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(54) WASHING MACHINE WITH A DRAINAGE MOTOR PUMP

(57) A washing machine (1) comprising a washing tub (2c), a chassis (1a) having a door (8) to access the interior of the washing tub (2c), a motor pump (4) having a body (4a), an electric motor (4d) to pump washing water (L) coming from the washing tub (2) out of the washing machine (1), a drainage opening (5a) in the body (4a), and a plug (7) coupleable with the drainage opening (5a) accessible from outside the washing machine (1) by a user to access the interior of the body of the motor pump (4a), wherein the washing machine (1) also has a blocking system (10) able to block the opening of the door (8) during an operation of the washing machine (1), and the chassis (1a) also has a window of motor pump (1e) so that the user can access the plug (7) of the motor pump (4). To make the washing machine safer, the blocking system (10) can also block the window of motor pump (1e) during the operation of the washing machine (1).

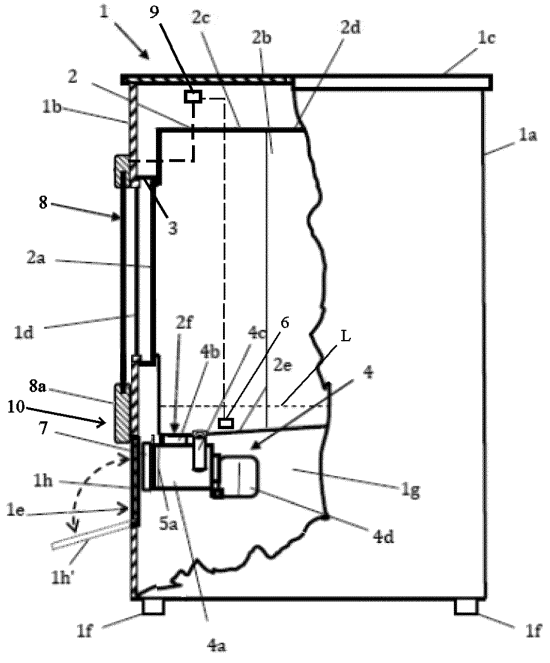

FIG.1

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Description

[0001] The invention relates to the field of washing machines comprising a washing tub, a chassis having a door to access the interior of the washing tub, a motor pump having a body, an electric motor to pump washing water coming from the washing tub out of the washing machine, a drainage opening in the body, and a plug coupleable with the drainage opening accessible from outside the washing machine by a user to access the interior of the body of the motor pump, wherein the washing machine also has a blocking system able to block the opening of the door during an operation of the washing machine, and the chassis also has a window of motor pump so that the user can access the plug of the motor pump at any time.

[0002] Washing machines, also understood as washing machines/dryers, comprise washing tubs, a housing or chassis in which a washing tub closable by a door is housed, in which a washing drum rotates, driven by an electric motor. In order to avoid any danger of opening during the washing, washing machines have a door blocking system that can block the door during the operation of the washing machine.

[0003] In washing machines, used washing water is evacuated from the washing tub by means of a drainage system that comprises a motor pump receiving water accumulated in the bottom of the washing tub and pumping it through a drainage line towards outside the machine or, in some machines, alternatively through a recirculation line through which washing water is recirculated again, directly or indirectly, towards the washing tub.

[0004] To prevent conduits evacuating the washing water from the tub from getting obstructed with material such as lint, solid pieces, residual paper, etc., swept along by the washing water evacuated from the tub, a drainage system is provided being connected with a drainage opening accessible from outside the machine and closed by a screwable and unscrewable plug.

[0005] In most cases, the motor pump is mounted on the bottom of the chassis of the washing machine and connected to the washing water outlet of the tub by means of a discharge conduit. Washing machines are also known in which the motor pump is incorporated in the washing tub. The motor pump is accessible by the user and can be opened at all times even during the operation of the washing machine.

[0006] The object of the present invention is a washing machine safer for the user. Other advantageous features of the invention shall derive from that described in the specification hereafter.

[0007] The term "washing machine" utilized herein refers to washing machines and to washing machines/clothes dryers.

[0008] According to the invention, the washing machine comprises a washing tub, a chassis having a door to access the interior of the washing tub, a motor pump having a body, an electric motor to pump washing water coming from the washing tub out of the washing machine, a drainage opening in the body, and a plug coupleable with the drainage opening accessible from outside the washing machine by a user to access the interior of the body of the motor pump, wherein the washing machine also has a blocking system able to block the opening of the door during an operation of the washing machine, and the chassis also has a window of motor pump so that the user can access the plug of the motor pump. The blocking system of the washing machine can also block the window of motor pump during the operation of the washing machine.

[0009] The body of the motor pump can be mountable at the chassis of the washing machine, mounted at a bottom front of the washing tub, or it can be preferably moulded with at least a bottom front of the washing tub in a sole piece, preferably in such a manner that it protrudes downwards from the bottom front of the washing tub. The front part can be, for example, one of the pieces forming the washing tub, which is called "front tub".

[0010] In those embodiments in which the body of the motor pump is mounted or moulded together with the front part or with the entire washing tub, it is achieved that the drainage opening remains at a higher height than when the motor pump is mounted at the chassis, which results in the user being able to access the drainage opening and draining more comfortably.

[0011] On the other hand, the moulding of the washing tub and the body of the motor pump in a sole piece reduces the level of vibrations and offers a more secure connection regarding tightness between the tub and the body of the motor pump.

[0012] Preferably, the electric motor of the motor pump of the drainage system is mounted at an end of the body of the motor pump, opposite to the drainage outlet.

[0013] The blocking system of the washing machine blocks the opening of the door of the machine during its operation. An "operation" of the machine is also to be understood in the sense that, although the machine has finished a washing cycle or the washing cycle has been stopped at any point of the process, there is washing liquid inside the tub above a predetermined amount and/or that the temperature of the washing liquid is higher than a predetermined temperature and/or that a drum arranged inside the machine, where the items to be washed are arranged, is rotating. That is, the blocking system blocks the opening of the door when the machine is working during a washing cycle and/or when there is an amount of washing liquid inside the tub and/or the liquid from inside the tub is at a temperature above a predetermined temperature. For this, the washing machine can have a temperature sensor to measure the temperature of the washing liquid inside the tub and/or a liquid level sensor or a pressure control to measure the liquid level inside the washing tub.

[0014] When the door is blocked, it cannot be opened normally by the user to guarantee his/her safety. To be able to open it, it is required that the washing cycle has

ended and the drum is not rotating, that the water level is under the predetermined level and that the temperature is under the predetermined temperature. At least the first one of the conditions must be met.

[0015] If the washing machine stops during its operation for any reason, which can be one or several among those consisting in that the machine has run out of electric power during a washing cycle, the user has intentionally stopped the washing cycle, the washing cycle cannot be finished unexpectedly due to a malfunctioning of the machine, that the drainage pump has got obstructed and cannot drain the washing liquid normally, that the drainage line to the exterior is obstructed or for any other reason, the user needs to be able to access the interior of the washing tub to take the items to be washed from inside the same. For this, it is provided that the user can do it by means of the motor pump, evacuating the washing liquid to so have the door unblocked.

[0016] The motor pump is arranged being well-fixed to the chassis of the machine or well-fixed to the washing tub. When it is fixed in the washing tub, the body of the motor pump can be moulded in one piece with the washing tub, both being made e.g. of plastics. When the body of the motor pump is connected with the washing tub, it is arranged in the bottom of the washing tub to facilitate the evacuation of the washing liquid from inside the washing tub. If the motor pump is independent from the washing tub, it is arranged under the washing tub to facilitate the extraction of the washing liquid. Anyway, it is required that the chassis has a window of motor pump to be able to access the plug closing the body of the motor pump.

[0017] For a higher safety, the blocking system of the machine's door keeps the door blocked and also keeps the window of motor pump blocked so that the user does not access the motor pump and may not get burnt with the washing liquid if the temperature of the same is higher than the pre-established temperature, e.g. above 40 °C. In this case, the blocking system will block the door and the window of motor pump until the temperature of the liquid falls below the predefined temperature.

[0018] For the blocking system to block the access door to the washing tub as well as the window of motor pump, it is provided that, when the door is closed, this covers at least part of the window of motor pump and prevents access to the motor pump. This is achieved by a door with a frame-shaped door edge extending beyond an edge of a tub opening of a loading opening of the washing tub and covering at least part of the window of motor pump, thereby blocking the access to the user when trying to open the motor pump.

[0019] To prevent total access to the motor pump when the blocking system is blocking the access to the washing tub, it is provided that the window of motor pump is closable by a cover and that the machine has a lock bar operable by an actuator to open the cover. In this manner, the door edge can cover a small part of the cover and this cannot be opened by the user while it is covered by the same. When opening the machine door, the cover can be opened by the user when operating the lock bar.

[0020] And if the door does not even cover a part of the window of motor pump, the blocking system can block the lock bar by means of an electrically, mechanically and/or magnetically operable closing element. For example, a bolt that blocks the lock bar, a magnet and/or an electromagnet.

[0021] In another blocking form, when the door does not cover the window of motor pump at all, the door covers the actuator when the door is closed. This may occur when the actuator is arranged at a distance from the window and connected with the lock bar mechanically, electrically and/or magnetically. In this manner, the configuration of the washing machine with the window of motor pump can look aesthetically more similarly to a washing machine from the state of the art, wherein the window of motor pump is arranged in the bottom front of the machine in a corner spaced apart from the door. The actuator can be a simple push button covered by the door when this is closed, which remains accessible and poorly visible due to its size when the door is opened. The actuator can be accessible through a small orifice made in the chassis and operable by means of a thin element such as an elongated element and having a reduced diameter like, for example, a pencil or the like. The actuator can be connected with the lock bar by means of mechanical elements such as levers and pushing cams or electric elements such as electromagnets, switches and/or magnetic elements such as permanent magnets.

[0022] In the event that the machine has remained stopped with the blocking system blocking the door and the window of motor pump, an unblocking system accessible to the user is required to deactivate the blocking system. This unblocking system, being accessible to the user, can be also controlled by the temperature sensor and access to the motor pump will not be possible when the temperature is higher than the predetermined temperature.

[0023] In a particular embodiment, the chassis has an opening to access the unblocking system. The opening can be arranged in the machine front and closed by a lid. The unblocking system is connected with the blocking system mechanically, electrically and/or magnetically.

[0024] If the washing machine has stopped during a washing cycle at a moment when the washing tub has a big amount of washing liquid inside it and the door cannot be opened without the danger of overflowing and the plug of the motor pump should not be opened due to the danger of a quick spilling of washing liquid's volume flow, it is provided that the machine has a drainage channel connected to the motor pump and accessible to the user to discharge the washing liquid from the washing machine without an opening of the plug of the motor pump being required. The drainage channel has a flow-through section for the liquid flow-through smaller than a drainage opening of the body of the motor pump closable by the plug. The drainage opening also has a threaded cylindrical wall to screw the plug on and a sealing gasket for it

to properly close.

[0025] Furthermore, it is provided that the machine has a controlling system receiving the temperature sensor's signal and controlling the access to the drainage channel depending on the temperature, allowing the access to the drainage channel when the temperature of the water contained in the washing tub is lower than a predetermined value. In this way, the risk of high-temperature liquid flowing out is eliminated.

[0026] Aspects and embodiments of the invention are described in the following based upon schematic drawings, in which

figure 1 is a partially sectioned schematic side elevation view of a washing machine according to the invention;
figure 2 is a perspective view of another embodiment of the invention; and
figure 3 is a schematic front view of a part of the interior of the washing machine from figure 2.

[0027] Figure 1 shows a washing machine 1 with a chassis 1a comprising a front panel 1b and a top cover 1c. The front panel 1b is provided with a loading aperture 1d closed by a loading door 1e. The washing machine 1 rests on supporting legs 1f.

[0028] A washing tub 2 is housed in the interior 1g of the washing machine 1, whose loading opening 2a is horizontally aligned with the loading aperture 1d and closed with the loading door 8. The edges of the loading aperture 1d and the loading opening 2a are connected by a ring flange 3 of an elastic material. The interior space 2b of the tub 2 houses a rotating washing drum (not shown in the figures) in a per se conventional manner. The tub 2 is composed of a front part 2c and a rear part 2d, which can be also named "front tub" y "rear tub" respectively, assembled in a conventional manner.

[0029] The bottom 2e of the washing tub 2 has a fall towards the front panel 1b of the washing machine 1. The water drainage outlet 2f of the washing tub 2 is located in the lowest part of said fall and the body 4a of the motor pump 4 is connected to the same by means of a connecting piece 4b through whose interior a drainage passage extends, through which washing water coming from the tub 2 flows into the body 4a of the motor pump 4. The motor pump 4 is driven by an electric motor 4d mounted in the rear part of the body 4a.

[0030] A connecting pipe 4c protrudes from the rear side part of the body 4a of the motor pump 4 and a conventional drainage pipe (not shown in figure 1) for draining washing water can be connected to the same.

[0031] The front part 2c of the washing tub 2 and the body 4a of the motor pump 4 with its connecting piece 4b and the connecting pipe 4c are moulded in a sole piece. The front part of the body 4a of the motor pump 4 has a drainage outlet 5a that is closed by a plug 7. The drainage outlet 5a is connected with an internal cylindrical chamber in the body 4a of the motor pump 4. The cylindrical chamber is connected with the interior of the washing tub 2 through the drainage passage in the connecting piece 4b.

[0032] The plug 7 of the motor pump 4 is accessible through a window of motor pump 1e arranged in the front wall 1b of the chassis 1a. The window of motor pump 1e is closable by means of a cover 1h that can be hinged down between a closed position and an open position 1h' through which the user can have access to the plug 7 from outside the washing machine 1.

[0033] The loading door 8 has a frame 8a that, in closed position as shown in the figure, covers part of the cover 1h preventing its opening. When the blocking system 10 is blocking the door 8, this cannot be opened and, therefore, neither can the cover 1h. In the lowest part of the washing tub 2, there is a temperature sensor 6 that, when there is washing liquid L above a predefined temperature inside the washing tub 2, sends a signal to a controlling system 9 that blocks the blocking system 10, thereby blocking the door 8 and the cover 1h at the same time. The controlling system 9 can also detect when the machine is working in a washing cycle and activates the blocking system 10. Furthermore, the controlling system 9 can detect the washing liquid level inside the tub 2 and, when it is higher than a predetermined level, it activates the blocking system 10, thereby preventing the door 8 from being opened.

[0034] Figure 2 shows another embodiment of the invention in which the loading door 8 of the washing machine 1 is opened. The frame 8a of the door 8 is connected to the front panel 1b of the chassis 1a at a hinge 8b on the one hand and to the front panel 1b again at the latch 8c. When the blocking system 10 is active, it blocks the latch 8c, thereby preventing the opening of the door 8.

[0035] The motor pump 4 is fixed to the chassis 1a in the lowest part of the machine 1. The window of motor pump 1e is closed by the cover 1h and has a lock bar 12 keeping it closed. To open it manually, it can be opened by pressing the actuator 11 arranged in the chassis 1a when the door 8 is open. When the door 8 is closed, the actuator 11 remains hidden under the frame 8a and cannot be operated.

[0036] Figure 3 is a front view of the washing machine 1 from figure 2 schematically showing the drainage system inside it. The front panel 1b of the chassis 1a is closed by the door 8 that, in turn, closes the loading opening 2a of the washing tub 2. The washing tub 2 is connected with the motor pump 4 with its connecting piece 4b and its connecting pipe 4c is connected with the outside of the machine 1 through the drainage pipe 13. The body of the motor pump 4a is closed with the plug 7 closing the drainage opening 5a.

[0037] The machine 1 has a controlling system 9 controlling the blocking system 10 depending on the temperature of the washing liquid L, on the operating state of the machine 1 and/or on the washing liquid level inside the tub 2. The blocking system 10 can block the opening of the door 8. When the door 8 is blocked, the actuator

11 cannot be accessed to unblock the lock bar 12 of the cover 1h. Therefore, the cover 1h of the window of motor pump 1e cannot be opened.

Reference numerals

[0038]

1	washing machine
1a	housing
1b	front panel
1c	top cover
1d	loading aperture
1e	window of motor pump
1f	supporting legs
1g	interior of the washing machine
1h, 1h'	cover
2	washing tub
2a	loading opening
2b	interior space
2c	front part
2d	rear part
2e	bottom
3	gasket
4	motor pump
4a	body of the motor pump
4b	connecting piece
4c	connecting pipe
4d	electric motor
5a	drainage opening
6	temperature sensor
7	plug
8	loading door
8a	frame
8b	hinge
8c	latch
9	controlling system
10	blocking system
11	actuator
12	lock bar
13	drainage pipe

Claims

1. A washing machine (1) comprising

a washing tub (2c),
a chassis (1a) having a door (8) to access the interior of the washing tub (2c),
a motor pump (4) having a body (4a), an electric motor (4d) to pump washing water (L) coming from the washing tub (2) out of the washing machine (1), a drainage opening (5a) in the body (4a), and a plug (7) coupleable with the drainage opening (5a) accessible from outside the washing machine (1) by a user to access the interior of the body of the motor pump (4a),
wherein the washing machine (1) also has a blocking system (10) able to block the opening of the door (8) during an operation of the washing machine (1), and the chassis (1a) also has a window of motor pump (1e) so that the user can access the plug (7) of the motor pump (4),
characterized in that
the blocking system (10) can also block the window of motor pump (1e) during the operation of the washing machine (1).

2. The washing machine according to claim 1, **characterized in that** the body of the motor pump (4a) is mountable at the chassis (1a) of the washing machine (1).

3. The washing machine according to claim 1, **characterized in that** the body of the motor pump (4a) is mounted at the washing tub (2).

4. The washing machine according to claim 1, **characterized in that** the body of the motor pump (4a) and at least a part (2c) of the washing tub (2) are moulded in a sole piece.

5. The washing machine according to claim 4, **characterized in that** the body of the motor pump (4a) is moulded protruding downwards from the part (2c) of the washing tub (2).

6. The washing machine according to any of the preceding claims, **characterized in that**, when the door (8) is closed, it covers at least part of the window of motor pump (1e) and prevents access to the motor pump (4).

7. The washing machine according to any of the preceding claims, **characterized in that** the window of motor pump (1e) is closable by a cover (1h) having a lock bar (12) operable by an actuator (11) to open it.

8. The washing machine according to claim 6, **characterized in that** the blocking system (10) can block the lock bar (12).

9. The washing machine according to any of the preceding claims, **characterized in that** the door (8) covers the actuator (11) when the door (8) is closed.

10. The washing machine according to any of claims 7 to 9, **characterized in that** the door (8) covers at least part of the cover (1h) when the door (8) is closed and prevents its opening.

11. The washing machine according to any of the preceding claims, **characterized in that** it has an unblocking system to deactivate the blocking system (10).

12. The washing machine according to claim 11, **characterized in that** the chassis (1a) has an opening to access the unblocking system.

13. The washing machine according to any of the preceding claims, **characterized in that** it has a drainage channel connected to the motor pump (4) and accessible to the user to discharge the washing liquid from the washing machine (1) before opening the plug (7) of the motor pump (4).

14. The washing machine according to any of the preceding claims, **characterized in that** it has a temperature sensor (6) to sense the temperature of the washing liquid (L) inside the washing tub (2) and a controlling system (9) controlling the blocking system (10) and/or the access to the drainage channel depending on the temperature, allowing the unblocking of the blocking system (10) and/or the access to the drainage channel when the temperature of the washing liquid (L) contained in the washing tub (2) is lower than a predetermined value.

15. The washing machine according to any of the preceding claims, **characterized in that** the body of the motor pump (4a) has a drainage opening (5a) provided with a thread to screw the plug (7) on.

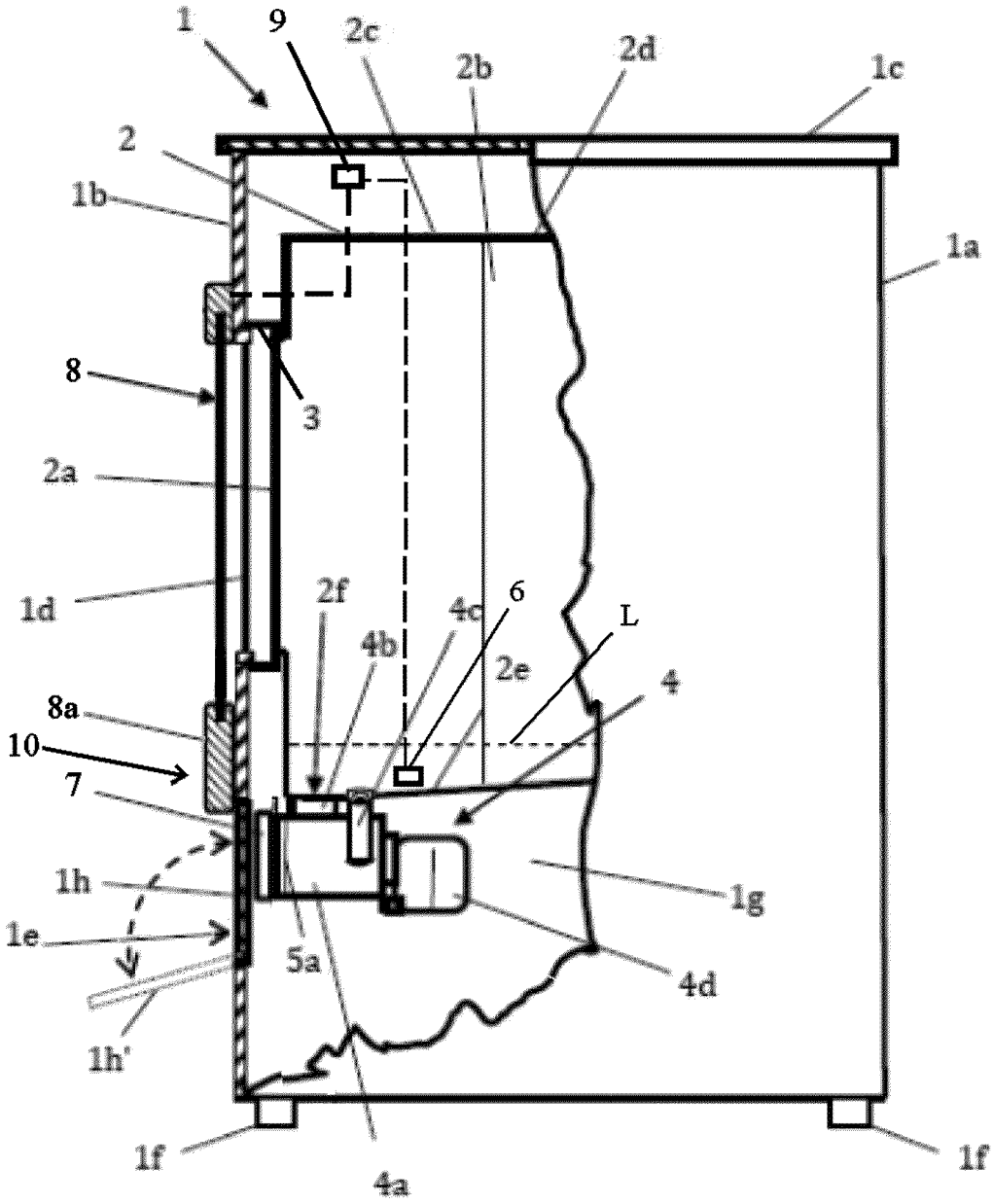
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FIG.1

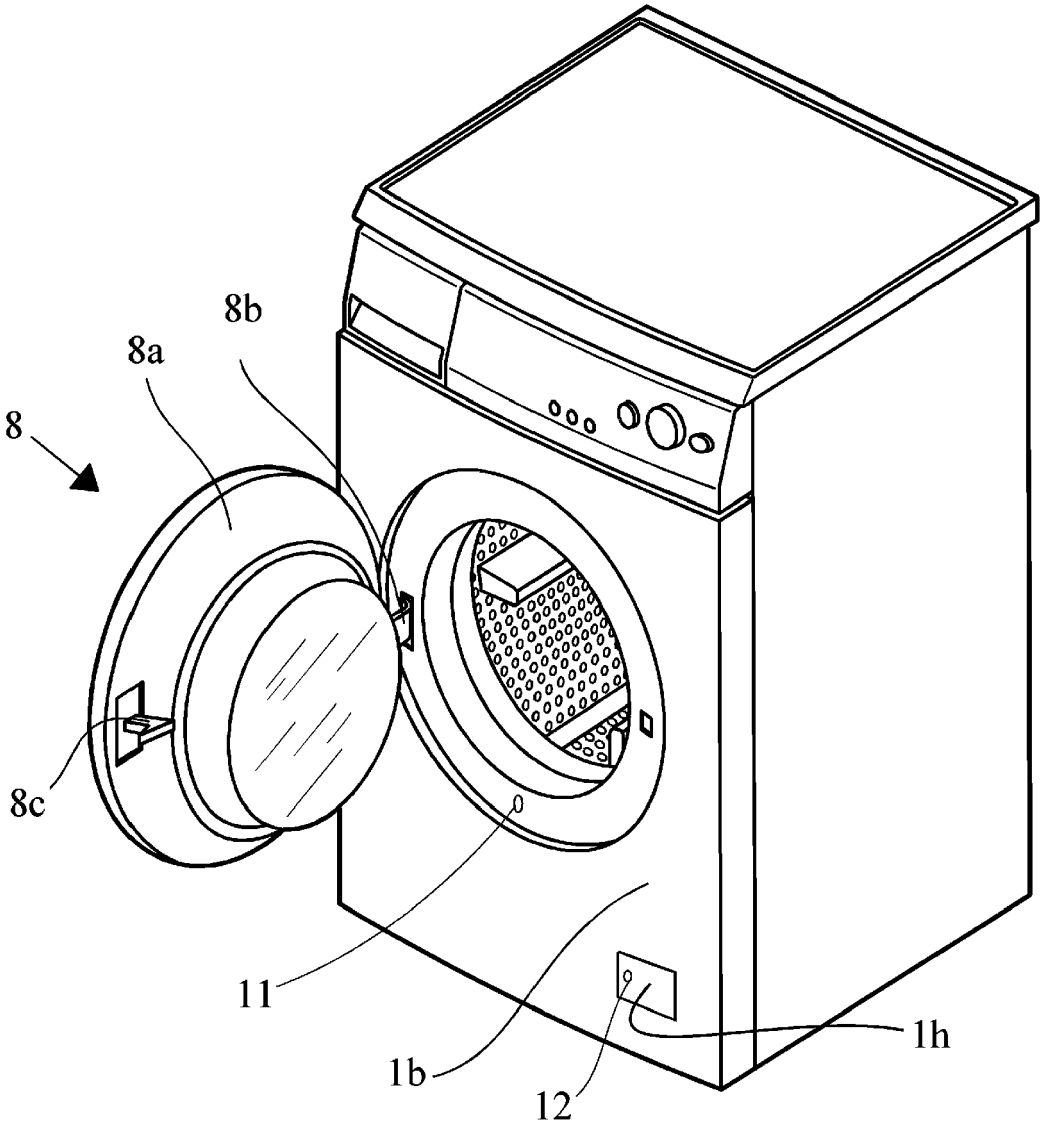

FIG.2

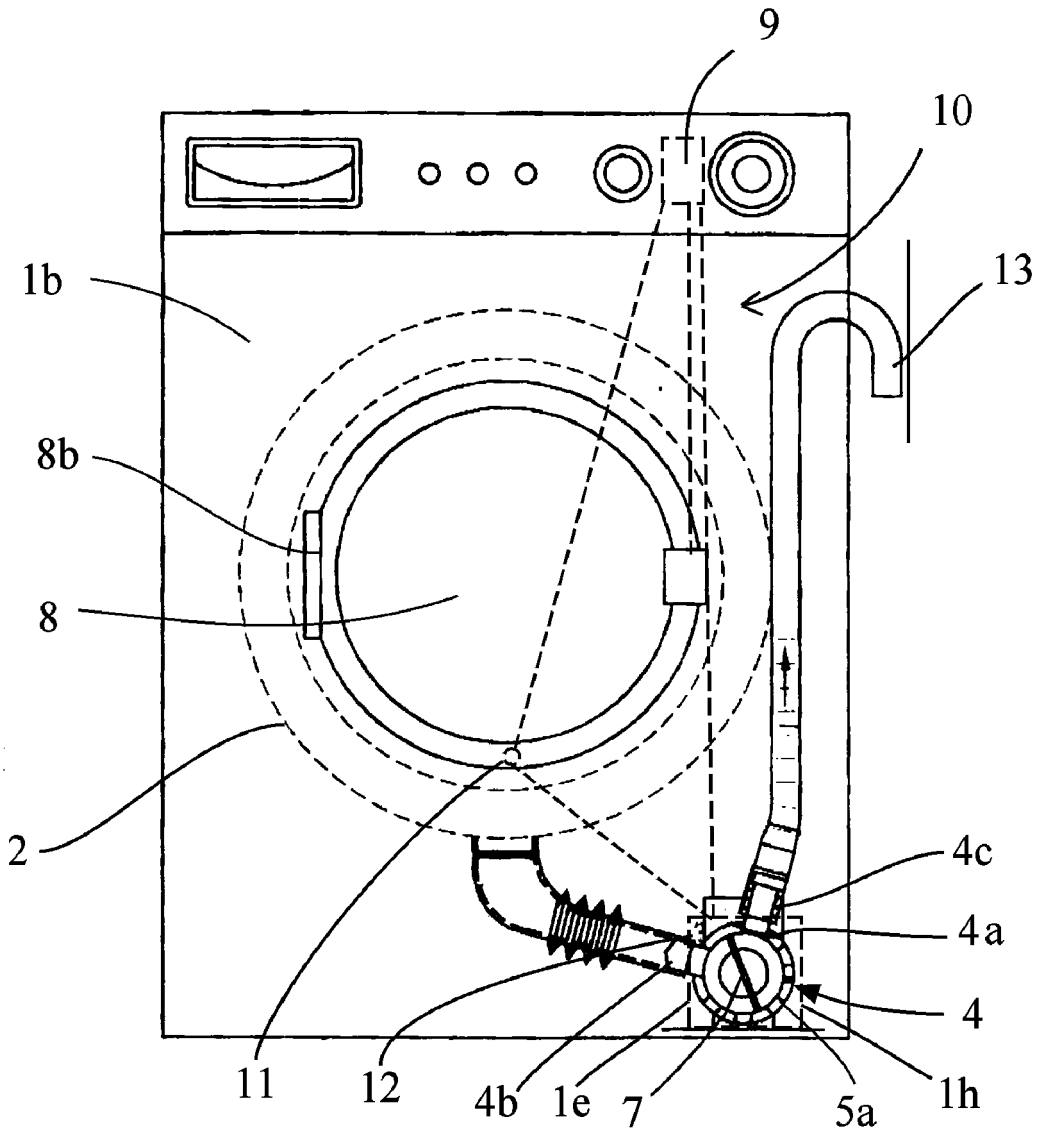

FIG.3

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EUROPEAN SEARCH REPORT

Application Number
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D06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	6 May 2022	Stroppa, Giovanni

CATEGORY OF CITED DOCUMENTS

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