



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
23.07.2014 Bulletin 2014/30

(51) Int Cl.:
D06F 39/08 (2006.01)

(21) Application number: **13151546.2**

(22) Date of filing: **17.01.2013**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

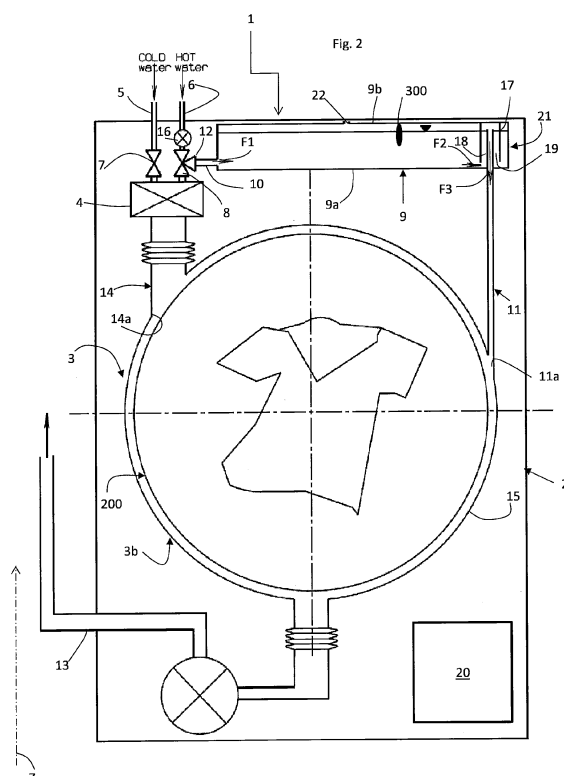
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(54) **Laundry appliance**

(57) It is disclosed a laundry appliance (1) having a hot water intake, including: a casing (2) containing a washing chamber (3) for receiving laundry to be washed; a reservoir (9) apt to contain an amount of water; a first conduit (6;14) connected or connectable to a hot water source external to this appliance and connected to the washing chamber (3) in such a way to be able to channel a flow of water coming from the hot water source into the washing chamber (3); a second conduit (10) apt to connect the reservoir (9) to a hot water source external to the appliance (1) in such a way to be able to channel a flow of water coming from the hot water source into the reservoir (9); a third conduit (11) connecting the reservoir (9) to the washing chamber (3) apt to channel a flow of water to the washing chamber (3); a first valve (8) located along the first conduit (6;14) to allow or interrupt the flow of water into the washing chamber (3); a second valve (12) located along the second conduit (10) to allow or interrupt the flow of water into the reservoir (9); a control device (20) apt to command the first (12) and/or the second valve (8) and to open or close the same; a siphon (21) in fluid communication with the third conduit (11) to selectively allow water to flow from the reservoir (9) to the washing chamber (3).



Description

Field of the invention

[0001] The present invention relates to a laundry machine, e.g. a washing machine or a washer/drier, of the type adapted to be connected to a hot water source. The laundry appliance is so configured and realized to reduce fabrication costs, energy and water consumption of the appliance itself.

Background of the invention

[0002] It is known that the peak of energy consumption of a laundry 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 to lower the energy consumption during the washing cycles, it has been proposed to connect the appliance directly to a hot water supply, in addition to a cold 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 (e.g. a washing machine or a washer/dryer) of the type adapted to be connected to a hot water source which has a reduced cost compared to the known appliances and at the same time minimizes energy and water consumption, in particular during the washing cycles.

[0006] 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, a heating device can be included in the appliance for example to be used in combination with the external hot water source, or alternatively to the latter in case the external hot water source is not available.

[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] Hot water which is introduced in the laundry 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 container 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).

[0009] 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.

[0010] 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.

[0011] The laundry appliance of the invention includes a reservoir which may be connected to the hot water source. The reservoir can be located internally to the casing, according to a preferred embodiment of the invention, as well as externally to the same. Moreover, a connection between the hot water source and the washing chamber is present as well.

[0012] Further, a conduit connects the reservoir to the washing chamber of the appliance, so that water can flow from the reservoir to the washing chamber.

[0013] 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.

[0014] In order not to waste water, also the "cold" water initially fed into the reservoir is used, for example during the rinsing cycles of the appliance where usage of cold water is proper. Therefore, during such a rinsing cycle, the reservoir is substantially emptied by flowing the water contained therein into the washing chamber.

[0015] In EP 2031120, the washing machine therein described includes, in order to regulate the intake of water from the reservoir to the washing chamber, hydraulic regulation means. Applicant has realized that this is not an optimal solution, due to the high costs of a hydraulic valve and the relatively high occurrence of breakdown or fault.

[0016] According to the invention, a siphon is provided, in fluid connection to the reservoir, in order to control the flow of water from the reservoir to the washing chamber.

The siphon is primed when the cold water contained in the reservoir is to be used during an operating cycle of the appliance, while it stays not primed (i.e. it does not allow flow of water from the reservoir to the washing chamber) when hot water is introduced directly into the washing chamber or when the cold water present in the hot water piping is introduced in the reservoir. To do so, the water level inside the reservoir is controlled appropriately so that it is high enough to prime the siphon when cold water flow is required, and it is lower than a priming level when there should be no water flow between the reservoir and the washing chamber.

[0017] Using a siphon instead of a hydraulic valve lowers the costs of the overall laundry appliance, due to the intrinsic lower cost of a siphon than a hydraulic valve, and at the same time, lacking movable parts, it assures a higher reliability over time. Indeed, damages or breakdowns in a siphon are much rarer than in a hydraulic valve.

[0018] According to a first aspect, the invention relates to a laundry appliance having a hot water intake, including:

- a casing containing a washing chamber for receiving laundry to be washed;
- a reservoir apt to contain an amount of water;
- a first conduit connected or connectable to a hot water source external to said appliance and connected to said washing chamber in such a way to be able to channel a flow of water coming from said hot water source into said washing chamber;
- a second conduit apt to connect said reservoir to a hot water source external to said appliance in such a way to be able to channel a flow of water coming from said hot water source into said reservoir;
- a third conduit connecting said reservoir to said

washing chamber apt to channel a flow of water to said washing chamber;

- a first valve located along said first conduit to allow or interrupt the flow of water into said washing chamber;
- a second valve located along said second conduit to allow or interrupt the flow of water into said reservoir;
- a control device apt to command said first and/or said second valve and to open or close the same;
- a siphon in fluid communication with said third conduit to selectively allow water to flow from said reservoir to said washing chamber.

[0019] In other words, the introduction of water into the reservoir is controlled by the second valve, which is opportunely commanded by a control device so that at the beginning of the water loading, by opening the second valve and closing the first valve, water is introduced from the hot water source to the reservoir and then, by opening the first valve and closing the second valve, hot water is introduced into the washing chamber. In this way, at least part of the "cold water" present in the piping connecting the hot water source to the appliance is diverted to the reservoir and stays in the same, due to the fact that the siphon, with this amount of cold water, is not primed, i.e. the reservoir design and the opening/closure time intervals of the first and second valves (i.e. the time intervals in which the first and second valves are kept opened and closed, preferably by the control device) are such that the level of water reached by the introduction of the first amount of cold water is not enough to prime the siphon. The following water coming from the hot water source, most probably really "warm" or "hot", is directed towards the washing chamber to perform the washing cycles, preferably opening the first valve and closing the second. The valves are more preferably commanded by the control device.

[0020] The siphon is then primed, for example adding further water into the reservoir, which is preferably achieved controlling the operation(s) of the first and second valves by the control device, so that the cold water inside the reservoir reaches a priming level and it can flow through siphon into the washing chamber, so that it is not wasted and it is used by the appliance, for example during a rinsing cycle.

[0021] The siphon works due to the principle of the communicating vessels. In other words, the siphon defines a channel through which the water present into the reservoir, when it is above the priming level, can flow into the third conduit reaching the washing chamber, being sucked down by the siphon effect.

[0022] Preferably, the siphon includes a first and a second sleeve one inside the other in order to form an annular

channel through which the water can flow from the reservoir to the washing chamber when the siphon is primed.

[0023] The annular channel allows the flow of cold water from the reservoir to the washing chamber.

[0024] According to a preferred embodiment, the second sleeve is the inner sleeve and it is connected to the third conduit.

[0025] Preferably, the siphon uses, as one of the two sleeves to form the annular channel, at least part of the third channel to avoid addition of extra building parts.

[0026] Preferably, the second and first sleeves extend substantially parallel to a vertical direction.

[0027] According to a preferred embodiment, the reservoir includes a bottom wall and a top wall, the second sleeve projects from the bottom wall and the first sleeve projects from the top wall, the first sleeve including a free end forming a gap with the bottom wall.

[0028] Preferably, the bottom wall of the reservoir is inclined, the inclination being in a direction such that water flows toward the siphon, e.g. toward the gap formed between the free end of the first sleeve and the bottom wall which is the entrance of the annular channel of the siphon. Thanks to this inclination and/or to the size of the gap, the water present inside the container is advantageously completely discharged into the third channel when the siphon is primed, in other words the siphon effect is enough to substantially suck all the water out of the reservoir into the third conduit.

[0029] Preferably, the vertical height of an outlet of the third duct in said washing chamber is lower than the vertical height of the bottom wall of the reservoir.

[0030] This design allows the correct functioning of the siphon.

[0031] Preferably, the reservoir is located inside the casing.

[0032] In this way the appliance is more compact being as a single unit and no additional parts have to be mounted at the user's home.

[0033] Advantageously, the second conduit branches off from the first conduit.

[0034] In this way, most of the "cold" water included in piping before reaching the washing chamber is directed into the reservoir when the second valve has been opened. In other words, the cold water still present in the piping is preferably minimized, minimizing the length of the piping where it can be still present.

[0035] Preferably, the first valve is located downstream of or at said branch point of the second conduit from the first conduit.

[0036] More preferably, the first and second valve form a two-way valve, the two-ways valve being located at the branch point of the second conduit from the first conduit to interchangeably allow water to flow from the hot water source either to the washing chamber through the second conduit or to the reservoir through the first conduit.

[0037] In this configuration, the number of independent valves is minimized, optimizing the design of the appliance. In addition, the length of piping in which "cold water"

may remain is also minimized.

[0038] Preferably, in order to stop the water flow inside the container before reaching the priming level, the appliance includes a sensor apt to measure the amount of water entering into the reservoir.

[0039] More preferably, the sensor apt to measure the amount of water entering into the reservoir is apt to send a measurement signal to the control device and the control device is apt to open or close the first and/or second valve as a function of this measurement signal.

[0040] Preferably, the sensor apt to measure the amount of water entering into the reservoir is located along the first or second conduit.

[0041] More preferably, the sensor apt to measure the amount of water entering into the reservoir includes a flow meter located along the first conduit upstream of the two-way valve apt to measure the amount of water entering into the reservoir.

[0042] Advantageously, in order to stop the water flow inside the container before reaching the priming level, the appliance may include a sensor apt to measure the amount of water present in the reservoir.

[0043] More preferably, the sensor apt to measure the amount of water present in the reservoir is apt to send a measurement signal to the control device and the control device is apt to open or close the first and/or second valve as a function of this measurement signal.

[0044] The amount of water allowed into the reservoir depends, among other, on the size of the reservoir itself, on its shape, on the length of the piping connecting the hot water source to the appliance. In addition it may vary depending on the model and/or type of appliance.

[0045] In a preferred embodiment, the reservoir includes a through hole realized in one of its walls arranged in such a way to allow external air to enter the reservoir, so as to maintain atmospheric pressure within the reservoir.

[0046] When the siphon is primed, in order to have a proper functioning of the same, the pressure inside the reservoir is preferably maintained substantially equal to the atmospheric pressure. In order to achieve this, a hole is realized in one of the walls of the reservoir.

[0047] More preferably, the reservoir includes a duct extending from the through hole towards the interior of the reservoir.

[0048] The appliance is generally transported several times before being installed at the final destination, e.g. at the user's home. In addition, also after the first installation, the appliance can be transported again, for example due to repairing and maintenance activities. In this transport, the appliance might still contain water inside the reservoir: if the appliance is tilted or tipped over, water may spill from the through hole. In order to minimize the spilling, the duct is realized.

[0049] Even more preferably, said duct is substantially perpendicular to a top wall of the container, the through hole being one end of said duct.

[0050] According to a different 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 apt to contain an amount of water;
- o a first conduit connected or connectable to a hot water source external to said appliance and connected to said washing chamber in such a way to be able to channel a flow of water coming from said hot water source into said washing chamber;
- o a second conduit apt to connect said reservoir to a hot water source external to said appliance in such a way to be able to channel a flow of water coming from said hot water source into said reservoir;
- o a third conduit connecting said reservoir to said washing chamber apt to channel a flow of water to said washing chamber;
- o a first valve located along said first conduit to allow or interrupt the flow of water into said washing chamber;
- o a second valve located along said second conduit to allow or interrupt the flow of water into said reservoir;
- o a control device apt to command said first and/or second valve to open or close the same;
- o a regulating device apt to allow or interdict the flow of water through said third conduit;
- o wherein said reservoir includes a through hole through one of its walls and a duct extending from the through hole towards the interior of said reservoir, said hole being arranged in such a way to allow external air to enter the reservoir so as to keep the pressure inside said reservoir substantially equal to atmospheric pressure.

[0051] The presence of a hole in the reservoir which allows to maintain the atmospheric pressure inside the reservoir and having a duct which minimize water spilling has a more general application and does not depend on the presence of a siphon.

[0052] Indeed this solution can be applied also in the appliance described in EP 2031120.

Brief description of the drawings

[0053] These and other features and advantages of the invention will be better apparent from the following description of some exemplary and non-limitative em-

bodiments, to be read with reference to the attached drawings, wherein:

- Fig. 1 is a perspective view of a laundry appliance having an 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 the elements of the appliance of fig. 1;
- Fig. 3 is a top view of a detail of the appliance of figs. 1 and 2;
- Fig. 4 is a sectional lateral view of the detail of fig. 3 along the A-A line;
- Fig. 5 is an enlarged view of Fig. 4.

Detailed description of preferred embodiments of the invention

[0054] With initial reference to figs. 1 and 2, a laundry appliance having a hot water intake according to the present invention is globally indicated with 1. As an example of the type of appliance, a washing machine is described.

[0055] 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 during normal functioning of the appliance is indicated.

[0056] Moreover, in the present context, the terms "vertical" and "horizontal" are referred to the positions of elements with respect to the appliance position in its normal installation or functioning.

[0057] Appliance 1 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 in 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.

[0058] 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 device 1.

[0059] Appliance 1 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.

[0060] With now reference to fig. 2, appliance 1 is connected to a water supply system, such as the water mains. Advantageously the mains water is supplied to the appliance 1 via an inlet pipe 5. Preferably, this main supply is a cold water supply and supplies the cold water to the laundry appliance 1 from the distribution network more or less directly. Additionally, a first conduit 6 connects the appliance 1 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.

[0061] 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 8,7 each of which can be preferably independently controlled so as to open or close the respective pipe 6,5 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 source (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.

[0062] Appliance 1 further includes a reservoir 9. Preferably, the reservoir 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 the washing chamber 3 via a third conduit 11. Preferably, the valve 8 regulating the water flow into the first conduit 6 is located downstream of the branch point where the second conduit 10 branches off from the first conduit 6.

[0063] 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, and defines a bottom wall 9a and a top wall 9b which are substantially opposite one to the other. In the preferred example in which the reservoir is located inside casing 2 on top of washing chamber 3, the bottom wall 9a has preferably, but not necessarily, a concave shape so as to better adapt to the shape of the cylindrical washing chamber 3, in order to minimize the overall volume, e.g. the bottom surface 9a is concave and it follows the contour of a cylindrical envelope 15 defining the outer wall of the washing tub 3b. The bottom wall 9a has therefore preferably a concavity realized in a surface external to the reservoir facing the washing chamber. Preferably,

top wall 9b is planar so that the reservoir can be easily located under a standard flat top panel of casing 2. It is to be understood that the reservoir may advantageously include a concave and/or planar wall which are different from the top and bottom wall.

[0064] The third conduit 11 includes an outlet 11a into the washing chamber 3. Outlet 11a may be different than, or the same as, the outlet 14a of common pipe 14 into the washing chamber 3. In other words, the third conduit 11 and the common single pipe 14 may merge in a single conduit, therefore forming a single aperture into the washing chamber 3, or, as in the embodiment illustrated in Fig. 1, they can be completely separated.

[0065] Preferably, the outlet 11a of the third conduit 11 into the washing chamber 3, regardless of whether it coincides to outlet 14a, is located at a height along the vertical direction Z (see arrow Z in Fig. 2) which is lower (i.e. placed at a lower height) than the height at which the bottom wall 9a of reservoir 9 is located.

[0066] The inflow of water from the second conduit 10 to the reservoir 9 is regulated by valve 12. The valve 12 is advantageously located on the conduit 10.

[0067] According to a preferred embodiment, the hydraulic valve 8 which opens and closes the first conduit 6 and the hydraulic valve 12 which opens and closes the second conduit 10 form a single two-ways valve (i.e. a single two-way valve comprises both first and second valves 8 and 12), as shown schematically in fig. 2. The two-way valve is advantageously mounted at the branch point. Alternatively, two different valves 8,12 can be advantageously used, the first valve being located downstream the branch point, and the second valve being located along the second conduit 10. The operation of the two-ways valve (or of the two separated valves 8,12) is commanded by control device 20 which is advantageously electrically connected to the two ways valve/separated valves 8, 12. The control device 20 is apt 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: by operating above valve(s) the water flow from the hot water source may be directed either toward the washing chamber 3 or the reservoir 9 and the switch from one direction to the other is advantageously operated by the control device 20. Control device 20 is schematically depicted in fig. 2 as located within casing 2, however other positions are included in the present invention. Control device 20 may be advantageously embedded (or comprised) in the main electric board (not shown) of appliance 1. The connection between the control device 20 and the valves 8,12 can be via electrical wires, or it can be wireless.

[0068] Preferably, a sensor 16 apt to measure the amount of water entering into reservoir 9 is provided, preferably in the first conduit 6, to measure the amount of water entering from the hot water source into the reservoir 9 (when valve 12 is opened and valve 8 is closed) or into the tub (when valve 12 is closed and valve 8 is opened). According to a preferred embodiment, also a

temperature sensor (not shown) can be located along the same first conduit, upstream or downstream of valve 8.

[0069] Sensor 16 can be for example a flow meter.

[0070] Preferably sensor 16 apt to measure the amount of water entering into reservoir 9 is apt to send a measurement signal to control device 20 and control device 20 is apt to open or close first 8 and/or second valve 12 as a function of this measurement signal.

[0071] In addition or instead of sensor 16, a sensor 300 apt to measure the amount of water present in reservoir 9 may be provided; for example a pressure switch, a float switch, an optical sensor, etc.

[0072] Preferably sensor 300 apt to measure the amount of water present in reservoir 9 is apt to send a measurement signal to control device 20 and control device 20 is apt to open or close first 8 and/or second valve 12 as a function of this measurement signal.

[0073] A fourth conduit 13, also called discharge pipe, allows the discharge of water from the washing chamber 3 during the washing and rinsing cycles as known in the art.

[0074] The inflow of water from the reservoir 9 to the washing chamber 3 via the third conduit 11 is regulated, according to the invention, by a siphon 21. Siphon 21 is primed, i.e. flow of water from reservoir 9 to washing chamber 3 is possible, when the level of water inside the reservoir 9 reaches or it is above a minimum level, called priming level. Otherwise, the water in the reservoir 9 remains inside the latter and flow of water from the reservoir to the washing chamber is inhibited. When siphon 21 is primed, substantially all the water contained in the reservoir 9 flows into washing chamber 3 due to the siphon sucking effect.

[0075] According to a preferred embodiment, better visible in the section of fig. 4, siphon 21 includes a first and a second sleeve, 17, 18 preferably substantially cylindrical, one located inside the other. An annular conduit 19 is therefore defined between the first and second sleeve where water can flow. Preferably, the first sleeve 17 has a diameter larger than the second sleeve 18, the latter being the inner sleeve. Preferably, first and second sleeves 17, 18 are arranged so as to be substantially parallel to the vertical direction Z. Advantageously, the second sleeve 18 includes an end portion 11b, preferably corresponding to the end portion of the third conduit 11 leading to washing chamber 3; end portion 11b is opposite to outlet 11a; in other words, sleeve 18 is preferably a continuation of the third conduit 11.

[0076] In a preferred embodiment, the second sleeve 18 extends from the bottom wall 9a of the reservoir 9 inside the reservoir itself. The height of the second sleeve is such that it does not touch the first sleeve, i.e. the end 11b of the third conduit 11 is open. The first sleeve 17 has a close end 17a and it preferably extends from the top wall 9b of the reservoir 9 for a length which is smaller than the distance between the top and bottom wall, i.e. it does not touch the opposite wall, having therefore a

free open end 17b. In this way, a first gap g1 is formed between the bottom wall 9a of reservoir 9 and the open end 17b of the first sleeve 17: this gap g1, in other words the distance between the bottom wall 9a and the free end 17b of the first sleeve, substantially represent the entrance to the annular channel 19 of the siphon. The two sleeves one inside the other, advantageously leave a second gap g2 therebetween, e.g. between the close end 17a of the first sleeve 17 and the open end of the third conduit (which corresponds to the open end of the second sleeve 18).

[0077] When water level in reservoir 9 is such high that water completely exceeds end portion 11b of second sleeve 18, and preferably completely fills second gap g2, the siphon is primed and it starts sucking water from reservoir 3 and admitting it into washing chamber 3; this effect continues until practically all the water in reservoir 9 is sucked and admitted into washing chamber 3.

[0078] As an example of siphon construction and dimensions, the diameter of the first sleeve 17 is of about 20 mm, the diameter of the second sleeve 18 is of about 10 mm and the first gap g1 between the bottom wall 9a and the open end 17b of the first sleeve has a width of about 5 mm along the Z axis.

[0079] Preferably, the bottom wall 9a of reservoir 9 is at least partially inclined, and the inclination has a direction such that the water entering the reservoir 9 from the second conduit 10 is forced to flow toward the siphon 21, so as to enter into the annular channel 19 via the first gap g1. In this way, the siphon, when primed, is capable of sucking all water out of reservoir 9.

[0080] Preferably, reservoir 9 includes at least one through hole 22 realized through the top wall 9b in such a way to allow external air to enter the reservoir 9 in order to maintain in its interior a pressure substantially identical to the atmospheric pressure, in particular when siphon 21 is primed. More than one hole can be realized as well, for example in the depicted embodiment of figs. 3 and 4 two holes 22 are formed. Around the hole 22, protruding from the top wall 9b towards the interior of the reservoir, a duct 23 is preferably realized, having opposite open ends, one open end corresponding to hole 22. Preferably, each hole 22 also includes a duct 23 around it. Preferably, duct 23 is cylindrical. Preferably, duct 23 extends substantially parallel to the vertical direction Z, more preferably it extends perpendicularly to the top wall 9b.

[0081] The appliance 1 operates as follows.

[0082] First, the user selects the appropriate program of the washing cycles, for example selecting the temperature and type of fabric.

[0083] In the washing cycle, hot water is required by the appliance 1. At the beginning of the washing 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, 12 is therefore commanded by the control device 20 in such a way that from the 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, e.g. the first conduit 6 downstream the valve 8,12 is closed. In case of two separate valves 8 and 12, only the valve 12 which directs to the reservoir via the second conduit 10 is commanded to open, while the valve 8 stays closed. Preferably, the size and shape of the reservoir 9 and the amount of water introduced in the first phase of the water loading procedure are set in such a way that in this initial phase the activation or priming level of the siphon is not exceeded. In the example illustrated in enclosed figures, the priming level of the siphon 21 corresponds to the level at which water in reservoir 9 exceeds end portion 11b of second sleeve 18, and preferably completely fills second gap g2.

[0084] The direction of the water flow from conduit 10 to the reservoir 9 is depicted in fig. 2 with an arrow F1. Preferably, as mentioned, due to the inclination of bottom wall 9a, water concentrates around the base of siphon 21, at the entrance of the annular channel 19 represented by the gap g1.

[0085] The water from the hot water source flows inside the reservoir 9 and the amount of water flowing is preferably measured by sensor 16; alternatively, or in addition to this measurement, sensor 300, if provided, may measure the amount of water in the reservoir 9.

[0086] The measuring signal(s) is/are reported to the control device 20 for example by means of electrical signals. Depending on the signal(s) sent to the control device, e.g. on the amount of water present in the reservoir 9, the control device 20 activates valve 8,12. Preferably, as soon as a given water amount threshold has been reached inside the reservoir 9, the water flow is stopped. More preferably, valve 12 is closed so that no further water can flow into the second conduit 10. Alternatively, in case of a two way valve, the valve is switched and the water flow from the hot source is diverted onto the washing chamber, and no further water can flow into reservoir 9. According to an embodiment of the invention, the threshold in the amount of water 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 threshold 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 in order to prime siphon 21 depends also on the geometrical shape of the reservoir 9.

[0087] The amount of water set as a threshold is additionally set so that it is not enough to activate the siphon 21. Indeed, the level of water inside the reservoir 9 at this threshold is lower than the priming level, i.e. it is not high enough to reach the end portion 11b end of the second sleeve 18 so that the siphon can be activated.

[0088] After the initial flow of water inside the reservoir 9, the control device 20 activates the two way valve 8,12 or the valve 8 and 12 separately (depending on the presence of two distinct valves or of a three-ways valve), so

that the hot water is now directed directly into the washing chamber 3. No more water is introduced in the reservoir 9.

[0089] 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 coming 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 (not shown in the drawings), may activate the valve 7 opening the inlet pipe 5 connected to the water mains.

[0090] At the end of the washing cycle, or whenever cold water is needed (for example in a rinsing phase of the washing cycle), the substantially cold water present in the reservoir 9 can be used. This water can be used also in "cooling down" the hot water during the washing cycle as above described.

[0091] According to an embodiment, the water present into the reservoir 9 may be not enough to complete a rinsing cycle, therefore in this case additional cold water may be introduced into the washing chamber 3, before or after or at the same time in which the water from reservoir 9 is used. For this purpose, preferably, the control device 20 activates valve 7 opening the latter, so that cold water from the mains can flow into the inlet pipe 5 and then into the washing chamber 3. Control device 20 sends an off or closure signal to valve 7 when the desired amount of cold water has reached the washing chamber 3.

[0092] In order to use the water coming from the reservoir 9, water inside the reservoir has to reach the priming level so that the siphon 21 can be activated. Therefore, preferably, from control device 20, a signal is sent to the valve 8,12 which opens and allows water to flow inside the reservoir 9 till such a priming level is reached. When the priming level is reached, control device 20 activates again valve 12 to close the same so that no further water is introduced inside the reservoir 9. "The threshold amount" of water which is introduced in the reservoir has been preferably set in such a way that the amount of water to be added in order to prime the siphon in this phase is rather small.

[0093] Due to the additional amount of water introduced into the reservoir 9, the water rises in the annular channel 19 (see the arrow F2 showing the water entering the channel 19 in figure 2) of siphon 21 and reaches the free end of the second sleeve 18, spilling over in the third duct 11.

[0094] Due to the physical structure of the siphon 21, as soon as the end of the annular channel 19 has been reached, the water present in the reservoir 9 is then sucked through the third conduit 11 to the washing chamber 3 (see arrow F3 in fig. 2) via the annular channel 19. The water is completely drained by siphon 21.

Claims

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

including:

- a casing (2) containing a washing chamber (3) for receiving laundry to be washed;
 - a reservoir (9) apt to contain an amount of water;
 - a first conduit (6;14) connected or connectable to a hot water source external to said appliance and connected to said washing chamber (3) in such a way to be able to channel a flow of water coming from said hot water source into said washing chamber (3);
 - a second conduit (10) apt to connect said reservoir (9) to a hot water source external to said appliance (1) in such a way to be able to channel a flow of water coming from said hot water source into said reservoir (9);
 - a third conduit (11) connecting said reservoir (9) to said washing chamber (3) apt to channel a flow of water to said washing chamber (3);
 - a first valve (8) located along said first conduit (6;14) to allow or interrupt the flow of water into said washing chamber (3);
 - a second valve (12) located along said second conduit (10) to allow or interrupt the flow of water into said reservoir (9);
 - a control device (20) apt to command said first (12) and/or said second valve (8) and to open or close the same;
 - a siphon (21) in fluid communication with said third conduit (11) to selectively allow water to flow from said reservoir (9) to said washing chamber (3).
2. The appliance (1) according to claim 1, wherein said siphon (21) includes a first and a second sleeve (17,18) one inside the other in order to form an annular channel (19) through which the water can flow from the reservoir (9) to the washing chamber (3), when said siphon (21) is primed.
 3. The appliance (1) according to claim 2, wherein said second sleeve (18) is the inner sleeve and it is connected to said third conduit (11).
 4. The appliance (1) according to claim 3, wherein said reservoir (9) includes a bottom wall (9a) and a top wall (9b), said second sleeve (18) projects from said bottom wall (9a) and said first sleeve (17) projects from said top wall (9b), said first sleeve (17) including a free end (17b) forming a gap (g1) with said bottom wall (9a).
 5. The appliance (1) according to one or more of the preceding claims, wherein said reservoir (9) is located inside said casing (2).
 6. The appliance (1) according to one or more of the

preceding claims, wherein said second conduit (10) branches off from said first conduit (6;14).

7. The appliance (1) according to claim 6, wherein said first valve (8) is located downstream of or at said branch point of said second conduit (10) from said first conduit (6;14).
8. The appliance (1) according to claim 6 or 7, wherein said first (8) and second (12) valve form a two-way valve, said two-way valve (8,12) being located at the branch point of said second conduit (10) from said first conduit (6;14) to interchangeably allow water to flow from an hot water source either to the washing chamber (3) through said second conduit (10), or to the reservoir (9) through said first conduit (6;14).
9. The appliance (1) according to one or more of the preceding claims, including a sensor (16) apt to measure the amount of water entering into said reservoir (9), said sensor being located along said first (6;14) or second conduit (10).
10. The appliance according to claim 9, wherein said sensor (16) apt to measure the amount of water entering into said reservoir (9) is apt to send a measurement signal to said control device (20) and said control device (20) is apt to open or close said first (8) and/or second valve (12) as a function of said measurement signal.
11. The appliance (1) according to one or more of the preceding claims, including a sensor (300) apt to measure the amount of water present in said reservoir (9).
12. The appliance according to claim 11, wherein said sensor (30) apt to measure the amount of water present into said reservoir (9) is apt to send a measurement signal to said control device (20) and said control device (20) is apt to open or close said first (8) and/or second valve (12) as a function of said measurement signal.
13. The appliance according to one or more of the preceding claims, wherein said reservoir (9) includes a through hole (22) in one of its walls (9a) arranged in such a way to allow external air to enter the reservoir in order to maintain atmospheric pressure within said reservoir (9).
14. The appliance (1) according to claim 13, wherein said reservoir (9) includes a duct (23) extending from the through hole (22) towards the interior of said reservoir (9).
15. The appliance (1) according to claim 4, where the vertical height of an inlet (11a) of said third duct (11)

in said washing chamber (3) is lower than the vertical height of the bottom wall (9a) of said reservoir (9).

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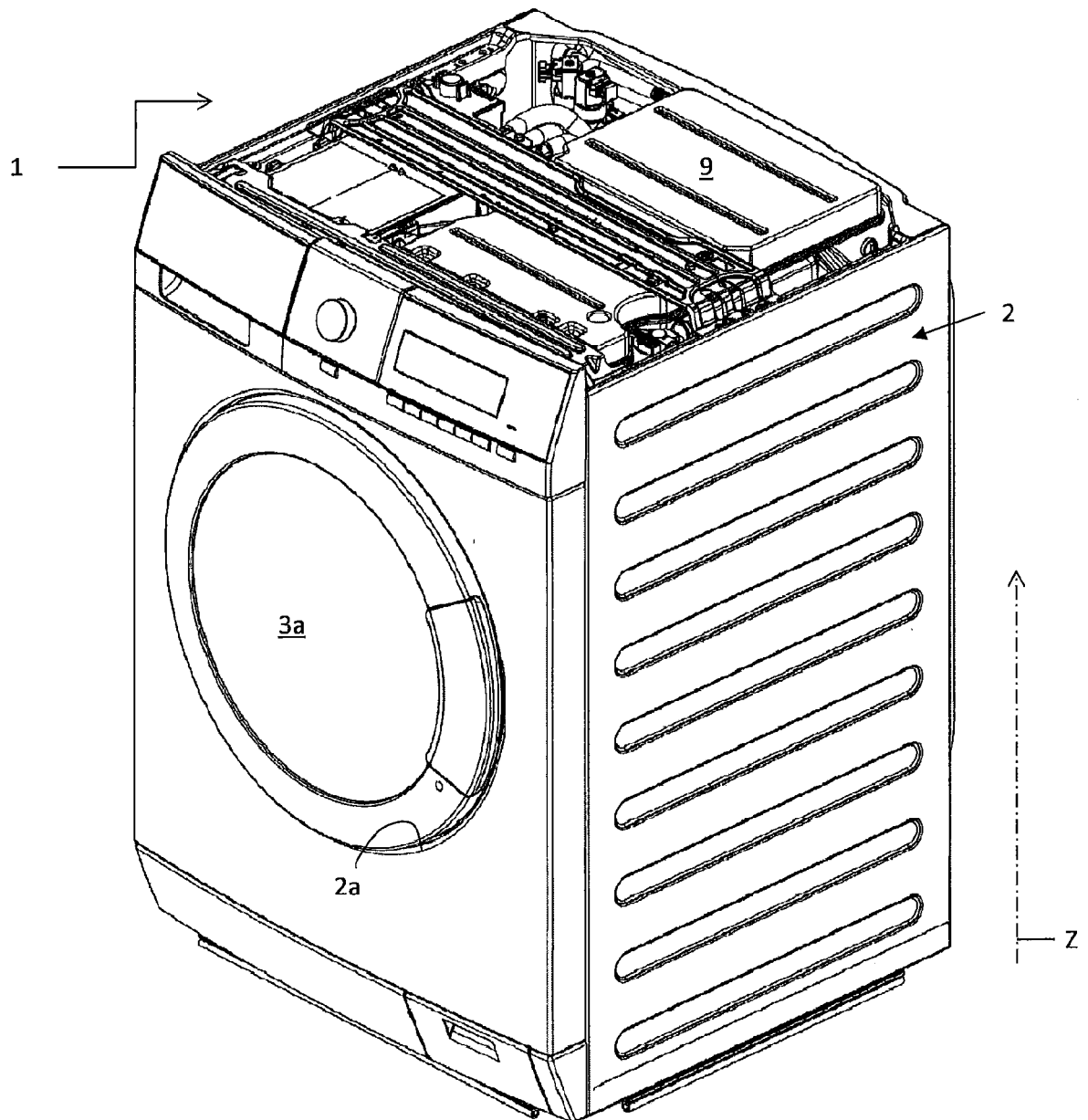
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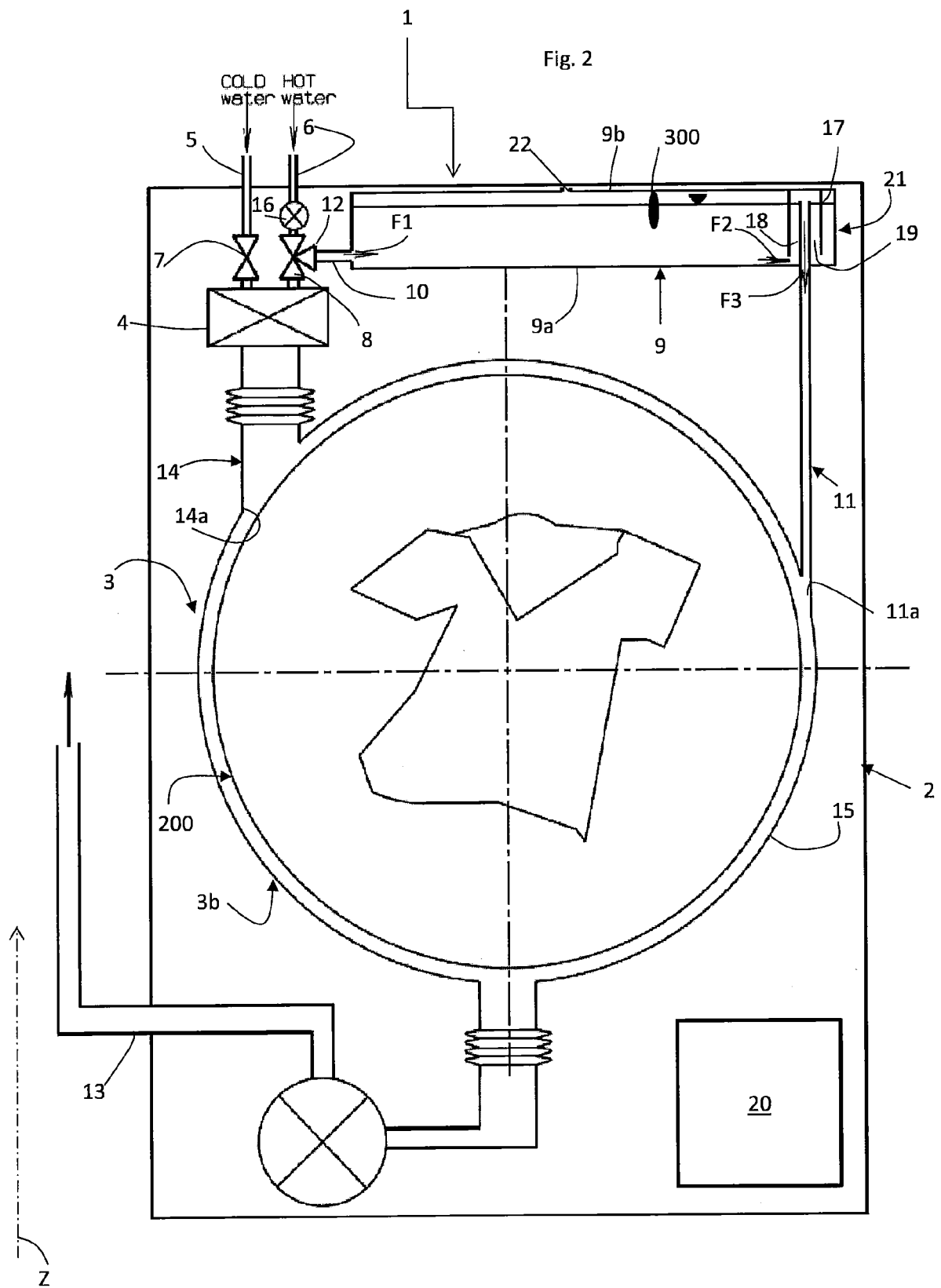
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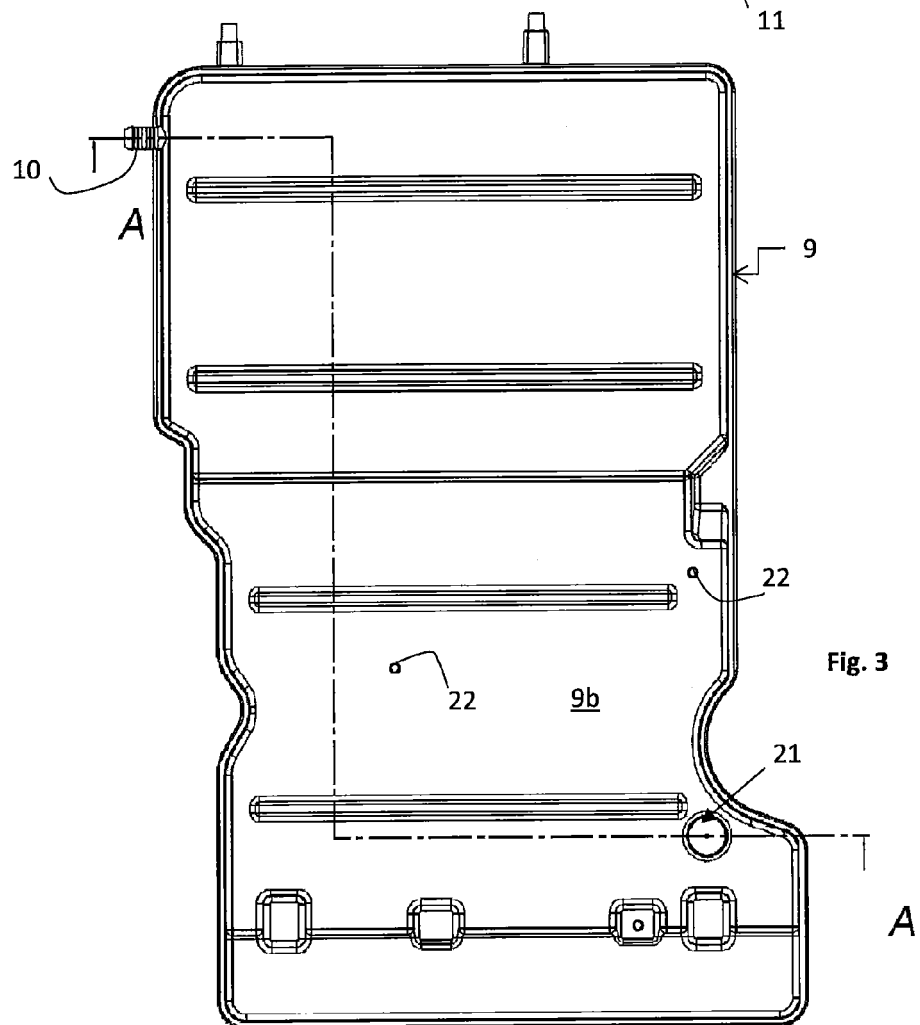
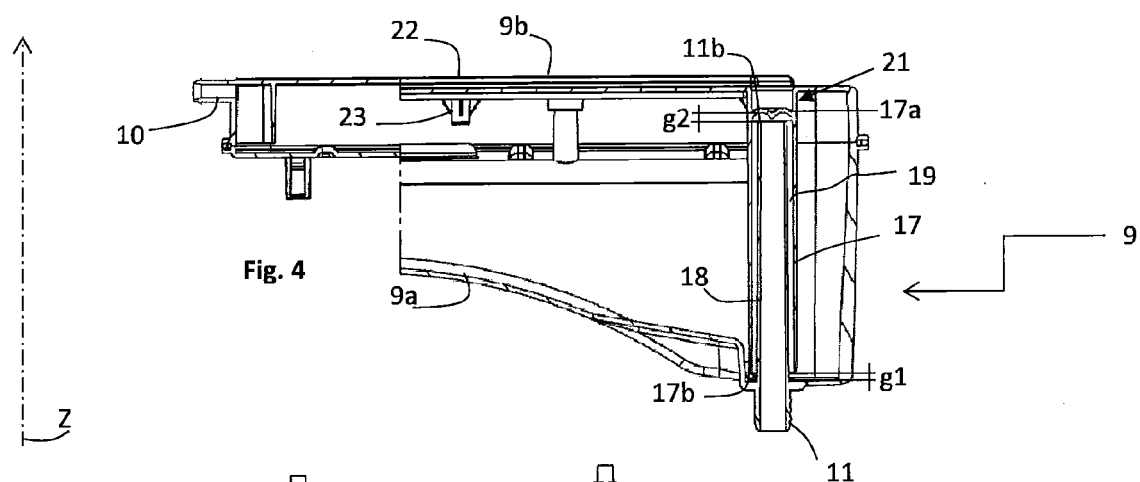
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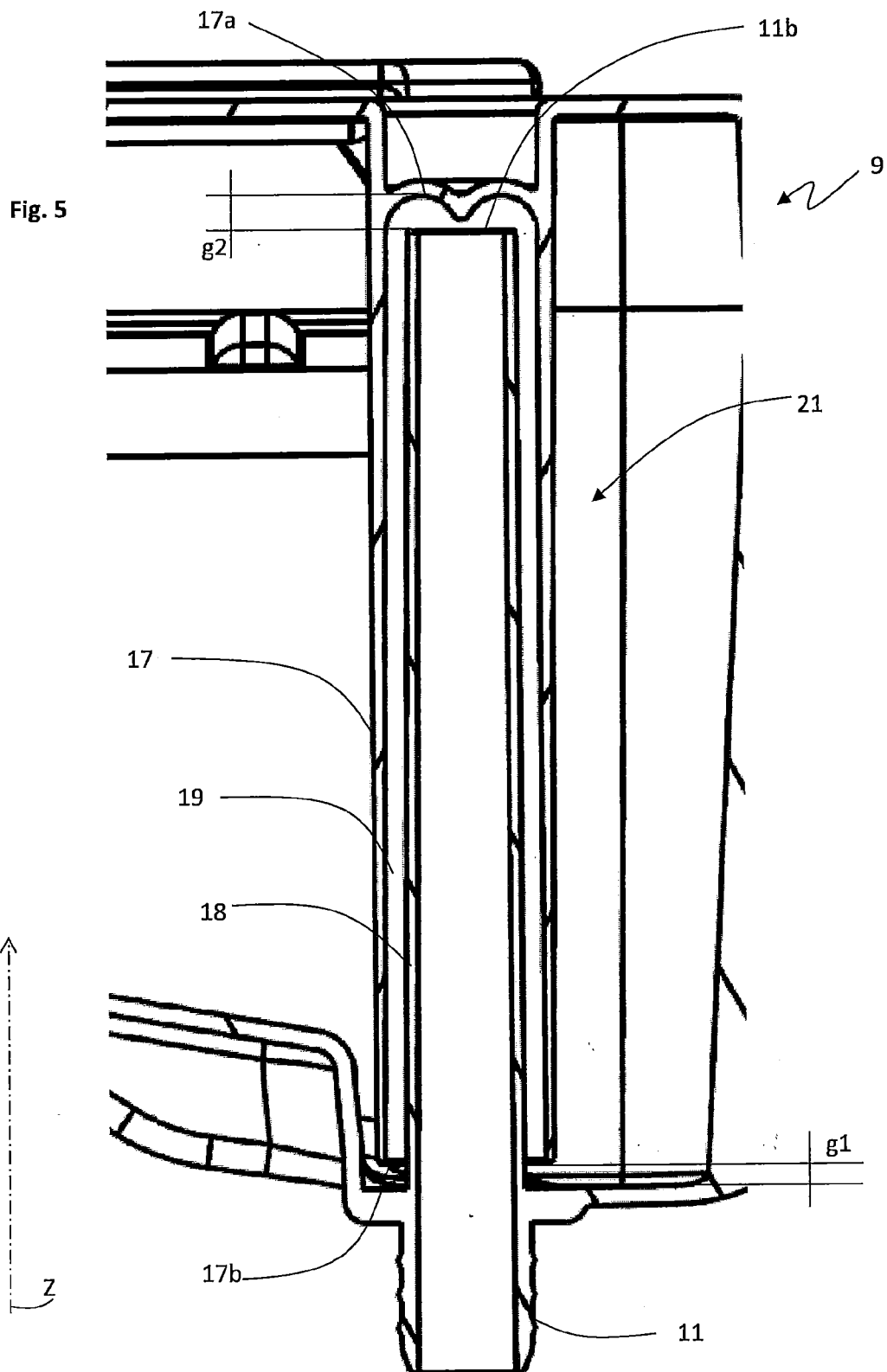
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Fig. 1











EUROPEAN SEARCH REPORT

Application Number
EP 13 15 1546

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	CH 703 489 A2 (V ZUG AG [CH]) 31 January 2012 (2012-01-31) * paragraphs [0008] - [0010], [0022] - [0025]; figure 1 *	1-15	INV. D06F39/08
A	US 2005/127194 A1 (LAHRMANN ANDREAS [DE] ET AL) 16 June 2005 (2005-06-16) * paragraphs [0023] - [0025]; figures * -----	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			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
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CH 703489	A2	31-01-2012	NONE

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

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