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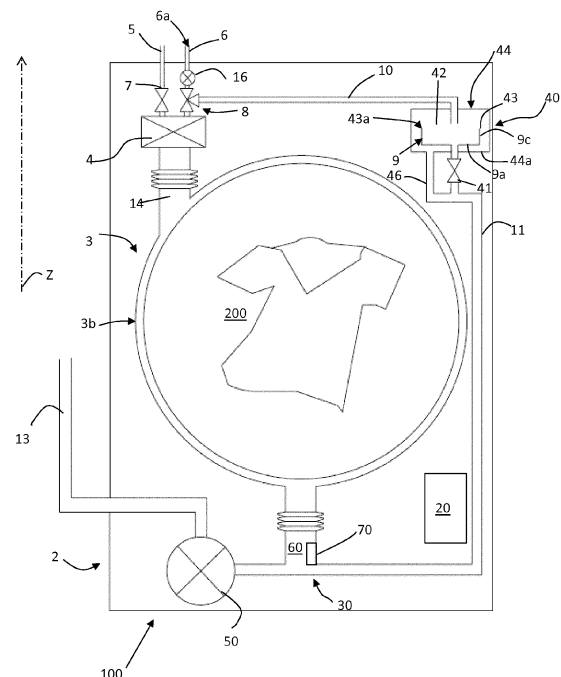
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(54) **Laundry appliance**

(57) The invention is relative to a laundry appliance (100) having a hot water intake, including a casing (2) containing a washing chamber for receiving laundry to be washed; a reservoir (9), fluidly connected or connectable to the washing chamber (3), apt to contain an amount of water, the amount of water defining a water level inside the reservoir (9) and wherein a maximum acceptable water level is defined; a first conduit (6) which inlet (6a) is connected or connectable to a hot water source, this conduit (6) being connected to the washing chamber (3) in such a way to be able to channel a flow of water coming from the inlet (6a) into the washing chamber (3); a second conduit (10) apt to connect the reservoir (9) to the inlet (6a) in such a way to be able to channel a flow of water coming from the inlet (6a) into the reservoir (9); a valve (8) arranged for allowing or interrupting the flow of water from the inlet (6a) to the reservoir (9); and a third conduit (11) to connect the reservoir (9) to a discharge station (30) in such a way to discharge water from the reservoir (9). Furthermore, the appliance (100) includes a discharge device (40) apt to discharge an amount of water exceeding the maximum acceptable water level present in the reservoir (9) into the discharge station (30) via the third conduit (11).

Fig. 2



Description

Field of the invention

[0001] The present invention relates to a laundry appliance, preferably an household appliance, having, during the washing cycles, an intake of hot water, i.e. it is connected or connectable to a hot water source. The appliance is configured to avoid accidental reflux of water from a water reservoir to a hot water conduit.

Background of the invention

[0002] It is known that the peak of energy consumption of an appliance performing washing cycles, such as a washing machine or a combined washer/dryer, takes place during the heating of the water used during the washing cycle. The water to be heated generally comes from the water mains at a rather cold temperature, in any case generally not suitable for the washing cycle(s). Thereafter, for example in the rinsing cycle(s), generally cold water is used, which can be directly taken from the water mains without any heating process.

[0003] In order to solve this problem and lower the energy consumption during the washing cycles, it has been proposed to connect the appliance directly to a hot water supply, instead of a cold water one. An example is given in US 6499321, where a laundry machine is disclosed, which has a wash enclosure to which a supply of water is admitted through a hot water valve and a cold water valve. A temperature sensor senses the temperature of the combined water flow from the hot and cold valves or the temperature of the water collected in the water enclosure. The hot and cold water valves are preferably controlled in accordance with a program executed on a microprocessor. In a wash operation the controller opens the hot water valve and monitors the temperature indicated by the temperature sensor. The controller only opens the cold valve once the sensed temperature has reached or exceeded a threshold temperature. The effect of the cold water contained in the hot water pipes of a household water supply on wash temperature or wash volume is reduced.

[0004] In EP 2031120, an apparatus for the supply of hot water to a washing machine is described. The apparatus comprises a storage reservoir or boiler containing an amount of liquid supplied by an outer source, including the water mains; heating means of the liquid contained in said boiler; a recovery reservoir; a first conduit connecting said boiler to said reservoir; hydraulic deviation means a temperature sensor and control means for processing the signal emitted by said sensor and transmitting suitable ON/OFF commands to said hydraulic deviation means.

Summary of the invention

[0005] An object of the invention is to provide a laundry

appliance having a hot water intake in which the supply of water is properly regulated. The appliance of the invention minimizes energy and water consumption, in particular during the so called washing cycles, and at the same time avoid reflux of water into the inlet piping.

[0006] In the present context, with "laundry appliance", a washing machine or a washer/dryer combined appliance is meant.

[0007] The appliance includes a casing in which a washing chamber is present, wherein the items to be washed (laundry, clothes, etc.) can be located. The washing chamber comprises an opening to and from which the items can be inserted or retrieved. The opening is closable by a suitable door or porthole.

[0008] Moreover, such an appliance is connected to a hot water source.

[0009] Hot water which is introduced in the appliance may be heated by any means, i.e. the hot water source might be of any type. For example, hot water might come from a boiler which is heated by fuel or electrical energy, or it might come from a reservoir heated by sun radiation or photovoltaic panels, etc. In addition, the hot water can be obtained directly by the water mains in those countries whether such a service is provided (e.g. Iceland).

[0010] The fact that the appliance is connected to a hot water source does not exclude that the appliance also includes a heating device to heat water. Indeed, heating device can be included in the appliance for example to be used in combination with the external hot water source or alternatively, in case the external hot water source is not available.

[0011] It has been recognized that cold water is still introduced in prior art appliances despite the latter being connected to the hot water source, nullifying the expected energy saving. A primary factor for this cold water introduction is caused by the water contained in the length of plumbing between the appliance entry valve and the hot water source, e.g. the water boiler. Therefore, a cold initial amount of water enters the appliance through the hot water valve prior to the "real" hot water being received.

[0012] It has been found that in washing cycles using low water volumes, such as the so called "eco-friendly cycles", the presence of the cold initial amount of water can greatly inhibit the temperature of the total volume of wash liquid entering the appliance from reaching the desired wash temperature.

[0013] The appliance of the invention includes a reservoir connected to the hot water source. The reservoir can be located internally to the appliance, according to a preferred embodiment of the invention, as well as externally to the same.

[0014] Water coming from the external hot water source is fed into the reservoir until the end of a time interval at which it is considered that all the initial amount of cold water present in the plumbing connecting the reservoir to the hot water source has most probably ended has been reached. At the end of this time interval, what is believed to be "really" hot water coming from the hot

water source is fed into the washing chamber so that the washing cycle may start according to the user's selection.

[0015] The reservoir includes in addition an outlet channel, in order to discharge water from the reservoir. This water present in the reservoir can be for example used by the appliance itself when cold water is needed, e.g. during a rinsing cycle, or it can be discharged in the waste water draining sewage system.

[0016] In EP 2031120, the washing machine therein described includes, in order to regulate the intake of water from the hot water source to the reservoir, a hydraulic regulation valve. Applicant has realized that, for example in case of a breakdown of the valve regulating the intake of water into the reservoir or in case of over pressure of water present into the hot water conduit, water can fill up the reservoir and thus return back into the hot water conduit.

[0017] In order to comply with current regulations on electrical appliances, when supply water is fed to and enters an appliance, it should not be reintroduced, not even accidentally, into the piping external to the appliance itself.

[0018] A need is therefore present to avoid the aforementioned drawback and consequently to develop an appliance connectable or connected to a hot water source so configured that the amount of water inside the reservoir can be controlled to avoid overflows, or in any case wherein water cannot flow back into the hot water inlet piping.

[0019] To obtain such an appliance, Applicant has realized that the level of the water introduced into the reservoir should be controlled in such a way that it does not exceed a maximum level, or a maximum amount, above which the risk of reflux becomes relevant. The maximum level or maximum amount of water allowed in the reservoir is pre-set and depends, among others, on the size of the reservoir and on its geometrical shape, as well as on the type and model of the appliance.

[0020] According to the invention, the laundry appliance includes, in correspondence to the reservoir, a discharge device to discharge the excess water, i.e. the water exceeding the maximum water level or maximum amount.

[0021] The excess water is then discharged outside the appliance itself.

[0022] It is to be understood that preferably no signal or action is required in order to activate the discharge device, i.e. in order that the discharge device discharges the excess water outside the reservoir, activation of the device can be also automatic when the maximum water level or amount has been substantially reached.

[0023] According to a first aspect, the invention relates to a laundry appliance having a hot water intake, including:

- o a casing containing a washing chamber for receiving laundry to be washed;

- o a reservoir, fluidly connected or connectable to the washing chamber, apt to contain an amount of water, the amount of water defining a water level inside the reservoir and wherein a maximum acceptable water level or water amount is set;

- o a first conduit which inlet is connected or connectable to a hot water source, this conduit being connected to the washing chamber in such a way to be able to channel a flow of water coming from the inlet into the washing chamber;

- o a second conduit apt to connect the reservoir to the inlet in such a way to be able to channel a flow of water coming from the inlet into the reservoir;

- o a valve arranged for allowing or interrupting the flow of water from the inlet to the reservoir;

- o a third conduit apt to connect said reservoir to a discharge station in such a way to discharge water from the reservoir; and

- o a discharge device apt to discharge an amount of water exceeding the maximum acceptable water level or water amount present in the reservoir into the discharge station via the third conduit.

[0024] The provision of a discharge device which "controls" the water level or water amount in the reservoir and it is able to discharge all water which is exceeding the pre-determined maximum water level or water amount, strongly limits the possibility of reflux of water from the reservoir to the hot water conduit.

[0025] This discharge device does not hinder the normal functioning of the reservoir, in other words the reservoir still prevents the initial cold water from entering the washing chamber and stores the same, for example for using the stored water during the rinsing cycle of the appliance.

[0026] Moreover, preferably the discharge device is of a simple construction and does not need too many additional components to be fabricated.

[0027] With the term "discharge station", a location where water is then discharged outside the appliance is meant. The station might advantageously include an additional discharge water tank located for example inside the casing of appliance, e.g. below drum, or it can include a standard drain hose of the appliance, where also the water used for the washing and rinsing cycle of the laundry is then discharged.

[0028] The discharge of water from the discharge station and, if provided, from the water tank, may be advantageously aided by means of a drain pump. As an example, the discharged water may fill the water tank and then, when a certain level or amount has been reached, the drain pump may discharge the water outside the appliance into the sewage system.

[0029] Alternatively, discharge station includes a dedicated discharge conduit and the water so discharged from reservoir is then preferably collected into the sewage system.

[0030] The invention in the above aspect may include, alone or in combination, one or more of the following characteristics.

[0031] Preferably, a second valve is located along the third conduit to allow or interrupt the flow of water from the reservoir to the discharge station.

[0032] The second valve is used to remove water from the reservoir in "standard" situations, e.g. not when there is excess water to be discharged, but when the water inside the reservoir is to be used by the appliance, so as not to be wasted. For this purpose, the discharge station is filled with the water contained in the reservoir by opening the second valve, but it is then not discharged outside the appliance, e.g. the drain pump is not activated. Indeed, the discharge station is preferably in fluid communication with the washing chamber and thus the reservoir water is introduced into the latter, for example during a rinsing cycle.

[0033] The laundry appliance, in a preferred embodiment, includes a control device apt to command the valve arranged for allowing or interrupting the flow of water from the inlet of the first conduit to the reservoir.

[0034] The laundry appliance, in a further advantageous embodiment, includes a control device arranged to command the valve arranged for allowing or interrupting the flow of water from the inlet of the first conduit to the reservoir, and/or the second valve to open and close the same. The control device includes for example a controller and/or it is located in a portion of the main circuit board of the appliance, being integral to the same.

[0035] According to a preferred realization, the discharge device is in signal communication with the control device and it is arranged to send to the control device a signal dependent on the water level or water amount inside the reservoir.

[0036] Therefore, preferably, the discharge device can communicate with the control device so that the latter receives information relative to the water level or water amount inside the reservoir. The communication signals are for example electrical signals.

[0037] More preferably, the discharge device includes a sensor arranged to measure the amount of water entering into the reservoir and arranged to send to the control device measurements signal relative to the water level or water amount inside the reservoir.

[0038] In this way, the control device receives measurements related to the level or amount of water present in the reservoir in a simple manner. The signals relative to the water level or amount measurements might be advantageously sent at a given frequency, e.g. each few seconds a new signal is sent, or alternatively only when the maximum water level is approaching or it is reached.

[0039] Preferably, the sensor is apt to send to the control device a warning signal when the maximum acceptable

water level has been approached or exceeded.

[0040] As mentioned, signals from the level sensor can be sent continuously at a given frequency or only when the "dangerous" level is approaching. In this latter case, preferably, the level sensor might send a suitable signal - different from the standard measurement signals - to the control device in order to warn the same that the maximum level has been reached or is within reach.

[0041] More preferably, the control device, in response to a water level measurements signals indicating that the maximum water level or water amount has been exceeded or to the warning signal sent by the discharge device, is arranged to send a command signal to the second valve to open the same and/or a command signal to the valve arranged for allowing or interrupting the flow of water from the inlet of the first conduit to the reservoir, to operate the same, in such a way that a water level or water amount below the maximum acceptable water level or water amount in the reservoir is re-established.

[0042] In order to avoid that water flows from the reservoir back into the hot water piping, the control device, having received the proper signal from the level or amount sensor, either commands the second valve to open so that the reservoir is in fluid communication with the discharge station, and in this way the reservoir is emptied and no water is present any more in the reservoir, or it commands the valve arranged for allowing or interrupting the flow of water from the inlet of the first conduit to the reservoir to close, so that no more water from the hot water source can enter into the reservoir, blocking the water level or amount therein. Also a combination of these two solutions is possible, i.e. the second valve is opened and the valve arranged for allowing or interrupting the flow of water from the inlet of the first conduit to the reservoir kept in a condition in which the flow of water from the inlet of the first conduit to the reservoir is prevented.

[0043] In an alternative embodiment, the discharge device does not measure the amount or level of the water inside the reservoir.

[0044] Preferably, in the alternative embodiment, the discharge device includes an aperture realized on the reservoir and fluidly connected to the third conduit, the aperture being located at a height substantially equal to a height reached by the maximum acceptable water level inside the reservoir, in such a way that water exceeding the maximum acceptable water level or amount brims over through the aperture.

[0045] In this embodiment, when the reservoir is "too full", automatically water starts to drip from the aperture which is conveniently located at the maximum desired height of the water in the reservoir, in other words at the maximum acceptable water level. No electrical signal has to be sent, either from the discharge device or by the control device, the dripping operates automatically. Thus in this embodiment the discharge device is activated in an automatic manner as soon as the water inside the reservoir has reached the maximum acceptable level or

amount.

[0046] More preferably, the discharge device includes a container fluidly connected to the third conduit and arranged with respect to the reservoir in such a way that water brimming over said aperture falls into said container.

[0047] Water dripping from the reservoir when it has exceeded the maximum allowable water level preferably falls in a container located underneath, so that it can be collected.

[0048] More preferably, the discharge device includes a by-pass conduit connecting said container to the third conduit to channel water present into the container to the discharge station.

[0049] In order to discharge the water in excess which has fallen into the container, an additional conduit has been realized which brings such excess water into the third conduit leading to the discharge station.

[0050] Even more preferably, the by-pass circuit has an inlet in a bottom wall of the container.

[0051] In a preferred embodiment, the reservoir is basin-shaped having an open top side, the aperture being defined by the open top side, so that water exceeding the maximum acceptable water or water amount level brims over through this top side.

[0052] Preferably, the discharge station is preferably in fluid communication with the washing chamber.

[0053] The water collected in the discharge station can be either reused in the washing/rinsing cycle of the appliance or it is simply discharged at the exterior of the appliance such as in the sewage system.

[0054] Preferably the discharge station includes a water sump which is located below the washing chamber.

[0055] Preferably, the appliance includes a drain hose to discharge water outside the appliance from the discharge station.

[0056] The drain hose has thus the purpose of discharging water coming from the washing/rinsing cycles and also the water which is collected in the discharge station due to an excess of water in the reservoir.

[0057] Preferably, the discharge station includes a sensor arranged to measure the amount or level of water inside the discharge station, and a drain pump, the sensor being arranged to send a command signal to the pump to discharge water contained into the discharge station when the water level or amount inside the discharge station exceed a certain pre-set level or amount.

[0058] Preferably, the command signal from the sensor to the pump is sent first to the control device which in turn sends a command signal to the drain pump to activate the latter. The discharged water from the reservoir when is "excess water" is preferably discharged outside the appliance and not reused. For this purpose, another sensor is preferably located inside the discharge station, for example in the water sump located in the appliance, and when "too much water" is present inside the water sump, as detected by the sensor, the pump is activated, so that, preferably via the drain hose, the water

is directed into the sewage system.

[0059] In the "normal functioning" of the appliance, i.e. when there is no excess water in the reservoir which needs to be discharged, and the appliance need some cold water in the washing chamber, the control device is preferably arranged to send a signal to the second valve to open the same so that water can flow from the reservoir to the discharge station via the third conduit. In this preferred embodiment, the water collected into the reservoir and which does not exceed the maximum acceptable level is re-used in the washing/rinsing cycles in order not to waste water. The valve in the third conduit is commanded to open and the water can flow to the discharge station which is preferably in fluid communication with the washing chamber and thus used in the appliance's cycles. Indeed, in this situation, the drain pump is preferably not activated so that the rising water rising inside the discharge station enters the washing chamber.

20 Brief description of the drawings

[0060] These and other features and advantages of the invention will be better apparent from the following description of some exemplary and non-limitative embodiments, to be read with reference to the attached drawings, wherein:

- Fig. 1 is a perspective view of a laundry appliance having a hot water intake according to the present invention, in which a portion of the casing has been removed;
- Fig. 2 is a schematic drawing of a front sectional view of a first embodiment of the appliance of fig. 1;
- Fig. 3 is a schematic drawing of a front sectional view of a second embodiment of the appliance of fig. 1.

40 Detailed description of preferred embodiments of the invention

[0061] With reference to the appended drawings, a laundry appliance having a hot water intake according to the present invention is globally indicated with 100. As an example of the type of appliance, a washing machine is described.

[0062] In the following, with the terms "downstream" and/or "upstream", a position with reference to the direction of the flow of a fluid inside a conduit is indicated.

[0063] Moreover, in the present context, the terms "vertical" and "horizontal" are referred to the positions of elements with respect to the appliance 100 position in its normal installation or functioning.

[0064] Appliance 100 comprises an outer box casing 2, preferably but not necessarily parallelepiped-shaped, and a treatment or washing chamber 3, such as a washing tub 3b containing a rotatable drum 200, for example having the shape of a hollow cylinder, for housing the

laundry and in general the clothes and garments to be washed and/or dried. The washing tub 3b is contained into the casing. In a preferred embodiment, drum 200 can rotate around a preferably horizontal axis (in alternative embodiments, rotation axis may be vertical or tilted). Access to the washing tub 3b and drum 200 is achieved for example via an aperture 2a formed on the casing itself. Aperture 2a preferably faces washing tub 3b and drum 200 and it is apt to be closed - or even sealed - by a door 3a.

[0065] The door 3a is adapted to alternatively open and close the laundry loading aperture 2a of the appliance 1 and is advantageously pivotally mounted, for example hinged, and thus supported at the casing 2 of the appliance 100.

[0066] Appliance 100 also comprises an electrical motor (not shown) assembly for rotating, on command, drum 200 along its axis inside casing. Casing 2, drum 200 and electrical motor are common parts in the technical field and are considered to be known; therefore they will not be described further in details.

[0067] Preferably laundry appliance 100 comprises a control device 20, only schematically illustrated in enclosed figures, for example comprising an electronic board and/or a microprocessor, operatively connected to the electric/electronic components of the laundry appliance 100 and arranged to control the functions of the laundry appliance 100 by operating on these electric/electronic components.

[0068] With reference to fig. 2 and 3, the appliance 100 is connected to a water supply system, such as the water mains. Advantageously, the mains water is supplied to the appliance 100 via an inlet pipe 5. Preferably, this main supply is a cold water supply and supplies the cold water to the appliance 100 from the distribution network more or less directly. Additionally, a first conduit 6 connects the appliance 100 to a hot water source, such as an external water tank (not shown in the appended drawings). The external water tank, e.g. a boiler, can be for example also connected to the water mains so as to be filled by cold water, which is then heated by any suitable heating source.

[0069] Inlet pipe 5 and first conduit 6 are in fluid communication with the washing chamber 3. First conduit 6, and also preferably inlet pipe 5, are both selectively openable and closable by respective valves 7,8, each of which are preferably independently controlled so as to open or close the respective pipe 5,6, so as to allow or interrupt the flow of cold/hot water into the washing chamber 3, when needed. In a preferred embodiment, first conduit 6, and also preferably inlet pipe 5, connect the water sources (either hot and cold) to a detergent dispenser 4 located inside casing 2, which in turn is connected, for example via a single pipe 14 in which both cold and hot water might flow, to the washing chamber 3.

[0070] A further conduit 13, also called drain hose, allows the discharge of water from the washing chamber 3 during the washing and rinsing cycles as known in the

art. The discharge of water to an external sewage system can be aided by discharge pump 50, preferably located inside casing 2.

[0071] Appliance 100 further includes a reservoir 9. Preferably, the reservoir 9 is located inside casing 2, as shown in fig. 1 where a panel on top of the casing 2 has been removed in order to show the reservoir 9. In the preferred depicted example, reservoir 9 is located on top of the washing chamber 3, however other locations are possible. Reservoir 9 is connectable or connected to the hot water source via a second conduit 10, which in a preferred embodiment branches off from the first conduit 6, and it is connected to a discharge station 30 via a third conduit 11.

[0072] The inflow of water from the inlet 6a of the first conduit 6 to second conduit 10, and therefore to the reservoir 9 is regulated by a valve.

[0073] According to the preferred embodiment shown schematically in figs. 2 and 3, the hydraulic valve 8 is a two-ways valve, arranged advantageously in the branch point where the second conduit 10 branches off from the first conduit 6, arranged in such a way to be able to selectively direct water coming from then inlet 6a of the first conduit 6 to the washing chamber 3 or to the second conduit 10 (and therefore into reservoir 9), and to selectively prevent water coming from then inlet 6a of the first conduit 6 to enter washing chamber 3 of second conduit 10,

[0074] Therefore in this preferred embodiment hydraulic valve 8 is a two-ways valve regulating the inflow of water from the inlet 6a of the first conduit 6 to both the washing chamber 3 and the reservoir 9,

[0075] In a different advantageous embodiment, not illustrated, the two-ways valve 8 is replaced by two distinct valves, one regulating the inflow of water from the inlet 6a of the first conduit 6 to the washing chamber 3, and the other regulating the inflow of water from the inlet 6a of the first conduit 6 to the reservoir 9.

[0076] The operation of the two-ways valve 8 or of the two separated valves, not illustrated, is commanded by control device 20 which is electrically connected to the two ways valve/separated valves. The control device 20 is arranged to send appropriate signals to the valve(s) in order to operate them in an ON/OFF mode or to select the desired output of the two-ways valve: the water flow from the hot water source may be directed either toward the washing chamber 3 or toward the reservoir 9, and the switch from one direction to the other is operated by the control device 20. Control device 20 is schematically depicted in figs. 2 and 3 as located within casing 2, however other positions are included in the present invention. Control device 20 may be advantageously embedded in the main electric board (not shown) of appliance 100. The connection between the control device 20 and the two-ways valve 8 (or two separated valves, not illustrated) can be via electrical wires, or it can be wireless.

[0077] Preferably, a temperature sensor 16 is provided (e.g. an NTC), preferably in the first conduit 6, upstream

or downstream of valve 8 (or two separated valves, not illustrated), to measure the temperature of the water entering from the hot water source and flowing in first conduit 6; temperature sensor 16 is advantageously operatively connected to control device 20 and in a preferred embodiment the latter is arranged in such a way to keep two-ways valve 8 in a condition in which water from the inlet 6a of first conduit 6 is directed into the second conduit 10 and then into the reservoir 9 and substantially no water can flow into the washing chamber 3 (or, if two-ways valve is replaced by two distinct valves, to keep open the valve connecting the inlet 6a of first conduit 6 to the reservoir 9 and to keep closed the valve connecting the inlet 6a of first conduit 6 to the washing chamber 3) until the temperature of the water flowing in the first conduit 6a and measured by temperature sensor 16 is below a prefixed threshold, and to switch two-ways valve 8 in a condition in which water from the inlet 6a of first conduit 6 is directed into washing chamber 3 and substantially no water can flow into the reservoir 9 (or, if two-ways valve is replaced by two distinct valves, to keep closed the valve connecting the inlet 6a of first conduit 6 to the reservoir 9 and to keep opened the valve connecting the inlet 6a of first conduit 6 to the washing chamber 3) when temperature of the water flowing in the first conduit and measured by temperature sensor 16 reaches a prefixed threshold.

[0078] According to a preferred embodiment, a flow meter (not illustrated), is provided, or any other type of sensor, preferably in the first conduit 6, to measure the amount of water entering from the hot water source into the reservoir 9 and/or into the tub.

[0079] Discharge station 30 can advantageously include a water sump 60 located for example inside the casing 2 of appliance 100, e.g. below drum 200, or it can include the standard drain hose 13 of appliance 100, where also the water used for the washing and rinsing cycle of the laundry is then discharged. Alternatively, discharge station 30 may advantageously include a dedicated discharge conduit (not shown in the appended drawings) by which the water discharged from reservoir 9 is directly collected into the sewage system.

[0080] Advantageously, the discharge water sump 60 is located below tub 3a and is in fluid communication with the washing chamber 3 of appliance 100.

[0081] Reservoir 9, better shown in an enlarged view in figs. 3 and 4, is preferably realized in plastic material, more preferably in polyethylene or in polypropylene, reinforced or not.

[0082] Preferably, a sensor 70 of the level of water or of the amount of water inside the water sump 60 is located inside the water sump 60. Sensor 70 is preferably in signal communication with the control device 20 and/or drain pump 50.

[0083] According to the invention, the inflow of water from the reservoir 9 to the discharge station 30 is regulated, when such a water exceed a maximum level or maximum amount within reservoir 9, by a discharge device 40 which is so configured to allow flow of water from

the reservoir to the discharge station when the water inside the reservoir exceeds the given maximum level/amount. In other words, the discharge of water from reservoir 9 takes place via the discharge device 40 when the water level inside the reservoir exceed a pre-defined maximum level or amount, which is considered the maximum acceptable level or amount of water inside the reservoir. The maximum level or amount depends, among other, on the geometrical shape of reservoir 9 and on the type of appliance 100.

[0084] According to a preferred embodiment, a valve 41 is located on the third conduit 11 to open or close the same, so as to allow or interrupt the flow of water from the reservoir 9 to the discharge station 30. The opening of valve 41 may depend or not on the level/amount of the water inside reservoir 9.

[0085] Preferably, valve 41 is commanded by control device 20, or by an additional control device not shown in the drawings.

[0086] Advantageously, conduit 11 has an inlet 11a preferably realized on a bottom wall 9a of the reservoir 9, so that, when valve 41 is opened, the water flow to the discharge station 30 driven by gravity.

[0087] With now reference to fig. 2, a first preferred embodiment of the discharge device 40 is depicted. Discharge device 40 includes an aperture 42 in the reservoir 9 positioned at a height along the vertical direction Z equal to the height reached by the maximum acceptable water level in the reservoir 9. The aperture 42 is in fluid communication with the discharge station 30 via the third conduit 11. Any water added into the reservoir which reaches a level above the aperture 42, brims over the same into conduit 11. For example, in the depicted embodiment of fig. 2, reservoir 9 has a basin shape, e.g. it includes a bottom wall 9a and lateral walls 9c, and no top wall. The basin defines an outer rim 43 corresponding to the open ends 43a of the lateral walls 9c. In this case, the aperture 42 is the open side of the reservoir 9, i.e. the opening is defined by the "missing" top wall. A top wall can also be partially present so as to cover the top of the reservoir at least in part (embodiment not depicted), so that the aperture 42 corresponds to the area not covered by the partial top wall. The vertical height of the rim 43, in other words in the depicted embodiment the vertical height of the lateral walls 9c, corresponds to the maximum water level, e.g. the height of rim 43 is equal to the vertical height reached by the water at the maximum allowable water level.

[0088] Preferably, still with reference to fig. 2, the appliance 100 includes a container 44 so arranged with respect to the reservoir 9 that the water brimming over through aperture 42 falls into container 44. Therefore, at least a portion of container 44 is located below reservoir 9, with respect to the vertical direction Z. Preferably, the extension of the portion of the container 44 located below the reservoir is bigger than the extension of bottom wall 9a of reservoir 9, so that all water brimming over reservoir 9 can be collected by container 44. In the depicted em-

bodiment, reservoir 9 is completely contained within container 44.

[0089] Preferably, the third conduit 11 connecting the reservoir 9 to the discharge station passes through a bottom wall 44a of container 44.

[0090] A by-pass conduit 46 preferably connects container 44 to the third conduit 11. The by-pass conduit 46 preferably includes an inlet 46a realized on the bottom wall 44a of container 44. According to a preferred embodiment, conduit 46 and conduit 11 merge so that a single conduit leads to the discharge station 30.

[0091] In this embodiment, valve 41 along the third conduit 11 is advantageously located upstream of the point in which the by-pass conduit 46 and the third conduit 11 merge.

[0092] In a different embodiment of the invention, depicted in fig. 3, discharge device 40 includes a sensor 47, such as for example a sensor level, preferably located within reservoir 9. Sensor level 47 is advantageously arranged to measure the water level or water amount within reservoir 9 and to send measurement level or amount signals to a control device, for example to control device 20. The various signals from and to the sensor 47 and the control device 20 can be sent via electrical wires or wireless.

[0093] In a non-depicted embodiment of the invention, the discharge device 40 includes a siphon, defining an annular channel connecting the reservoir to the third conduit. When the maximum level inside the reservoir has been exceeded, the siphon is so designed that it is primed and the water inside the reservoir is sucked into the third conduit leading to the discharge station 30.

[0094] The laundry appliance 100 operates as follows.

[0095] First, the user selects the appropriate program of the washing cycles in appliance 100, for example selecting the temperature and type of fabric.

[0096] In the washing cycle, hot water is required by the appliance 100. At the beginning of the cycle, water from the hot water source is directed towards the reservoir 9, due to the fact that the initial water in the piping is most probably cold. The two-ways valve 8 is therefore commanded by the control device 20 in such a way that from the inlet 6a of first conduit 6 water is directed into the second conduit 10 and then into the reservoir 9 and substantially no water can flow into the washing chamber 3, i.e. the first conduit 6 downstream the valve 8 and directed to the washing chamber 3 is closed. In case of two separate valves replacing two-ways valve 8, only the valve which directs to the reservoir 9 via the second conduit 10 is commanded to open, while the valve connecting the inlet 6a to the washing chamber 3 stays closed.

[0097] In the advantageous embodiment in which temperature sensor 16 is provided in the first conduit 6, temperature sensor 16 detects temperature of water in the first conduit 6 and communicates this temperature to the control device 20, which keeps two-ways valve 8 in a condition in which water from the inlet 6a of first conduit 6 is directed into the second conduit 10 and then into the

reservoir 9 and substantially no water can flow into the washing chamber 3 (or, if two-ways valve is replaced by two distinct valves, control device 20 keeps valve connecting the inlet 6a of first conduit 6 to the reservoir 9 opened, and keeps the valve connecting the inlet 6a of first conduit 6 to the washing chamber 3 closed) until the temperature of the water flowing in the first conduit 6 is below a prefixed threshold (e.g. 60 °C); when the temperature of the water flowing in the first conduit 6 reaches a this prefixed threshold, control device 20 operates the two way valve 8 in such a way that hot water is now directed from the first conduit 6 into the washing chamber 3 and substantially no water can flow into the second conduit 10, and therefore into the reservoir 9 (or, if two-ways valve is replaced by two distinct valves, control device 20 keeps closed the valve connecting the inlet 6a of first conduit 6 to the reservoir 9 and to keeps opened the valve connecting the inlet 6a of first conduit 6 to the washing chamber 3). Then the washing cycle can start, using the hot water coming from first conduit 6, optionally mixed with cold water coming from inlet pipe 5, as explained in the following.

[0098] During the initial phase in which the reservoir 9 is filled with the initial "cold" water, the valve 41 connecting the reservoir 9 to the discharge station 30 is kept closed.

[0099] Preferably, the size and shape of the reservoir 9 are set in such a way that - under normal operative conditions - in the initial phase in which water enters reservoir 9, the amount of entered water does not exceed the maximum pre-defined water level or amount into the reservoir 9.

[0100] It is to be understood that during the washing cycle, also cold water can be required, for example when the temperature of the hot water from the first conduit 6 is too high and it might damage the laundry. Therefore, control device 20, for example triggered by temperature signals sent by a suitable temperature sensor provided in the washing chamber 3 (not shown in the drawings), may activate the valve 7 opening the inlet pipe 5 connected to the water mains.

[0101] At the end of the washing cycle, or whenever cold water is needed, the substantially cold water present in the reservoir 9 is advantageously discharged into washing chamber 3. This cold water can be used also in "cooling down" the hot water during the washing cycle as above described.

[0102] In order to use the water coming from the reservoir 9 in this "normal operating conditions", water should advantageously flow from the reservoir to the discharge station 30, the latter being preferably in fluid communication with washing chamber 3. Therefore, preferably, from control device 20, a signal is sent to the valve 41 which opens and allows water to flow from the reservoir 9 into the third conduit 11 to the discharge station 30. The discharge station 30 preferably includes sump 60 located below the drum 3a, so that the discharged water can enter the drum rising from below and be used

for example for the rinsing cycle. When the water has reached the sump 60, control device 20 activates again valve 41 to close the same.

[0103] Alternatively, a direct connection, for example via an additional direct conduit, not shown in enclosed figures, may advantageously be provided for connecting the reservoir 9 to the washing chamber 3. In this case valve 41 can be a two way valve so that, when the water into reservoir 9 is required into the washing chamber for example for a rinsing cycle, the two way valve is commanded so that water can flow from the reservoir to the washing chamber via the mentioned direct conduit.

[0104] In case too much water flows from the second conduit 10 into reservoir 9 during the initial phase in which reservoir 9 is filled with the initial "cold" water, and this water exceed the maximum acceptable water level or water amount defined in the reservoir 9, the discharge device 40 is activated in order to discharge the excess water, i.e. the "extra" water above the maximum acceptable level. This water is also discharged into the discharge station 30, however instead of being re-used in a rinsing cycle, it is preferably discharged outside the appliance.

[0105] For example, sensor 70 detects if in the initial phase there is too much water inside the discharge station 30. In the affirmative case, the pump 50 is activated and the water is discharged outside the appliance, before water might enter into the washing chamber 3. Pump is advantageously activated by a command signal sent by the sensor 70 or by the control device 20 which is in turn in communication with sensor 70. Water is discharged via hose 13 into the sewage system.

[0106] In a further advantageous embodiment, in a standard situation, during the initial phase in which reservoir 9 is filled with the initial "cold" water, water from the hot water source flows inside the reservoir 9 and the amount of water is preferably measured by flow meter, not illustrated: the measuring signals are reported to the control device 20 for example by means of electrical signals. Depending on the signals sent to the control device, e.g. on the amount of water present in the reservoir 9, the control device 20 operates the two-ways valve 8 (or the two distinct valves if the latter replace two-ways valve 8). Preferably, as soon as a given water amount threshold has been reached inside the reservoir 9, the water flow is stopped. More preferably, valve 8 is (or valve connecting the inlet 6a to reservoir 9, if two distinct valves replace two-ways valve 8) operated in such a way that no further water can flow into the second conduit 10, and preferably that water flow from the hot source is diverted into the washing chamber 3 (if two distinct valves replace two-ways valve 8, this is obtained by opening the valve connecting the inlet 6a to the washing chamber 3). According to an embodiment of the invention, the amount of water initially sent into reservoir 9 is set in such a way that the probability that after this initial amount of water, the following water coming from the hot water source be warm or hot, is high. Preferably, this initial amount can be

changed and depends on the appliance itself (e.g. type or model), on the program selected by the user (e.g. the temperature involved) and on the installation of the appliance itself. Preferably, the amount of water to be introduced into reservoir 9 depends also on the geometrical shape of the reservoir 9.

[0107] The amount of water admitted initially into reservoir 9 is preferably additionally selected so that it is not enough to activate discharge device 40, i.e. it does not reach the maximum acceptable water level or water amount.

[0108] Alternatively, instead of using a flow meter, the water may be advantageously directed to reservoir 9 for a fixed time-interval, during which - in normal operative conditions - the water level inside reservoir 9 does not reach the maximum allowed water level, after which valve 8 is operated in such a way that water no more flows from the inlet 6a to the reservoir 9.

[0109] After the initial flow of water inside the reservoir 9, the control device 20 activates the two way valve 8 (or the two distinct valves if the latter replace two-way valve 8), so that the hot water is now directed into the washing chamber 3. No more water is introduced in the reservoir 9. Then the washing cycle may start using the hot water coming from first conduit 6, optionally mixed with cold water coming from inlet pipe 5, as explained above.

[0110] In relation to the functioning of the discharge device 40, in the embodiment of fig. 2, the water above the maximum acceptable water level or water amount defined in the reservoir 9 brims over the rim 43 of the open reservoir 9, falling into container 44. More in general, the water falls from aperture 42 which is connected to the third conduit 11. In the preferred depicted embodiment, the water flows into by-pass conduit 46 opened at the bottom wall 44a of container 44 so that, by gravity, the water falls into the third conduit 11 leading to the discharge station 30. Advantageously, in this phase, valve 41 connecting reservoir 9 to the discharge station 30 remains closed.

[0111] Preferably, pump 50, for example by a command signal sent by control device 20, is activated so that the excess water coming from container 44 is drained away through drain hose 13. Alternatively, the water may remain in sump 60 and later discharged when a signal from sensor 70 is sent (for example the water may risk to enter into washing chamber 3).

[0112] In the embodiment of fig. 3, the sensor 47 advantageously detects the level or amount of the water inside the reservoir. In a normal situation, the sensor detects the level or amount of the water inside reservoir 9 and no further action is taken. In an "abnormal situation" in which too much water flows from the second conduit 10 into reservoir 9 during the initial phase in which reservoir 9 is filled with the initial "cold" water, the sensor 47 advantageously sends a warning signal to the control device 20 when the water level or amount is approaching the maximum acceptable water level or water amount, so that in turn the control device 20 sends command sig-

nals to move in an open position valve 41 to discharge water from reservoir 9 to discharge station 30, and/or it activates valve 8 (or one or both distinct valves mentioned above, if they replace two-ways valve 8) to stop inflow of water inside the container. Both these actions (i.e. opening valve 41 and closing valve 8) can be performed. Alternatively, sensor 47 sends regularly level or amount measurements signals to control device 20 which compares the measured value with a stored water level or amount threshold, and when such a threshold is reached, the control device opens valve 41 and/or operates valve 8 (or one or both distinct valves mentioned above, if they replace two-ways valve 8).

[0113] Water so discharged from the reservoir 9 via the third conduit 11 to the discharge station 30 can be either drained away through drain hose 13 by pump 50 or it may remain in sump 60 and later be discharged via the hose 13 when a proper signal from sensor 70 is sent.

[0114] Alternatively, in the embodiment in which discharge device 40 includes a siphon, the siphon is primed when the water inside reservoir 9 reaches the maximum level. The water is then sucked into the third conduit 11 into the discharge station 30 and, as in the previous embodiment, it can either immediately discharged in the sewage system by activation of pump 50, or it can be discharged when it has reached a certain amount or level, as detected by sensor 70. The siphon is so realized that some water remains inside the reservoir 9 also after the siphon has been primed, so that only the excess water is discharged when the maximum water level has been reached, and some water still remain into the reservoir 9, not to be wasted and for example to be reused as explained in the above described preferred embodiments.

[0115] It is underlined that the discharge device 40 is advantageously arranged in such a way to be activated when the water level in the reservoir 9 is above the maximum acceptable water level or water amount defined in the reservoir 9, and therefore not only during the initial phase in which reservoir 9 is filled with the initial "cold" water.

Claims

1. A laundry appliance (100) having a hot water intake, including:

- o a casing (2) containing a washing chamber (3) for receiving laundry to be washed;
- o a reservoir (9), fluidly connected or connectable to said washing chamber (3), apt to contain an amount of water, said amount of water defining a water level inside said reservoir (9) and wherein a maximum acceptable water level or maximum water amount is set;
- o a first conduit (6) which inlet (6a) is connected or connectable to a hot water source, said con-

duit (6) being connected to said washing chamber (3) in such a way to be able to channel a flow of water coming from said inlet (6a) into said washing chamber (3);

- o a second conduit (10) apt to connect said reservoir (9) to said inlet (6a) in such a way to be able to channel a flow of water coming from said inlet (6a) into said reservoir (9);

- o a valve (8) arranged for allowing or interrupting the flow of water from said inlet (6a) to said reservoir (9);

- o a third conduit (11) apt to connect said reservoir (9) to a discharge station (30) in such a way to discharge water from said reservoir (9); and

- o a discharge device (40) apt to discharge an amount of water exceeding said maximum acceptable water level or maximum water amount present in said reservoir (9) into said discharge station (30) via said third conduit (11).

2. The laundry appliance (100) according to claim 1, comprising a second valve (41) located along said third conduit (11) to allow or interrupt the flow of water from the reservoir (9) to said discharge station (30).
3. The laundry appliance (100) according to claim 1, including a control device (20) apt to command said valve (8) arranged for allowing or interrupting the flow of water from said inlet (6a) of said first conduit (6) to said reservoir (9).
4. The laundry appliance (100) according to claim 2, including a control device (20) arranged to command said valve (8) arranged for allowing or interrupting the flow of water from said inlet (6a) of said first conduit (6) to said reservoir (9) and/or said second valve (41) to open and close the same.
5. The laundry appliance (100) according to claim 3 or 4, wherein said discharge device (40) is in signal communication with said control device (20) and it is arranged to send to said control device (20) a signal dependent on the water level or water amount inside said reservoir (9).
6. The laundry appliance (100) according to claim 5, wherein said discharge device (40) includes a sensor (47) arranged to measure the amount of water entering into said reservoir (9) and arranged to send to said control device (20) measurements signal relative to the water level or water amount inside said reservoir (9).
7. The laundry appliance (100) according to claim 5 or 6, wherein said discharge device (40) is arranged to send to said control device (20) a warning signal when said maximum acceptable water level or water amount has been approached or exceeded.

8. The laundry appliance (100) according to claim 6 or 7 when depending on claim 2, wherein said control device (20), in response to a water level measurements signals indicating that said maximum water level or water amount has been exceeded or to said warning signal sent by said discharge device (40), is arranged to send a command signal to said second valve (41) to open the same and/or a command signal to said valve (8) arranged for allowing or interrupting the flow of water from said inlet (6a) of said first conduit (6) to said reservoir (9), to operate the same, in such a way that a water level or water amount below said maximum acceptable water level or water amount in said reservoir is re-established.
9. The laundry appliance (100) according to any of claims 1 to 4, wherein said discharge device (40) includes an aperture (42) realized on said reservoir (9) and fluidly connected to said third conduit (11), said aperture (42) being located at a height substantially equal to a height reached by the maximum acceptable water level or water amount inside said reservoir (9), in such a way that water exceeding said maximum acceptable water or water amount level brims over through said aperture (42) and enters said third conduit (11).
10. The laundry appliance according to claim 9, wherein said discharge device (40) includes a container (44) fluidly connected to said third conduit (11) and arranged, with respect to said reservoir (9), in such a way that water brimming over said aperture (42) falls into said container (44).
11. The laundry appliance (100) according to claim 10, wherein said discharge device (40) includes a bypass conduit (46) connecting said container (44) to said third conduit (11) to channel water present into said container (44) to said discharge station (30).
12. The laundry appliance (100) according to any of claims 9-11, wherein said reservoir (9) is basin-shaped having an open top side (43a), said aperture (42) being defined by said open top side (43a), so that water exceeding said maximum acceptable water or water amount level brims over through said top side (43a).
13. The laundry appliance (100) according to any of the preceding claims, wherein said discharge station (30) is in fluid communication with said washing chamber (3).
14. The laundry appliance (100) according to one or more of the preceding claims, including a drain hose (13) to discharge water outside said appliance (100) from said discharge station (30).
15. The laundry appliance (100) according to any of the preceding claims, wherein said discharge station (40) includes a sensor (70) arranged to measure the amount or level of water inside said discharge station (40), and a drain pump (50), said sensor (70) being arranged to send a command signal to said pump (50) to discharge water contained into said discharge station (40) when the water level or amount inside said discharge station (40) exceed a certain pre-set level or amount.

Fig. 1

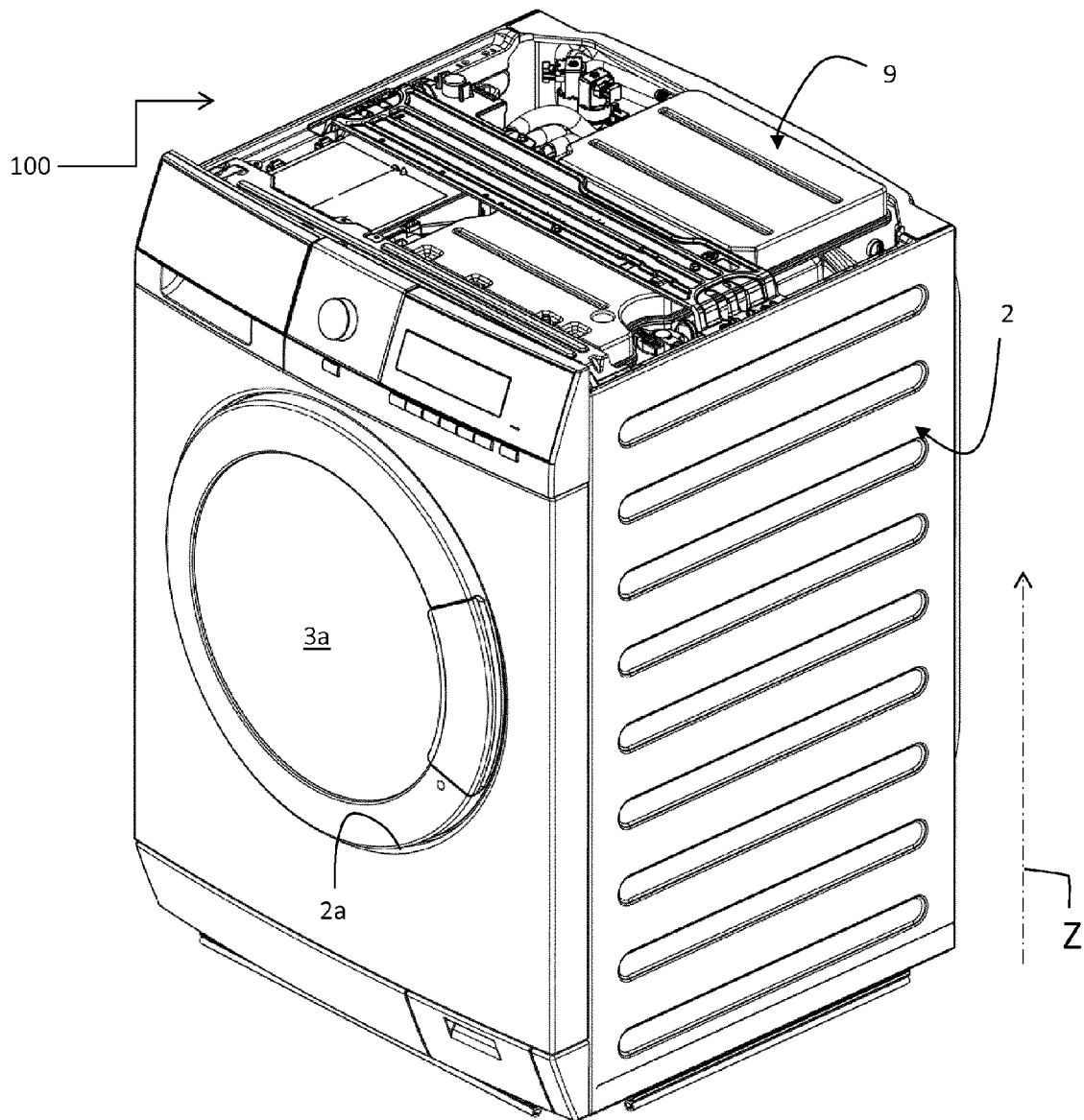


Fig. 2

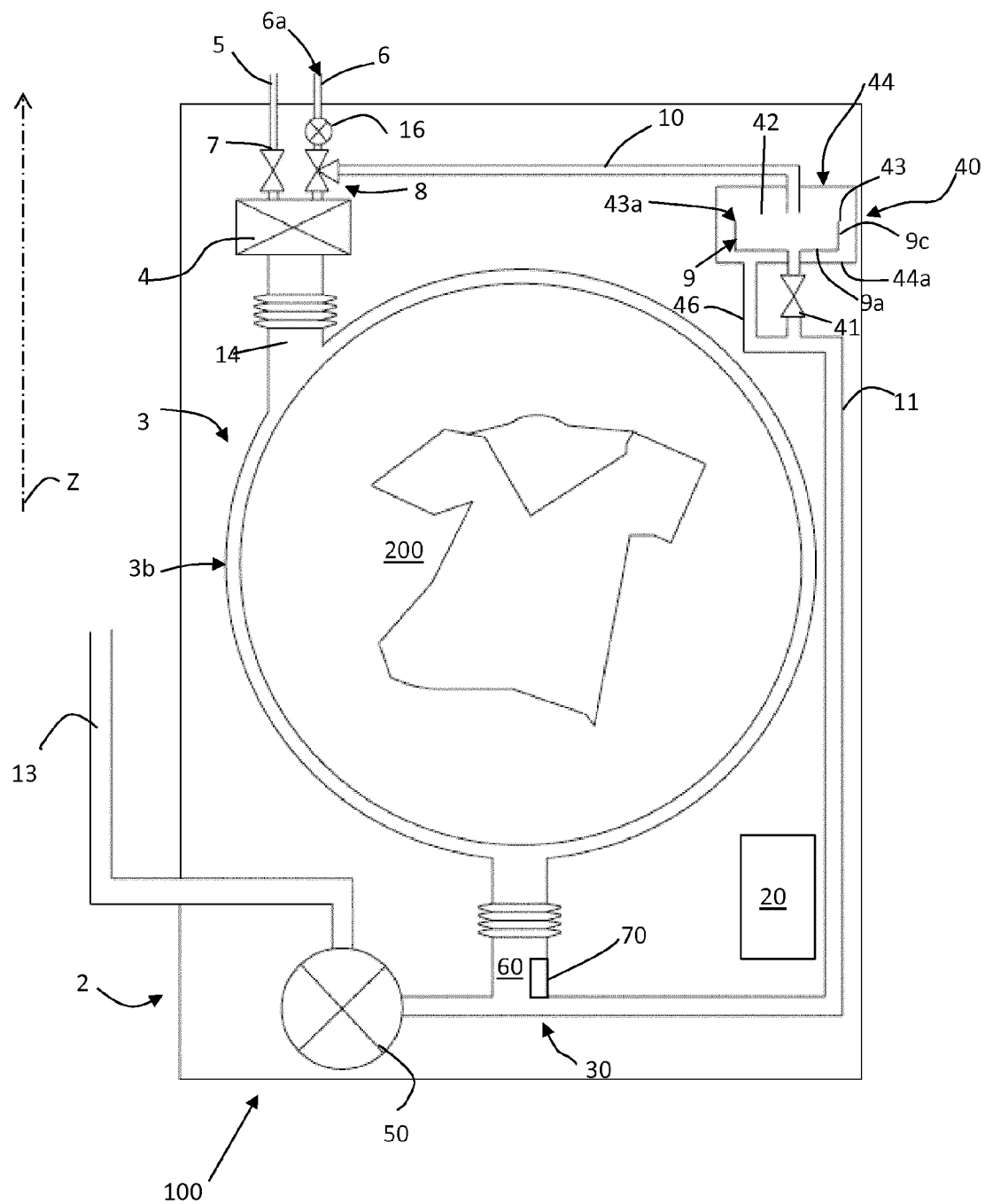
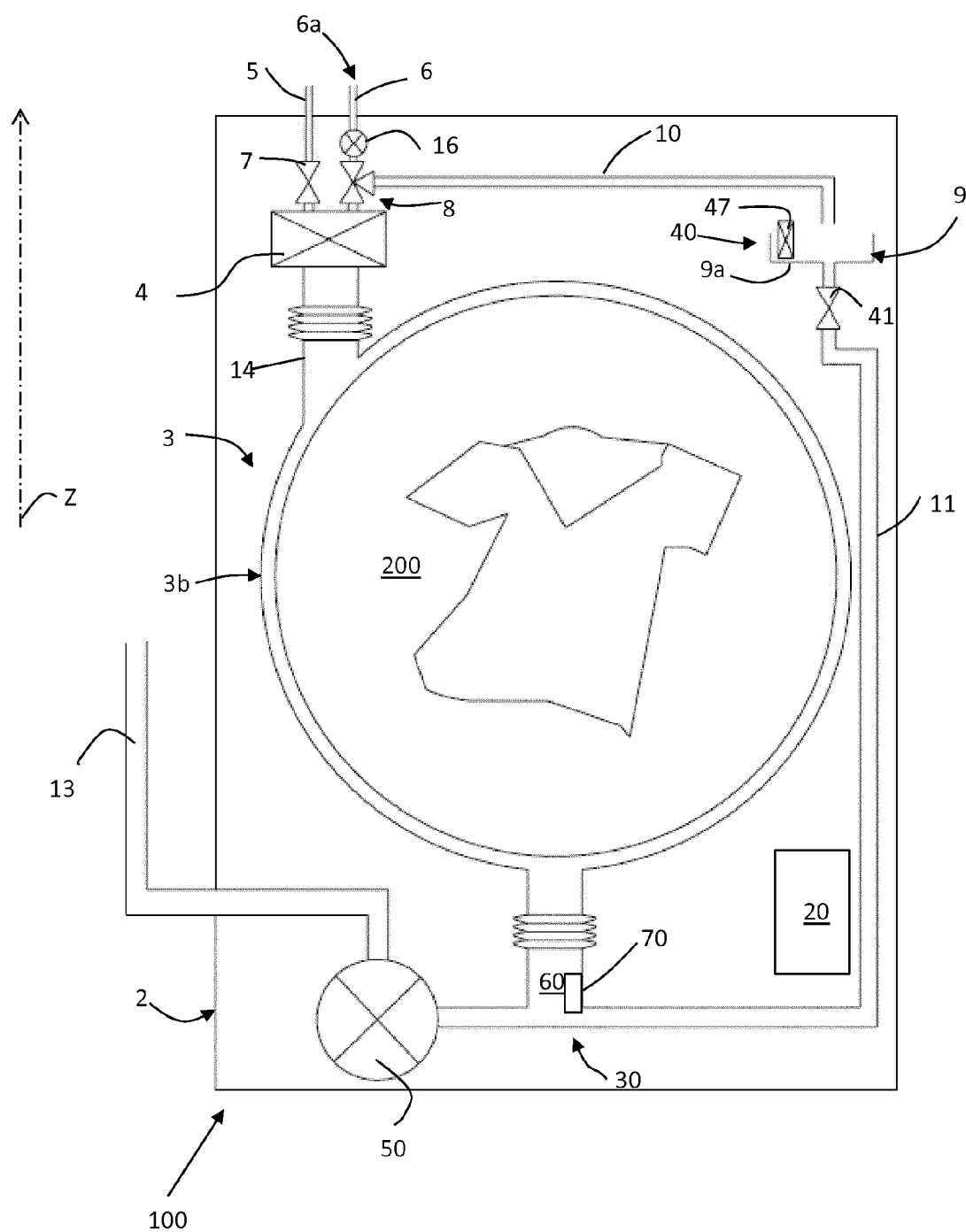


Fig. 3





EUROPEAN SEARCH REPORT

Application Number
EP 13 15 1584

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			D06F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 20 June 2013	Examiner Stroppa, Giovanni
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	
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