(19) Europäisches Patentamt
European Patent Office
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(11) **EP 1 842 478 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
10.10.2007 Bulletin 2007/41

(51) Int Cl.:
A47L 15/42 *(2006.01)*

(21) Application number: **06112271.9**

(22) Date of filing: **05.04.2006**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

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(54) **Dishwasher with improved regeneration circuit**

(57) The present invention relates to a dishwasher with an improved regeneration circuit.
A dishwasher according to the invention comprises a washing chamber (1), a liquid collecting sump (2) placed in a base region of the chamber (1) and a water softening unit (7), said dishwasher further comprises a water flow control system (13) and a regeneration circuit (9), hydraulically connecting a water supplying network (4) to the sump (2) passing through a regenerating medium (11) for regenerating the softening unit (7). The dishwasher according to the invention is characterised in that a water quantity measuring device (15) is placed in the sump (2) for monitoring the quantity of water used for regeneration of the softening unit (7).

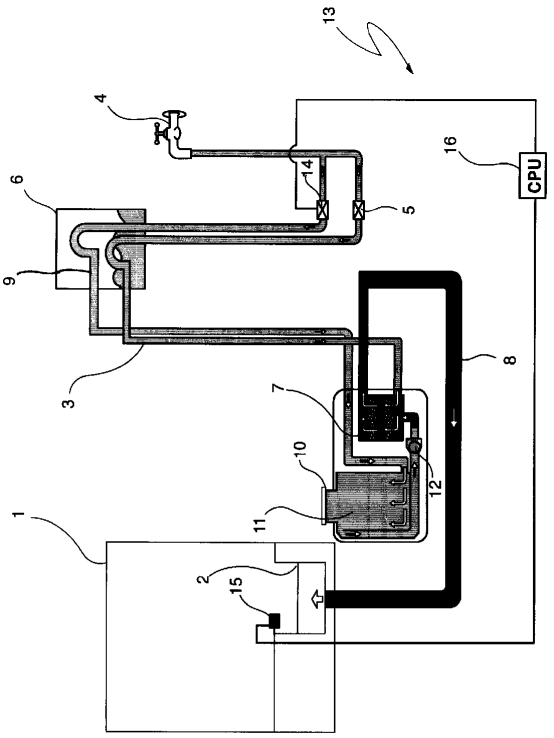


Fig. 1

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Description

[0001] The present invention relates to a dishwasher with an improved regeneration circuit.

[0002] In general, dishwashing machines comprise a main water supplying conduit connected to the water network for conveying water to a washing chamber in which dishes to be washed are placed. The network water often contains a large amount of calcium and magnesium that are undesirable for washing operations and must be reduced before introducing the water in the washing chamber. For this reason a water softening system is disposed in the main conduit between the water network connection and the washing chamber.

[0003] A water softening system generally comprises a ion-exchange chamber which contains a supply of ion-exchange resin acting as water softening agent. The resin loses its softening properties as the number of washing cycles increases, and therefore a resin regenerating process is needed after a certain amount of washing cycles performed by the machine.

[0004] In dishwashers of known type the regenerating process is made by leading an amount of water to mix with a solution of sodium chloride stored in a container and by introducing the mixture in the ion-exchange chamber. The mixture is maintained in chemical contact with the resin for a predetermined period of time during which the salt regenerates the ion-exchange resin. When the regeneration process has been completed the salt solution is flushed out.

[0005] In order to ensure that the mixture of water and salt solution enters the ion-exchange chamber with a pressure and a flow suitable to steep the whole amount of resin, a water tank having a predetermined volume is provided in the dishwasher. This tank is kept full of water ready to be flushed in the salt container and then within the ion-exchange chamber for regeneration.

[0006] Because of the presence of the tank in the dishwashing machine, the overall size of the latter is disadvantageously cumbersome. In addition, if the machine is not used for a relatively long period of time, the water contained in the tank can be a source of bacteria and algae proliferation that can pollute the washing chamber and consequently the dishes treated by the machine.

[0007] The aim of the present invention is therefore to solve the noted problems, eliminating the drawbacks of the cited known art and thus providing a dishwasher that does not need any water storage to perform the regeneration of the ion-exchange resin.

[0008] Another object of the present invention is to provide a dishwasher having a reduced size compared to the dishwashing machines of known type, the improved dishwasher having also a reduced number of components and therefore being simpler to be assembled.

[0009] Advantages, objects, and features of the invention will be set forth in part in the description which follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from practice of the invention. The objects and advantages of the invention may be realised and attained as particularly pointed out in the appended claims.

[0010] The accompanying drawing, which is included to provide a further understanding of the invention and is incorporated in and constitute a part of this specification, illustrates a possible embodiment of the invention and together with the description serve to explain the principles of the invention.

[0011] In the drawing:

[0012] Figure 1 shows a schematic view of the hydraulic circuits of a dishwashing machine according to the invention.

[0013] With reference to the drawing, a dishwasher according to the present invention comprises a washing chamber 1 receiving dishes to be washed and a sump 2 disposed in a base region of the chamber 1 for collecting water used for washing operations. Such operations are performed with water drawn from the main water supplying network 4 by a first hydraulic circuit 3. Circuit 3 comprises valve means 5, an air break 6 that physically separates the water supplying network 4 from the circuit 3 and a water softening unit 7 provided with resins acting as softening agent in order to reduce scale-forming substances like calcium and magnesium salts normally present in the network water. An end portion 8 of the circuit 3 connects the softening unit 7 to the sump 2 for admitting water into the washing chamber 1.

[0014] A second circuit 9 is connected to the main water supplying network 4 via the air-break 6. Water drawn for the network 4 is led to a reservoir 10 containing a regenerating medium 11, such as a solution of sodium chloride, suitable for regenerating the water softening resin after a number of working cycles performed by the dishwasher. The regenerating circuit 9 hydraulically connects the reservoir 10 to the softening unit 7 for conveying a mixture of water and regenerating medium 11 in the unit 7. A non-return valve 12 is provided in the regenerating circuit 9 between the reservoir 10 and the softening unit 7, so as to prevent the mixture to undesirably return to the reservoir 10 during regenerating operations. The end portion 8 of the regenerating circuit 9 departing from the softening unit 7 and terminating in the sump 2 is common to the end portion of the first circuit 3.

[0015] A water flow control system 13 is provided for controlling operations during the softening resin regeneration process. The system 13 comprises valve means 14 hydraulically connected to the regenerating circuit 9, a water quantity measuring device 15 and a control unit 16. When a predetermined number of washing cycles has been performed by the dishwasher, and the softening resin must be regenerated, the control unit 16 opens the valve means 14 allowing water from the network 4 to flow within the regenerating circuit 9. As described above, before being discharged in the sump 2, said water flows through the regenerating medium 11 and then through the softening unit 7.

[0016] The water quantity measuring device 15 is placed in the sump 2 and monitors the quantity of water used for regeneration process, i.e. the quantity of water flown through the regenerating circuit 9. In response to the measurement provided by the water quantity measuring device 15, the water flow control system 13 operates the supply of water in the second circuit 9. The amount of water flown in the regenerating circuit 9 is regulated by the water flow control system 13 through a valve means 14 and said amount is sufficient for carrying out a complete regeneration of the softening resin.

[0017] Valve means 14 can be commanded by the control unit 16 in a known manner, like for example by way of an electric actuator.

[0018] The water quantity measuring device 15 placed in the sump 2 is suitable for measuring the water quantity used for ordinary dish washing operations, i.e. the quantity of water flowing through the first circuit 3.

[0019] The water quantity measuring device can be a pressure sensor and, in particular, it can be a pressure sensor of analogical type suitable for continuously detecting the amount of water in the sump 2. Alternatively the water quantity measuring device 15 can be a device suitable for measuring the level of water in the sump 2. According to this embodiment the water level progressively growing in said sump 2 during the regenerating process is monitored by the device 15 and the water supply in the circuit 9 is stopped when a set level has been reached in the sump 2. Said set level is defined such that the amount of water flown in the regenerating circuit 9 is sufficient for carrying out a complete regeneration of the softening resin.

[0020] Conclusively it can be stated that a dishwashing machine according to the present invention has a reduced overall volume compared to the known dishwashers, the same machine having a regeneration circuit of improved reliability.

Claims

1. A dishwasher comprising a washing chamber (1), a liquid collecting sump (2) placed in a base region of the chamber (1) and a water softening unit (7), said dishwasher further comprises a water flow control system (13) and a regeneration circuit (9), hydraulically connecting a water supplying network (4) to the sump (2) passing through a regenerating medium (11) for regenerating the softening unit (7), **characterised in that** a water quantity measuring device (15) is placed in the sump (2) for monitoring the quantity of water used for regeneration of the softening unit (7).

2. A dishwasher according to claim 1 wherein said water quantity measuring device (15) monitors the quantity of water used for ordinary dish washing operations.

3. A dishwasher according to claim 1 or 2 wherein the supply of water in said regeneration circuit (9) is operated by the water flow control system (13) in response to the water quantity measured by said water quantity measuring device (15).

4. A dishwasher according to any preceding claim wherein said water quantity measuring device (15) is a water level measuring device adapted to measure the level of water reached in the sump (2).

5. A dishwasher according to any claim from 1 to 3 wherein said water quantity measuring device (15) is a pressure sensor.

6. A dishwasher according to claim 5 wherein said pressure sensor is of analogical type suitable for continuously detecting the amount of water in the sump (2).

7. A dishwasher according to any preceding claim wherein said water flow control system (13) comprises valve means (14) for altering the supply of water in the regenerating circuit (9).

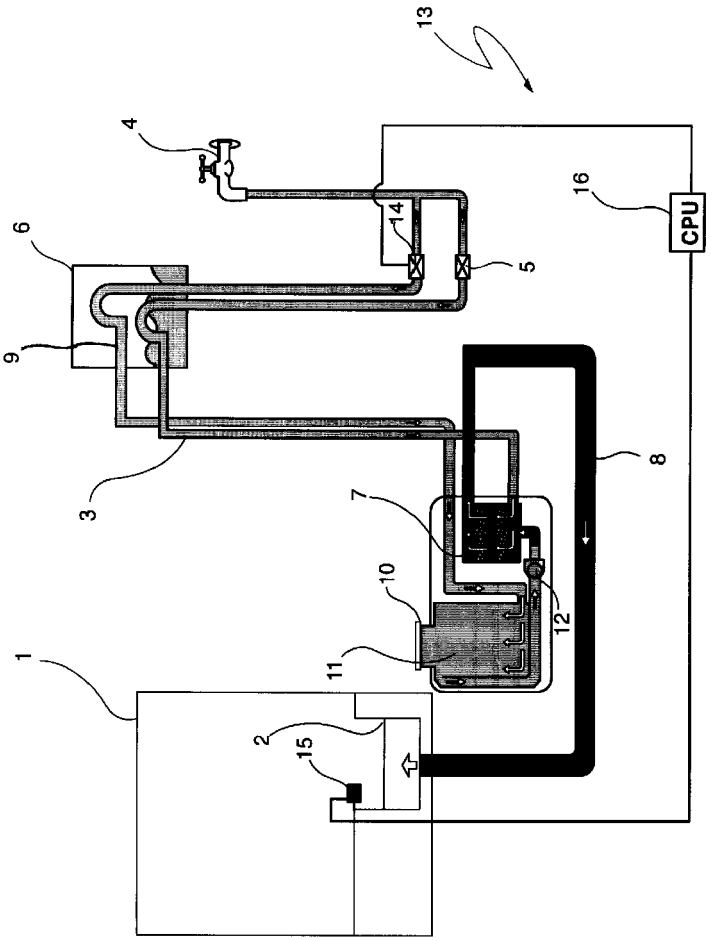


Fig. 1

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EUROPEAN SEARCH REPORT

Application Number
EP 06 11 2271

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	14 September 2006	REDELSPERGER, C

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 06 11 2271

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