A washing apparatus such as a dishwasher having an auxiliary distributor for separately treating certain elements to be washed such as silverware. The auxiliary distributor may comprise a thermal pump which not only effects delivery of the washing liquid onto the silverware, but also effects a heating of the washing liquid for improved washing action. The auxiliary heater is coordinated with the main heater for improved overall dishwashing action in the apparatus.

17 Claims, 7 Drawing Figures
1. Field of the Invention
This invention relates to washing apparatus, and in particular, to dishwashing apparatus.

2. Description of the Prior Art
In the conventional dishwasher, dishes to be washed are placed in a dishwashing rack and are subjected to a spray of hot dishwashing liquid conventionally by means of a rotating spray arm. The dishwashing liquid may include hot rinse water, hot washing liquid having detergent or soap dissolved therein, and final rinse water having antispotting rinse additive therein. It is found conventional in the known dishwashers to provide a heating element for drying the dishes upon completion of the washing operation. The heating element is conventionally disposed in the sump of the dishwasher tub and further serves to heat the water for improved sanitary washing of the dishes.

Still further, conventionally, means are provided in such dishwashers for holding silverware and the like separate from other dishes. In one form of known dishwasher, as illustrated in U.S. Pat. No. 3,288,155 of Norman T. Swetnam, a separate spray arm is provided subjacent the silverware holder for providing an auxiliary spraying of the silverware.

As shown in the Swetnam patent, it is conventional to provide the necessary pressure head to effect the spraying of the washing liquid by means of an impellor driven by an electric motor. In another form of washing apparatus, as shown in the W. G. Givone U.S. Pat. No. 1,433,546, a clothes washing machine is illustrated as being provided with a percolator-type liquid pump wherein the water in the sump is heated by a subjacent burner and caused to be distributed over the clothes in the manner of a conventional coffee percolator pump system. Thus, in Givone, the entire body of washing liquid is heated to the pumping temperature which may be close to the boiling temperature as the pumping action functions on the basis of slugs of steam being formed in the lower pump chamber, lifting slugs of water upwardly through the pump stem as they rise to the top of the stem. The nearly-boiling water is then caused to flow down over a distributor strainer onto the subjacent clothes to be received in a sump disposed below a permeable support for the clothes, for subsequent repumping.

It is further conventional to carry the silverware in removable baskets mounted on the door of the dishwasher so as to be in the path of the washing liquid sprayed by the spray arm whereby the silverware is washed by a portion of the sprayed dishwashing liquid during the washing of the main body of dishes.

SUMMARY OF THE INVENTION
The present invention comprehends a washing apparatus having improved means for washing an auxiliary group of objects disposed within the washing chamber separately of the main group of objects. More specifically, the invention is adapted for use in a dishwasher for providing improved washing of silverware and the like normally carried separately from the main body of dishes arranged to be washed by the main spray means of the dishwasher.
BRIEF DESCRIPTION OF THE DRAWING

Other features and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawing wherein:

FIG. 1 is a perspective front view of a dishwasher having an improved silverware washing means embodying the invention;

FIG. 2 is a fragmentary vertical section thereof;

FIG. 3 is a fragmentary enlarged vertical section thereof illustrating in greater detail the auxiliary delivery means;

FIG. 4 is a fragmentary enlarged vertical section thereof illustrating in greater detail the thermal pump means;

FIG. 5 is a fragmentary elevation of the silverware basket and washing liquid delivery means;

FIG. 6 is a schematic diagram showing the electrical wiring of the dishwasher; and

FIG. 7 is a schematic diagram showing the electrical wiring of a modified form of such dishwasher.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the exemplary embodiment of the invention as disclosed in the drawing, a washing apparatus generally designated 10 comprising a dishwasher, is shown to include a cabinet 11 provided with a tub 12 defining a forwardly opening washing chamber 13 which is selectively closed by a hingedly mounted front door 14. Tub 12 defines a lowermost sump 15. Dishes are carried in washing space 13 on suitable racks 16 so as to have washing liquid L sprayed thereagainst by a main spray arm 17 and a secondary spray arm 18. Spray arm 17 is rotated by the washing liquid forced upwardly through the spray arm by means of a pump 21 driven by a drive motor 19 disposed below the bottom wall 20 of tub 12.

Door 14 carries a silverware basket 22, a detergent dispenser 23, and a rinse additive dispenser 24. Chamber 13 is vented through the door by means of a vent 25 so as to facilitate drying of the dishes by discharging the humid air in the drying cycle. A suitable timer control 26 is mounted on door 14 for controlling the automatic operation of the dishwasher.

Water is delivered into tub 12 through opening 27 from a supply conduit 27a. A valve 28 is connected between supply conduit 27a and a delivery conduit 29 which is connected to a suitable source (not shown) for controlling delivery of the water into tub 12 under the control of timer control 26.

Motor 19 may comprise a reversible motor whereby forward rotation of pump 21 causes spraying of the washing liquid upwardly through chamber 13. As shown in FIG. 1, spray arm 17 may be provided with a nozzle 30 for directing a jet of washing liquid upwardly to spray arm 18 for operation of spray arm 18 to provide a secondary spray onto the dishes from an upper portion of the washing chamber 13. When motor 19 is operated in a reverse direction, the pump 21 is caused to drain the washing liquid from sump 15 for discharging as desired.

An electric heating element 31 is provided at sump 15 for heating the washing liquid L during the washing cycle. Upon completion of the washing operation, heater 31 may be energized to effect a heated drying of the dishes. A switch 32 is controlled by a float 33 responsive to the level of washing liquid L in sump 15 for controlling operation of the washing apparatus as will be brought out more fully hereinafter. As shown in FIG. 2, a screen 34 may be provided on the bottom wall 20 to filter the washing liquid delivered to the pump 21.

As discussed briefly above, the invention comprehends providing an auxiliary body of washing liquid to the silverware basket 22 in addition to the water spray provided by spray arms 17 and 18 for washing silverware and the like (not shown) disposed therein. As best seen in FIGS. 2 and 4, this auxiliary washing liquid delivery means herein includes a well structure 35 opening to sump 15 for receiving a portion of the washing liquid. A coil heater 36 may be disposed about the lower end 37 of well 35 below a screen 38. A conduit 39 is provided with a lower end 40 extending downwardly through screen 38 into the lower chamber 41 heated by coil heater 36. A baffle plate 42 is mounted on an enlarged lower end 43 of the conduit 39 to restrict upward flow of steam generated in chamber 41 generally into conduit 39. The percolator action is effected causing slugs of steam and hot water to rise through conduit 39. The conduit includes an upper portion 44 carried by door 14 and an outlet 45 having a series of discharge elements 46 adapted to spray the pumped washing liquid downwardly into basket 22, as seen in FIGS. 2, 3, and 5. Energization of coil heater 36 is controlled by timer control 26 to effect the selective pumping of a portion of the dishwashing liquid onto the silverware to provide the desired improved silverware washing action.

Operation of dishwasher 10 may be best seen by reference to the wiring diagram of FIG. 6. Timer control 26 may be connected to a suitable source of power through power supply leads L1 and L2 and may be grounded to the ground connection G. The timer motor 47 is connected from power supply lead L2 through normally closed door switch 48 and normally closed on-off switch 49 to power supply lead L1. A mechanical control knob 50 projecting forwardly from door 14 (see FIG. 2) is mechanically connected to timer motor 47 and switch 49. Control 26 further includes a series of normally closed switches 51, 52, 53, 54, 55, 56 and 57, which are cam operated as a result of operation of timer motor 47 to effect controlled opening thereof in controlling the operation of the dishwasher.

More specifically, switch 51 is connected from switch 49 and in series with the electric heater 31 which illustratively may comprise a rheostat resistance heating element of conventional construction. Switch 52 is connected from switch 49 in series with the solenoid 58 of the water supply valve 28 for controlling delivery of water to the tub as discussed above.

Switch 53 is connected from switch 49 in series with a solenoid 59 for operating the detergent dispenser 23 at the proper time in the washing cycle to effect the desired sequence of rinse and washing operations. Switch 54 is connected from switch 49 through a series connection of float switch 32 and auxiliary coil heater 36 for energizing auxiliary heater 36 only when the level of liquid L in sump 15 is at or above a preselected minimum level so as to prevent operation of heater 36 during a dry condition or low level condition of the dishwasher and thereby prevent burnout of heater 36. It should be understood that float switch 32 is a safety device that might be replaced by a thermostat or thermistor in well 37 to perform the same function. Further, cam operation of switch 54 permits effective energiza-
3,890,987

The invention of heater 36 in conjunction with float switch 32 during preselected times in the operation of the dishwasher so as, for example, to provide a pre-wash operation in connection with the silverware as well as a washing operation during the normal washing operation of the dishwasher.

Switch 55 is connected from switch 49 through a starting relay 60 for controlling operation of motor 19, having a solenoid coil 61 for controlling a normally closed power switch 62. The starter solenoid coil 61 is connected through a run winding 63 of motor 19 and an overload device 64 to power supply lead L2 and the forward and reverse operation of the motor is controlled by the selective closing of either switch 56 or 57 in series with switch 62 and the forward winding 65 or reverse winding 66, respectively, of motor 19 which are connected in parallel with winding 63, as shown in FIG. 6.

Thus, in normal operation, when the user initiates the dishwashing cycle by suitable manipulation of control knob 50, a sequence of operation of cam operated switches 51–57 is effected to provide a sequential series of dishwashing cycles. Depending on the cam controlled timing of the opening of switches 51 and 54, the energization of auxiliary heater 36 may be effected prior to or concurrently with the energization of main heater 31.

As shown in FIG. 7, a modified form of control may be provided wherein the heaters 31 and 36 are connected in series with the float controlled switch 32 so as to permit operation of the two heaters concurrently. In this arrangement, auxiliary heater 36 may comprise a portion of main heater 31 or a separate heater connected electrically in series therewith as desired. Further, a cam operated switch 67 is provided to shunt the float controlled switch 32 and heater 36 during the heated drying of the dishes.

Where it is desired to provide a pre-wash operation with the apparatus as shown in FIG. 6, the heater 36 is preferably a relatively high wattage heater so as to effect rapid heating of the water in chamber 41 for effecting a pumping action in the absence of a heating of the water by heater 31. If desired, the power capacity of heater 36 may be substantially similar to that of heater 31 so that control 26 may be arranged to utilize heater 36 concurrently with the operation of pump 21 but with the main heater 31 de-energized.

Thus, dishwasher 10 provides an improved washing of silverware and the like separately from the main body of dishes. By suitable arrangement of the control, pre-wash of the silverware may be effected. The means for delivering the washing liquid to the silverware provides flexibility in the operation of the dishwasher by effecting separate heating of the portion of water to be delivered to the silverware so that by suitable selection of the control parameters, this auxiliary heating operation may be utilized in a number of different ways as desired. The temperature of the washing liquid delivered to the silverware may be made to be different from that of the main body of washing liquid for improved washing of silverware which has been found to be difficult with conventional dishwashers. Further, as the temperature of the silverware washing liquid may be made to be close to the boiling temperature, improved sterilization thereof may be effectively provided. The silverware treating means of the present invention is extremely simple and economical of construction while yet providing the highly desirable advantages discussed above.

The foregoing disclosure of specific embodiments is illustrative of the broad inventive concepts comprehendend by the invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A washing apparatus comprising: wall means defining a washing chamber having a lower sump; spray means for circulating washing liquid from a main body of washing liquid in said chamber sump against a first and a second group of objects to be washed disposed in said chamber and back to said sump; basket means for holding said second group of objects to be washed separate from said first group; collecting means for collecting a portion of the washing liquid from said sump during the circulation of the washing liquid; heating means for heating the collected portion of the washing liquid to a temperature higher than that of said main body in the chamber sump; and delivery means for delivering said portion of the washing liquid to substantially only said second group of objects in said basket means for high temperature washing of said second group of objects concurrently with the washing thereof by the washing liquid delivered by the spray means.

2. The washing apparatus of claim 1 wherein said wall means includes a movable door, and said basket means is mounted on said door.

3. The washing apparatus of claim 1 wherein said wall means includes a movable door and a sump portion for collecting said main body of washing liquid for recirculation thereof against said first and second group of objects.

4. The washing apparatus of claim 1 including means in said washing chamber for heating said main body of washing liquid.

5. The washing apparatus of claim 1 wherein said delivery means comprises means responsive to the heating of said washing liquid portion to effect the delivery of said portion of said second group of objects.

6. A dishwasher comprising: wall means defining a washing chamber; spray means for directing hot washing liquid in said chamber against dishes to be washed disposed in said chamber; basket means for holding silverware to be washed separate from said dishes; a sump for collecting the dishwashing liquid from said washing chamber to be directed by said spray means against said dishes; and thermally operated pump means for delivering a portion of the dishwashing liquid from said sump to substantially only said silverware in said basket means for washing said silverware, said dishwashing liquid portion being returned to said sump for recirculation by said spray means and said thermally operated pump means.

7. The dishwasher of claim 6 wherein the thermally operated pump means comprises a vapor pump defining a heating chamber communicating with said sump, and heating means for heating dishwashing liquid in said heating chamber and causing delivery of heated dishwashing liquid therefrom to said silverware as a result of said heating.

8. The dishwasher of claim 6 wherein the thermally operated pump means comprises a vapor pump defining a heating chamber communicating with said sump,
first heating means for heating dishwashing liquid in said heating chamber and causing delivery of heated dishwashing liquid therefrom to said silverware as a result of said heating, and said sump includes a second heating means for heating dishwashing liquid in said sump.

9. The dishwasher of claim 6 wherein the thermally operated pump means comprises a vapor pump defining a heating chamber communicating with said sump, first heating means for heating dishwashing liquid in said chamber and causing delivery of heated dishwashing liquid therefrom to said silverware as a result of said heating, said sump including a second heating means for heating dishwashing liquid in said sump, and circuit means are provided for energizing said first heating means for heating the liquid in said chamber prior to operation of said spray means to effect a pre-wash of the silverware.

10. The dishwasher of claim 6 further including means for preventing operation of the thermally operated pump means when the level of dishwashing liquid in the sump is below a preselected level.

11. The dishwasher of claim 6 wherein said sump includes first heater means for heating the washing liquid in the sump, and said thermally operated pump means includes second heater means for effecting the delivery of said washing liquid portion to the silverware.

12. The dishwasher of claim 6 wherein said sump includes first heater means for heating the washing liquid in the sump, said thermally operated pump means includes second heater means for effecting the delivery of said washing liquid portion to the silverware, and circuit means are provided for operating said second heater means prior to operation of said first heater means to effect a pre-wash of the silverware.

13. The dishwasher of claim 6 wherein said sump includes first heater means for heating the washing liquid in the sump, and said thermally operated pump means includes second heater means for effecting the delivery of said washing liquid portion to the silverware, and circuit means are provided for operating said second heater means prior to operation of said first heater means to effect a pre-wash of the silverware.

14. The dishwasher of claim 6 wherein said spray means includes a pump, said sump includes first heater means for heating the washing liquid in the sump, said thermally operated pump means includes second heater means for effecting the delivery of said washing liquid portion to the silverware, and circuit means are provided for operating said first and second heater means alternatively concurrently with operation of the pump.

15. The dishwasher of claim 6 wherein said sump includes first heater means for heating the washing liquid in the sump, and said thermally operated pump means includes second heater means for effecting the delivery of said washing liquid portion to the silverware, and said first and second heater means comprising electrical heater elements connected for concurrent energization.

16. The dishwasher of claim 6 wherein said sump includes first heater means for heating the washing liquid in the sump, and said thermally operated pump means includes second heater means for effecting the delivery of said washing liquid portion to the silverware, said first and second heater means comprising electrical heater elements connected in series for concurrent energization.

17. The dishwasher of claim 6 wherein said sump includes first heater means for heating the washing liquid in the sump, and said thermally operated pump means includes second heater means for effecting the delivery of said washing liquid portion to the silverware, said first and second heater means comprising portions of a single heating element.

* * * * *