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29A3B

(56) Documents cited
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A4F
Selected US specifications from IPC sub-classes A47L
B08B

(54) **Dishwasher**

(57) A dishwasher (10) comprises a washing chamber (20) including a rotatable rack (23, 24) for receiving utensils to be washed, nozzles (26A, 26B) for spraying water at the utensils in the rack, so as to rotate the rack and wash the utensils, nozzles (25A, 25B) for spraying water onto the utensils, and a blower (38) for blowing air at ambient temperature onto the washed utensils to dry them. Wash water may be heated in unit 31 by a gas heater and stored in reservoir 32, and its temperature may be regulated by a thermostat. Pump 37 may be used to pump detergent from reservoir 15 into the wash water pumped into the wash chamber by pump 36. The operation of the pumps and blower may be automatically controlled by controller 39.

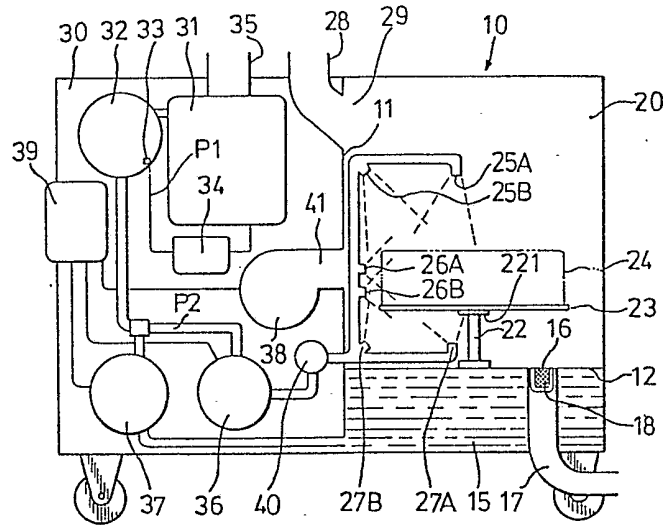


FIG.1

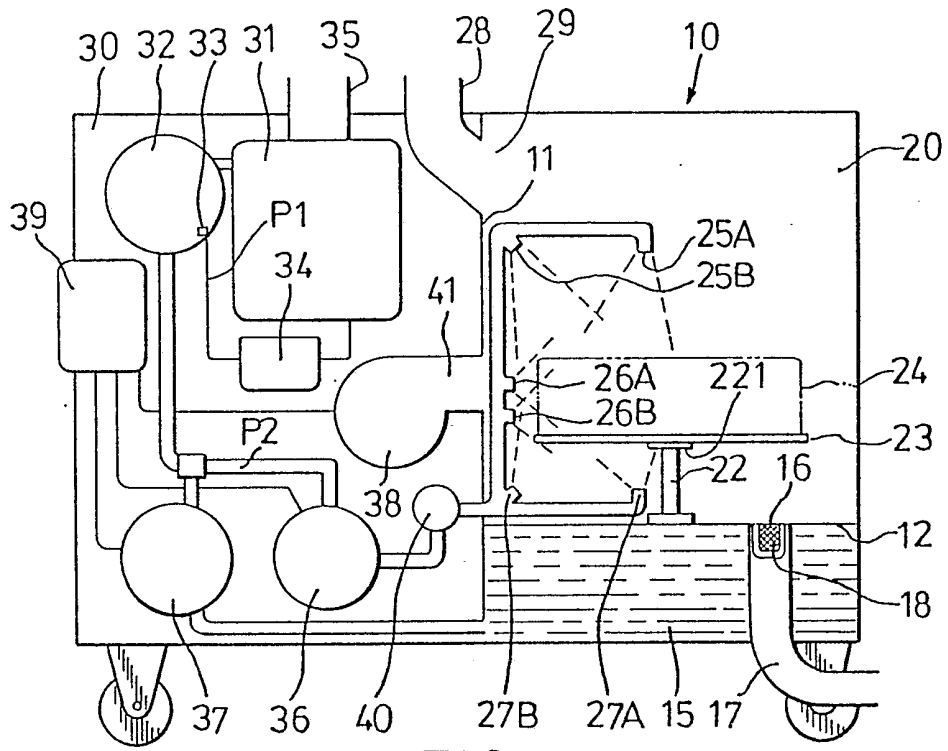


FIG. 1

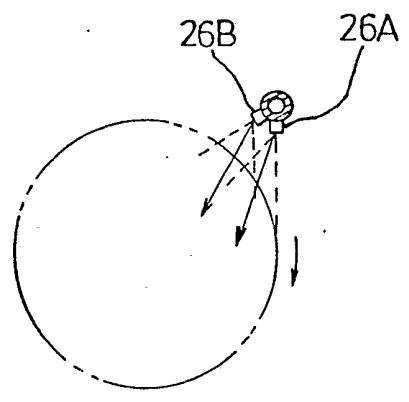


FIG. 3

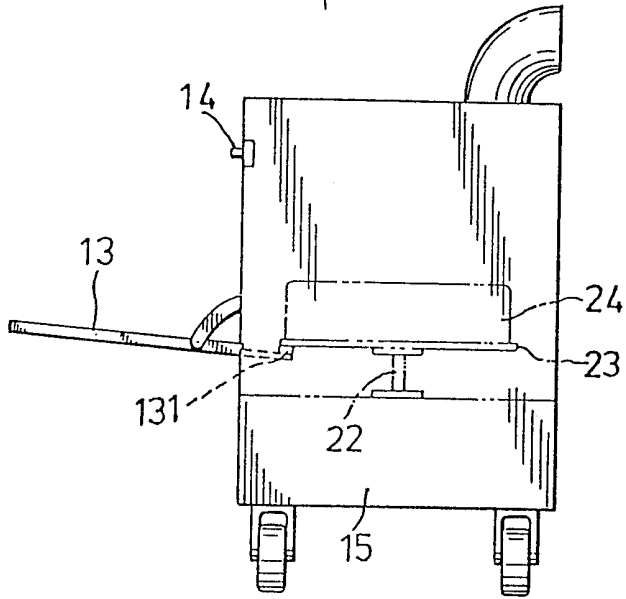


FIG. 2

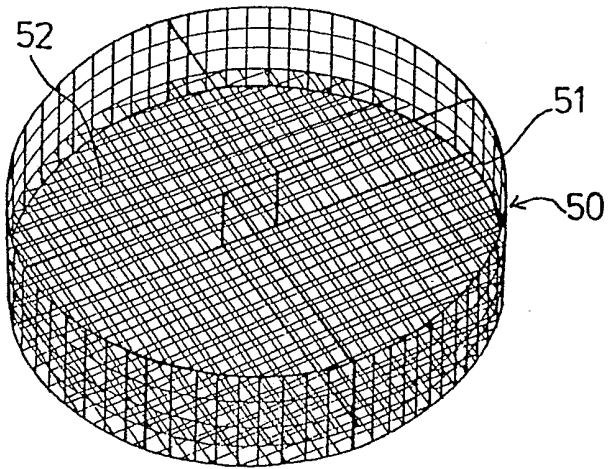


FIG. 4

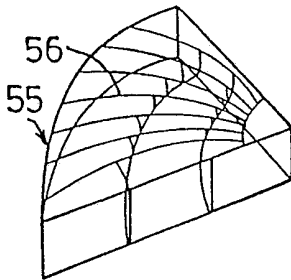


FIG. 5

SPECIFICATION

Dishwasher

5 This invention relates to a dishwasher for simultaneously washing various eating and cooking utensils, dishes, cutlery, pots and pans, and particularly to a dishwasher for washing numerous eating utensils rapidly and effectively and for drying them rapidly to a normal temperature after washing.

10 There is at present a preferred type of known dishwasher for simultaneously washing numerous eating utensils. This type of known dishwasher includes a rotatable rack which is provided with a utensil-receiving portion at an upper end thereof and a vane wheel at a lower portion thereof. A first water spray nozzle is directed at the vane wheel so as to rotate the rack, and a second water spray nozzle is disposed above the rack for spraying water to wash the eating utensils on the rack. A conduit connects the first nozzle and the second nozzle for delivering the water to be sprayed, and a two-way valve is provided in the conduit for controlling the quantity of water fed to the first nozzle and to the second nozzle.

25 Since the water to the first nozzle and the second nozzle is supplied from the same conduit via the two-way valve, if the water supplied to the second nozzle is less than that supplied to the first nozzle the washing effect is poor, whereas if the water supplied to the first nozzle is less than that supplied to the second nozzle the speed of rotation of the rack is slow, which also lowers the quality of the wash. After the utensils have been cleaned, common known dishwashers dry the utensils by a heating arrangement so that hot air increases the temperature of the dishes, with the result that the dishes which have just been cleaned cannot be used immediately.

40 An object of the present invention is to provide a dishwasher for washing tableware and pots and pans rapidly and effectively, and for drying the utensils to a normal temperature, so that after they have been cleaned they can be used immediately.

45 According to the invention, there is provided a dishwasher for washing utensils comprising a washing chamber; a rack mounted rotatably within the washing chamber for receiving the utensils; a water feeding unit; first water spraying means, connected to the water feeding unit, including a first spray nozzle level with the rack for spraying water directly on the utensils so as to rotate the rack and wash the utensils simultaneously; second water spraying means connected to the water feeding unit, including a second spray nozzle for spraying water directly on the utensils to wash them; and a drying unit including a blower for blowing air on the utensils at a normal temperature to dry the utensils after they have been cleaned.

60 An embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings, wherein:

Figure 1 is a schematic cross-sectional view of a dishwasher according to the invention;

65 *Figure 2* is a schematic side elevation of the dishwasher of *Figure 1*;

Figure 3 is a schematic view showing the operation of a first water spraying unit with respect to a circular rotary plate in a washing chamber of the dishwasher of *Figure 1*;

70 *Figure 4* is a perspective view showing a basket for receiving utensils in the dishwasher of *Figure 1*; and

Figure 5 is a perspective view showing an inner basket adapted to nest in the basket of *Figure 4*.

75 Referring to *Figure 1*, the interior of a dishwasher 10 according to the invention is divided by a vertical partition 11 and a horizontal partition 12 into a detergent reservoir 15 below the horizontal partition 12, a washing chamber 20 above the horizontal partition 12, and a mechanical chamber 30.

80 Within the mechanical chamber 30 there is a feed water heating unit 31 comprising a gas heater (not shown) and an exhaust outlet 35 communicating with the exterior of the dishwasher 10. A hot water reservoir 32 communicates with the heating unit 31, via a first conduit P1, for receiving hot water from the unit. A thermostat for measuring and maintaining the water temperature in the heating unit 31 at a desired temperature range of around 80°C-90°C includes a temperature sensor 33 disposed within the water reservoir 32 and a hot water controller 34 disposed on the first conduit P1 between the water reservoir 32 and the heating unit 31. The controller 35 is responsive to the temperature sensor 33, when the temperature falls below 70°C, to output a signal to an ignition system (not shown) in the gas heater of the heating unit. A first pump 36 is disposed between the water reservoir 32 and the washing chamber 20 for pumping water from the water reservoir 32 to three water spraying units in the washing chamber 30. A second pump 37 is disposed between the detergent reservoir 15 and a second conduit P2 which is disposed between the water reservoir 32 and the first pump 36. The pump 37 pumps detergent from the detergent reservoir 15 to become entrained in the water in the conduit P2. A blower 38 can be activated to blow air into the washing chamber 20 at a normal (e.g. room) temperature through an orifice 41 in the vertical partition 11. An automatic electric controller 39 includes a timing device (not shown) for remote control of the first pump 36, the second pump 37 and the blower 38. A check valve 40 is disposed between the first pump 36 and the two water spraying units for preventing the water from flowing in the reverse direction (i.e. away from the washing chamber).

115 Within the washing chamber 20, there is a vertical support rod 22 having a hub 221 at its upper end, the rod being fixed at its lower end to the centre of the transverse partition 12. A circular rotary plate 23 having a grid structure is centrally disposed rotatably on the upper end of the support rod 22 above the hub 221. A basket 24 of net structure is disposed detachably on the circular rotary plate 23 for receiving eating utensils (not shown). A first water spraying unit includes two first spray nozzles 26A and 26B, the nozzle 26A being above the nozzle 26B. Each of the nozzles is directed towards the basket 24 in a direction inclined relative to the centre of the circular rotary plate 23, the upper nozzle 26A being inclined at a greater angle than the nozzle 26B. Both nozzles are so directed as to rotate the basket

24, and hence the circular rotary plate 23, in a clockwise direction as shown in Figure 3. A second water spraying unit includes two second spray nozzles 25A and 25B above the basket 24, both of which are inclined at an angle of around fifteen degrees relative to a vertical plane to spray water over a sector, for example a semicircular region, of the plate 23. A third water spraying unit includes two third spray nozzles 27A and 27B, each of which is disposed below the plate 23, opposite the second injection nozzles 25A and 25B respectively. An orifice 41 is provided, level with the basket 24 and adjacent the first injection nozzles 26A and 26B, for directly blowing air at a normal temperature on to eating utensils received within the basket 24 in a direction inclined relative to the centre of the circular rotary plate 23 and towards the opposite side of the centre to the nozzles 26A and 26B, so as to rotate the basket 24, and hence the rotary plate 23, in a counterclockwise direction. An exhaust opening 29 is provided in the vertical partition 11 and is connected to a second exhaust outlet 28. A drain opening 16 with a filter 18 is provided in the horizontal partition 12 and is connected to a drain pipe 17.

Referring to Figure 2, the outside wall of the washing chamber 20 is provided with an opening for receiving the basket and the eating utensils and a hinged door 13 which is mounted for sealably covering the opening. The door is provided with a brake shoe 131 at its lower edge for making contact with the underside of the plate 23 when the door is pivoted to a horizontal position, resulting in stopping of the rotation of the plate 23 so as to provide a safety function. A microswitch 14, connected to the automatic electric controller 39 (Figure 1), causes the controller to switch off when the door 13 is opened, so as to stop the action of the first pump 36, the second pump 37 and the blower 38, thereby providing a further safety function.

Referring to Figure 4, one suitable form for the basket 24 is shown. The basket is divided by three grid partitions 51 into four receiving regions 52. It should be understood that the form may be varied depending on the utensils to be washed. Depending on the form of the basket 24, several inner baskets of suitable shapes are provided. For example, an inner basket 55 shaped in the form of a quarter of a circle as shown in Figure 5 is provided with a plurality of radial strips 56 for inserting respective eating utensils therebetween. The shape of the inner basket 55 may be also modified as required.

With the arrangement of the three water spraying units, momentum is produced in operation, so that all of the surfaces of the dirty utensils are sprayed completely so that they become clean. As the blower 38 and the first nozzles 26a and 26B rotate the basket 24 and the rotary plate 23 in opposite directions, the effect of washing and drying the cleaned eating utensils is superior. Furthermore, since the blower 38 blows air at a normal temperature (e.g. at room temperature) the cleaned utensils can be used immediately after washing and drying.

In order to sterilise the eating utensils, an ultraviolet ray device (not shown) is disposed within

the washing chamber 20.

In use, when the dirty utensils have been placed in the basket 24 on the rotary plate 23, the door 13 must be closed. The automatic electric controller 39 is then switched on, so that the second pump 37 pumps detergent from the detergent reservoir 15 for entrainment in the water in the pipe P2. Simultaneously the first pump 36 pumps the water in the pipe P2 to the nozzles 25A, 25B, 26A, 26B, 27A and 27B which spray the mixture of hot water and detergent to clean the utensils and to rotate the basket 24 in a clockwise direction. After about ten seconds, the timing of which is controlled by a timing device in the controller 39, the second pump 37 no longer pumps detergent, so the nozzles spray only hot water to wash the utensils. After about thirty seconds, also controlled by the timing device, pumping of the water by the first pump 36 is arrested, so that no more water is sprayed on the utensils. The blower 38 then starts to blow air on the utensils for decelerating the rotation of the circular plate 23, until the plate starts to rotate in a counterclockwise direction. The vapour within the washing chamber 20 is released through the exhaust outlet 28 and the water from the eating utensils is drained off through the drain opening 16. After around thirty seconds, also controlled by the timing device, operation of the blower 38 is terminated. During the blowing of air on the dishes, the ultraviolet ray device operates to sterilise the dishes. Finally, the user may open the door 13, which causes rotation of the plate 23 to be arrested by the brake shoe 131. The user may then take the eating utensils out of the dishwasher.

The dishwasher of this invention washes and dries dishes quickly and effectively, and so is convenient for use in the kitchen.

CLAIMS

1. A dishwasher for washing utensils comprising a washing chamber; a rack mounted rotatably within the washing chamber for receiving the utensils; a water feeding unit, first water spraying means, connected to the water feeding unit, including a first spray nozzle level with the rack for spraying water directly on the utensils so as to rotate the rack and wash the utensils simultaneously; second water spraying means connected to the water feeding unit, including a second spray nozzle for spraying water directly on the utensils to wash them; and a drying unit including a blower for blowing air on the utensils at a normal temperature to dry the utensils after they have been cleaned.
2. A dishwasher as claimed in claim 1, further comprising a detergent reservoir communicating with the first water spraying means and the second water spraying means so as to entrain detergent from the reservoir in the water to be sprayed.
3. A dishwasher as claimed in claim 1 or claim 2, further comprising a basket disposed detachably on the rack for receiving the utensils.
4. A dishwasher as claimed in any preceding claim, wherein the rack comprises support means fixed within the washing chamber and having a hub

at its upper end, and a circular plate mounted rotatably on the support means by the hub.

5. A dishwasher as claimed in claim 4, wherein the first spray nozzle sprays water on the utensils in a direction inclined relative to the centre of the circular plate and to one side of the centre of the plate for rotating the plate.

6. A dishwasher as claimed in claim 4 or claim 5, wherein the second spray nozzle is disposed above the rack and sprays water over a sector of the rotary circular plate.

7. A dishwasher as claimed in claim 4, claim 5 or claim 6, further comprising third water spraying means including a third spray nozzle connected to the water feeding unit and disposed below the circular plate and opposite the second spray nozzle.

8. A dishwasher as claimed in claim 5, wherein the blower outlet of the drying unit is disposed adjacent the first spray nozzle and blows air on the utensils in a direction inclined relative to the centre of the circular plate and along the side of the centre opposite to the direction of spraying of the first spray nozzle, for drying the utensils and for rotating the circular plate in a direction opposite to that caused by the first spray nozzle.

9. A dishwasher as claimed in any preceding claim, further comprising a thermostat for controlling the temperature of the water in the water feeding unit.

10. A dishwasher as claimed in any preceding claim, further comprising an ultraviolet ray device disposed within the washing chamber for sterilising the cleaned utensils.

11. A dishwasher as claimed in any preceding claim, wherein the water feeding unit comprises piping for guiding water to the first and second spray nozzles; a pump for pumping the water through the piping; and a check valve disposed between the pump and the water spray nozzles for preventing water carried by the piping from flowing in a reverse direction.

12. A dishwasher as claimed in claim 11, further comprising an automatic electric control unit for controlling the pump and the blower.

13. A dishwasher as claimed in any preceding claim, wherein the washing chamber includes an opening adjacent the rack and a hinged door for sealably covering the opening, the door having means for arresting rotation of the rack when the door is opened.

14. A dishwasher substantially as hereinbefore described with reference to the accompanying drawings.