

[54] TABLE WARE WASHER

[75] Inventors: **Soichi Fukuzawa; Ryoichiro Oshima**, both of Hitachi-shi, Japan

[73] Assignee: **Hitachi, Ltd.**, Tokyo, Japan

[22] Filed: **Aug. 30, 1971**

[21] Appl. No.: **176,068**

[30] **Foreign Application Priority Data**

Aug. 28, 1970 Japan..... 45-74867

[52] U.S. Cl..... **134/178, 134/179, 239/66**

[51] Int. Cl..... **B08b 3/02**

[58] Field of Search..... **134/176, 178, 179; 239/66**

[56] **References Cited**

UNITED STATES PATENTS

3,160,164 12/1964 Constance et al. 134/178 X

FOREIGN PATENTS OR APPLICATIONS

1,920,575 11/1970 Germany 134/179

Primary Examiner—Robert L. Bleutge

Attorney, Agent, or Firm—Craig, Antonelli & Hill

[57]

ABSTRACT

A device for alternately changing the swing direction of the nozzle arm provided with a plurality of nozzles and installed in a table ware washer; said device comprising two channels for conveying liquid to be jetted from said nozzles to swing the nozzle arm, each channel comprising a liquid inlet compartment and a liquid jet nozzle compartment, said two compartments being disposed opposite to each other with respect to the axis of the nozzle arm (e.g., when the nozzles of one channel are directed right with respect to the nozzle arm axis, the nozzles of the other channel are directed left with respect to the nozzle arm axis) so that the liquid flowing in said two channels is shut out alternately by the use of a ball. Thus, said device is capable of alternately changing the liquid jet direction and thereby changing the swing direction of the nozzle arm alternately.

7 Claims, 5 Drawing Figures

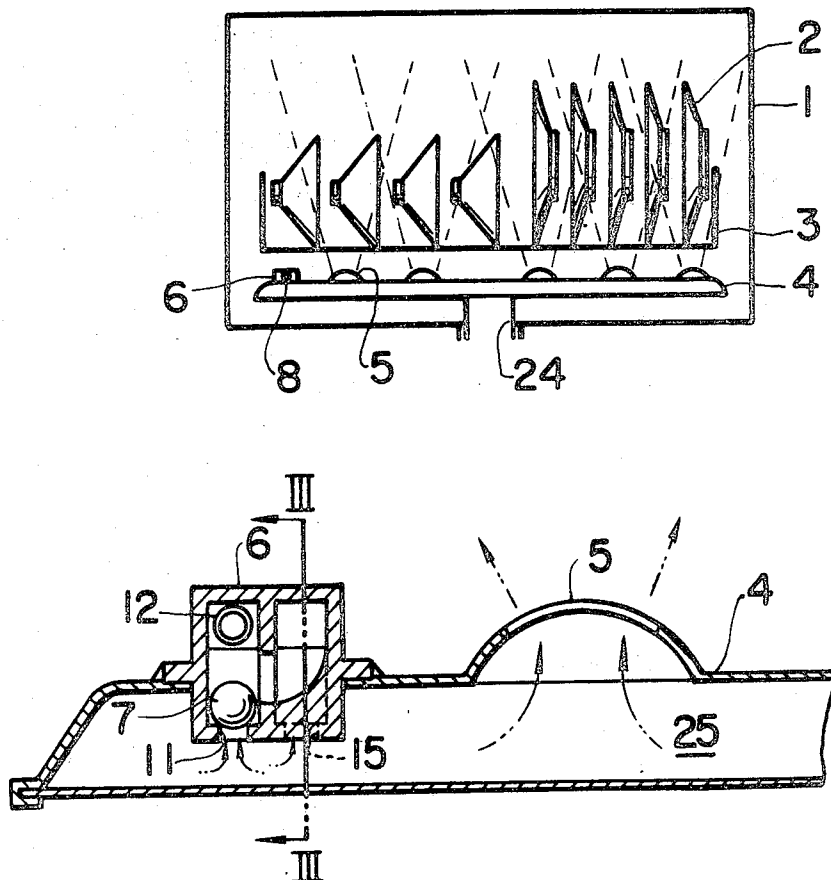


FIG. 1

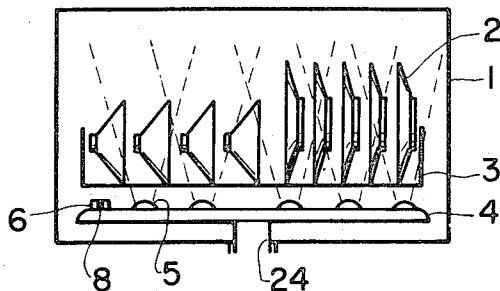


FIG. 2

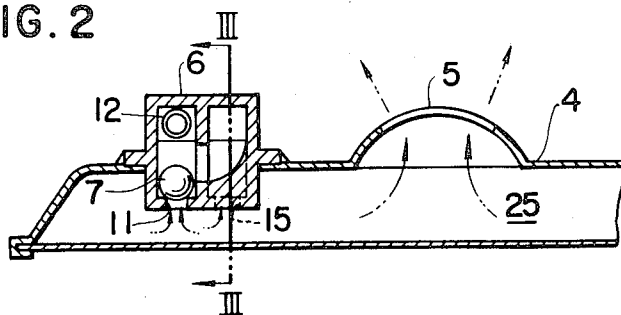
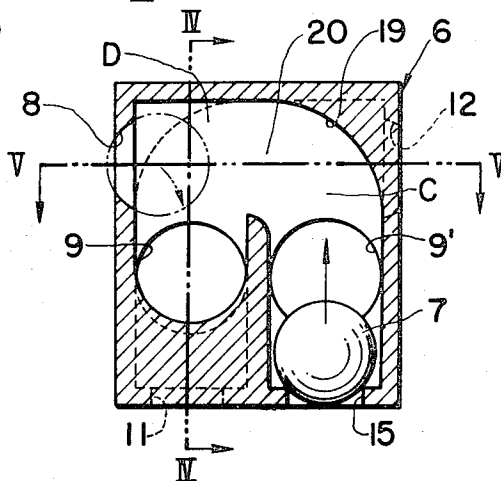


FIG. 3



INVENTORS

SOICHI FUKUZAWA

RYOICHIRO OSHIMA

BY *Craig, Antonelli & Hill*

ATTORNEYS

FIG. 4

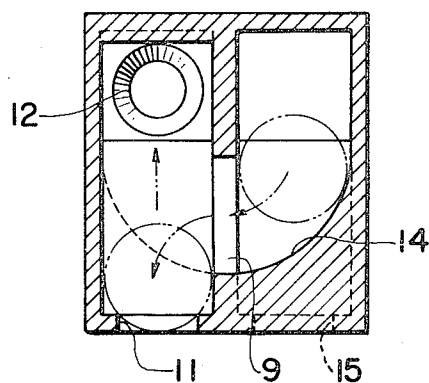
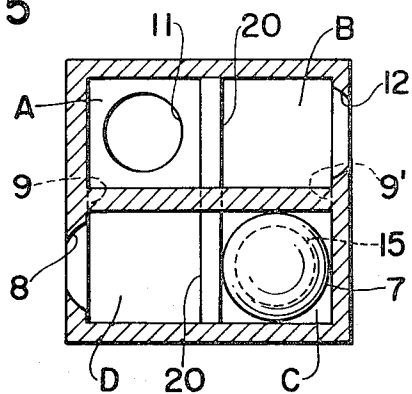


FIG. 5



INVENTORS

SOICHI FUKUZAWA

RYOICHIRO OSHIMA

BY *Craig, Antonelli & Hill*

ATTORNEYS

TABLE WARE WASHER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to jet stream table ware washers and more particularly to devices for changing alternately and auto-matically the swing direction of the nozzle arm having a plurality of liquid jet nozzles.

2. Description of the Prior Art

In the table ware washer according to the prior art, the nozzle arm having a plurality of nozzles swings only in one direction. Hence, the beam of the detergent solution jetted from the nozzle arm in the upper direction runs at a composite speed of the swing speed of the nozzle arm and the speed of the solution jetted from the nozzle. As a result, the jet stream direction is slanted toward the direction along which the nozzle arm is swinging. This means that the table ware held in the basket receives the liquid stream from only one direction at all times and it is impossible to uniformly wash the table ware.

To solve this problem, a method using a drive source, such as a motor, has been proposed. According to this method, the swing direction of the nozzle arm is reversed by changing over the rotation direction of the drive source. This device, however, is structurally complicated and can hardly be manufactured at a commercially reasonable price.

SUMMARY OF THE INVENTION

In view of the foregoing, an object of this invention is to provide a device having simple structure and which is capable of alternately changing the swing direction of the nozzle arm.

A second object of this invention is to provide a device capable of alternately changing the swing direction of the nozzle arm without depending on any drive source.

A third object of this invention is to provide a device manufacturable at a low cost and capable of alternately changing the swing direction of the nozzle arm with a high accuracy.

Briefly, the device of this invention is characterized in that the swing direction of the nozzle arm is changed by the use of a changeover valve each time the pump for circulating the detergent solution in the table ware washer is stopped. Thus, the swing direction of the nozzle arm can be changed with a definite cycle by stopping the pump operation at a definite cycle.

The changeover valve comprises two channels for supplying the detergent solution, each channel having a detergent solution inlet compartment and a detergent solution jet nozzle compartment. The two inlet compartments are connected to a common detergent source, which is connected to a pump for circulating the detergent solution.

The nozzles of each channel are disposed symmetrically with respect to the axis of the nozzle arm. When the detergent solution is supplied to one of the channels, the nozzle arm is swung in a specific direction by the reaction force produced by the detergent solution when jetted. When the solution is supplied to the other channel, the nozzle arm is swung in the reverse direction. According to this invention, the channels are alternately closed when the detergent solution is supplied. Namely, a valve ball moves from one channel to the other each time the operation of the solution circu-

lating pump is stopped, whereby the channels are alternately closed. The swing direction of the nozzle arm is changed over by the reaction force of the detergent solution jetted alternately from the nozzles of the two channels.

According to this invention, the swing direction of the nozzle arm can be easily changed over by the use of a simple changeover valve without depending on any drive source. This makes it possible to manufacture the device at a low cost.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic sectional view of a table ware washer embodying this invention;

FIG. 2 is a fragmentary sectional view showing the nozzle arm;

FIG. 3 is a sectional view of the changeover valve taken along line III—III in FIG. 2; and

FIGS. 4 and 5 are sectional views taken along lines IV—IV and V—V in FIG. 3, respectively.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1 there is shown a table ware washer of this invention wherein the reference numeral 1 denotes a washing chamber accommodating a plurality of pieces of table ware 2 supported in a basket 3, and a nozzle arm 4. The nozzle arm 4 has a plurality of slit-like nozzles 5 on its upper part disposed swingably adjacent the lower part of said basket 3. The detergent solution is supplied from a pipe 24 by way of the nozzle arm 4 and is jetted toward the table ware 2 from the slit-like nozzle 5. A changeover valve 6 is disposed at one end of the nozzle arm 4. This changeover valve is provided with detergent solution jet nozzles in both directions with respect to the axis of nozzle arm 4. The nozzle arm 4 is swung by the reaction force produced by the detergent solution when jetted from the nozzles. The numeral 8 denotes one of two nozzles disposed at the changeover valve 6.

In FIG. 2 the major part of the detergent solution is supplied from the pipe 24 (FIG. 1) through a passage 25 in the nozzle arm 4 and is jetted from the slit-like nozzle 5. Another part of the detergent solution is applied to the changeover valve 6 from an inlet 11 or an inlet 15 and is jetted from a nozzle 12 or a nozzle 8 selected by a valve ball 7.

FIG. 3 shows a sectional view of the changeover valve 6 taken along line III—III in FIG. 2, and FIGS. 4 and 5 are sectional views of the changeover valve 6 taken along lines IV—IV and V—V, respectively, in FIG. 3.

Referring to FIGS. 3 through 5, when the detergent solution is supplied thereto via the inlet 15, the valve ball 7 closes the nozzle 8 by way of the passage 20 defined by the upper guide wall 19 in the compartment C. As a result, the detergent solution supplied via the inlets 15 and 11 is jetted from the nozzle 12, and the nozzle arm is swung in one direction by the reaction force of the jetted solution. To make the valve ball 7 move smoothly from the compartment C to the nozzle 8, it is desirable that the diameter of the valve ball path in the compartment C be least different from the diameter of the valve ball 7 and that the amount of the detergent solution escaping through the gap in the valve ball path and passage 20 against the valve ball 7 be minimum. It is also desirable that the inner wall of the nozzle be

sloped so as to bring the valve ball 7 into close contact with the nozzle as shown in FIG. 3. Then, by stopping the operation of the detergent solution circulating pump (not shown diagrammatically), the pressure of the detergent solution flowing into the changeover valve 6 is lowered and the force pressing the valve ball 7 against the nozzle 8 is released. The valve ball 7, due to its own weight, moves to the compartment A (FIG. 5) via the passage 9 defined by the guide wall 14 (FIG. 4). The passage 9 has a slope to allow the valve ball 7 to move by its own weight.

When the pump is operated again, the valve ball is moved from the compartment A to the compartment B via passage 20 by the detergent solution flowing from the inlet 11 in the compartment A. By this means, the nozzle 12 is closed, and the detergent solution supplied via the inlets 15 and 11 is jetted from the nozzle, thereby reversing the swing direction of the nozzle arm. The diameter of the passage 20 is slightly larger than the diameter of the valve ball 7.

When the circulating pump operation stops, the valve ball 7 moves along the passage 9 which is sloped toward the compartment C. Thus, by intermittently operating the detergent solution circulating pump, it is possible to change the swing direction of the nozzle arm alternately. Therefore, the angle at which the detergent solution is jetted against the table ware is reasonably changed and any possible non-uniformity of washing is minimized.

What is claimed is:

1. An improvement in table ware washers comprising a basket means for holding table ware; a nozzle arm disposed swingably adjacent said basket means, a plurality of first nozzles in said nozzle arm for jetting a detergent solution forward the table ware, means for supplying said detergent solution to said first nozzle, control nozzle means including second and third nozzles disposed at one end of said nozzle arm from which the detergent solution is jetted in the direction opposite to the axis of said nozzle arm for exerting a swing force on said nozzle arm in opposite directions, and changeover valve means for alternately applying the detergent solution to said second and third nozzles in response to successive reductions in the pressure of the detergent solution supply to the changeover valve whereby the swing direction of the nozzle arm is alternately changed; the improvement comprising said changeover valve including a housing having second and third compartments provided with said second and third nozzles, respectively, for jetting the detergent solution in mutually opposite directions with respect to said nozzle arm so that a swing force is exerted on said nozzle arm, first and fourth compartments having inlets for sucking the detergent solution jetted from said second and third nozzles, a ball positioned in said housing, and partition means for moving said ball from said first compartment to said second compartment and from said fourth compartment to said third compartment in response to the pressure of the detergent solution and for moving said ball from said third compartment to said first compartment

ment and from said second compartment to said fourth compartment in response to the reduction of the pressure of the detergent solution and also by the weight of said ball itself, whereby the swing direction of the nozzle arm is reversed each time the detergent solution supply is stopped.

2. An improvement in accordance with claim 1 wherein the diameter of the passage for said ball from the first compartment to said second compartment and from the fourth compartment to said third compartment is different from the diameter of said ball.

3. An improvement in accordance with claim 1 wherein said partition means includes a sloped passage disposed in said housing so that said ball can be moved by its down weight from the third compartment to said first compartment and from the second compartment to said fourth compartment.

4. In an improved table ware washer comprising a basket means for holding table ware, a nozzle arm disposed swingably adjacent said basket means, a plurality of first nozzles disposed in said nozzle arm for jetting a detergent solution toward the table ware, means for supplying said detergent solution to said first nozzle, and changeover valve means disposed in said nozzle arm; the improvement comprising said changeover valve means including first and second inlets for introducing the detergent solution into said changeover valve means, first and second outlets disposed in said changeover valve means for jetting the detergent solution in the direction opposite to the axis of said nozzle arm for exerting a swing force on said nozzle arm in opposite directions, and a ball positioned in said changeover valve means, said ball being moved between one of the first inlet to the first outlet and the second inlet to the second outlet by the pressure of said detergent solution acting directly on the surface of said ball.

5. A table ware washer in accordance with claim 4, wherein said changeover valve means includes four passages for moving said ball, the first passage being provided between said first inlet and said first outlet, the second passage being provided between said first outlet and said second inlet, the third passage being provided between said second inlet and said second outlet, the fourth passage being provided between said second outlet and said first inlet, and wherein said ball closes one of the first and second outlets.

6. A table ware washer in accordance with claim 5, wherein said ball is moved by the pressure of said detergent solution acting directly on the surface of said ball in said first and third passages, and said ball moving by its own weight in said second and fourth passages.

7. A table ware washer in accordance with claim 6, wherein the diameter of said first and second outlets of the changeover valve means are smaller than the diameter of said ball, and the inner wall of said first and second outlets are communicated to the inner wall of said passages through a sloped inner wall so that said ball perfectly closes either outlet in response to the pressure of the detergent solution.

* * * * *