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(54) Domestic appliance with external water supply

(57) The invention relates to a domestic appliance (1) for textiles, especially to a dryer or a washing machine. To improve the possibility to carry out a steam treatment of the textiles the invention suggests that the domestic appliance (1) is equipped with a steam unit (2) for applying water steam, especially hot or superheated steam, to the textiles, wherein a water supply unit (3) is provided in and/or at the domestic appliance (1) for receiving water destined for the steam unit (2) and for forwarding this water (4) to the steam unit (2), and wherein the water supply unit (3) is designed to be connected to an external water source (4), especially a public water supply (4).

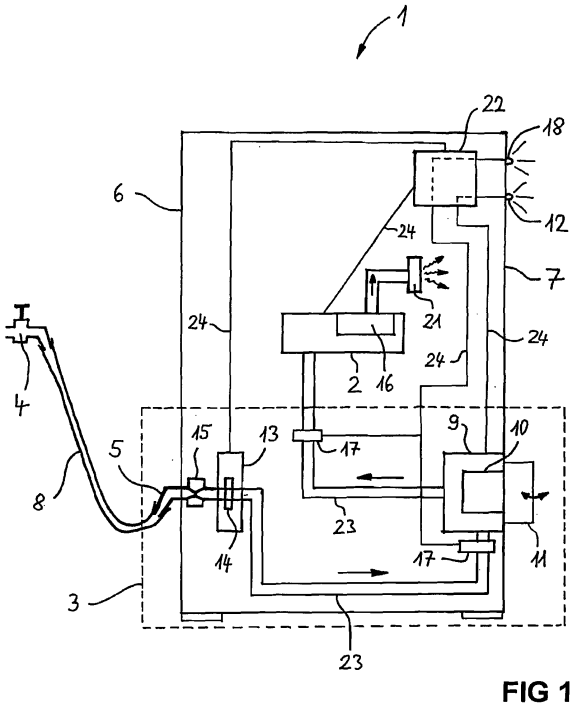

FIG 1

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Description

[0001] The invention relates to a domestic appliance, especially to a dryer for textiles or a washing machine.

[0002] Domestic appliances are well known in the state of the art. It is known to wash and to dry textiles by them. Dryers usually use a condensation process or a wet exhausting air process.

[0003] It has been found that the quality of the treatment of textiles can be improved by using steam which is applied to the textiles in the domestic appliance. By doing so unwanted odours can be removed. For this purpose water steam, particularly hot or superheated water steam is fed into the drum which contains the textiles. For this the domestic appliance needs to have a steam unit.

[0004] A problem is that the steam unit needs to be supplied by fresh water which has to be free from lime and other contaminations. Normally, the condense water from the condensation in a dryer can not be used because it contains foreign matters and dirt which is cumulated during the condensation process in the condensate reservoir. If such water would be used dirt and other foreign matters would be brought again into the textile, which is not desirable.

[0005] One solution to this problem is, to equip the domestic appliance with a water reservoir for receiving water for the steam unit. But this solution involves new problems: design modifications, additional development effort and costs, additional material costs.

[0006] Therefore, it is an object of the present invention to propose a domestic appliance, especially a home dryer or a washing machine, which has the possibility to treat the textiles with hot steam without any charge of dirt or any other foreign matter or contamination in the supply water for the steam unit. In doing so, an alternative solution to the water reservoir solution mentioned above ought to be presented.

[0007] This object is achieved by a domestic appliance according to claim 1. Preferred embodiments are mentioned in the dependent claims.

[0008] According to claim 1 the invention is characterized in that the domestic appliance is equipped with a steam unit for applying water steam, especially hot or superheated steam, to the textiles, that a water supply unit is provided in and/or at the domestic appliance for receiving water destined for the steam unit and for forwarding this water to the steam unit, and that the water supply unit is designed to be connected to an external water source, especially a public water supply.

[0009] With this concept it is possible to supply water to the steam unit without providing a water reservoir for the storage of water destined for the steam unit. Therefore it is one advantage of the invention that fresh water directly from an external water source, that is a water source outside the domestic appliance, is supplied to the steam unit. Advantageously the external water source is a public water supply, thus the steam unit is hydraulically connected to the public water supply. Alternatively the connection to a separate water supply of a house or to another external water supply or water reservoir is possible.

[0010] Another advantage of this solution is that no or almost no design modifications of the domestic appliance are necessary. Simply a connection piece, especially a nipple, for the hydraulic connection to the external water source has to be installed in or at the domestic appliance. Inside the domestic appliance this nipple hat to be hydraulically connected to the water inlet of the steam unit. The development effort and costs and as well additional material costs are comparatively small, especially compared to the water reservoir solution mentioned above.

[0011] Furthermore it is an advantage of the solution according to the invention that the external water source provides pressurised water. Thus, additional water pumps to supply water to the steam unit and/or steam pumps downstream the steam generator, which might be necessary in the water reservoir solution, are not required.

[0012] A further advantage is the easy handling of the water supply for the steam unit. After installing the hydraulic connection to the external water source no further steps are necessary. At the most a water tap has to be opened. However, a periodical filling of a water reservoir with water destined for the steam unit is not necessary.

[0013] Preferably, following the aforesaid remarks, the water supply unit comprises a connecting piece to enable the connection of the water supply unit to the external water source, wherein the connecting piece especially is a nipple and/or wherein the connecting piece preferably is located at a back side and/or rear panel of the domestic appliance. The connecting piece can be or is connected to the external water source via a tube, especially a flexible tube. Thus the hydraulic connection to the external water source is simplified.

[0014] Furthermore, the water supply unit can be a modular kit or unit. This allows the integration of one type of water supply unit in different domestic appliances. Furthermore this enables to built a domestic appliance in different versions or models, with and without a water supply unit. Further the modular design of the water supply unit permits retrofitting of water supply units at domestic appliances.

[0015] Public water supply or other external water sources may provide water with a water hardness which is to high for a long-term save operation of the steam unit. Thus, according to a preferred embodiment of the invention, the water supply unit comprises a water softening unit arranged to provide water with a preset and/or reduced and/or low water hardness for the steam unit. This upstream softening of the water ensures a save, steady and long-term operation of the steam unit, especially of a steam generator of the steam unit.

[0016] The water softening unit can be a modular kit or unit. This allows the integration of one type of softening unit in different domestic appliances. Furthermore this

enables to built a domestic appliance in different versions or models, with and without a water softening unit. Further the modular design of the water softening unit permits retrofitting of water softening units at domestic appliances.

[0017] Furthermore the water softening unit can comprise a filter cartridge, especially an exchangeable filter cartridge. This enables a simple handling of the softening unit.

[0018] Advantageously the water softening unit comprises a filter-cartridge-exchange-signal-device, especially a display and/or lamp, for informing that the filter cartridge should be changed. Thereby it is assured that the softening unit always works reliably.

[0019] According to one embodiment a system of at least two sensors, especially water pressure sensors, is provided to enable the determination of a pressure loss across the water softening unit and, in case the determined pressure loss exceeds a given value, to activate a filter-cartridge-exchange-signal-device. In doing so, at least one first sensor is provided upstream the water softening unit and at least one second sensor is provided downstream the water softening unit.

[0020] The water softening unit can be arranged inside the domestic appliance, especially in such a manner that it is accessible from outside to enable an exchange of a filter cartridge, preferably via a control panel or via a front cover or via a front door region or via a condensate reservoir reception slot or via a side cover of the domestic appliance. Alternatively the water softening unit can be arranged outside the domestic appliance, especially hydraulically engaged in a tube connecting the water supply unit to the external water source and/or in a connecting piece, preferably a nipple, provided at the domestic appliance to enable the connection of the water supply unit to the external water source.

[0021] Of course a filter, for example a sieve, can be provided in the water supply unit and/or in a hydraulic connection between the external water source and the domestic appliance and/or at the external water source, for filtering contaminations, for example dirt, contained in the water provided by the external water source.

[0022] Preferably, the water supply unit comprises a switching device and/or control unit for regulating and/or interrupting water supply from the external water source. This ensures that water is only provided at the steam unit when it is required, especially in the amount required.

[0023] Advantageously, the switching device and/or control unit is or comprises a valve, especially a magnetic valve, preferably an electrically and/or electronically controlled magnetic valve.

[0024] Furthermore the water supply unit can comprise a water-volume-flow-control-unit. This water-volume-flow-control-unit can be arranged to provide a preset water volume flow for the steam unit. The water volume flow provided by the water-volume-flow-control-unit can be adjustable. The water-volume-flow-control-unit can be a electrical and/or mechanical and/or hydraulic system.

[0025] Advantageously, the water-volume-flow-control-unit is implemented in a connecting piece, preferably a nipple, provided at the domestic appliance to enable the connection of the water supply unit to the external water source. The water-volume-flow-control-unit can be a flow limiter, for instance a flow limiter comparable to the flow limiters know from washing machines.

[0026] To make sure that the steam unit, especially the steam generator, does not operate if there is no or not enough water forwarded to it, the domestic appliance can comprise means for preventing the activation and/or operation of the steam unit, especially of a steam generator, in this case. This avoids damage of the steam unit and therefore provides an extension of lifetime of the steam unit.

[0027] Preferably, the means for preventing the activation of the steam unit comprise a sensor, especially a water pressure sensor, preferably implemented in or at or near a water intake of the steam unit and/or in or at the water supply unit and/or in the steam unit. This sensor can be one of the sensors already mentioned in regard to the determination of a pressure loss across the water softening unit. In case the sensor detects a deficiency of water supply the means for preventing the activation of the steam unit will switch of the steam unit or at least the steam generator or they will prevent the activation of steam unit or steam generator. This controlling can be integrated in a control unit of the domestic appliance.

[0028] An alarm unit, especially a display and/or lamp and/or speaker, can be provided, whereby the alarm unit is arranged to signal a water deficiency and/or a malfunction of the steam unit and/or a malfunction of the water supply unit. Thereby a malfunction can be detected in short time, a rapid correction of the underlying problem is possible.

[0029] Furthermore, additionally a water reservoir can be located in or at the domestic appliance for receiving water for the steam unit. This water reservoir can be located in a reception slot in the domestic appliance. Of course the water reservoir can hydraulically be connected with the steam unit. This solution enables to decide between two versions of forwarding water to the steam unit. Besides direct connection to an external water source it is possible to use suitable water stored in said water reservoir for the steam unit. This version enables to operate the steam process of the domestic appliance even if an external water source, e.g. a public water supply, is not available. A control unit for mechanical and/or automatic switching between the different versions can be provided.

[0030] Additionally the water reservoir can hydraulically be connected with the external water source, particularly via the water supply unit, especially downstream the water softening unit. This embodiment enables an automatic filling of the water reservoir. In a further embodiment the hydraulic system of the domestic appliance can be designed in such a way that the hydraulic connection of the steam unit to the water supply unit is solely

achieved via the water reservoir. In this case the hydraulic connection to the external water source it only necessary occasionally, to fill the water reservoir. Thus, sensors or other means for preventing the operation of the steam unit if no water from the external water source is forwarded to the steam unit are not necessary. Alternatively the hydraulic system can comprise an immediate hydraulic connection between the water supply unit and the steam unit, additionally and parallel to the hydraulic connection via the water reservoir.

[0031] Overall the invention provides an extension of the lifetime of the steam unit, especially because of the supply of a preset, constant and steady water volume flow and/or because of a preset, particularly low water hardness.

[0032] In the drawings different embodiments of the invention are schematically depicted.

FIG 1 schematically shows an example of a domestic appliance according to the invention in a side elevation, and

FIG 2 schematically shows a second, different example of a domestic appliance according to the invention in a side elevation.

[0033] The same reference numbers are used in FIG 1 and FIG 2 for according parts and components.

[0034] In FIG 1 a domestic appliance 1, e.g. a home dryer for drying textiles or a washing machine, is shown in a schematic side elevation, the front side 7 and the back side 6 of the appliance 1 are indicated. Different components which are of relevance for the invention are schematically shown inside and outside the appliance 1. A steam unit 2 with a steam generator 16, which is connected via a steam connection with steam outlet nozzle 21, can be seen. A drum where textiles are placed for drying and/or washing is not shown, but of course the steam outlet nozzle 21 (which is only shown schematically) is arranged to inject the steam into this drum. The steam unit 2 via electrical connections 24 is electrically connected to a domestic appliance control unit 22 which amongst other things controls the steam unit 2.

[0035] In the underpart of the appliance 1 a water supply unit 3 is schematically depicted. This water supply unit 3 comprises a connection piece 5, namely a nipple 5, for a hydraulic connection to an external water source 4. In the depicted case the external water source 4 is a public water supply, symbolised by a water tap. The hydraulic connection is realised by means of a flexible tube 8.

[0036] Downstream the connecting piece 5 a water-volume-flow-control-unit 15, namely a flow limiter as known from the usual water supply of washing machines, is installed. This water-volume-flow-control-unit 15 makes sure that a preset water volume flow is provided for the steam unit 2. The water volume flow provided by the water-volume-flow-control-unit 15 can be adjustable, but this is not shown in FIG 1. The Water-volume-flow-control-unit 15 and the connection piece 5 can be one unit, especially the water-volume-flow-control-unit 15 can be implemented in the connecting piece 5.

[0037] Downstream the water-volume-flow-control-unit 15 a switching device 13, which also forms a control unit 13, is arranged. This switching device 13 is designed for regulating and/or interrupting water supply from the external water source 4. For this purpose it is equipped with a magnetic valve 14, which preferably is an electrically and/or electronically controlled magnetic valve 14. The switching device 13 is electrically connected to the control unit 22 of the domestic appliance 1 via electrical connections 24.

[0038] Downstream of this switching device 13 the water from the external water source 4 is conducted to a water softening unit 9 via hydraulic connections 23. It is the purpose of this softening unit 9 to provide water with a reduced, low water hardness for the steam unit 2. A desired water hardness can be preset by the design of the softening unit 9 and/or by adjustment of the softening unit 9. The softening unit 9 is designed as a modular unit that can be used for several domestic appliances and that enables retrofitting of appliances. An essential part of the softening unit 9 is an exchangeable filter cartridge 10. To enable an exchange of the filter cartridge 10 a door 11 is provided at the front side 7 of the domestic appliance 1.

[0039] A further part of the water softening unit 9 is a filter-cartridge-exchange-signal-device 12 which is a lamp 12, which is electrically connected with the main part of the water softening unit 9 via electrical connections 24 and via the control unit 22 of the domestic appliance 1, which also controls the activation of the filter-cartridge-exchange-signal-device 12. The task of the filter-cartridge-exchange-signal-device 12 is to inform that the filter cartridge 10 should be changed.

[0040] After passing the water softening unit 9 the water is conducted via hydraulic connections 23 to the steam unit 2.

[0041] To avoid an operation of the steam generator 16 without water supply or with insufficient water supply a sensor 17, especially a water pressure sensor 17, is implemented in the water supply unit 3, in FIG 1 upstream the water softening unit 9. A further sensor 17 is implemented in the hydraulic connections 23 upstream the steam unit 2. Of course the providing of only one of these sensors 17 would be enough, too. However, the providing of both sensors 17, one upstream and one downstream the water softening unit 9, has the advantage that a pressure loss across the water softening unit 9 can be determined by comparing the measured pressure values of both sensors 17. In case the determined pressure loss exceeds a given value, an exchange of the filter cartridge 10 is necessary and the filter-cartridge-exchange-signal-device 12 can be activated. An integration of a sensor in the steam unit 2, upstream the steam generator 16, is possible, too.

[0042] The sensor 17 is electrically connected to an alarm unit 18, which here is a lamp 18, via electrical connections 24 and via the control unit 22 of the domestic appliance. The alarm unit 18 signals a water deficiency detected by the sensor 17. It is controlled by the control unit 22 of the appliance 22 and can also be used to signal a malfunction of the steam unit and/or a malfunction of the water supply unit. When a water deficiency is detected by the sensor, the control unit 22 will switch off the steam generator 16 or the steam unit 2 or will prevent the activation of the steam generator 16 or the steam unit 2.

[0043] FIG 2 shows a second, different domestic appliance 1 which again can be a home dryer for drying textiles or a washing machine. FIG 2 again is a schematic side elevation of the appliance 1. The illustration and the construction of the appliance 1 are comparable to the appliance depicted in FIG 1. The only difference is an additional unit, namely an additional water reservoir 19 for receiving water for the steam unit 2. This water reservoir 19 is located in a reception slot 20 inside the domestic appliance 1, which is schematically depicted in FIG 2. The water reservoir 19 has to be filled with water destined for the steam unit 2. To forward this water to the steam unit 2 the water reservoir 19 is hydraulically connected with the steam unit 2 via hydraulic connections 23. Thus two possibilities to supply water to the steam unit 2 are realised, whereby the possible field of application of the domestic appliance 1 is extended.

[0044] In a further embodiment that is not depicted the water reservoir 19 is hydraulically connected to the external water source 4, particularly via the water supply unit 3, especially downstream the water softening unit 9. This embodiment enables an automatic filling of the water reservoir 19, particularly controlled by a water level sensor integrated in the water reservoir 19.

[0045] The hydraulic system of the domestic appliance 1 can be designed in such a way that the hydraulic connection of the steam unit 2 to the water supply unit 3 is solely achieved via the water reservoir 19. Alternatively the hydraulic system can comprise an immediate hydraulic connection between the water supply unit 3 and the steam unit 2, additionally and parallel to the hydraulic connection via the water reservoir 19.

[0046] The providing of the water reservoir 19, especially the mentioned hydraulic connection between external water source 4 and the water reservoir 19, enables to use a usual steam unit in the domestic appliance, particularly a steam unit known from domestic appliances with steam units which are not hydraulically connected to an external water source. Especially the hydraulic connection to the external water source it only necessary occasionally, to fill the water reservoir. Thus, sensors or other means for preventing the operation of the steam unit if no water from the external water source is forwarded to the steam unit are not necessary.

Reference Numerals

[0047]

1	Domestic appliance
2	Steam unit
3	Water supply unit
4	External water source, public water supply
5	Connecting piece, nipple
6	Back side
7	Front side
8	Tube, flexible tube
9	Water softening unit
10	Filter cartridge
11	Door
12	Filter-cartridge-exchange-signal-device, lamp
13	Switching device, control unit
14	Valve, magnetic valve
15	Water-volume-flow-control-unit, flow limiter
16	Steam generator
17	Sensor, water pressure sensor
18	Alarm unit, lamp
19	Water reservoir
20	Reception slot
21	steam outlet nozzle
22	Domestic appliance control unit
23	Hydraulic connections
24	Electrical connections

Claims

1. Domestic appliance (1) for textiles, especially home dryer or washing machine,
wherein the domestic appliance is equipped with a steam unit (2) for applying water steam, especially hot or superheated steam, to the textiles,
wherein a water supply unit (3) is provided in and/or at the domestic appliance (1) for receiving water destined for the steam unit (2) and for forwarding this water to the steam unit (2), and
wherein the water supply unit (3) is designed to be connected to an external water source (4), especially a public water supply (4).

2. Domestic appliance according to claim 1, **characterized in that** the water supply unit (3) comprises a connecting piece (5) to enable the connection of the water supply unit (3) to the external water source (4), wherein the connecting piece (5) especially is a nipple (5) and/or wherein the connecting piece (5) preferably is located at a back side (6) and/or rear panel of the domestic appliance (1).

3. Domestic appliance according to claim 2, **characterized in that** the connecting piece (5) can be or is connected to the external water source (4) via a tube (8), especially a flexible tube (8).

4. Domestic appliance according to at least one of claims 1 till 3, **characterized in that** the water supply unit (3) is a modular kit.

5. Domestic appliance according to at least one of claims 1 till 3, **characterized in that** the water supply unit (3) comprises a water softening unit (9) arranged to provide water with a preset and/or reduced and/or low water hardness for the steam unit (2).

6. Domestic appliance according to claim 5, **characterized in that** the water softening unit (9) is a modular kit.

7. Domestic appliance according to claim 5 or 6, **characterized in that** the water softening unit (9) comprises a filter cartridge (10), especially an exchangeable filter cartridge.

8. Domestic appliance according to claim 7, **characterized in that** the water softening unit (9) comprises a filter-cartridge-exchange-signal-device (12), especially a display and/or lamp (12), for informing that the filter cartridge (10) should be changed.

9. Domestic appliance according to at least one of claims 5 till 8, **characterized in that** a system of at least two sensors (17), especially water pressure sensors, is provided to enable the determination of a pressure loss across the water softening unit (9) and, in case the determined pressure loss exceeds a given value, to activate a filter-cartridge-exchange-signal-device 12, whereby at least one first sensor (17) is provided upstream the water softening unit (9) and at least one second sensor (17) is provided downstream the water softening unit (17).

10. Domestic appliance according to at least one of claims 5 till 9, **characterized in that** the water softening unit (9) is arranged inside the domestic appliance (1), especially in such a manner that it is accessible from outside to enable an exchange of a filter cartridge (10), preferably via a control panel or via a front cover or via a front door region or via a condensate reservoir reception slot or via a side cover of the domestic appliance (1), or that the water softening unit (9) is arranged outside the domestic appliance (1), especially hydraulically engaged in a tube (8) connecting the water supply unit (3) to the external water source (4) and/or in a connecting piece (5), preferably a nipple (5), provided at the domestic appliance (1) to enable the connection of the water supply unit (3) to the external water source (4).

11. Domestic appliance according to at least one of claims 1 till 10, **characterized in that** the water supply unit (3) comprises a switching device (13) and/or control unit (13) for regulating and/or interrupting water supply from the external water source (4).

12. Domestic appliance according to claim 11, **characterized in that** the switching device (13) and/or control unit (13) is or comprises a valve (14), especially a magnetic valve (14), preferably an electrically and/or electronically controlled magnetic valve.

13. Domestic appliance according to at least one of claims 1 till 12, **characterized in that** the water supply unit (3) comprises a water-volume-flow-control-unit (15).

14. Domestic appliance according to claim 13, **characterized in that** the water-volume-flow-control-unit (15) is arranged to provide a preset water volume flow for the steam unit (2).

15. Domestic appliance according to claim 13 or 14, **characterized in that** the water volume flow provided by the water-volume-flow-control-unit (15) is adjustable.

16. Domestic appliance according to at least one of claims 13 till 15, **characterized in that** the water-volume-flow-control-unit (15) is a electrical and/or mechanical and/or hydraulic system.

17. Domestic appliance according to at least one of claims 13 till 16, **characterized in that** the water-volume-flow-control-unit (15) is implemented in a connecting piece (5), preferably a nipple (5), provided at the domestic appliance (1) to enable the connection of the water supply unit (3) to the external water source (4).

18. Domestic appliance according to at least one of claims 13 till 17, **characterized in that** the water-volume-flow-control-unit (15) is a flow limiter (15).

19. Domestic appliance according to at least one of claims 1 till 18, **characterized in that** the domestic appliance (1) comprises means (17) for preventing the activation and/or operation of the steam unit (2), especially of a steam generator (16), if no or not enough water is forwarded to the steam unit (2).

20. Domestic appliance according to claim 19, **characterized in that** the means for preventing the activation of the steam unit comprise a sensor (17), especially a water pressure sensor, preferably implemented in or at or near a water intake of the steam unit (2) and/or in or at the water supply unit (3) and/or in the steam unit (2).

21. Domestic appliance according to claim 19 or 20, **characterized in that** an alarm unit (18), especially a display and/or lamp (18) and/or speaker, is provid-

ed, whereby the alarm unit (18) is arranged to signal a water deficiency and/or a malfunction of the steam unit and/or a malfunction of the water supply unit.

22. Domestic appliance according to at least one of claims 1 till 21, **characterized in that** additionally a water reservoir (19) is located in or at the domestic appliance (1) for receiving water for the steam unit (2).

23. Domestic appliance according to claim 22, **characterized in that** the water reservoir (19) is or can be located in a reception slot (20) in the domestic appliance (1).

24. Domestic appliance according to claim 22 or 23, **characterized in that** the water reservoir (19) is hydraulically connected with the steam unit (2).

25. Domestic appliance according to at least one of claims 22 till 24, **characterized in that** the water reservoir (19) is hydraulically connected with the external water source (4), particularly via the water supply unit (3), especially downstream the water softening unit (9).

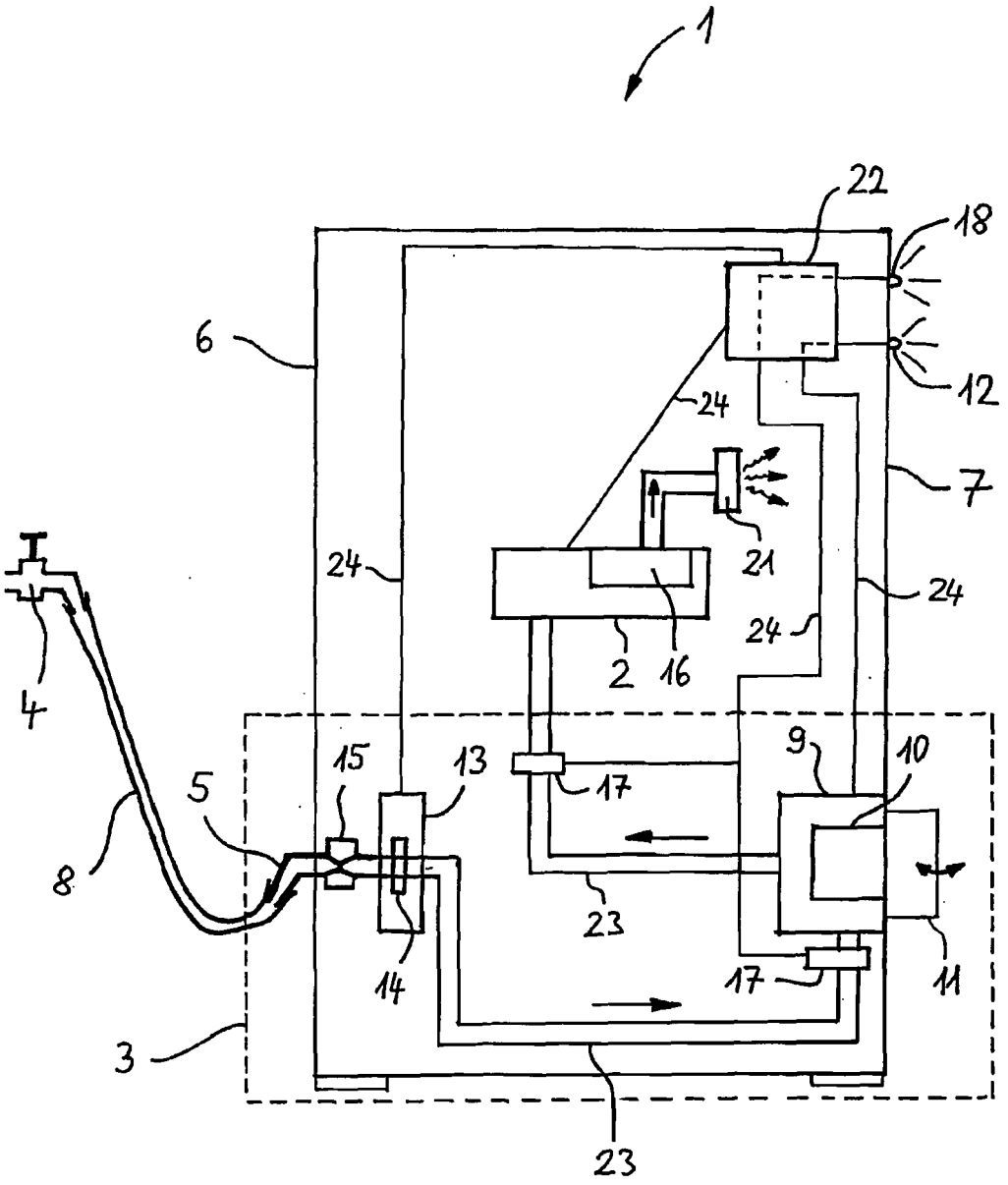

FIG 1

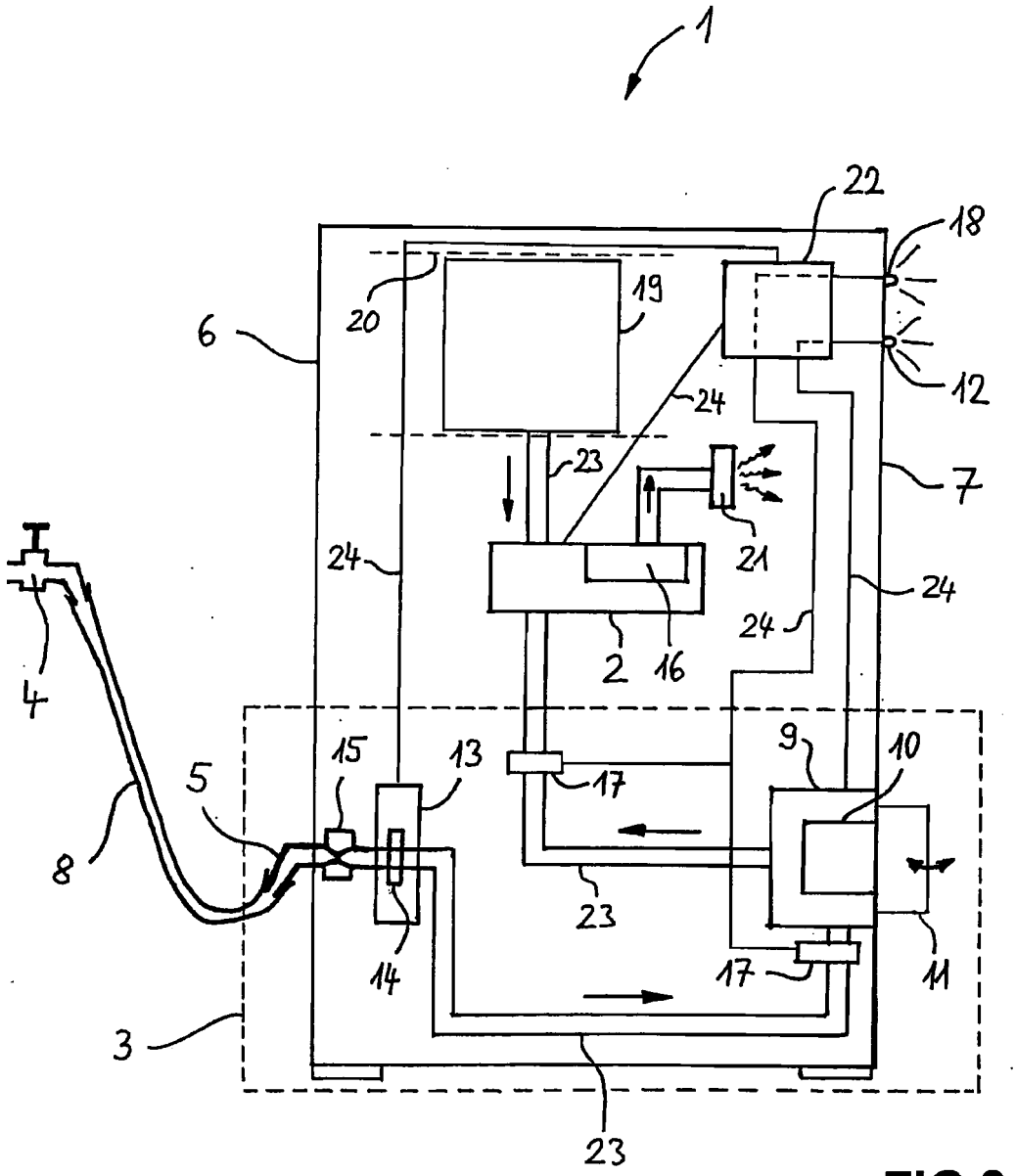
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FIG 2