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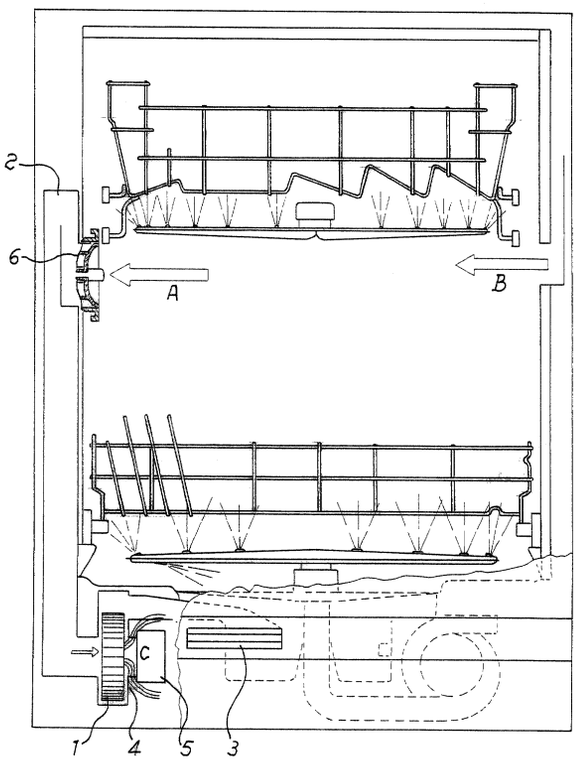
(54) Dishwasher with adjustable drying cycle

(57) A dishwasher includes a fan (1) which takes moist air out of the tank through a removal duct (2) and mixes it with dry ambient air taken in through an opening (4) before discharging it through an outlet (3), and it further includes an adjustment device which allows the user to adjust the taking out of moist air through the duct (2) and/or the intake of dry air through the opening (4) so as to change the strength and/or duration of the drying cycle.

Fig.1



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Description

[0001] The present invention relates to dishwashing machines, and in particular to a dishwasher provided with a device which allows the user to adjust the drying cycle.

[0002] It is known that there are dishwashers wherein the final drying at the end of the washing cycle is carried out by forced ventilation, i.e. by taking out moist air from inside the tank and mixing it with dry ambient air before discharging it from the machine, usually at the lower frontal area.

[0003] The mixing with ambient air is necessary in order to reduce the humidity percentage of the air coming from the tank, so as to prevent the formation of condensate on the discharge outlet or on the adjacent areas. The moist air taken out of the tank is replaced by dry ambient air, until a complete drying of the dishes in the tank is achieved.

[0004] In order to keep almost constant the humidity percentage of the air discharged through the outlet, the mixing is carried out with progressively decreasing proportions. In fact, at the beginning a lot of dry air is required to reduce the humidity percentage of the air taken from the tank, while as the cycle goes on said air is less and less moist and therefore the amount of dry air to be mixed therewith also decreases. This automatic adjustment is performed by electromechanical mechanisms which progressively reduce the intake cross-section of the dry air and/or of the moist air.

[0005] In the above-mentioned type of conventional dishwashers the user has only an indirect control over the drying cycle, in that he can set a washing cycle with a temperature of the final rinsing which is more or less high. If the user selects a "saving" program with a temperature lower than usual this implies extending the drying time, since the amount of water at saturation contained in the air is obviously proportional to its temperature. As a consequence, in order to remove the same amount of humidity from the tank it is necessary to take out a greater volume of air and thus keep the fan running for a longer time.

[0006] Moreover, the user can not select the intensity and/or duration of the drying cycle according to the need, i.e. he must stick to the average drying cycle set at the factory on the basis of standard tests.

[0007] Therefore the object of the present invention is to provide a dishwasher which overcomes the above-mentioned drawbacks:

[0008] This object is achieved by means of a dishwasher provided with one or more devices suitable to allow the user an adjustment of the drying cycle. Other advantageous features are disclosed in the dependent claims.

[0009] The fundamental advantage of the dishwasher according to the invention is exactly the freedom of choice given to the user, who can decide to use a drying cycle which is more or less long and/or strong independently of the selected washing cycle.

[0010] A further advantage of this dishwasher comes from the structural simplicity of the above-mentioned devices which positively affects the ease of use and the manufacturing costs.

[0011] These and other 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 two embodiments thereof, with reference to the annexed drawings wherein:

Fig.1 is a diagrammatic front see-through view of a first embodiment of the present dishwasher with a manual adjustment device;

Fig.2 is an enlarged vertical sectional view along the line II-II of fig.3a of the adjustment device illustrated in fig.1;

Figs.3a, 3b and 3c are diagrammatic front views of the above-mentioned device illustrated in different adjustment positions; and

Fig.4 is a diagrammatic lateral see-through view of a second embodiment of the dishwasher with an electromechanical adjustment device.

[0012] With reference to fig.1, there is seen that the dishwasher according to the invention includes a conventional centrifugal fan 1 which takes the moist air out of the tank (flow A) through a duct 2 and mixes it with dry air (flow C) coming from the space below the tank before discharging it through an outlet 3. The intake of dry air takes place through an opening 4 arranged on the side of the fan motor 5, i.e. on the side opposite with respect to duct 2, and the mixing occurs within the fan itself. The moist air removed from the tank is replaced by dry air coming from outside (flow B) through an opening opposite the removal opening.

[0013] The novel aspect of the present invention is a chokable grid arranged at the mouth 6 of the removal duct 2. An example of such a grid is illustrated in detail in figures 2 and 3a-3c.

[0014] As clearly shown in said figures, grid 7 has a central hub 8 on which there are rotatably mounted a plurality of opposite pairs of sectors 9, three in this case, which can be overlapped and are mutually connected so as to allow their dragging through a single control. In other words, the outermost pair of sectors has a central knob 10 by rotating which in the clockwise direction it is possible to go from the configuration of maximum opening of fig.3a (the passage area corresponding to the hatched surface), to the intermediate configuration of fig.3b and then to the configuration of minimum opening of fig.3c.

[0015] In practice, if the user leaves the sectors overlapped as in fig.3a he obtains an area for removing the moist air which is about twice the area obtained when the sectors 9 are completely extended as in fig.3c. This means that the amount of moist air mixed with dry air will be greatest in the first case and smallest in the sec-

ond case, therefore corresponding respectively to a maximum and minimum strength of the drying cycle. In this way the user may accept a greater introduction of humidity in the environment in order to have drier dishes or vice versa he can limit the introduction of humidity in the environment to the detriment of a perfect drying.

[0016] It is obvious that the grid with the overlapping sectors 9 is just an example of a possible device for choking opening 6, said device being possibly made in several other equivalent ways such as with a horizontal or vertical shutter, or a radial diaphragm and the like.

[0017] An electromechanical adjustment can be achieved through the device illustrated in the second embodiment of fig.4. In this case, opening 4 of fan 1 is choked by a gate 11 (in broken line in the open position) mobile under the action of a thermoactuator 12.

[0018] When the user decides to increase the drying strength, by pushing a relevant button on the control panel, gate 11 is closed since the beginning of the drying cycle thus maximizing the amount of vapour emitted for each volume of discharged air. If the dishwasher is only provided with an electromechanical timer a stronger drying will thus be obtained as in the previous embodiment, but if it is provided with an electronic timer it is also possible to combine said maximum strength adjustment with a shortening of the drying cycle. The various possible combinations of strength/duration may be preset according to factory tests and managed by the control unit of the machine.

[0019] Thermoactuator 12 is particularly advantageous from an economical point of view, in that it is a cheap component and can be electrically connected in parallel with motor 5 without requiring an additional output on the timer. However, also in this case, gate 11 and thermoactuator 12 are just examples of a possible device for choking opening 4, whose passage area can also be adjusted with mechanisms using shutters, valves, cocks, etc.

[0020] Furthermore, a second gate could be provided on duct 2 to adjust the flow of moist air so as to achieve a more precise mixing of the discharged air, possibly in combination with the above-mentioned gate 11.

[0021] In a more sophisticated embodiment (not illustrated in the figures), the adjustment device could also include a humidity sensor which detects the humidity percentage of the air discharged through outlet 3 (flow D) and transmits said information to the control unit. In this way, the user can set a desired value of the humidity percentage of the discharged air and the opening of gate 11 will be automatically adjusted to keep said set value. Moreover, the drying cycle can end when the humidity sensor detects that the discharged air has reached a humidity percentage lower than a limit value, roughly corresponding to the percentage of the ambient air. In this way the duration of the cycle is always the minimum required to achieve a complete drying, regardless of the setting performed by the user.

[0022] It is clear that the above-described and illustrated embodiments of the dishwasher according to the invention are just examples susceptible of various modifications. In particular, in addition to the possible equivalents cited above, the manual adjustment may be combined with the electromechanical adjustment so as to further increase the adjustment possibilities available to the user.

Claims

1. A dishwasher including a fan (1) which takes moist air out of the tank through a removal duct (2) and mixes it with dry ambient air taken in through an opening (4) before discharging it through an outlet (3), characterized in that it further includes means suitable to allow the user to adjust the taking out of moist air through said duct (2) and/or the intake of dry air through said opening (4).

2. A dishwasher according to claim 1, characterized in that a means for adjusting the taking out of moist air is a chokable grid (7) arranged at the mouth (6) of the removal duct (2).

3. A dishwasher according to claim 2, characterized in that said grid (7) has a central hub (8) on which there are rotatably mounted a plurality of opposite pairs of sectors (9) which can be overlapped and are mutually connected so as to allow their dragging through a single control.

4. A dishwasher according to claim 3, characterized in that said single control is a central knob (10) integral with the outermost pair of sectors (9).

5. A dishwasher according to one or more of the preceding claims, characterized in that a means for adjusting the taking out of moist air is a gate suitable to choke the removal duct (2) under the action of an actuator.

6. A dishwasher according to one or more of the preceding claims, characterized in that a means for adjusting the intake of dry air is a gate (11) suitable to choke the opening (4) under the action of an actuator.

7. A dishwasher according to claim 5 or 6, characterized in that the actuator is a thermoactuator (12).

8. A dishwasher according to claim 7, characterized in that the thermoactuator (12) is electrically connected in parallel with the motor (5) of the fan (1).

9. A dishwasher according to one or more of the preceding claims, characterized in that it further includes a humidity sensor which detects the humidity

percentage of the air discharged through the outlet (3) and transmits said information to the control unit of the machine, to which control unit there are operatively connected the fan (1) and the mechanisms for adjusting the flow rate of the moist air and/or of the dry air.

Fig.1

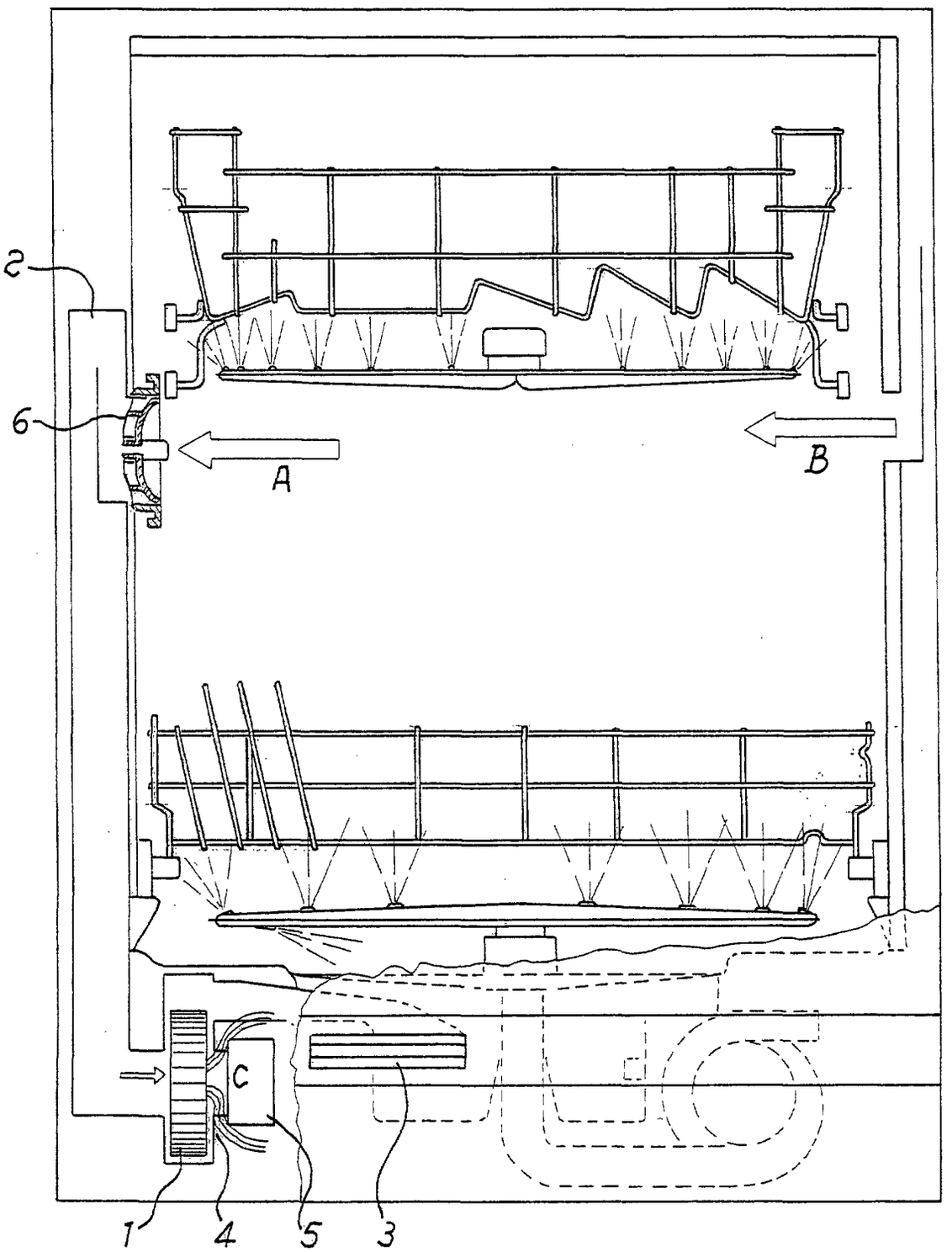

Fig. 3a

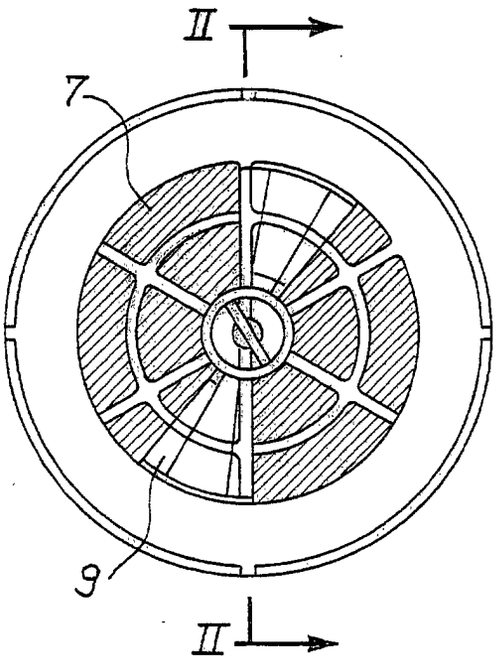

Fig. 2

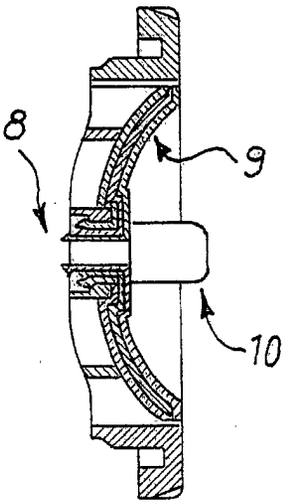

Fig. 3b

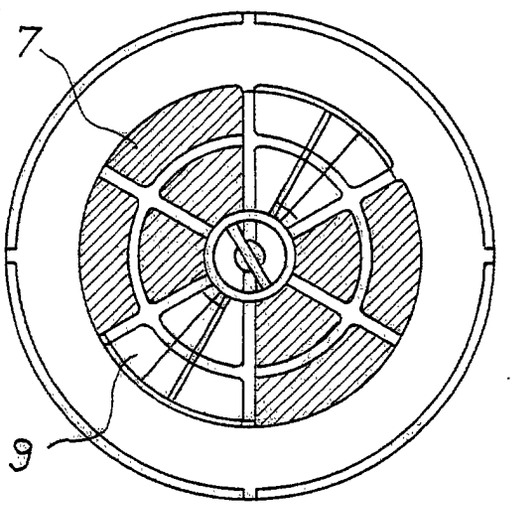

Fig. 3c

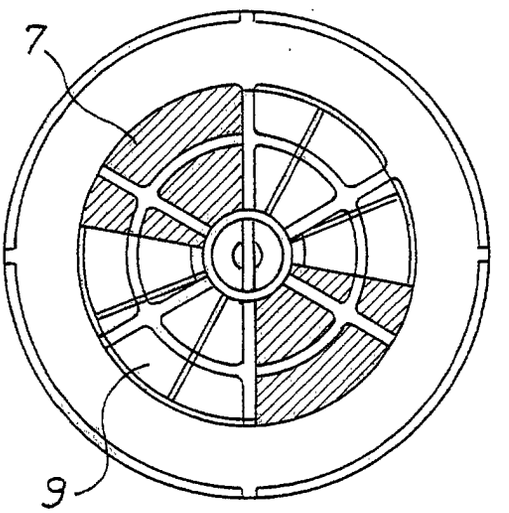

Fig.4