades 19 and the second set of blades 20, where the second set of blades 20 is placed above the first set of blades 19 and the first set of blades 19 and the second set of blades 20 are placed concentrically on the shaft 18. During the drying process the pump-valve assembly 11 starts to work and the water is pumped by the first set of blades 19 in the direction of the second set of blades 20. The second set of blades 20 starts to rotate. The second outlet 16 is opened and the water flows into the condensate container (not shown on the figure). When the drying cycle is in its final phase and the first outlet 15 should be opened the BLDC or DC motor changes rotation of the first set of blades 19 and next the second set of blades 20 which are hydrokinetically connected with the rib 21 (not shown on the figure) so that the second body 13 rotates in relation to the first body 12 and one of the opening 22 aligns with the first outlet 15 and makes the flow of the water possible through the first outlet 15 and direct the water outside the appliance by the drain.

[0022] Fig. 4 shows a top view of the pump-valve assembly 11 in a first working position. The pump-valve assembly 11 has a first body 12 with an inlet 14, a first outlet 15 and a second outlet 16. The second body 13 has four openings 22. The second body 13 can be rotated

in relation to the first body 12 in the second working position.

[0023] The first working position is when the second body 13 is placed in its extreme left position. The opening 22 is aligned with the first outlet 15. The rotation of the second body 13 in relation to the first body 12 is possible thanks to the rib 21 which is pushed by the flow of water generated by the second set of blades 20. Such arrangement provides the opening of the first outlet 15 through which the water is transferred outside the dryer through the drain hose to the sewage system of the house (not shown on the figure).

[0024] Fig. 5 shows a top view of the pump-valve assembly 11 in a second working position. The second working position is when the second body 13 reaches its extreme right position and opens the second outlet 16 through which the water is transferred from the pump-valve assembly 11 into the condensate container of the dryer (not shown on the figure). The second working position is setup by rotation of the second set of blades 20 which pushes the rib 21 by the force of the water flowing through the pump-valve assembly 11.

[0025] The present invention enables a household appliance in which the operation is controlled by a pump-valve assembly driven by a BLDC or DC motor in easy, automatic, and reliable way.

REFERENCE SIGNS

[0026]

- 10 household appliance
- 11 pump-valve assembly
- 12 first body
- 13 second body
- 14 inlet
- 15 first outlet
- 16 second outlet
- 17 impeller
- 18 shaft
- 19 first set of blades
- 20 second set of blades
- 21 rib
- 22 opening
- 23 chamber

2. The household appliance (10) according to claim 1, **characterized in that** the second set of blades (20) is placed above the first set of blades (19).

5 3. The household appliance (10) according to any of the preceding claims, **characterized in that** the first set of blades (19) and the second set of blades (20) rotates independently.

10 4. The household appliance (10) according to any of the preceding claims, **characterized in that** the first set of blades (19) and the second set of blades (20) of the impeller (17) rotates in a clockwise and/or counterclockwise direction.

15 5. The household appliance (10) according to any of the preceding claims, **characterized in that** the pump-valve assembly (11) is driven by a BLDC or DC motor.

20 6. The household appliance (10) according to any of the preceding claims, **characterized in that** the second body (13) is provided with at least one rib (21).

25 7. The household appliance (10) according to any of the preceding claims, **characterized in that** the second set of blades (20) are hydrokinetically connected with the rib (21).

30 8. The household appliance (10) according to any of the preceding claims, **characterized in that** the pump-valve assembly (11) has two working positions which are set by the rotation of the second body (13) with respect to the first body (12).

35 9. The household appliance (10) according to any of the preceding claims, **characterized in that** the inlet (14), the first outlet (15) and the second outlet (16) are placed on the first body (12).

40 10. The household appliance (10) according to any of the preceding claims, **characterized in that** the second body (13) has at least four openings (22) which after rotation of the second body (13) in relation to the first body (12) create inlet and outlet paths.

Claims

1. A household appliance (10) with a pump-valve assembly (11) comprising a first body (12), a second body (13) creating a chamber (23) and having an inlet (14), a first outlet (15), a second outlet (16) and an impeller (17) for transporting fluid, wherein the pump-valve assembly (11) is driven by a motor, **characterized in that** the impeller (17) has a shaft (18) and a first set of blades (19) and a second set of blades (20) placed coaxially on the shaft (18).

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Fig. 1

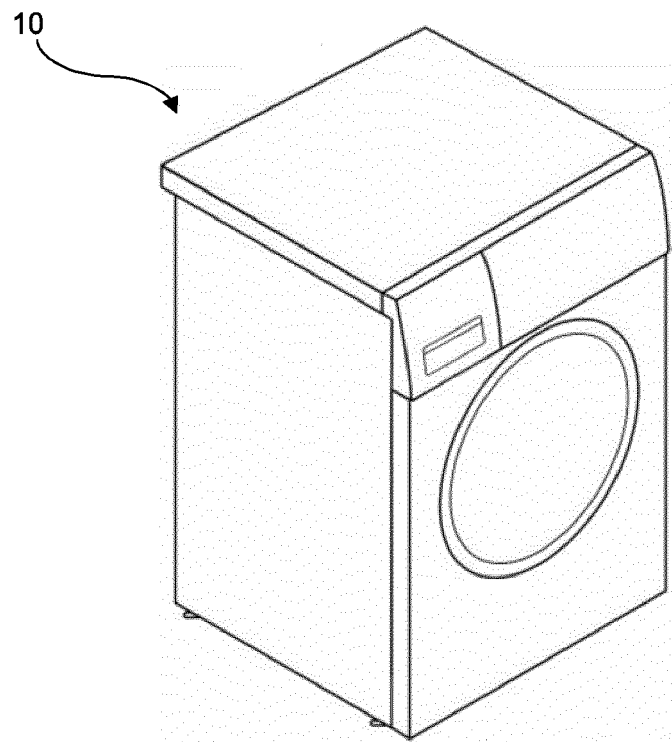


Fig. 2

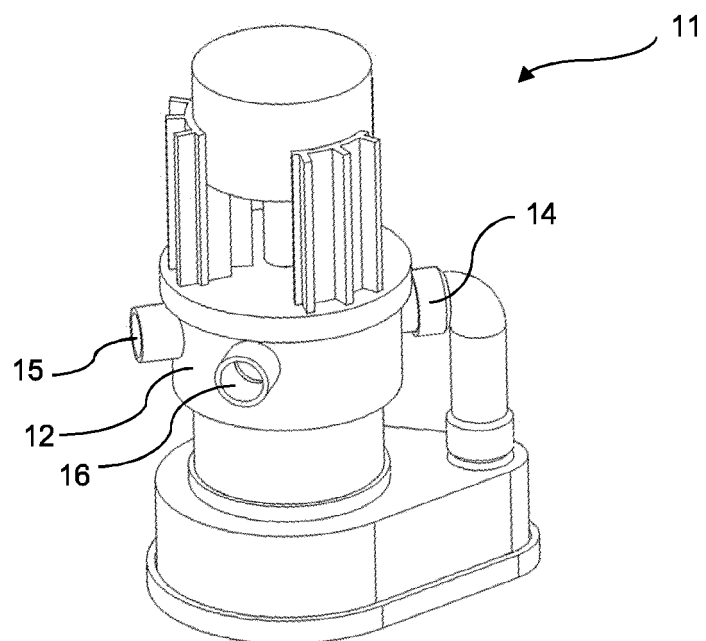


Fig. 3

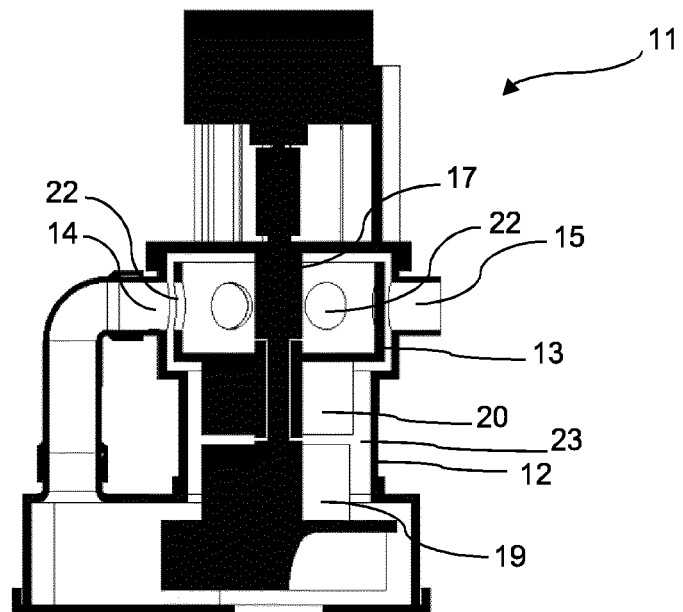


Fig. 4

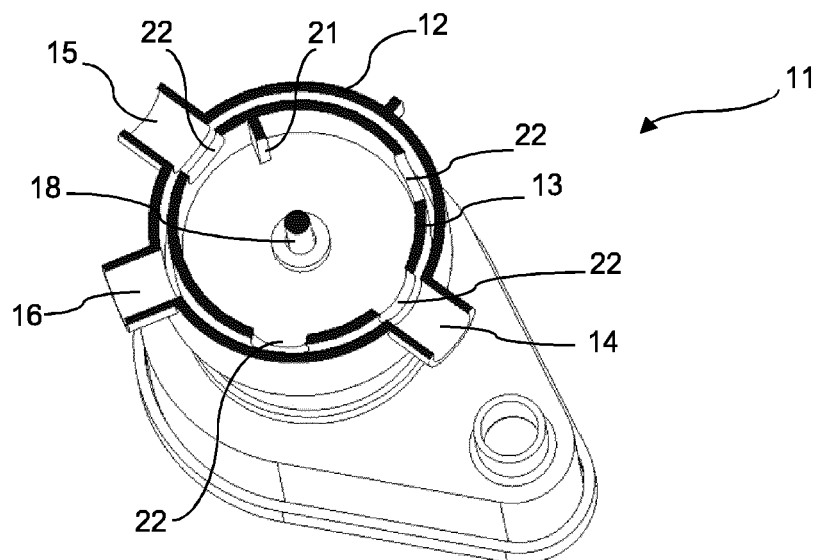
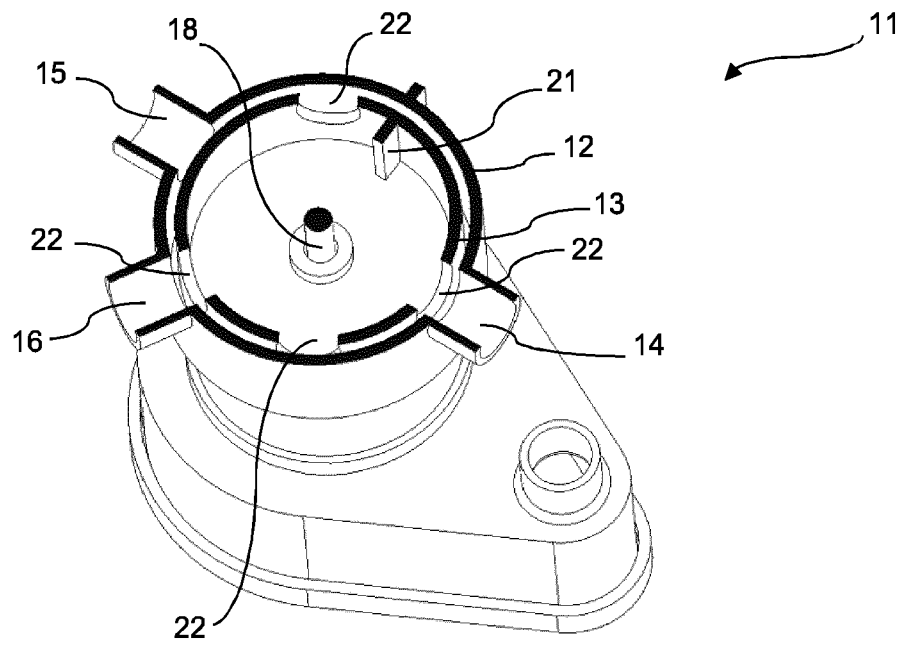


Fig. 5





EUROPEAN SEARCH REPORT

Application Number

EP 22 18 6045

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2016/202723 A1 (BSH HAUSGERAETE GMBH [DE]) 22 December 2016 (2016-12-22) * figures 1-5 * * page 2, lines 16-20 * * page 6, lines 24-28 *	1-10	INV. F04D29/48
X	US 5 924 432 A (THIES EDWARD L [US] ET AL) 20 July 1999 (1999-07-20) * figures 1-4 *	1-10	
			TECHNICAL FIELDS SEARCHED (IPC)
			F04D D06F
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		19 December 2022	Brouillet, Bernard
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 22 18 6045

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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19-12-2022

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