(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 425 815 A2**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **90118538.9**

(51) Int. Cl.5: **D06F 39/00**, A47L 15/42

(22) Date of filing: **27.09.90**

(30) Priority: **29.09.89 IT 6781989**

(43) Date of publication of application:
08.05.91 Bulletin 91/19

(84) Designated Contracting States:
DE ES FR GB

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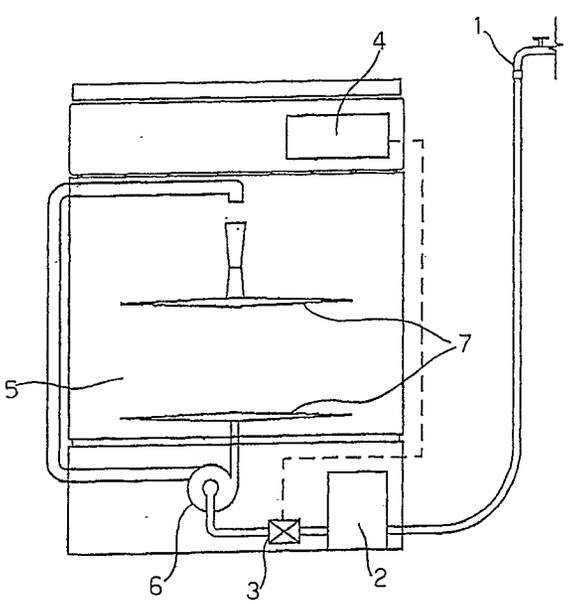
(54) Improved washing machine.

(57) Washing machine, particularly a domestic laundry- or dish-washer, comprising means which reduces the hardness of the water supplied to the machine and at least hardness sensor device for said water, characterized in that there are provided control means which, at least during a washing cycle, conditions the operation of the means which reduces the water hardness (2) in function of the result of the measuring effected by the sensor device (3) on the water which is supplied to the machine.

FIG. 1



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IMPROVED WASHING MACHINE

DESCRIPTION

The present invention refers to a washing machine, particularly a domestic laundry- or dish-washer, comprising means which reduces the hardness of the water supplied to the machine and at least a hardness sensor device for said water.

As it is known the quantity of detergent to use in a given type of washing, directly depends on the hardness of the water which is used for the washing itself. In fact, if the detergent quantity is insufficient, the calcium (Ca++) and magnesium (Mg++) ions, responsible for the water hardness, neutralize the surface-active part of the detergent, which has the principal function in the washing action, so that the washing results to be unsatisfactory.

On the contrary, if the detergent quantity is exuberant, a good washing can be reached, but in the following rinse cycle it is not possible to remove all the detergent residuals which remain in the washed item, so giving, rise to risks, for health in case of dishes washing, or of allergy, in case of laundry washing.

So it is usual to instruct the user, on the instruction manuals and the detergent packagings, to regulate the dosage in function of the water hardness. However several times the user cannot follow this advice, due to lack of specific culture or for the absence of suitable means which measures the water hardness.

In order to act on the water hardness, reducing it to medium levels and not to oblige the user to change the detergent dosages, some washing machines use specific artifices; particularly, dishwashers have a softening device for the washing and rinsing water, which exchanges the Ca++ and Mg++ ions of the water with the sodium (Na+) ions contained in appropriate resins arranged into the softnening device, and not impairing the action of the detergent or the aspect of the washed items. Some laundry machines, on the other hand, use an agent, which is usually contained in the detergent, which can reduce the water hardness and which operates according to its concentration during the use.

Nevertheless, even admitting to know the water hardness, which is not constant in time, but changes in function of the season and even of the weather conditions; in this way the analysis done when the machine was installed or an average of several samplings, does not prevent the inconvenience of not uniform and sometimes unsatisfactory washing and rinsing.

In the particular case of dishwashers, at a certain point, the resin loses its Na+ ions, to be exchanged with Ca++ and Mg++ ions of the water, and in this way the water, even passing through the resin, will maintain substantially the same hardness it had at the entry. To avoid this drawback, there is provided a phase that is called resin regeneration, introducing a salt (NaCl) solution with the purpose of washing the resin. This phase is generally done at every washing cycle, with a great consumption of salt, which has to be often refilled by the user; only some machines provide for the possibility of total or partial exclusion of the resin regeneration.

Further embodiments use, in the case of laundry washers, a sensor which analyses the water hardness and, according to the information obtained, during the washing of the laundry items increases or decreases the washing and/or rinsing time. In this case an obvious reduction of the machine efficiency is produced, because if, for example, during the washing of delicate laundry the water is detected as hard, the timer protracts the washing and rinsing cycles in order to grant a good washing, but the wear of the laundry is increased, causing the risk of damages; in addition the additional energy and water consumption must also be considered. The consequences in the opposit case (soft water) are evident if very dirty laundry has to be washed.

Thus, it is the object of the present invention to obviate the cited drawbacks, providing use of a hardness sensor which, depending on the analysis of the water supplied to the machine, conditions the operation of the washing machine as regards the resin regeneration and/or the quantity of agent used to reduce the water hardness.

To obtain the said object, the subject of the present invention is a washing machine, particularly a domestic laundry- or dish-washer, comprising means which reduces the hardness of the water supplied to the machine and at least a hardness sensor device for said water, characterized in that there are provided control means which, at least during a washing cycle, activate the means which reduces the water hardness in function of the result of the measuring effected by the sensor device.

Other objects and advantages of the present invention will be clear from the detailed description which follows and from the attached drawings, which are supplied only as an explanatory and not limiting example, wherein:

- figure 1 shows a view of a dishwashing machine, according to the invention;
- figure 2 shows a variant of the dishwashing machine, according to the invention;

- figure 3 shows a further variant of the dishwashing machine, according to the invention.

With reference to figure 1, there is shown, according to the invention, a dishwashing machine showing the supply hydraulic system for the washing; it comprises a connection to the water mains 1 which supplies the running water to a softener 2. In this way the resin in the softener 2 exchanges its Na+ ions with the Ca++ and Mg++ ions of the water. At this point the softened water is analysed by a sensor 3 , of known type, which verifies the good operation of said softener 2. The results obtained from the analisys are then collected by a programmer (timer) 4 which can transform them into signals recognizable by the user or by the machine itself. In the first case these signals (which can be of different type: visual, by means of warning lights, or acoustic, without departing from the scope of the present invention) allow, the user to verify istantaneously the hardness of the softened water, necessary for the washing and/or the rinse of the dishes; in this way it will be possible to do the ions regenerating phase only when these ones have lost their exchange capability, and not during any cycle.

In the automatic case, the water hardness levels, detected insstantaneously and which correspond to the resin consumption, are memorized and integrated by means of digital or analogic means, and if a predetermined threshold is exceeded, the latter informs the programmer in order to to enable the regeneration.

Once the regeneration is done, the analogic and digitals means are reset.

The water analysed in this way, is then supplied to the washing tank 5 by means of the hydraulic pump 6 which conveys it to the rotating collectors 7.

Figure 2 shows a variant of the dishwashing machine of figure 1, where said sensor 3, measuring the water hardness, is arranged upstream the softener 2, in respect of the direction of the water flow. In this way, and knowing the dishwashing machine cycle, the timer or the user have the possibility to know how much the resin is used, and to operate a regeneration with the quantity of solution strictly necessary to restore the resin to the initial conditions.

Also in this case, the information of the analysis is collected by the programmer 4 which, by means of automatic means or signallers recognizable by the user, commands the execution of the regeneration. By this second solution, it is also possible to realize a variant according to which, if the water supplied by the mains is already enough soft, it can be not necessary to activate the softener; for instance, if the dishwasher is connected to a centralized water softening plant, the hardness sensor detects water already soft, so that it is more functional even to by-pass the resin with appropriate means and not to enable the softening; and neither the regeneration. In the same way, in presence of water not very hard, it can be more efficient that only the water which is supplied in the tank, and then heated, passes through the softener, because only by exceeding given temperatures the water allows the lime to precipitate.

Figure 3 shows a further variant of the figures 1 and 2; it consists in the use of two sensors 3a and 3b or, in alternative, only a sensor which performs two analysis of the water, respectively upstream and downstream the softener. In this way it is possible to control completely the operating condition of the resin, and to realize an optimal regeneration. In fact, the hardness of the water supplied from the mains is analysed by means of the sensor 3a, and the water treated by the resin is analized by means of the sensor 3b, so having istantaneously, on the basis of these results, the value of the correct operation of the softener.

The characteristics of the described washing machine are clear from the given description and the annexed drawings.

Also clear are the advantages of the washing machine object of the present invention.

Particularly, they are represented by the fact that, according to anyone of the showed embodiments, the operation of the softening device is optimized, with the consequent reduction of the consumption of the salt (NaCl) used to obtain the necessary solution for the regenerating phase; a lesser pollution is obtained because a salt which is not completely used is never discharged, like it happens in the case of the known machines; the user can refill the salt container of the softener with intervals longer than in the known embodiments; the regeneration of the resin is done automatically, after a control of the information supplied by the sensors, which inform the timer about the exceeding of a hardness threshold. Furthermore, the water hardness sensor, which analyses the water during each supplying of the machine, measures its hardness, which can change depending on the season and the weather conditions, and for this reason it conditions the machine operation so to optimize it; this fact is not possible with the devices controlled by a machine or by an user which do not know istantaneously the hardness of the water used for the washing and/or the rinsing.

Measuring istantaneously the resin consumption make it possible to determine the efficiency level and to restore the best value, with a regenerating cycle only when needed.

It is obvious that many variations to the washing machine described as an example are possible for the man skilled in the art, without departing

from the novelty principles inherent to the invention.

For instance it is possible to realize a laundry machine which uses a sensor for the hardness of the water supplied from the mains and which sends istantaneously information to the timer or signals to the user, to allow a correct dosage of the detergent and/or other chemical elements, such as the softening detergent, which have also the function to decrease the water hardness, without modifications of the washing cycles.

Claims

1. Washing,machine, particularly a domestic laundry- or dish-washer, comprising means which reduces the hardness of the water supplied to the machine and at least a hardness sensor device for said water, characterized in that there are provided control means which, at least during a washing cycle, activate the means which reduces the water hardness in function of the result of the measuring effected by the sensor device (3).

2. Washing machine, according to claim 1, characterized in that there are provided analogic or digital or optic means which integrates the result of the measuring effected by the sensor device (3).

3. Washing machine, according to claim 1 or 2, characterized in that there are provided threshold detecting means which cause the activation of the means which reduces the water hardness when the threshold is exceeded.

4. Washing machine, according to claim 3, characterized in that said threshold detecting means, once the threshold is exceeded, are reset.

5. Washing machine, according to one of the previous claims, characterized in that said control means automatically and istantaneously inform the user about the result of the measuring of the water hardness, by means of the activation of informative elements.

6. Washing machine, according to claim 5, characterized in that the said control means are arranged inside the washing timer (4).

7. Washing machine, according to claim 6, characterized in that the sensor device (3) analyses the hardness of the water from the mains (1) to be supplied in the washing cycles.

8. Washing machine, according to claim 7, characterized in that the water supplied from the mains by-passes the means which reduces the hardness, if said water supplied by the mains (1) is analysed as soft by the sensor (3).

9. Washing machine, according to claim 6, characterized in that the sensor device (3) analyses the water after a water hardness reduction process.

10. Washing machine, according to claim 7 and 9, characterized in that one or more sensors (3a,3b) analyse the water both before and after the hardness reduction process.

11. Washing machine, according to one of the previous claims, characterized in that the water hardness reduction process is generated by softener (2) or by washing chemical agents introduced in the washing machine.

FIG. 1

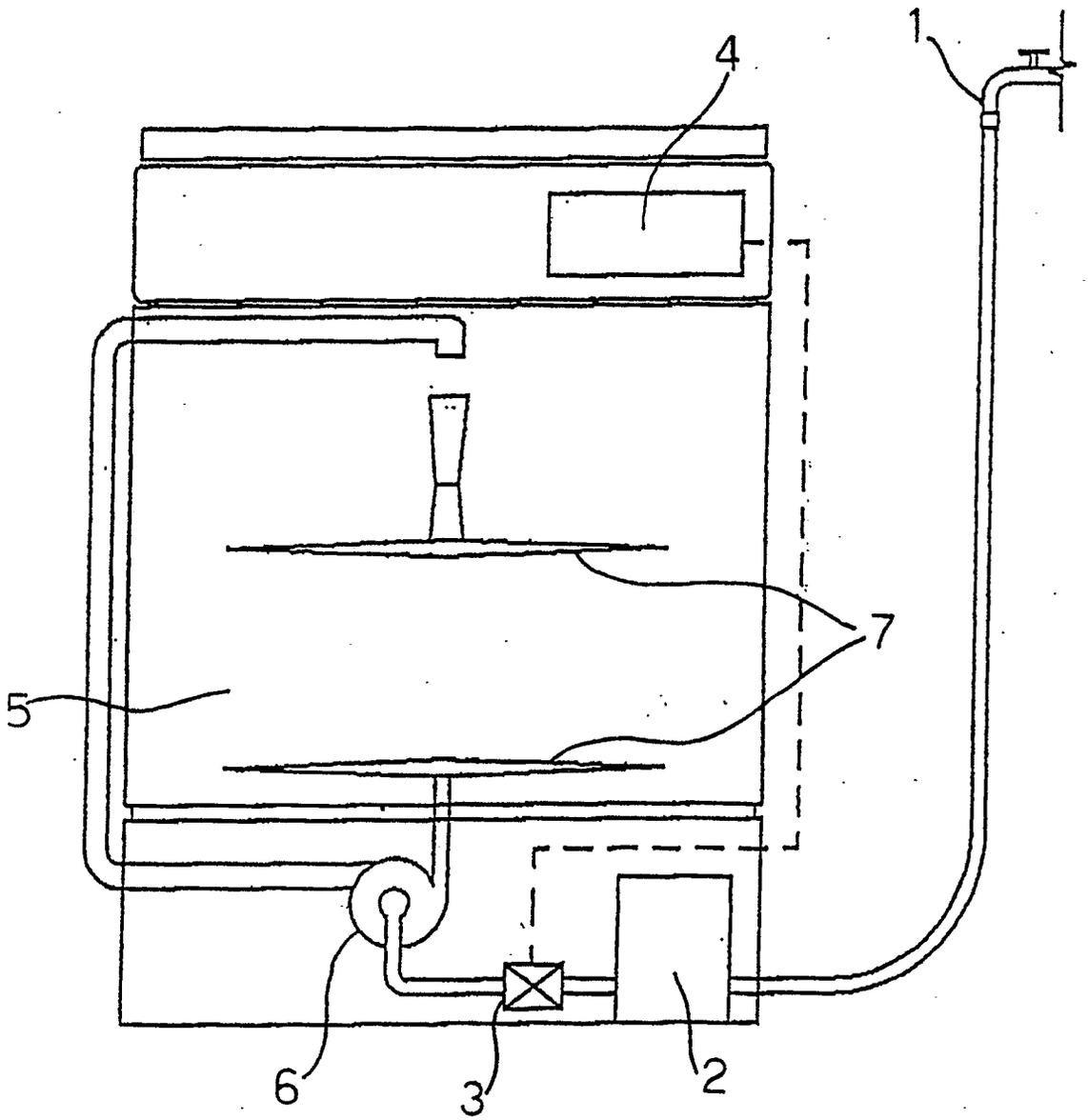

FIG. 2

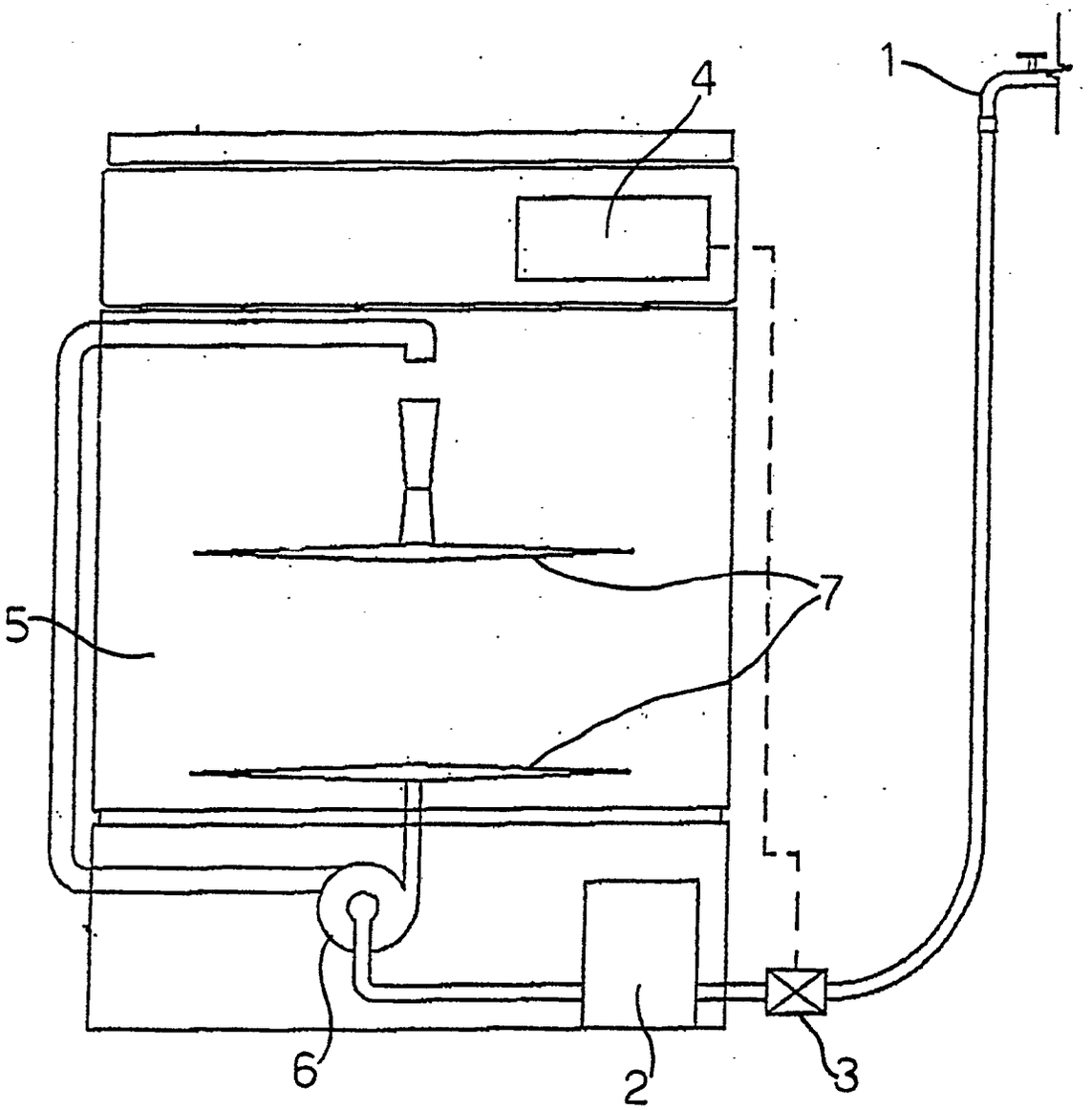

FIG. 3