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(54) **Dishwasher with sensor group in the washing tank**

(57) A dishwasher includes a control unit and a plurality of sensors housed in a body (C) arranged on the door of the dishwasher, said body (C) being provided with a top opening (F) and a mobile wall (M), elastically biased against the body (C), whose opening and closing movement is controlled by the control unit through an actuator (E) which acts on the mobile wall (M) through a pusher (P). In this way when it is required that the sensors carry out a reading it is sufficient that the pusher

(P) be retracted by the electro actuator (E) thus allowing the mobile wall (M) to abut on three sides of the body (C), whereby the water drops and the squirts rebounding from above in a little time will fill with washing liquid (W) the space that has been formed between the wall (M) and the body (C). After the set time has elapsed, the electro actuator (E) releases the pusher (P) and the wall (M) is pushed back to the vertical position, thus allowing the discharge of the washing liquid (W) and facilitating the washing of the sensors.

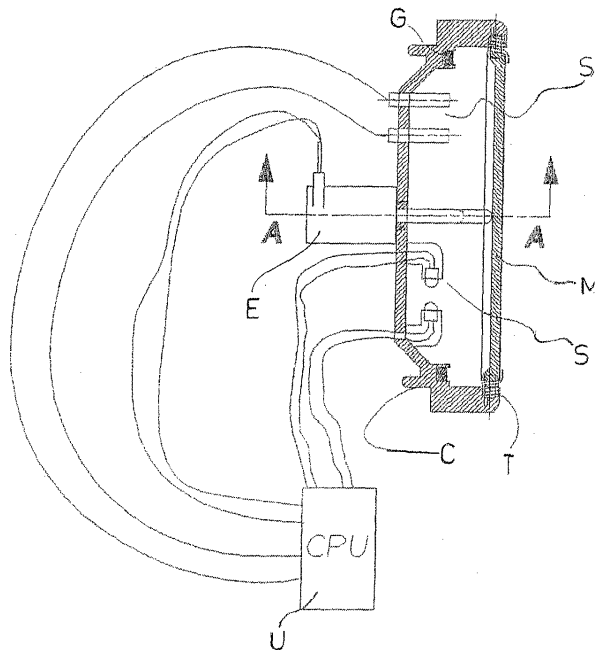


Fig. 1

Description

[0001] The present invention relates to dishwashing machines, and in particular to a dishwasher in which various sensors are gathered in a sensor group located in the washing tank.

[0002] It is known that dishwashers are more and more provided with different types of sensors to allow them to carry out "automatic" washing cycles, i.e. washing cycles selected by the control unit of the machine among the various combinations available according to the actual working conditions of the machine, reducing to a minimum the setting by the user. The sensors are used to detect at each cycle various parameters such as type and amount of dirt, entering water hardness, etc. which are the information required to consequently adapt the various working parameters (temperature, amount of water, number of water loads, cycle duration, etc.).

[0003] All of this is done with the purpose of optimizing the consumption of power, water and salt on the basis of the actual needs yet assuring good washing and drying results. In practice, the sensors allow the selection among the various washing solutions to adapt the latter to the number and type of dishes to be washed, for example by setting low temperature cycles, or power recovery cycles, or by feeding one sprinkler only and so on.

[0004] The commonly used sensors, in order to operate properly, in general must be immersed in the washing liquid and the liquid itself must be (at the time of the "reading") almost at rest. As a consequence, the sensors are arranged in areas of the hydraulic circuit where the flow is not turbulent or, if they are directly located inside the washing liquid passage ducts, at the time of the reading it is necessary to slow down or stop for some seconds the washing pump.

[0005] However these known solutions have drawbacks, since in the case of sensors arranged in quiet areas there can be dirt deposit phenomena which affect their operation, while if they are located in the passage ducts the slowing down or stopping of the pump can result in a more complex management of the cycle and/or a more complex manufacturing of the pump which requires a rotational speed control.

[0006] Moreover in both cases the sensors can not be inspected, whereby it can not be excluded that a soiling takes place over time which eventually causes the detection of wrong data, of which the user may hardly be aware and to which in any case he could not directly see himself.

[0007] Finally a further drawback stems from the fact that the sensors are arranged in various areas of the machine, which results in a complicated assembly and maintenance due to the wiring and connections required.

[0008] Therefore the object of the present invention is to provide a dishwasher which overcomes the above-

mentioned drawbacks.

[0009] This object is achieved by means of a dishwasher in which the various sensors are gathered in a sensor group located in the washing tank. Other advantageous features are disclosed in the dependent claims.

[0010] A first advantage of the dishwasher according to the present invention is that of concentrating the sensors in a single area of the machine, thus simplifying the construction and reducing the costs.

[0011] A second significant advantage of this dishwasher is that of providing an automatic cleaning of the outer surface of the sensors at each cycle, so as to guarantee their efficiency over time.

[0012] A further advantage of this type of machine stems from the fact that the sensor group can be easily inspected even by the user, who can check the condition of the surfaces and possibly see to an additional manual cleaning.

[0013] Further advantages and characteristics of the dishwasher according to the present invention will be clear to those skilled in the art from the following detailed description of an embodiment thereof, with reference to the annexed drawings wherein:

Fig.1 is a diagrammatic top plan view which shows the essential elements of the sensor group and their relevant connections;

Fig.2 is a lateral sectional view taken along line A-A of fig. 1;

Fig.3 is a front sectional view taken along line B-B of fig.2;

Fig.4 is a view similar to fig.2 of the sensor group in a parameter detection step;

Fig.5 is a diagrammatic partial side view which shows a possible location of the sensor group, which is shown in the reading step of fig.4; and

Fig.6 is a view similar to the preceding one which shows the sensor group in the washing step of fig.2.

[0014] With reference to figures 1 to 3, there is seen that the sensor group of the dishwasher according to the invention conventionally includes a control unit U connected through suitable wiring to a plurality of sensors, in the illustrated case two pairs of sensors S, S'.

[0015] The novel aspect of the present dishwasher is given by the fact that said sensors S, S' are housed in a body C provided with a top opening F and with a front mobile wall M which can open or close a bottom opening D by rotating around horizontal pins R.

[0016] More specifically, body C is provided with a gasket G on the three sides along which the mobile wall M abuts, said wall being biased on body C by torsion springs T arranged around pins R. The contact between the mobile wall M and gasket G is prevented by a central pusher P whose position is defined by an electro actuator E which is in turn controlled by the control unit U. In particular, pusher P is kept in the extracted position of fig.2 by a spring having a strength greater than the

torsion springs T which tend to close the mobile wall M on body C.

[0017] In the light of the description above and with reference also to figures 4 to 6, the simple operation of the present dishwasher is readily understood.

[0018] Body C is arranged on one of the four vertical walls of the washing tank, preferably on the door a little higher than the upper sprinkler J as illustrated in figs.5 and 6, and the mobile wall M usually maintains a substantially vertical position due to the extracted position of pusher P. In this way the water can freely pass through the sensor group and also the end jet X of sprinkler J can wash the inside of body C by entering through the bottom opening D (fig.6).

[0019] In order for sensors S, S' which must operate by immersion to be able to carry out the reading, at the times in the cycle where provided, pusher P is retracted by electro actuator E thus allowing the mobile wall M to abut on the three sides (bottom and lateral sides) of gasket G by rotating on pins R under the push of springs T.

[0020] In this condition the water drops and the squirts rebounding from above in a little time will fill with washing liquid W, as confirmed by experimental tests performed by the applicant, the space which has been formed between wall M and body C (figs.4, 5). It should be noted that possible small leakages between wall M and gasket G are not a problem in that at the same time the flow of liquid from above continues, and the liquid contained in the space is therefore in a condition of sufficient quiet for the readings.

[0021] After the set time has elapsed, electro actuator E releases pusher P and wall M is pushed back to the vertical position, thus allowing the discharge of the washing liquid W and facilitating the washing of sensors S, S' by the jets of sprinkler J.

[0022] Moreover, if the user wishes to inspect/clean the sensors it is possible to manually rotate wall M through 180° upwards; springs T will then return it into abutment on pusher P.

[0023] It is clear that the above-described and illustrated embodiment of the dishwasher according to the invention is just an example susceptible of various modifications. In particular, the number, type and arrangement of the sensors inside body C can be somewhat changed, and body C itself can be arranged in other positions in the washing tank as long as it receives a sufficient amount of water to wash the sensors and to create a temporary stagnation area for the liquid in order to detect the required parameters.

[0024] Furthermore, the opening and closing mechanism of the water collecting space can be made in other ways, for example by reversing the above-illustrated mechanism. In other words, the mobile wall M might be elastically biased away from body C and electro actuator E could be activated to push wall M against body C.

[0025] In another case wall M could be a laterally sliding wall which, under the push of the electro actuator overcoming the resistance of the spring biasing wall M

open, closes the sides and bottom of body C which is normally completely open. As an alternative, the spring could be present on pusher P only which in turn keeps wall M open, and the activation of electro actuator E could cause the closing of wall M through a bidirectional restraint, e.g. a crank mechanism.

[0026] Finally, electro actuator E itself could be replaced by another type of actuator, e.g. hydraulic or pneumatic, suitable to lock the pusher both in the extracted and retracted position, so that there would be no need for springs neither on pusher P nor on the mobile wall M.

15 Claims

1. A dishwasher including a control unit (U) and a plurality of sensors (S, S') operationally connected thereto, **characterized in that** said sensors (S, S') are housed in a body (C) arranged on one of the four vertical walls of the dishwasher washing tank, said body (C) being provided with a top opening (F) and a mobile wall (M), the opening and closing movement of said mobile wall (M) to form a washing liquid stagnation space being controlled by said control unit (U) through an actuator which acts on the mobile wall (M) through a pusher (P).
2. A dishwasher according to claim 1, **characterized in that** said actuator is an electro actuator (E).
3. A dishwasher according to claim 1 or 2, **characterized in that** the mobile wall (M) is elastically biased against the body (C) by one or more springs.
4. A dishwasher according to one or more of the preceding claims, **characterized in that** the mobile wall (M) rotates around horizontal pins (R) to open and close a bottom opening (D), the body (C) being provided with a gasket (G) on three sides along which the mobile wall (M) abuts, the latter being biased on the body (C) by torsion springs (T) arranged around said pins (R).
5. A dishwasher according to claim 4, **characterized in that** the mobile wall (M) can be manually rotated through 180° upwards.
6. A dishwasher according to one or more of the preceding claims, **characterized in that** the pusher (P) is located in a central position in the body (C) and is kept by a spring in an extracted position with respect to the electro actuator (E) whereby the mobile wall (M) remains at a distance from the body (C).
7. A dishwasher according to one or more of claims 1 to 3, **characterized in that** the mobile wall (M) is slidable with respect to the body (C) in such a way

that during the washing step the latter is completely open.

8. A dishwasher according to claim 8, **characterized in that** the push of the actuator overcomes the resistance of a spring biasing the mobile wall (M) open. 5
9. A dishwasher according to one or more of the preceding claims, **characterized in that** the body (C) is arranged on the door a little higher than the upper sprinkler (J). 10

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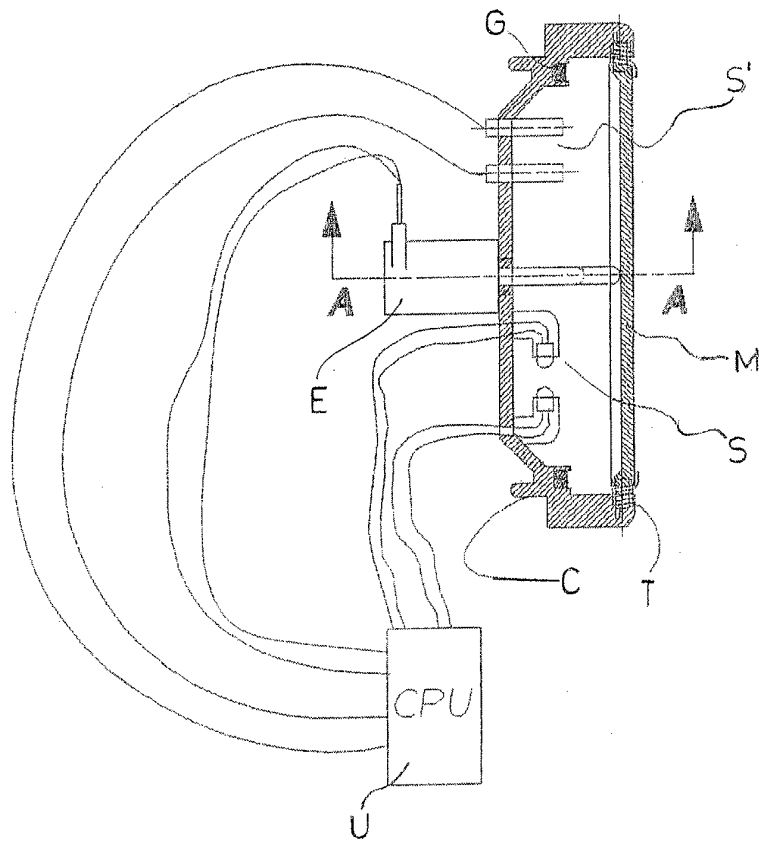


Fig. 1

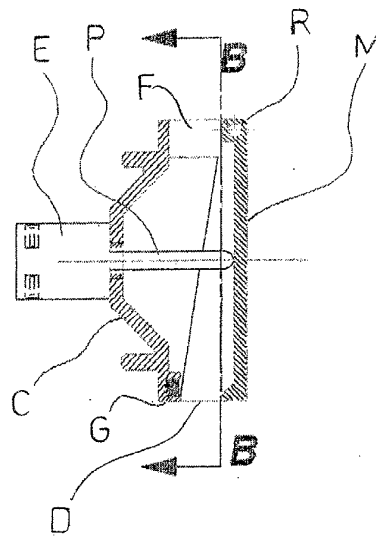


Fig. 2

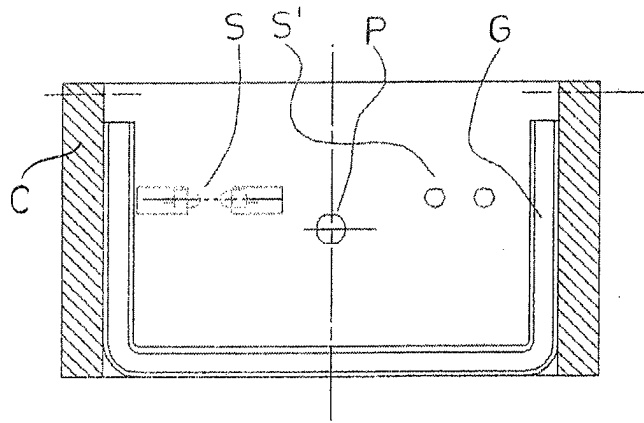


Fig. 3

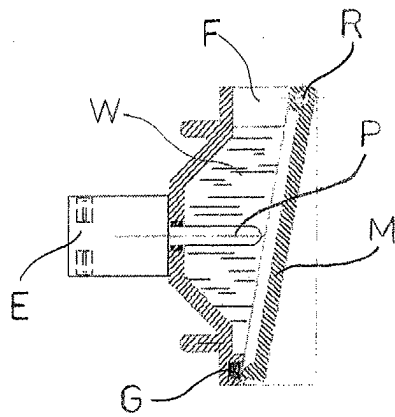


Fig. 4

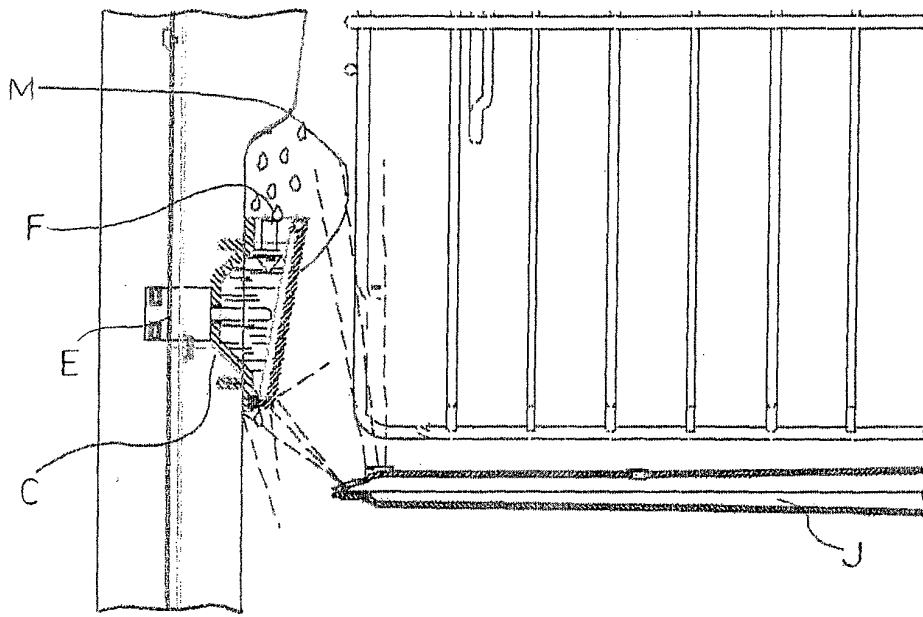


Fig. 5

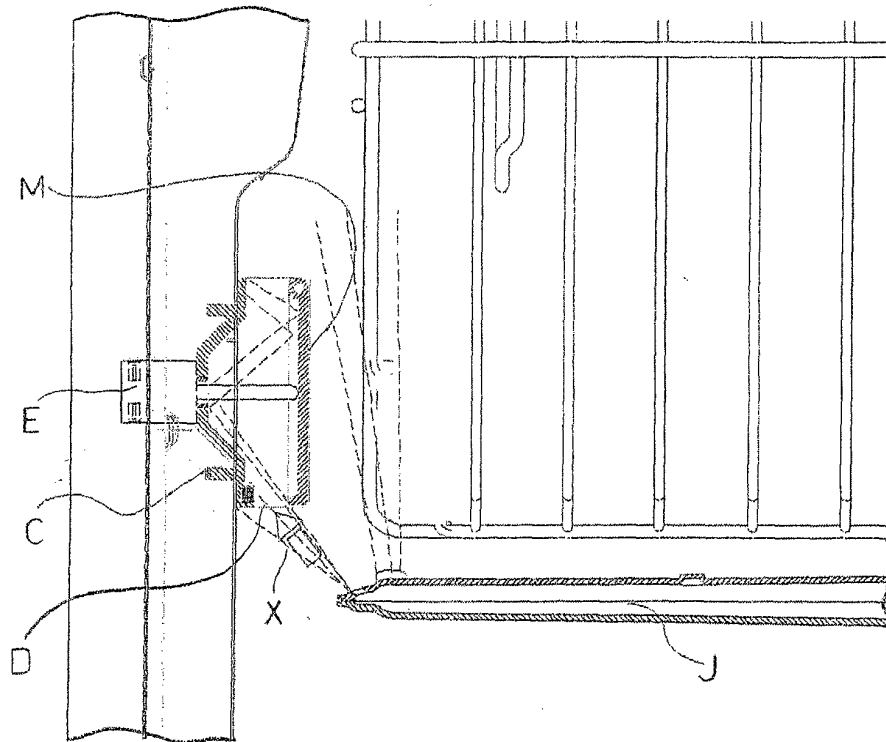


Fig. 6



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 03 42 5179

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Place of search MUNICH		Date of completion of the search 4 September 2003	Examiner Papadimitriou, S
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	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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