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(54) **Method and device to indicate the need for reintegration of a regenerating substance of the anti-calcium function in a washer machine such as dishwashers or suchlike**

(57) Method and device (10) to indicate the need for reintegration of a regenerating substance of the anti-calcium function in a washer machine (16), which comprises a containing tank (17) for a regenerating substance, a discharge pan (20) and a command unit (26) suitable to activate, after a defined number of washing cycles, a regeneration cycle that uses the regenerating substance. The method provides the following steps: a meter in the command unit (26) is zeroed at the moment a performed reintegration of the regenerating substance is detected in the tank (17); the quantity of regenerating substance

unloaded into the tank (17) is measured, by measuring the quantity of water that flows into the pan (20) following the reintegration; the number of regeneration cycles performed is progressively counted, starting from the last reintegration performed, and the quantity removed with every regeneration cycle is deducted from the measured quantity of regenerating substance introduced into the tank (17); and the need for reintegration is indicated after a number of regeneration cycles such that the regenerating substance remaining in the tank (17) has reached a preestablished minimum level.

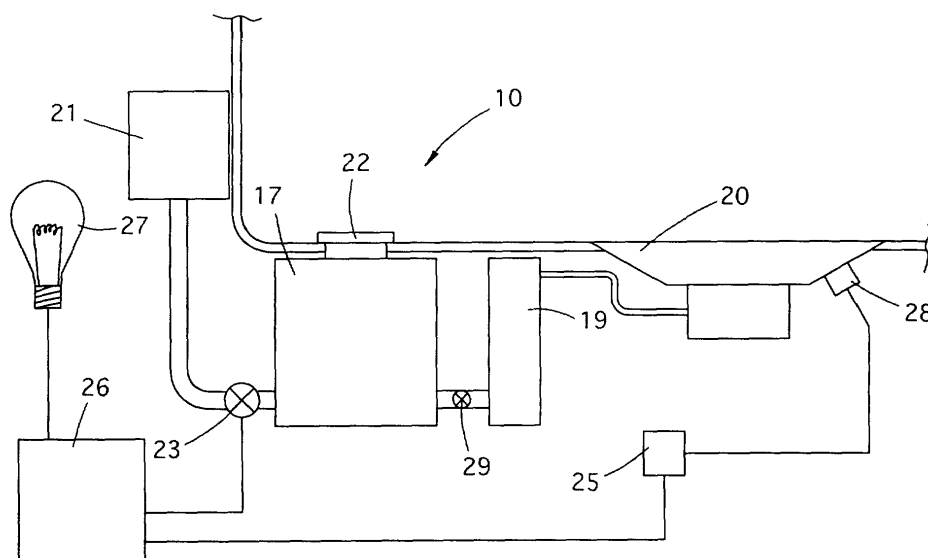


fig. 2

Description

FIELD OF THE INVENTION

[0001] The present invention concerns a method and the relative device to indicate the need for reintegration, or topping up, of a regenerating substance of the anti-calcium function, such as for example sodium chloride, or more simply salt, in a washer machine such as a dishwasher, glass-washer or suchlike.

[0002] The invention allows to obtain this function in a simple, reliable, economical and efficient manner.

BACKGROUND OF THE INVENTION

[0003] It is known that in washer machines, such as for example dishwashers, glass-washers or suchlike, of the domestic or industrial type, an anti-calcium unit is provided, the function of which is to decalcify the running water, fed from the mains water supply and used in the washing cycles, reducing the deposit of calcium on the various components of the dishwashers, improving the washing functionality, limiting malfunctions and increasing duration thereof.

[0004] Such anti-calcium units normally comprise a tank filled with water, into which a determinate quantity of salt is poured in order to create a saline solution with a desired level of saturation.

[0005] In a position adjacent to the salt tank, a tank is provided containing ion exchange resins which, as the washing water to be decalcified passes, exchange ions, typically sodium, with the ions of calcium and magnesium present in the water, substantially eliminating the calcium therefrom.

[0006] It is also known, after a certain number of washing cycles, to automatically effect a cycle to regenerate the resins, during which a certain quantity of clean water, taken from a suitable tank, is made to circulate, firstly through the saline solution and then through the tank of resins. The circulation of clean water on the one hand causes the resins to be charged with sodium ions, and consequently to be regenerated, and on the other hand it causes the saline solution to become diluted. The quantity of saline solution used to regenerate the resins frees a quantity of calcium and magnesium ions, and this excess of calcium and magnesium is discharged through the discharge pan of the washer machine.

[0007] As the various cycles of regeneration proceed, there is a progressive reduction in the salt in the saline solution provided inside the tank, so as to make reintegration necessary.

[0008] In the state of the art, various systems have been proposed in order to indicate to the user that the salt needs reintegration.

[0009] One of the most widespread solutions provides to use a float, associated with a magnet, disposed inside the salt tank, which, according to the progressively decreasing level of saturation of the saline solution, is grad-

ually displaced downwards, until it reaches a position wherein it indicates a lack of salt.

[0010] It is also known to provide sensors (for example, reed switches), associated with the float, in order to detect that the position corresponding to a lack of salt has been reached, and to send a signal to the command unit of the machine in order to signal to the user that reintegration is necessary.

[0011] This known solution has very high cost, which can reach up to 20-25% of the total cost of the anti-calcium unit, and is easily subject to malfunctions due to the possible defectiveness both of the float system and also of the sensor.

[0012] The float, for example, can be subject to blockages inside the tank, either in a position where it erroneously signals the absence of salt, or in a position where it erroneously signals the presence of salt, in both case creating anomalies and malfunctions.

[0013] The sensor too can be subject to defects which, in not detected in time, can entail a prolonged use of the dishwasher under incorrect conditions.

[0014] One purpose of the present invention is therefore to perfect a method, and achieve the relative device, to quickly indicate the need for reintegration of the regenerating substance of the anti-calcium function in a washer machine, which is efficient, reliable and that does not entail high costs of production and functioning due to the fact that it does not require either floats or sensors or systems of any other type, associated with the tank that contains the regenerating substance.

[0015] The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

SUMMARY OF THE INVENTION

[0016] The present invention is set forth and characterized essentially in the main claims, while the dependent claims describe other innovative characteristics of the invention.

[0017] The invention is applied in a washer machine comprising, in conventional manner, a tank containing the regenerating substance, hereafter called simply salt, associated with a tank for the ion exchange resins, a tank for the regeneration water and a command unit suitable to activate, after a defined number of washing cycles, a cycle to regenerate the resins. The regeneration cycle provides to make clean water flow through the salt tank and the resin tank, and to discharge the water loaded with the calcium and magnesium salts.

[0018] The method according to the invention is based on the premise that the quantity of salt removed from the tank (that is, the dilution of the saline solution) in every regeneration cycle is substantially constant.

[0019] The method provides a first step in which, at the moment of a reintegration operation, the quantity of salt poured by the user into the appropriate tank is meas-

ured, as will be explained hereafter.

[0020] The method then provides a second step in which, for every regeneration cycle, from the quantity of salt measured at the beginning, a quantity is deducted corresponding to the quantity presumed to have been removed with the regeneration.

[0021] With the succeeding regeneration cycles, calculating the difference, the command unit is able to establish after how many regeneration cycles the quantity of salt initially introduced has been reduced to a pre-established residual value in which the need for reintegration is indicated.

[0022] To measure the quantity of salt introduced with the reintegration, the method according to the invention provides to use a pressure sensor associated with the discharge pan. The pressure sensor effects the measurement by detecting the quantity of water that flows into the discharge pan following the unloading of salt into the appropriate tank.

[0023] In one embodiment of the invention, the pressure sensor is a normal pressure switch.

[0024] According to an advantageous variant, the pressure sensor is of the linear type.

[0025] The use of a linear pressure sensor allows to discriminate when the flow of water into the discharge pan is caused by the pouring of a corresponding quantity of salt into the relative tank, and not by other causes, for example the emptying of a saucepan or a glass.

[0026] The pressure sensor, which can already be advantageously present in the discharge pan in order to carry out other functions connected to the functioning of the washer machine, is in fact able to discriminate the discharge dynamics of the water, thus detecting the moment when the salt is reintegrated.

[0027] This detection is interpreted by the command unit as a so-called zero time, from which the counting is started of the regeneration cycles, which determine, according to the initial quantity measured by the same pressure sensor, and according to the presumed quantity removed with every regeneration cycle, the progressive reduction in the quantity of salt until the pre-established condition is reached, wherein the need for reintegration is indicated.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] These and other characteristics of the present invention will become apparent from the following description of some preferential forms of embodiment, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a schematic view of a washer machine in which the present invention is applied;
- fig. 2 is a schematic view of a first form of embodiment of the device according to the present invention;
- fig. 3 shows a variant of fig. 1.

DESCRIPTION OF SOME PREFERENTIAL FORMS OF EMBODIMENT OF THE INVENTION

[0029] With reference to the attached figures, the reference number 10 denotes in its entirety a device to indicate the need for reintegration of an anti-calcium substance, in this case salt, in a washer machine, in this case a domestic dishwasher 16.

[0030] The device 10 comprises a tank for the salt 17, a tank 19 containing ion exchange resins, disposed downstream of the salt tank 17, a discharge pan 20 for the water and a tank for the regeneration water 21, disposed upstream of the salt tank 17.

[0031] A linear pressure detection device is associated with the pan 20, and comprises in this case an air trap 28 with which a pressure sensor 25 is connected, advantageously but not only of the linear type.

[0032] The pressure detection device can normally be present in cooperation with the discharge pan 20 so as to perform other functions connected with the functioning of the washer machine 16.

[0033] The device 10 also comprises a command unit 26, of the programmable type, which activates the regeneration cycles, counts the number and determines the need for reintegration. The command unit 26 is connected at least to the linear pressure sensor 25, in order to receive therefrom the information relating to the discharge of water into the pan 20, and to a luminous indicator 27 to warn the user of the need for reintegration.

[0034] The salt tank 17 is normally filled with water and can be selectively opened from the outside by means of a stopper 22, so as to allow the user to introduce inside it a desired quantity of salt so as to form a saline solution with a determinate level of saturation.

[0035] The ion exchange resin tank 19 determines the decalcification of the running water used for washing, while the saline solution allows the regeneration thereof during said programmed cycles.

[0036] The tank for the regeneration water 21 allows to create cyclically a flow of clean water used to regenerate the resins, that is, to remove from them, after passing through the saline solution, the calcium and magnesium ions with which they became enriched due to the passage of the running water.

[0037] In this way, with every regeneration cycle, the resins re-acquire their functionality, giving up the calcium to the quantity of saline solution used, which is then discharged through the pan 20, while the saline solution is progressively diluted.

[0038] The pan 20 is connected to the discharge network and said linear pressure sensor 25 cooperates with it.

[0039] The linear sensor 25 is able to measure the quantity of salt reintegrated into the tank 17, measuring the quantity of water that pours into the pan 20, overflowing from the tank 17 following the unloading of the salt. Moreover, the linear sensor 25 performs the dynamic measurement of the increase in the level of water inside

the pan 20, and thus also detects the speed of unloading.

[0040] The linear sensor 25 is therefore able to discriminate whether the flow of water into the pan 20 derives from the unloading of salt into the tank 17, rather than a flow caused for example by the emptying of a saucepan or a glass.

[0041] The method according to the invention takes into account the number of regeneration cycles counted after each reintegration has occurred.

[0042] The regeneration cycle can occur in two different ways, according to the structural configuration of the components. Two different configurations are shown in figs. 2 and 3.

[0043] In the configuration in fig. 2, the device 10 comprises a valve 23 disposed between the regeneration water tank 21 and the salt tank 17 which, when closed, prevents the passage of the regeneration water. A non-return valve 29 is also present between the salt tank 17 and the resin tank 19.

[0044] In this solution, at pre-determined intervals, the valve 23 is opened by the command unit 26 in order to allow the clean water present in the regeneration tank 21 to enter the salt tank 17 and partly replace the saline solution which goes to regenerate the resin tank 19. This configuration allows to open the salt tank 17 by removing the stopper 22 without the saline solution leaking from the tank 17.

[0045] In the configuration in fig. 3, the closing valve 123 is positioned between the salt tank 17 and the resin tank 19.

[0046] In this case, with every regeneration cycle the valve 123 is opened so as to determine the flow of a determinate quantity of saline solution into the resin tank 19, while a corresponding quantity of clean water from the regeneration tank 21 takes its place.

[0047] To determine when the salt is to be topped up, the invention provides the following steps.

[0048] Starting from an initial condition in which the salt tank 17 is full of water, a determinate quantity of salt is added, so as to create the saline solution inside the tank 17.

[0049] The addition of salt to the tank 17 determines the overflow from the tank 17 of a quantity of water corresponding to the quantity of salt introduced, and this water pours into the discharge pan 20. The linear pressure sensor 25 detects the dynamic increase in the level and measures the quantity of water overflowing, so that the command unit 26 is able to deduce the measurement of the quantity of salt introduced.

[0050] In this way, the command unit 26 fixes a zero time to start the backward count-down of the quantity of salt, starting from the value measured by means of the linear sensor 25.

[0051] Assuming that the quantity of salt removed with every regeneration cycle is known, the command unit 26 is able to count how many regeneration cycles are necessary to reduce the quantity of salt in the tank 17 to a pre-established minimum value in order to indicate the

need for reintegration.

[0052] This count is effected by subtracting on each occasion, from the quantity of salt introduced initially into the tank 17, the quantity of salt removed with every regeneration cycle.

[0053] According to a variant, the calculation of the number of regeneration cycles also takes into account the progressive reduction in the level of saturation of the saline solution.

[0054] In this way, once a number of regeneration cycles has been reached, which is near the maximum possible number, the command unit 26 warns the user, for example by means of the visual indicator 27 and/or by means of an acoustic indicator, that he must reintegrate the salt in the tank 17.

[0055] At this point, when the salt is again reintegrated, the linear pressure sensor 25 dynamically detects that a certain quantity of water, corresponding to the salt introduced, has flowed into the pan 20, and again zeroes the counting of the command unit 26.

[0056] It is clear, however, that modifications and/or additions of parts or steps may be made to the method and device 10 as described heretofore, without departing from the scope of the present invention.

Claims

1. Method to indicate the need for reintegration of a regenerating substance of the anti-calcium function in a washer machine (16), wherein the washer machine (16) comprises at least a containing tank (17) for a regenerating substance, a discharge pan (20) and a command unit (26) suitable to activate, after a defined number of washing cycles, a regeneration cycle using said regenerating substance, **characterized in that** the method provides the following steps:

- a meter in the command unit (26) is zeroed at the moment a performed reintegration of the regenerating substance is detected in said tank (17);
- the quantity of said regenerating substance unloaded into the tank (17) is measured, by measuring the quantity of water that flows into said pan (20) following said reintegration;
- the number of regeneration cycles performed is progressively counted, starting from the last reintegration performed, and the quantity removed with every regeneration cycle is deducted from the measured quantity of regenerating substance introduced into said tank (17);
- the need for reintegration is indicated after a number of regeneration cycles such that the regenerating substance remaining in the tank (17) has reached a pre-established minimum level.

2. Method as in claim 1, **characterized in that** the measurement of the quantity of water that flows into said pan (20) due to the reintegration of the regenerating substance is performed by means of a pressure sensor (25) associated with said pan (20). 5

3. Method as in claim 2, **characterized in that** it provides to use a linear pressure sensor (25).

4. Method as in claim 3, **characterized in that** said linear pressure sensor (25) also detects the dynamics of the flow of the water into the pan (20) in order to discriminate whether said flow is caused by the unloading of the regenerating substance into the tank (17) or by other causes. 10
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5. Device to indicate the need for reintegration of a regenerating substance of the anti-calcium function in a washer machine (16) comprising at least a containing tank (17) for a regenerating substance, a discharge pan (20) and a command unit (26) suitable to activate, after a defined number of washing cycles, a regeneration cycle using said regenerating substance, **characterized in that** it comprises: 20
25
 - a pressure sensor (25) associated with said discharge pan (20) and able to measure the quantity of regenerating substance unloaded into the tank (17) during said reintegration by measuring the quantity of water poured into said pan (20); 30
 - a meter, in said command unit (26), which is zeroed at the moment said reintegration is performed, and starts the progressive count of the number of regeneration cycles performed starting from the last reintegration performed, removing from the measured quantity of regenerating substance introduced into the tank (17) a quantity removed with every regeneration cycle; 35
 - a visual (27) and/or acoustic indicator, activated by said command unit (26), to indicate the need for reintegration after a number of regeneration cycles such that the remaining regenerating substance has been reduced to a pre-established value for reintegration. 40
45

6. Device as in claim 5, **characterized in that** said pressure sensor (25) is of the linear type in order to detect the dynamics of the flow of water into said discharge pan (20) and to discriminate whether said flow has been caused by the unloading of the regenerating substance into the tank (17) or by other causes. 50

7. Device as in claim 5, **characterized in that** said pressure sensor (25) is a pressure switch. 55

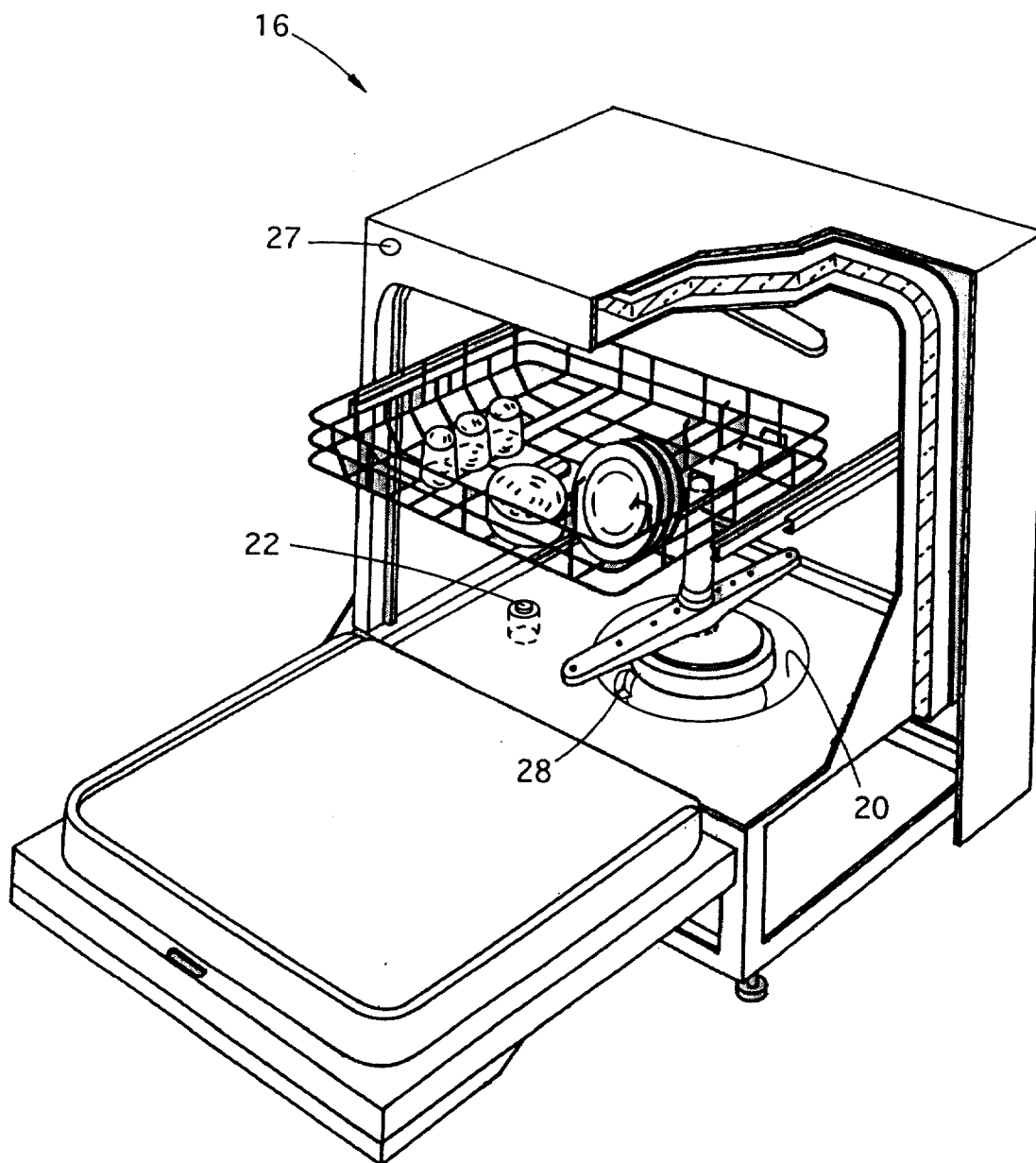


fig. 1

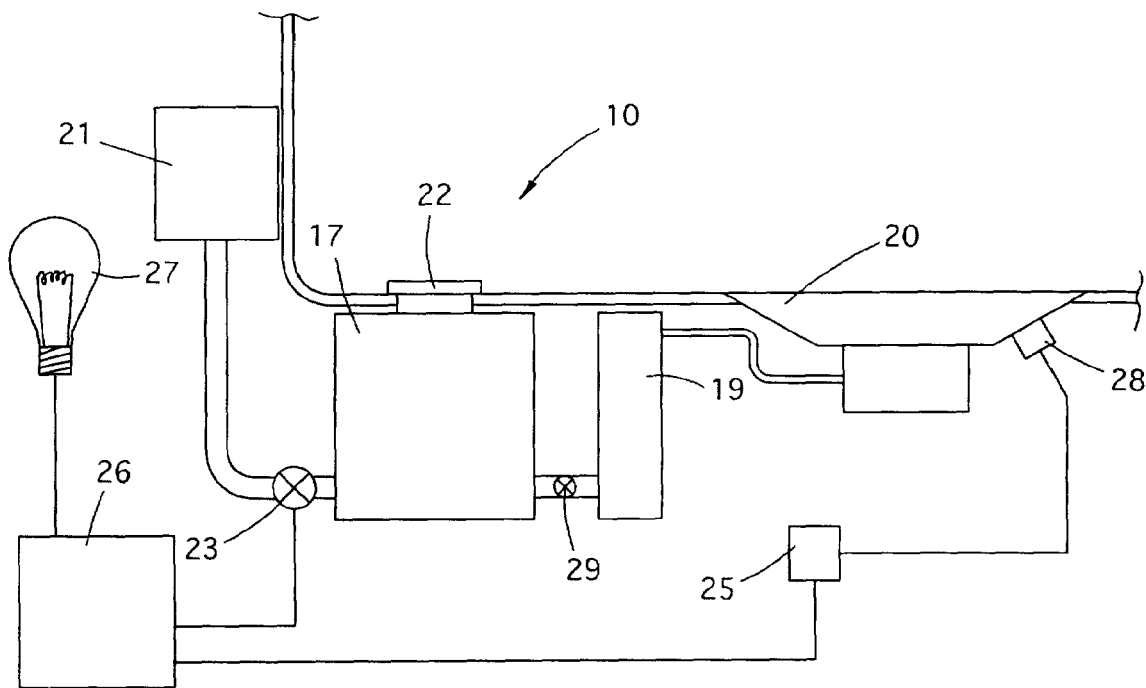


fig. 2

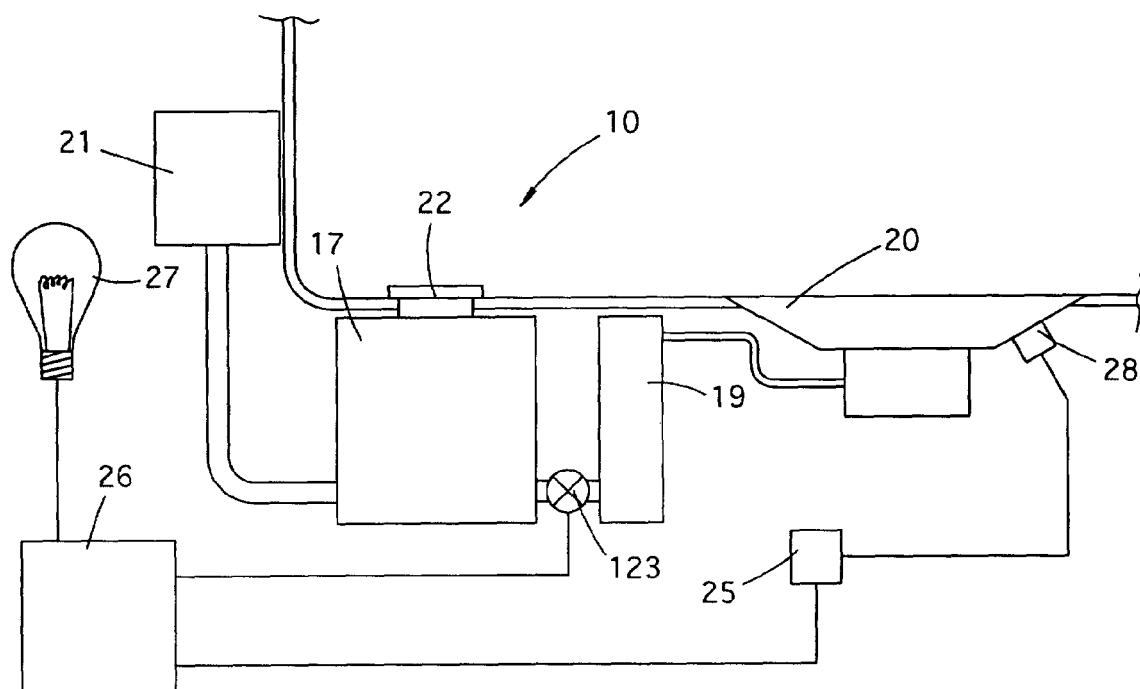


fig. 3



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 0 741 990 A (MERLONI ELETTRODOMESTICI S.P.A) 13 November 1996 (1996-11-13) * column 1, line 3 - line 8 * * column 3, line 46 - column 4, line 15 * * column 5, line 42 - column 8, line 2 * * figure 1 * -----	1,5	INV. A47L15/42
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			TECHNICAL FIELDS SEARCHED (IPC)
			A47L
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 16 August 2006	Examiner Redelsperger, C
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document 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			

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 06 11 3798

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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16-08-2006

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