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54 Improved dishwasher.

57 A dishwasher (10) comprises a tub (11), containing the dishes to be washed supported on racks, which is provided on the inside with a plurality of water spray nozzles (12) and connected on the bottom to an outlet (29) which can be opened by means of an electrically-controlled switch (18). A dispenser (20) is also provided for dispensing detergent in pre-established quantities in communication with the inside of the tub (11).

Said nozzles (12) are connected to the delivery side of a pump (13) whose suction inlet is connected to electrically-controlled changeover and cut-off devices (14) connecting said inlet alternately to a water pipe (15) drawing water from the bottom of said tub and to a source of water in the form of an electric water heater (17).

The pump (13), the changeover and cut-off devices (14), the dispenser (20) and the electrically-controlled switch (18) are connected to a timer (21) and are actuated sequentially according to a previously programmed cycle.

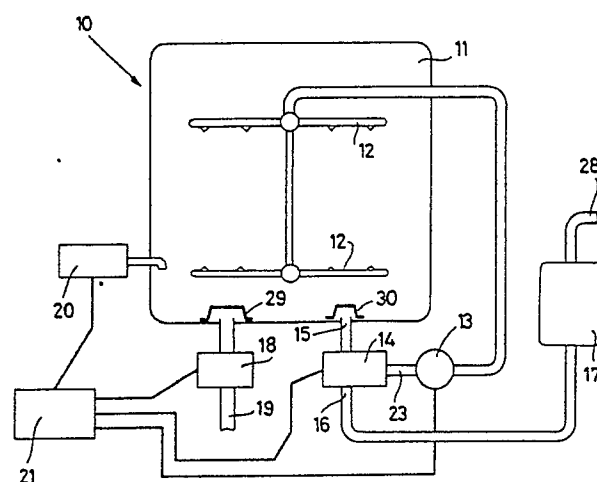


Fig.1

IMPROVED DISHWASHER

This invention refers to an improved dishwasher. There are known dishwashers which economize on water by utilizing recycled water for the wash with detergent. In a second step, clean water is then introduced into the tub to carry out the rinsing. This rinsing water is finally expelled and the next washing cycle for a new load of dishes is started by introducing more clean water into the tub of the dishwasher. This way of proceeding ensures a certain economy in the use of water, especially when compared to the water consumption in machines operating with continuous discharge cycles. The consumption is, however, still considerably high, especially for machines designed for intensive use such as those used in bars and restaurants.

Moreover, for reasons of economy in construction and overall dimensions, the rinsing cycle is usually carried out by introducing water from the mains without using a pump, but simply exploiting the natural pressure of the incoming water; this entails possible irregularities in the rinsing cycle due to the inconstancy of the pressure in the supply network.

The scope of this invention is to obviate the above mentioned problems by providing a dishwasher which is capable of further reducing the consumption of water and which has regular cycles regardless of the pressure in the water supply network.

The aforesaid scope is achieved by providing a dishwasher of the type comprising a tub, containing the dishes to be washed supported on racks, which is provided on the inside with a plurality of water spray nozzles and connected on the bottom to an outlet which can be opened by means of an electrically-controlled switch, and is also provided with a dispenser for dispensing detergent in pre-established quantities in communication with the inside of the tub, characterized by the fact that said nozzles are connected to the delivery side of a pump whose suction inlet is connected to electrically-controlled changeover and cut-off devices connecting said inlet alternately to a water pipe drawing water from the bottom of said tub and to a source of water.

The innovatory principles of this invention and its advantages with respect to the known technique will be more clearly evident from the following description of a possible embodiment applying such principles which is given by way of example, with reference to the accompanying drawings in which:

- figure 1 shows a schematic view of a dishwasher made according to the innovatory principles claimed herein;

- figure 2 shows a schematic phantom view of a valve unit which can be used in the dishwasher shown in figure 1.

With reference to the figures, a dishwasher 10 comprises a tub 11 internally provided with one or more rotating spray arms 12.

Said spray arms 12 are connected to the delivery side of a pump 13, the suction inlet of which is connected to the outlet 23 of a changeover and cut-off unit 14 having a first solenoid valve controlled inlet 15 in communication with the bottom of the tub 11 and a second solenoid valve controlled inlet 16 in communication with the outlet of a storage tank in the form of an electric water heater 17 the inlet of which is connected by means of a pipe 28 to a water supply network (not shown).

Also connected to the bottom of the tub 11 is a solenoid valve controlled discharge outlet 18 leading off into a waste pipe 19 connected to a drainage system of the known type and therefore not shown.

An electrically controlled dispenser 20 (for example, controlled by a solenoid valve or a small pump) containing detergent is disposed so that each time it is actuated it introduces a pre-established quantity of detergent into the tub 11.

The solenoid valve controlled discharge outlet 18 and the first solenoid valve controlled inlet 15 of the unit 14 are protected against the entry of foreign substances by filtering means 29, 30 respectively (for example, screens made of metal or other material).

Lastly, a timer 21 (for example, electromechanically-operated) ensures that the washing cycles in the dishwasher are carried out correctly.

The dishwasher obviously comprises other parts (such as, for example, removable racks for the dishes, thermostats, level gauges, drying means, etc.) which, since they are of known technique and consequently easily imaginable by anyone expert in the field, are neither shown nor further described herein.

Although the changeover and cut-off unit 14 may be made by means of a suitable combination of solenoid valves obtained by means of the known technique (as is easily imaginable by anyone expert in the field on the basis of the following descriptions) of the type which, when actuated, opens whenever the pressure in the system substantially drops to zero, it was found to be advantageous to use an integrated device as more clearly illustrated in the schematic phantom view shown in figure 2.

As can be seen in said figure, the unit 14

comprises an airtight housing 22 containing the connectors for the inlets 15, 16 and the outlet 23 mentioned previously. Disposed inside the housing 22, in correspondence with the two inlets 15 and 16, are normally closed diaphragm valves 24 and 25 respectively, which are made to open by means of solenoids 26 and 27 respectively.

A valve unit as described above thus enables the aperture of the inlets when the pressure substantially drops to zero and is extremely limited in dimensions.

The dishwasher described above operates in the following way.

After the dishes have been placed in the racks appropriately disposed inside the tub 11 and after the timer 21 has been set, the latter starts the washing cycle by opening the inlet 16 of the device 14 and actuating the pump 13 so as to convey hot water from the water heater 17 to the rotary spray arms 12 which, due to the force of the water, start to rotate and spray water inside the tub.

After a pre-established quantity of water has been sprayed, the control device 21 closes the inlet 16 and opens the inlet 15 so that the washing cycle continues with closed-cycle circulation of the water taken from the bottom of the tub and re-expelled by the rotary spray nozzles 12.

The dispenser 20 is simultaneously made to release a quantity of detergent into the tub.

The washing continues for a pre-established period of time, until the beginning of the discharge phase.

As soon as this phase begins the device 14 returns to the rest position, the pump 13 stops operating and the valve 18 opens to discharge the washing water, thereby putting the bottom of the tub in communication with the drainage system until the washing water has been completely drained out.

When the valve 18 re-closes, the control device 21 re-opens the inlet 16 and restarts up the pump 13 so as to send clean water into the tub through the spray nozzles 12. This clean water carries out the phase of rinsing the detergent from the dishes and then remains on the bottom of the tub.

The quantity of clean water used by the dishwasher during the rinsing phase is the same as that which it uses for the washing phase with detergent.

Thus, at the start of the next washing cycle with a new load of dishes, the timer 21 does not take water from the water heater but actuates the detergent dispenser and starts up the cycle for recirculating the water directly through the pump 13 and the inlet 15 of the device 14. On completion of the new washing cycle, the discharge and rinsing phases are carried out in the same way as described above, and so on, always using the

rinsing water for the subsequent washing phase, with an obvious economy in the consumption of water, which is thereby reduced to half.

Moreover, by using the rinsing water (containing, therefore, a certain amount of residual detergent) it is possible to use less detergent, since it is only necessary to integrate that part of it expelled with the water discharged during the previous cycle.

In addition to the advantages of saving a considerable amount of water and a certain amount of detergent, there is the added advantage that the washing phase with detergent and the rinsing phase are both carried out by means of a pump and, therefore, with constant pressure, regardless of the pressure of the water supply network and of the delivery of the latter, due to the presence of the water heater which acts as a pressure tank between the network and the tub.

The use of the changeover and cut-off unit described in figure 2, in place of combinations of valves of known technique, offers the further advantage of being able to limit the dimensions of the unit 14 so as to obtain, together with the presence of only one pump for circulation of the washing and rinsing water, a machine of very limited dimensions in relation to its capacity of dishes.

The water heater can be advantageously arranged with one non-insulated wall in contact with the bottom of the tub, so as to also keep the water on the bottom of the tub warm by conduction.

The foregoing description of a dishwasher and of a washing cycle related thereto has obviously been given by way of example in order to illustrate the innovatory principles claimed herein and should not therefore be considered as a limitation thereto.

For example, instead of being introduced directly into the tub, the detergent can be introduced at any point whatsoever of the flow of water entering the tub, in particular in the device 14. Moreover, the drainage system downstream to the valve 18 can, for example, comprise a pump in order to drain the water from the tub more easily. Lastly, aspersion of the water inside the tub can be achieved according to any other known technique whatsoever and not necessarily by means of rotating nozzles.

Claims

1. Dishwasher of the type comprising a tub, containing the dishes to be washed supported on racks, which is provided on the inside with a plurality of water spray nozzles and connected on the bottom to an outlet which can be opened by means of an electrically-controlled switch, and is also provided with a dispenser for dispensing detergent in

pre-established quantities in communication with the inside of the tub, characterized by the fact that said nozzles are connected to the delivery side of a pump whose suction inlet is connected to electrically-controlled changeover and cut-off devices connecting said inlet alternately to a water pipe drawing water from the bottom of said tub and to a source of water.

2. Dishwasher as claimed in Claim 1, characterized by the fact that said source comprises a storage tank in the form of an electric water heater.

3. Dishwasher as claimed in Claim 1, characterized by the fact that said outlet, said dispenser, said pump and said changeover and cut-off devices are connected to a timer device actuating in sequence, in a washing cycle: said pump to feed the nozzles and pre-arrangement of the changeover and cut-off devices for connection of the pump inlet to the water pipe on the bottom of the tub with simultaneous emission of a pre-established quantity of detergent in the flow of circulating water, in order to obtain a washing phase with detergent for a pre-set length of time with a closed-cycle circulation of water inside the tub; said electrically-controlled outlet, until all the water has been drained from the inside of the tub; said pump to feed the nozzles and pre-arrangement of the changeover and cut-off devices for connection of the pump inlet to the source of water for emission of a pre-established quantity of water from said nozzles for a rinsing phase with the outlet closed, so as to provide a subsequent supply of water on the bottom of the tub for the next new washing cycle.

4. Dishwasher as claimed in Claim 3, characterized by the fact that said timer can be actuated to enable the pump and the changeover and cut-off devices to withdraw an established quantity of water from said source to be sprayed from the nozzles, before the start-up of the washing cycle, so as to provide a subsequent supply of water on the bottom of the tub for the next washing cycle.

5. Dishwasher as claimed in Claim 1, characterized by the fact that said changeover and cut-off devices are made in the form of a watertight housing containing two inlet connectors for said connection to the source of water and to the pipe at the bottom of the tub, and an outlet connector for said connection to the inlet of the pump, diaphragm type cut-off valves, which are normally closed and made to open by means of solenoids connected to said timer, being disposed in correspondence with the two inlets.

6. Dishwasher as claimed in Claim 1, characterized by the fact that the nozzles are supported by arms which are made to rotate by the action of the water expelled therefrom.

7. Dishwasher as claimed in claim 1, character-

ized by the fact that the water outlet and inlet on the bottom of the tub are protected by filter means against the entry of foreign substances.

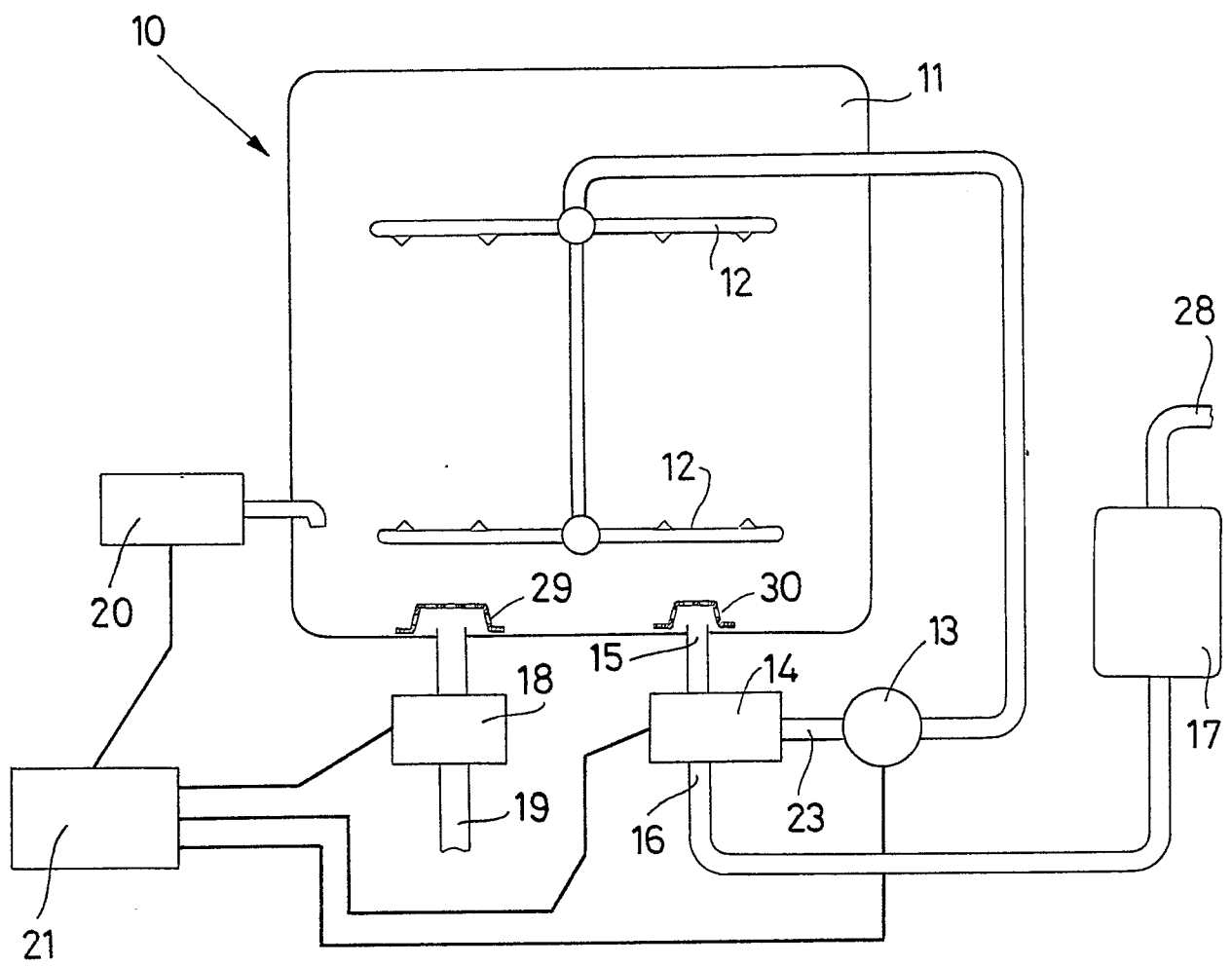


Fig.1

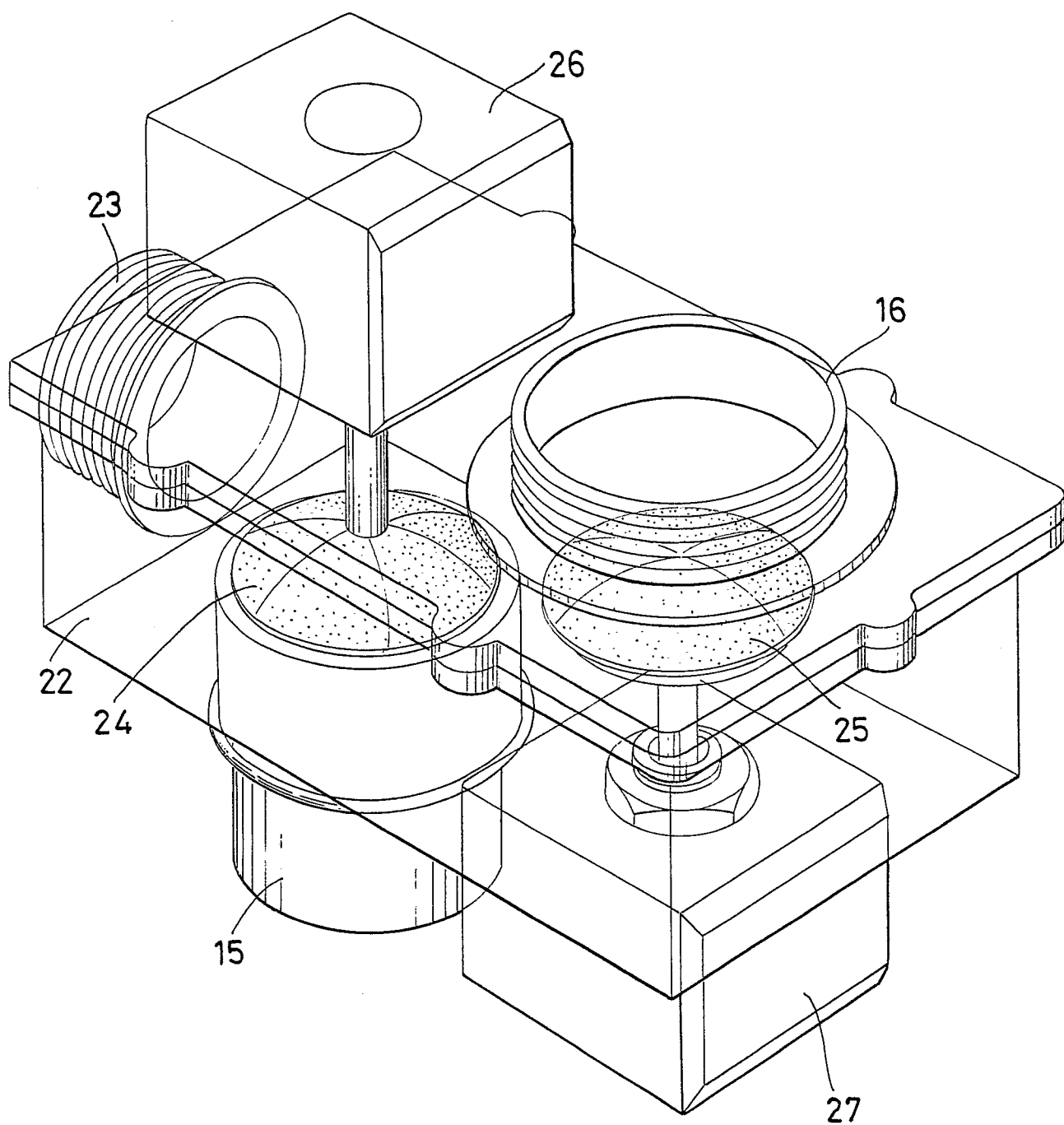


Fig.2



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	EP-A-0156161 (DAIKIN INDUSTRIES LTD.) * the whole document * ---	1-5	A47L15/46 A47L15/42
X	US-A-3083717 (BEAR) * the whole document * ---	1-5	
X	FR-A-1384930 (KITCHEN MACHINES HOLDING AG) * the whole document * -----	1-4	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			A47L
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 16 FEBRUARY 1990	Examiner SCHARTZ J.
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			