

March 3, 1970

H. M. RUMBAUGH

3,498,304

APPARATUS FOR CLEANING DISHWARE

Original Filed Oct. 24, 1965

4 Sheets-Sheet 1

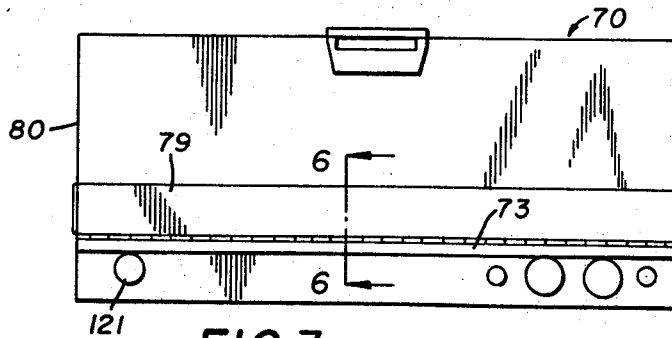


FIG. 3

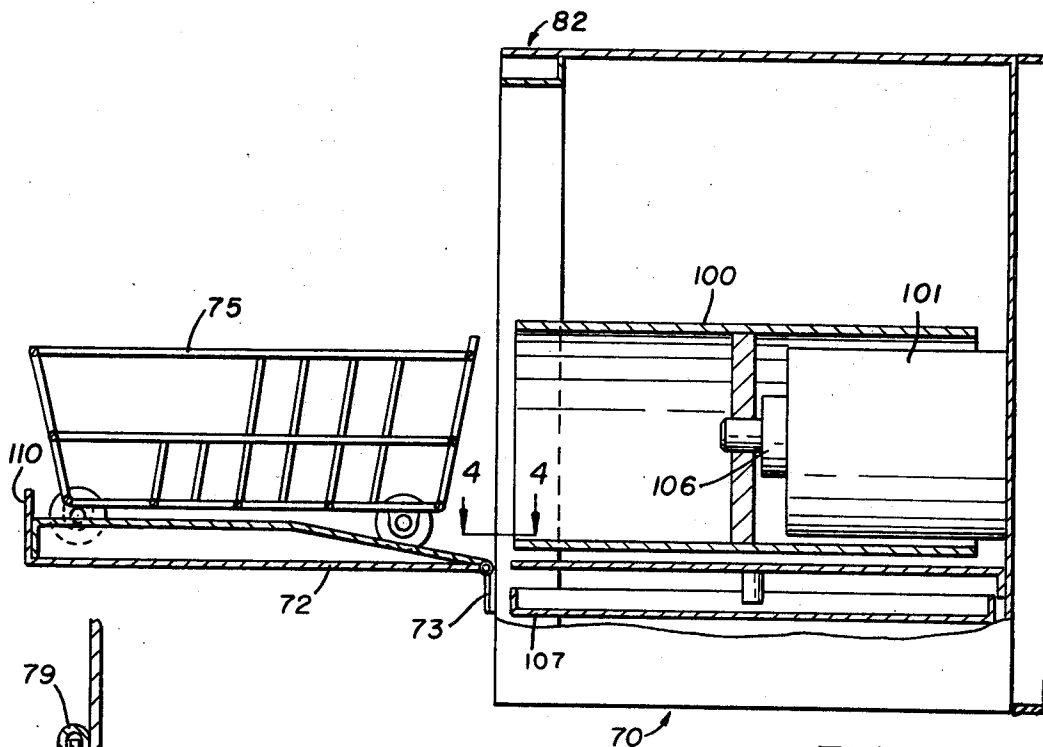


FIG. 1

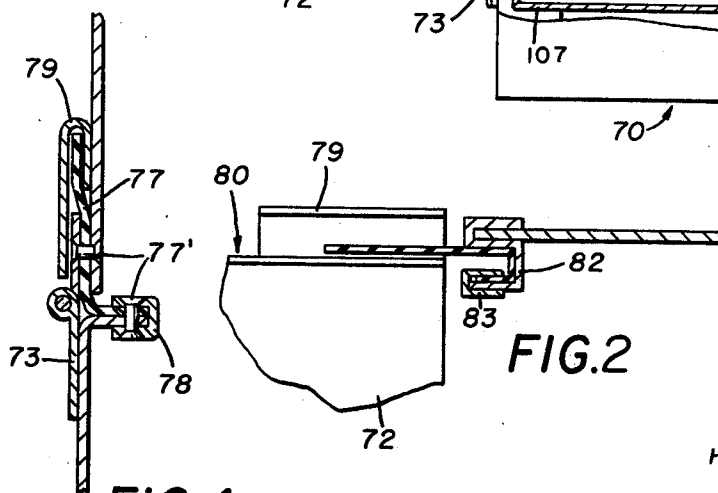


FIG. 2

FIG. 4

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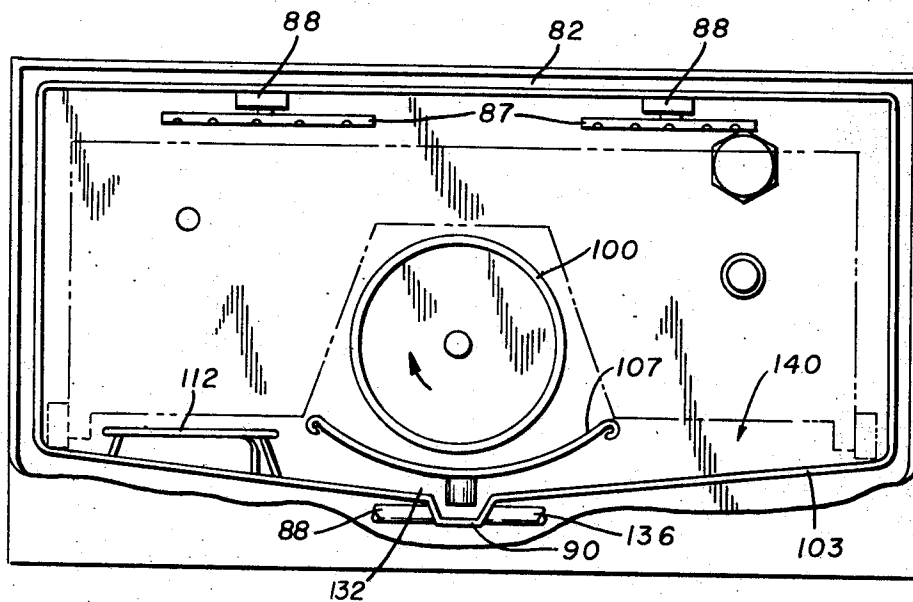
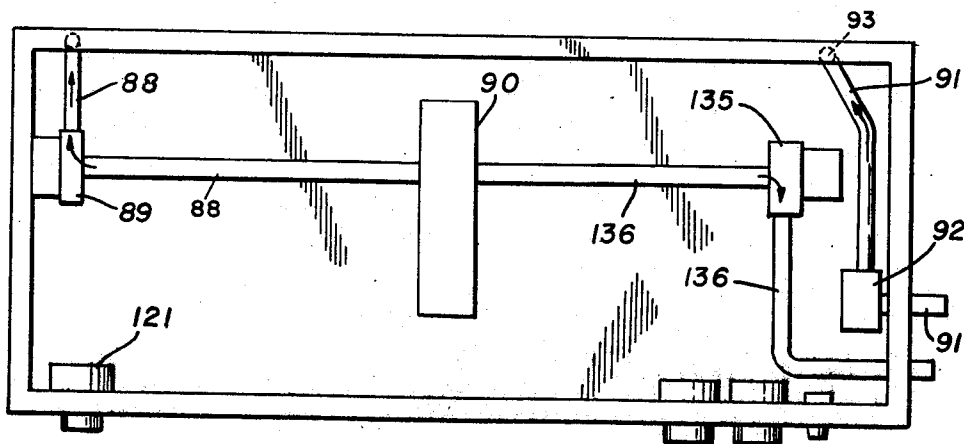
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APPARATUS FOR CLEANING DISHWARE

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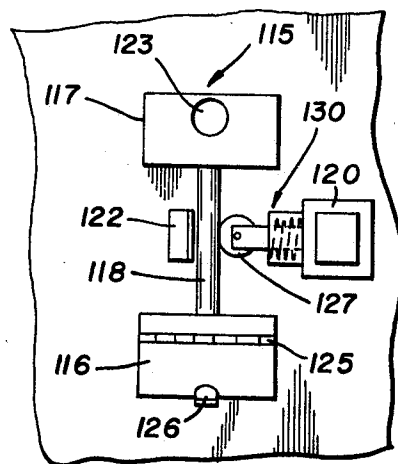
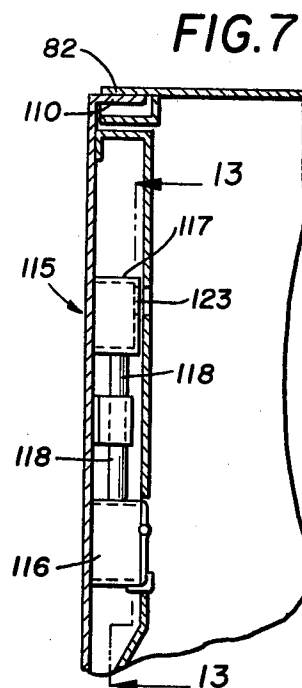


FIG. 8



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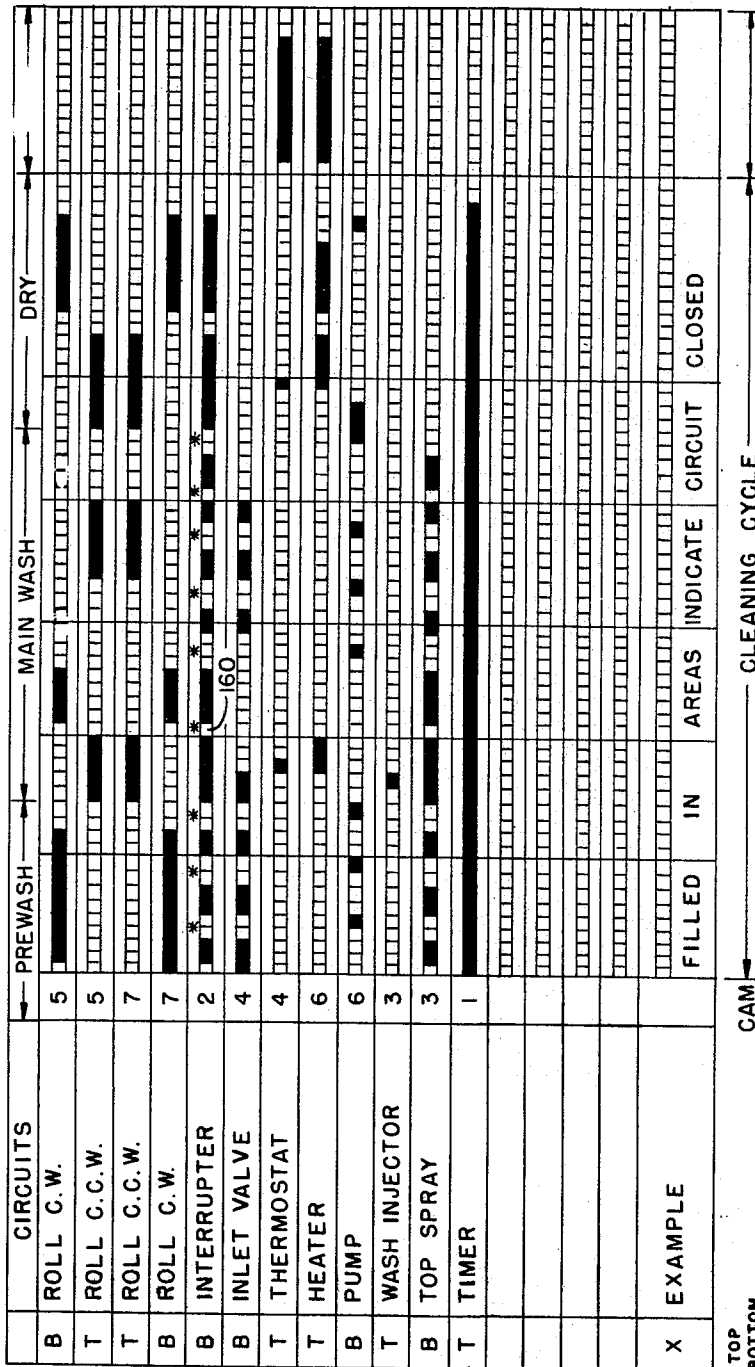
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* INDICATES SETTLING PERIOD

FIG. 9

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APPARATUS FOR CLEANING DISHWARE

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Continuation of application Ser. No. 504,775, Oct. 24, 1965. This application June 12, 1968, Ser. No. 757,170
Int. Cl. B08b 3/00, 9/00; B67d 5/06

U.S. Cl. 134—58

3 Claims

ABSTRACT OF THE DISCLOSURE

A dishware cleaning appliance with a detergent cleaning system having a timer to control the re-use of detergent charged reconditioned fluid upon reactivation of the fluid impeller to impel said fluid in a subsequent cleaning period. A system to initially wash detergent into said appliance's cleaning chamber by controlling the flow of detergent dispensing fluid in a flexible conduit by a pinch valve is also disclosed, said fluid flushes and pushes detergent out of a detergent reservoir into a dishware cleaning chamber.

This application is a continuation of applicants co-pending application Ser. No. 504,775 filed Oct. 24, 1965, now abandoned.

This application relates to novel apparatus for cleaning of dishware, by providing means to dispense, preserve, recondition, and re-use said detergent in a subsequent reactivated wash period.

Chemical detergents for automatic dishwashers are packaged in special moisture proof containers. The formulators caution their user's as follows: (IMPORTANT—CLOSE SPOUT AFTER USING—STORE IN DRY PLACE—.)

Spoilage of dishwashing detergent happens by chemical action when moisture is permitted to reach the detergent, prior to use in a dishwasher.

Moisture causes the detergent to lump up into a jelly mass and causes the detergent to become extremely incapable of going into solution, to do the job of cleaning it was formulated to do when dispensing into a dishwasher. When fresh detergent is placed into a detergent dispenser in a dishwasher for use in a subsequent washing period, the before mentioned problem is multiplied many times because of the steam conditions and the impelling of water under pressure in a prior wash period.

The following disclosed invention achieves a system to preserve detergent, and protect detergent in a holding period substantially from lumping up into a jelly mass and then dispenses when desired the detergent into the washing chamber to do the task it was formulated to do.

In addition means are provided to recondition the detergent charged fluid after a first use in a wash period, also means are provided to re-use said detergent charged fluid in a subsequent wash period.

Disclosed is a system of dispensing detergent from a tank like reservoir, from which detergent is washed out of by releasing a fluid held in a flexible conduit by controlled pinch valve pressure means, said released fluid flushes and pushes detergent out of a detergent reservoir into a dishware cleaning chamber.

The said fluid flows in said conduit when the pinch valve means releases its pressure from said conduit and allows fluid to wash detergent into the dish cleaning chamber to be impelled therein as desired.

After initially charging the wash fluid with detergent in the chamber and operating the impelling means to impel fluid over racked dishware, in a first wash period, means is provided to inactivate the fluid impelling means and cause a pause period to permit air, foam, and suds

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to settle out of the impelling means and sump area and also permit heavy matter to settle in the sump of the chamber. Means is provided to reactivate the impelling fluid means and the said conditioned fluid is re-used in a subsequent dish-cleaning period by impelling said fluid with renewed cleaning efficiency in a desired direction.

Thus, by providing means to substantially preserve the detergent and then washing the detergent out of the detergent dispenser said detergent quickly mixes in the washing fluid in the wash chamber and brings about better dishware cleaning efficiency by overcoming the before mentioned problem.

An object is the provision of a cleaning system that saves the use of clean water in its operation thus assisting in the solution of a national problem.

Another object is providing a fluid detergent system to dispense detergent by controlling the flow of detergent dispensing fluid within a flexible conduit by squeeze valve means and subsequently using said fluid to wash detergent out of a container into a washing chamber.

Another object is reconditioning detergent charged fluid by providing an abeyance period after an initial wash period of a dish cleaning period to cause a settling out of air, foam, suds from the impelling means and also allow heavy matter to settle in the fluid in the sump of said chamber and then re-use said fluid in a subsequent wash period in a desired direction of impelling said fluid over dishware.

The apparatus comprises a cabinet which includes a washing and steam chamber which is preferably open at the front. The front opening is closed by a bottom-hinged door which is pivotally mounted at the front of the cabinet for vertical movement between a closed position and a horizontal open position for access to the interior of the cabinet.

Across the front top and sides of the cabinet is a channel into which the extending lips of the door fits when closed. Across the bottom of the cabinet and secured to the front angle of the bottom of the front is a novel unbroken seal arrangement. The sides of the seal are cupped into, around and secured to the side channels of the cabinet. Said seal extends upwards above the spill-over point of the metal portion of the front opening of the cabinet. The lower outside portion of the door is positioned in front of the seal so that said seal extends part way up the outside of the door. The hinge of the lower part is secured to the bottom of the cabinet leaving its upper part to the outside of the door bottom and providing an upwardly extending seal section which forms a barrier and raises the spill-over point higher than any liquid height permitted in the washing chamber. The sides of the seal are also of the same height and are enveloped around the outside of the sides of the cabinet when the door is closed and are held against the sides by an angle which is secured to the strip that covers the seal extending up over the outside bottom of the door. The upper part of the hinge is secured to the door bottom with the seal between it and the outer trim strip.

The unbroken seal is held in place but not under overall pressure. This allows air pressure from the cabinet to escape through the overlap area and acts as a relief from build-up of pressure in the chamber's interior. When the impeller starts there is an expansion of heated air and water vapor. Said seal relieves this pressure.

The cabinet includes a bottom which forms a sump area and in the lower part of the sump is a drain outlet which is connected to a circulating pump and a drain pump. The circulating pump is connected through tubing to upper top spray units in the chamber which are preferably liquid-reacting, jet-type, revolving sprays and are controlled by a recirculating pump and timer means. The waste discharge is installed in the same way but the liquid

pump means conveys the waste to a drain. A liquid line, having an automatically controlled inlet fill, is interposed in the supply line. It is connected to an interior communicating air-pressure gap located on the rear wall of the chamber.

Supported by a member on the rear wall and spaced above a baffle facility is a smooth roll impeller or liquid slinger which extends adjacent the front and rear walls and rotates about an axis. The impeller is operated by an electric motor and is mounted on the motor shaft for rotation. The impeller is made of stainless steel and is cylindrical with open ends. A hub supports the impeller and said hub is connected to the motor shaft and is secured by setscrews through an insert.

A motor housing facility which encloses the motor is secured to the rear wall by an annular flange by means of nuts and bolts. The motor is of the reversing type.

The baffle facility under the impeller is for trapping out solids. The novel features of the solid baffle provide care-free operation, and its arrangement forces solid matter between the oven bottom and the baffle into a zone having a whirlpool effect where is trapped and easily pulled out of the sump area by the pump for discharge from the apparatus.

Preferred designs of equipment are shown in the drawings, in which—

FIGURE 1 is a side elevation of a modified oven with the door open to the horizontal position, with a central portion broken away, and a rack resting on the door;

FIGURE 2 is a plan view showing the corner construction of the chamber and the rubber seal;

FIGURE 3 is a front view of the chamber of FIGURE 1;

FIGURE 4 is a section on the line 6—6 of FIGURE 3;

FIGURE 5 is a front elevation of the chamber shown in FIGURE 1;

FIGURE 6 is a bottom view of the chamber shown in FIGURE 1;

FIGURE 7 is a section showing detergent means fastened to the door;

FIGURE 8 is a rear view of the door showing the detergent means; and

FIGURE 9 is a chart illustrating a programmed timing cycle which includes the cleaning cycle and cooking cycle, also a settling period.

FIGURES 1 to 8 show a modification or preferred type of chamber 70 which may measure approximately 16 inches in height and, if desired, will fit on a kitchen counter under overhanging storage cabinets, and is preferably adjacent a sink.

The door 72 is hinged by hinges 73 at the bottom. Stop means is usually provided to hold the door horizontal, when opened, so that it will support rack 75 to hold tableware for cleaning, when desired.

This rack is rolled into the chamber beside the impeller (described below) prior to starting a cleaning cycle.

There is an unbroken flexible resilient sheet 77 of neoprene or the like which is wider than the door and which is attached to the door and the chamber in such a way as to form a seal or barrier which prevents leakage of liquid from the interior of the chamber when the door is closed. One edge of this sheet, which is fastened to the door, is higher than the normal spill-over point of the door when the door is closed, thus increasing the amount of cleaning liquid that can be held in the chamber without changing the height of the spill-over and without increasing the height of the chamber. In order to do this, the side edges of this sheet are folded over one another and held against the exterior of the edge of the chamber opening which advantageously is the side wall of the chamber. The wall of the oven at the bottom of the door opening is flanged in, and this flange and the bottom edge of the sheet 77 are held together by the seal cap 78 which is fastened to this flange. The seal cap is no longer

than the door. The side edges of the sheet 77 protrude beyond the ends of the seal cap and are bent up and folded around inside of the portion of the S-member 82 which extends upward from the level of the bottom of the door. These edges of the sheet are clamped in place by the caps 83. The front edge of the sheet 77 overlaps the outside of the bottom of the door and is secured to the door by the rivets 77' which hold the hinge 73 in position. This permits release of any pressure that may build up within the chamber when used as a dishwasher. The cover plate 79 covers the portion of the sheet which is adjacent the front of the door, and the edges of the cover plate 79 are bent backward over the edges 80 of the door and spaced a short distance therefrom. The back-turned edges of the cover plate 79 embrace the edges of the outside chamber walls, covering the S-member 82. The edges of the sheet which protrude beyond the edges of the door are folded into these spaces provided between the edges of the door and the bent-over edges of the cover plate. They preferably are not attached to anything. As the door is closed, the edges of the sheet fold over and collect against the front of the portion of the S-member 82 which is embraced by the cover plate 79. Thus the front of the sheet is folded and the edges of the sheet are held up so as to form a barrier against the escape of any liquid from the chamber.

Within the chamber are two top sprays 87 (FIGURE 5) fed by conduit 88, and as shown in FIGURE 6, by recirculating pump 89 which takes water from sump 90. Fresh water is supplied by line 91 through inlet valve 92 to air gap 93. The use of these water sprays will be described below.

Impeller 100 is located in the chamber, at about its midpoint. The diameter is such that spray from it will fill the chamber with spray when operated at reasonable speed. In a chamber 16 inches high a smooth-surfaced impeller 2 to 8 inches and preferably about 6 inches in diameter is satisfactory. This impeller extends a substantial distance and preferably the major part of the distance between the front and back of the chamber, although it may be located to extend from side to side. It may be made in two or more coaxial portions, and in this case each portion may be no thicker than a fan blade. Two or more impellers may be located in a large chamber. It is driven by a motor within the housing 101 located at the rear of the chamber. The bottom 103 of the inside of the chamber drains to sump 90 which drains into conduit 88 for recirculation. The motor shaft flange 106 drives impeller 100. (FIGURE 1.) Below the impeller is the baffle 107 which is supported from the back of the chamber. The baffle separates the water in the space adjacent the impeller from the water on the bottom of the chamber under the baffle.

The dishware is placed in rack 75. The door is closed and the upper flange 110 fits into the S-shaped flange 82. (FIGURE 7.) The water is heated by element 112 or other suitable means. The inlet valve 92 has a timed flow and introduces just enough water to partly submerge the baffle 107 and cover the bottom of the impeller 100. The water is recirculated through top sprays 87 by jet reaction by recirculating water from pump 89. The sprays and impeller spray the chamber interior with cleansing water.

Detergent is added to both the pre-wash and the main wash.

Detergent supply means 115 is shown in detail in FIGURES 7 and 8. Detergent is added to the reservoir 116. This reservoir is connected with water reservoir 117 by rubber tubing 118. The solenoid 120 operated through timer means 121 and spring 130 initially squeezes the tubing against plate 122 closing off reservoir 117. Water sprayed within the chamber collects in reservoir 117, through opening 123. The pre-wash detergent is placed within the chamber, and conveniently placed in the sump 90 or on the open door. The main wash detergent

is placed in reservoir 116 through the door which is supported by hinge 125, when the door is open, and the reservoir is then closed by latch 126. When the main wash starts timer 121 energizes solenoid 120 drawing back roller 127 to allow water in reservoir 117 to flow through tube 118 into reservoir 116 forcing the latch 126 open and the detergent is transferred out into the chamber. A later impulse of timer de-energizes solenoid 120 and spring 130 pushes roller 127 against tube 118 against plate 122.

The cleansing equipment shown includes no screen for separation of solid particles. Screens are objectionable because they clog up. The means shown includes a solid baffle structure below the impeller. The space between the baffle and the bottom of the chamber provides an area 132 at one side or the other in the sump 90 wherein a whirlpool effect is created depending upon the direction of rotation of the impeller.

If the impeller is rotated in a clock-wise direction (see arrow in FIGURE 5) the whirlpool is located at the side of the sump area indicated by reference numeral 132 because although the impeller throws water in both directions, the major portion is thrown off on the side of the oven on which the impeller lifts out of the water. Water races down both sides of the bottom of the oven which forms a raceway. Both streams meet head-on in area 132 where the whirlpool is created and the solid matter is collected. The timer actuates waste-disposal pump 135 (FIGURE 6), when desired, and this pumps water and solid matter from the sump through conduit 136 to a suitable drain. Thus the solid particles trapped are prevented from being recycled through the chamber spray.

In operation the timing means is programmed to provide a settling period as shown in FIGURE 9. This abeyance period permits air, foam, suds and washing fluid to settle out of the impeller means, the pump and the sump. When the impeller means starts to operate the fluid has been conditioned by getting rid of the air and suds, to cause the impeller to impel its maximum amount of fluid and having its greatest pressure, which at this period removes the largest amount of food soil from the dishware. This condition decreases as air, foam and suds increase. The fluid impelled by the impeller cascades the fluid over the dishware, removing the soil. The fluid, mixed with food, runs down the raceway into the sump area. When it reaches the area 140, the portion of the fluid heavily laden with food continues under the baffle. The other portion of the fluid spills over the lip of the baffle and is recirculated. The fluid under the baffle, laden with food, continues to the whirlpool area where it remains until discharged.

On completion of the cleansing cycle, the timer stops the impeller, and after the oven is drained the pump 135 is shut off. The operation is repeated without detergent for the desired number of rinses.

FIGURE 9 shows timer cycle chart which will now be described in the operation of the apparatus. Filled-in areas indicate circuit closed, while open areas indicate an open circuit.

The interrupter line 160 indicates a programmed open circuit to cause a delay in the operation of the impeller. Said delay permits the settling out of air, foam or suds and food-laden fluid from the impeller, sump and pump for operation efficiency as herein explained.

PREFERRED CLEANING CYCLE FOR DISHWARE

Detergent is placed in the detergent reservoir 116; also in the sump area of the chamber.

The door 72 is closed.

Timer 121 is activated.

Time-controlled inlet water fill valve 92 admits liquid to the desired fill in the washing chamber.

Pump 89 is started and top sprays 87 operate.

Motor in housing 101 is started and impeller 100 operates counterclockwise, for prewash period.

Pump 89 and motor 101 stops and inactivates fluid impelling means.

Discharge pump 135 activates to dispose of pre-wash fluid then is stopped. The rinse period is repeated two more times.

Inlet valve 92 again admits water to the wash chamber.

Pump 89 and motor in housing 101 is started and impeller 100 operates clockwise for main wash period impelling wash fluid sprays 87 also operate.

Detergent solenoid 120 is activated and releases pressure on tube 118 allowing fluid to flow in said tube and washes detergent out of container 116 by a flushing action and pushing the detergent into the cleaning chamber.

Motor in housing 101 and pump 89 is stopped which inactivates fluid impelling means.

Timer 121 allows settling pause period and air, foam, suds, and heavy matter settle in the fluid impelling means and sump.

Pump 89 and motor in housing 101 is activated to reactivate the impelling means 100 operating in a counterclockwise direction.

Also pump 89 is started to impel fluid from sprays 87 in the chamber.

Pump 89 and motor in housing 101 is inactivated at end of this wash period.

Discharge pump 135 is activated to dispose of fluid in the wash chamber and is stopped when said fluid is disposed of.

The main wash cycle without detergent injections is repeated two or more times as desired to rinse the dishware, after which the drain pump removes fluid from the wash chamber before the subsequent dry period.

Heater 112 is activated by timer 121.

Motor in housing 101 is started and impeller 100 is started to impel heated air in the chamber over dishware to dry them. Part way through the dry period the impeller 100 is reversed by timer 121 to impel air in the opposite direction over dishware. Timer 121 at the end of the complete cycle turns off all operating parts.

FIGURE 9 is a chart giving suggested timing cycles. Such cycles include one or more of the following operations named at the top of the several columns of the chart; Pre-wash, Main Wash, and Dry. The possible specific operations are listed one below the other at the left of the chart. Thus, "Roll C.W." stands for clockwise rotation of the impeller. "Roll C.C.W." stands for counterclockwise rotation. "Wash Injector" stands for detergent dispersing means. A usual timer includes a number of cams, the bottom and top of each of which is designed for actuating different operations, and in the chart "T" and "B" refer to the tops and bottoms of the different cams, and the cams are identified by their numbers in the third column of the table.

The portion of the chart which refers to the different operations is divided into time increments, the length of each increment depending upon the number of degrees for each impulse. The filled areas indicate, as illustrative, the number of time increments during which the apparatus for the different operations is actuated. The timer selection dial (not shown) is of any usual construction.

Cam 4 thermostat means (not shown) is located on the underside of bottom 103 to sense the sump water temperature. All wiring is the usual method which is well known in this art. Many variations in the disclosed dish-water control system and detergent dispensing means may suggest themselves, particularly to those familiar with appliance design.

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

1. An appliance for cleaning dishware in a substantially fluid-tight accessible chamber having fluid impelling means for cleaning dishware in said chamber, means to supply and remove fluid from said chamber, means to

heat the fluid supplied to said chamber, means for turning the heating means on and off, a sump area in the bottom of said chamber for collecting fluid, said chamber having an opening for dishware, a door enclosing said opening which is movable from vertical or horizontal position, detergent dispensing means located on said door for dispensing detergent into the said cleaning chamber when said door is closed comprising:

a detergent reservoir, a passageway for detergent from said reservoir into the said cleaning chamber, a movable door for optionally opening and closing said reservoir passageway, whereby said movable door when closed prevents fluid being impelled in said chamber for being substantially mixed with detergent in the said reservoir until said detergent is washed from said reservoir by fluid flowing into the detergent reservoir through a fluid conveying conduit, said conduit having a portion which is flexible, the said conduit being connected to said detergent dispenser means reservoir, means to supply fluid which will flow when desired in said conduit, controlled pressure means located exteriorly of the flexible portion of said conduit, said pressure means being operated as desired to squeeze said flexible portion of said conduit to stop fluid flow therein and release said flexible portion to permit fluid flow therein so that when fluid is caused to flow in said conduit it will also flow into the said reservoir and dispense detergent through the said passageway into the said dishware cleaning chamber, including means characterized in that control program means which control the detergent means located on the said cleaning chamber door also controls means for retaining the detergent charged fluid in the sump area of said cleaning chamber for re-use after said control means operates to cause a period of inactivation of the impelling means in the said chamber, to permit a settling of air, foam, suds or solid matter contained in said fluid impelling means or sump area, means to reactivate the fluid impelling means, whereby said impelling means impels fluid over dishware in a desired direction.

2. A programmed control system for use in an appliance for cleaning dishware in a substantially fluid-tight accessible chamber, means to supply and remove fluid from said chamber, means to heat the fluid supplied to said chamber, means for turning the heating means on and off, a sump area in the bottom of the said chamber for collecting fluid, said chamber having a passageway

for dishware, a door enclosing said passageway which is moveable from vertical or horizontal position, detergent dispensing means located on said door for dispensing detergent into the dishware cleaning chamber when said door is closed, said programmed control system comprising:

control means to dispense detergent from said dispensing means located on said door which encloses said passageway for inserting dishware into said dishware cleaning chamber, means to impel the dispensed detergent in fluid in said cleaning chamber for a desired period of time during a cleaning period, means for retaining the detergent charged fluid in the sump area of the said cleaning chamber for re-use after said control means operates to cause a period of inactivation of the fluid impelling means in said chamber to permit a settling down of air, foam, suds, or solid matter contained in said fluid impelling means or sump area, means to reactivate the fluid impelling means in a second cleaning period as desired whereby said impelling means impels fluid over dishware in a desired direction.

3. A programmed control system for use in an appliance for cleaning dishware as set forth in claim 2, including a detergent reservoir located on a door which encloses a passageway for inserting dishware into a dishware cleaning chamber, said detergent reservoir having its own movable door for covering a passageway for detergent from said reservoir whereby said door is opened when desired by said programmed control system.

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ROBERT L. BLEUTGE, Primary Examiner

U.S. Cl. X.R.

134-93, 100, 182, 194; 222-193

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,498,304

Dated Mar. 3, 1970

Inventor(s) Hugh M. Rumbaugh

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3, line 8, after "adjacent" insert --to--; line 19, delete "out"; line 21, for "oven" read --chamber--; line 22, after "where" insert --the matter--; line 27, for "oven" read --chamber--; line 27, delete "modified"; line 30, after "view" insert --section on the line 4-4 of Figure 1--; line 42, after "door" insert --section on the lines 13-13 of Figure 7--; line 45, delete "and cooking cycle"; line 46, after the word "period" insert --at 160--; line 47, cancel "modification or"; line 50, after "adjacent" insert --to--; line 72, for "oven" read --chamber--;

Column 4, line 31, after "gap" insert --but not shown at--; line 45, after "chamber" insert --as desired--; line 57, after "a" insert --timer--;

Column 5, line 8, after "of" insert --the--; line 24, for "oven" read --chamber--; line 25, for "oven" read --chamber--; line 35, "Figure 9" insert --at 160--; line 54, for "oven" read --chamber--; line 71, for "Time-controlled" read --Timer-controlled--;

Column 6, line 46, after "impeller" insert --100--;

Drawing Figure 9, The numeral 160 should precede the words "INDICATES SETTLING PERIOD" which appear on Fig. 9 of the drawing

Claim 1, Column 7, line 14, for the word "for" read --from--.

Signed and sealed this 10th day of August 1971.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents