Dec. 20, 1966 R. S. BRADEN ETAL 3,292,645

REACTION SPRAY DISHWASHER HAVING AN IMPROVED WATER FILL SYSTEM

Filed Oct. 13, 1964 8 Sheets-Sheet 1

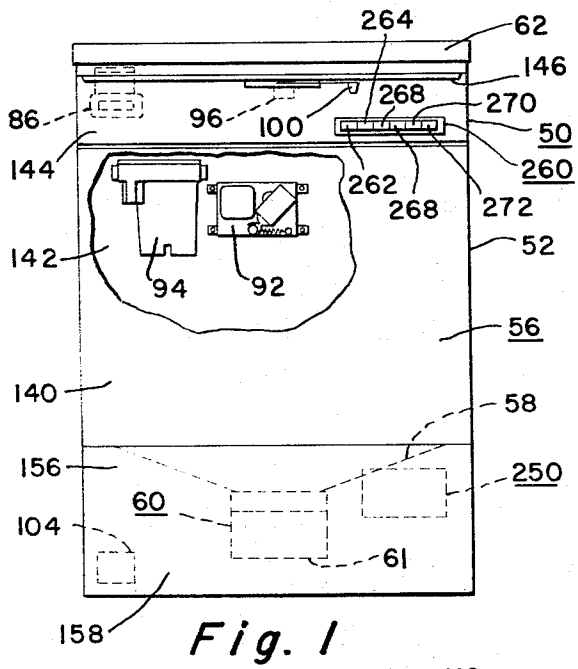


Fig. 1

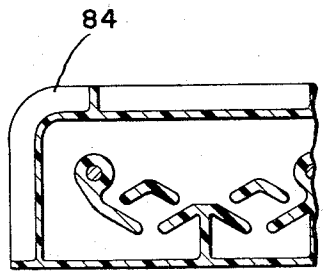


Fig. 17

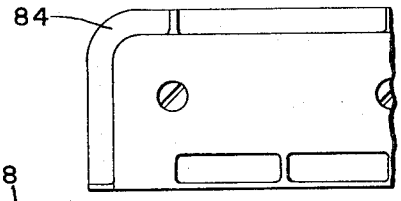


Fig. 16

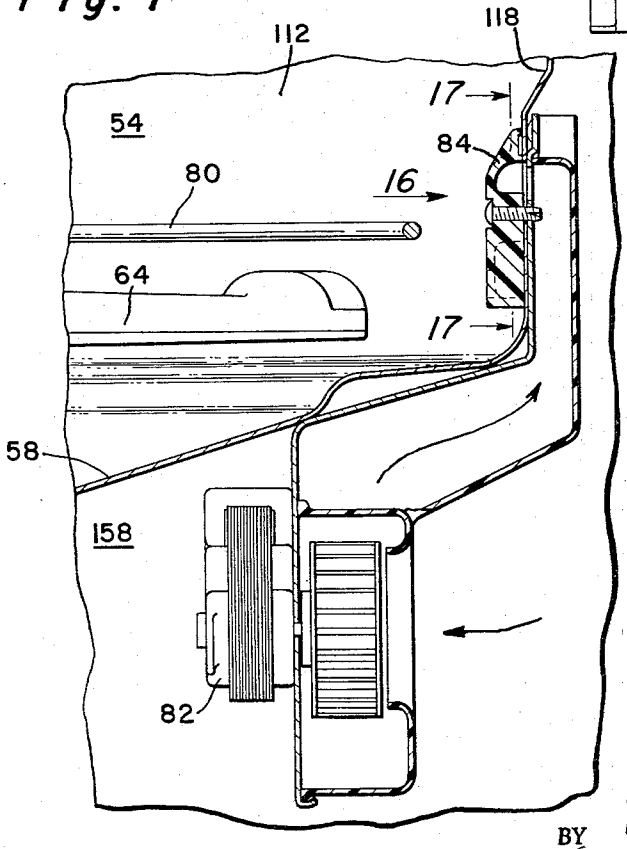


Fig. 15

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REACTION SPRAY DISHWASHER HAVING AN IMPROVED WATER FILL SYSTEM

Filed Oct. 13, 1964 8 Sheets-Sheet 2

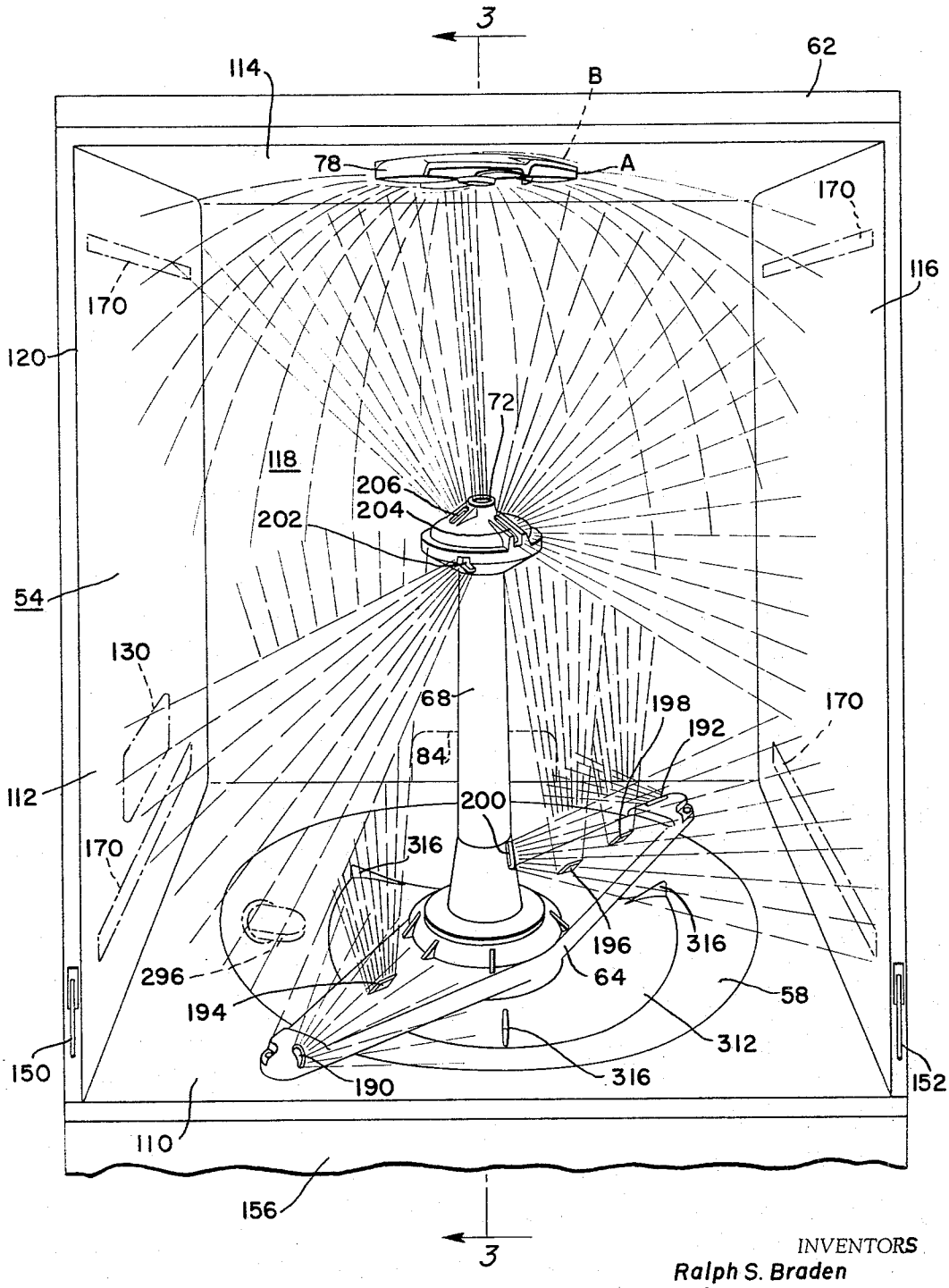


Fig. 2

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REACTION SPRAY DISHWASHER HAVING AN IMPROVED WATER FILL SYSTEM

Filed Oct. 13, 1964 8 Sheets-Sheet 3

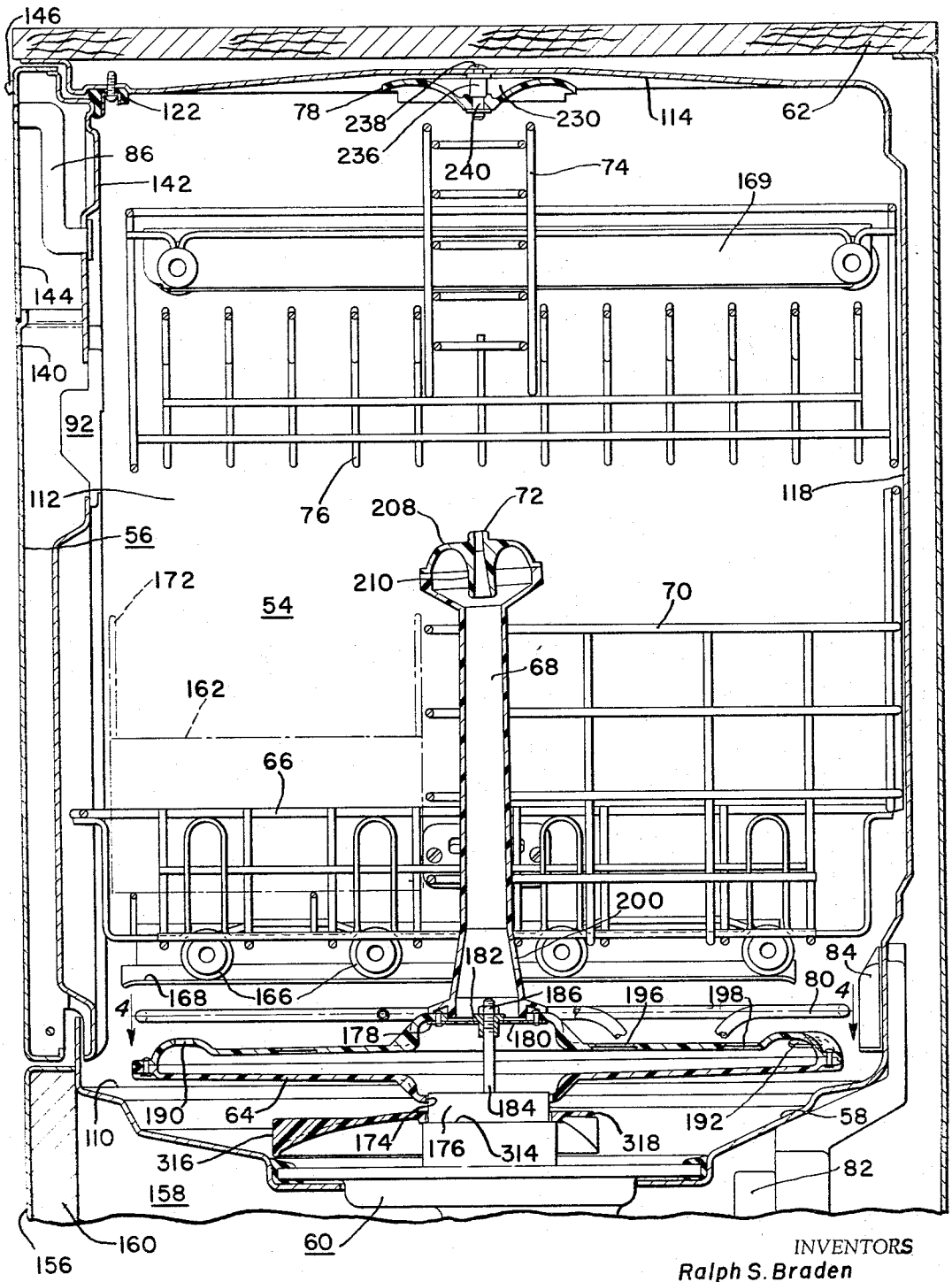


Fig. 3

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REACTION SPRAY DISHWASHER HAVING AN IMPROVED WATER FILL SYSTEM

Filed Oct. 13, 1964 8 Sheets-Sheet 4

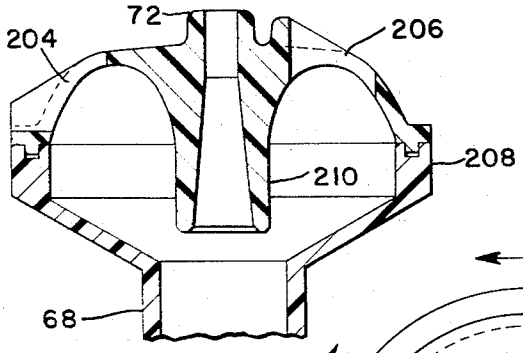


Fig. 6

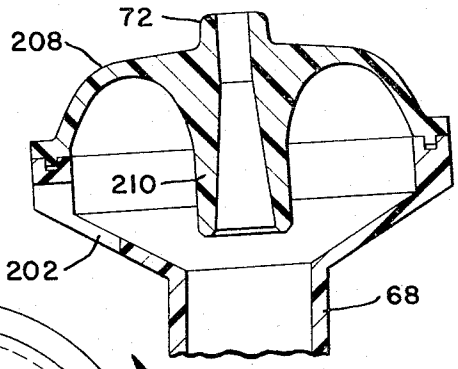


Fig. 7

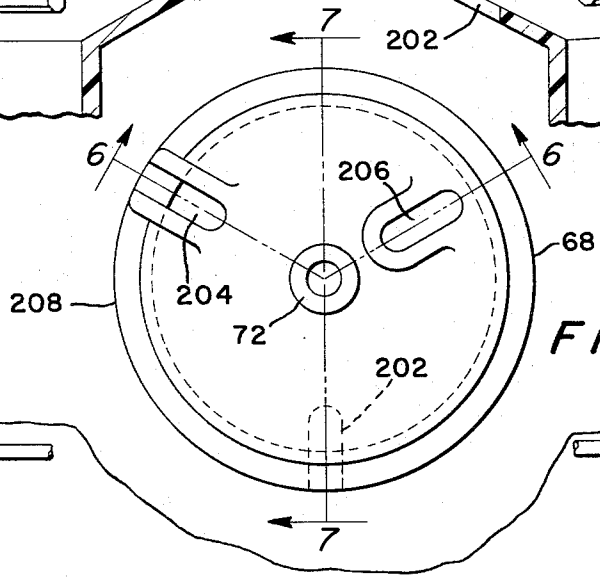


Fig. 5

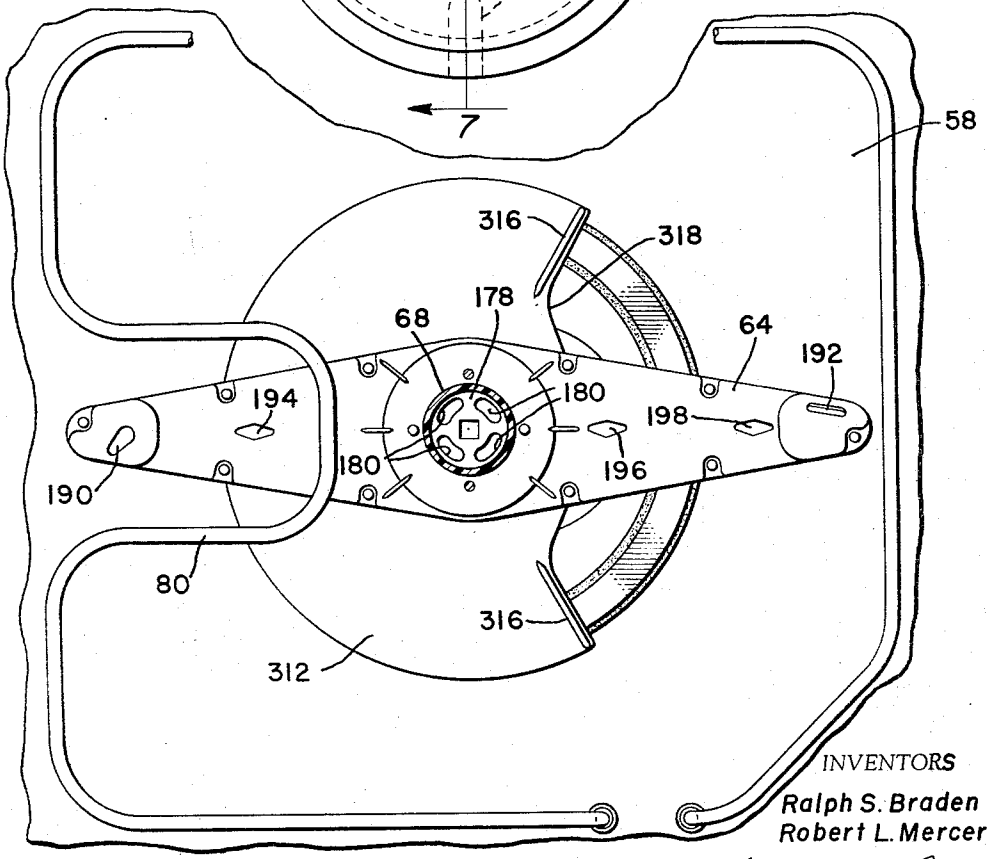
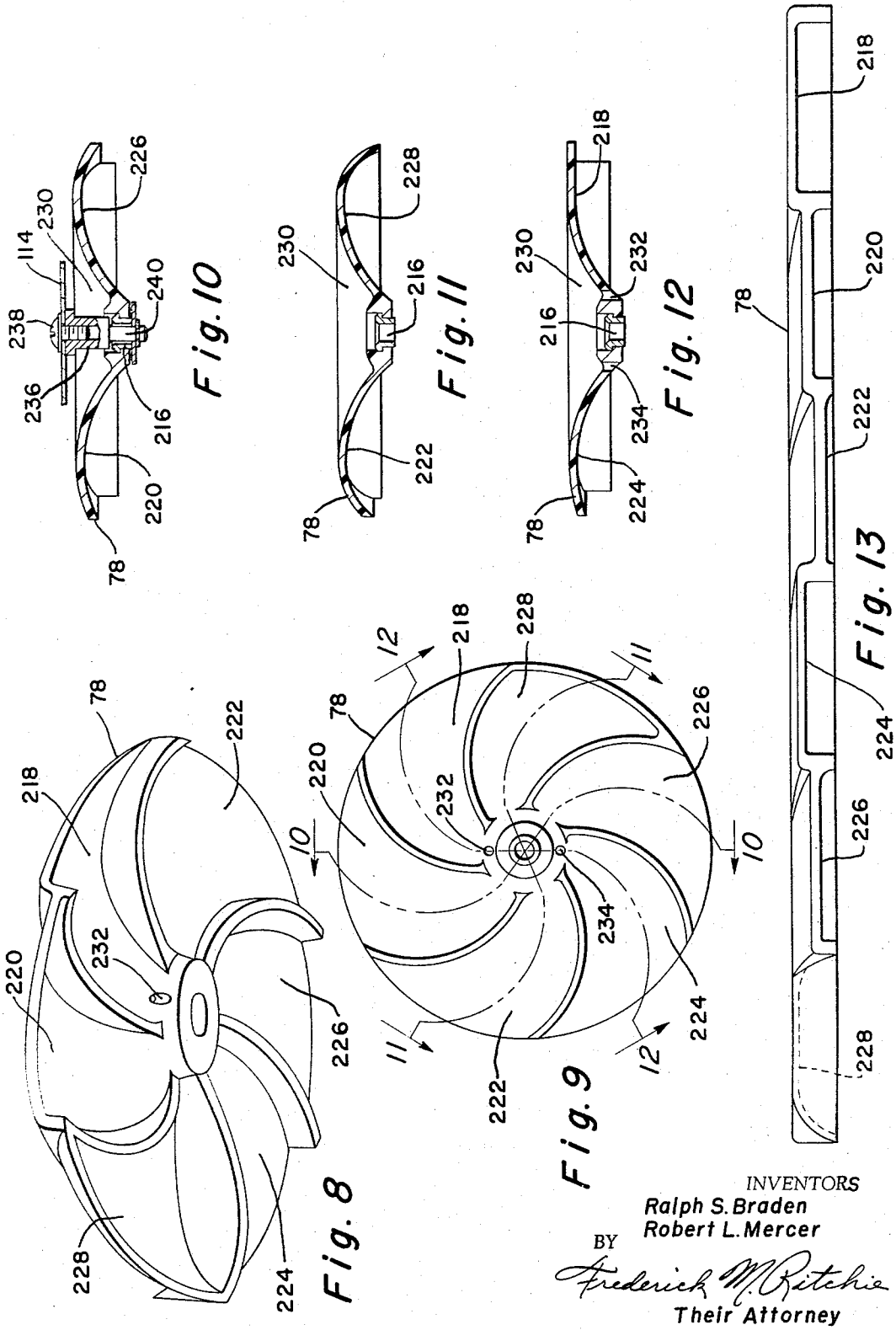


Fig. 4

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REACTION SPRAY DISHWASHER HAVING AN IMPROVED WATER FILL SYSTEM

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REACTION SPRAY DISHWASHER HAVING AN IMPROVED WATER FILL SYSTEM

Filed Oct. 13, 1964 8 Sheets-Sheet 6

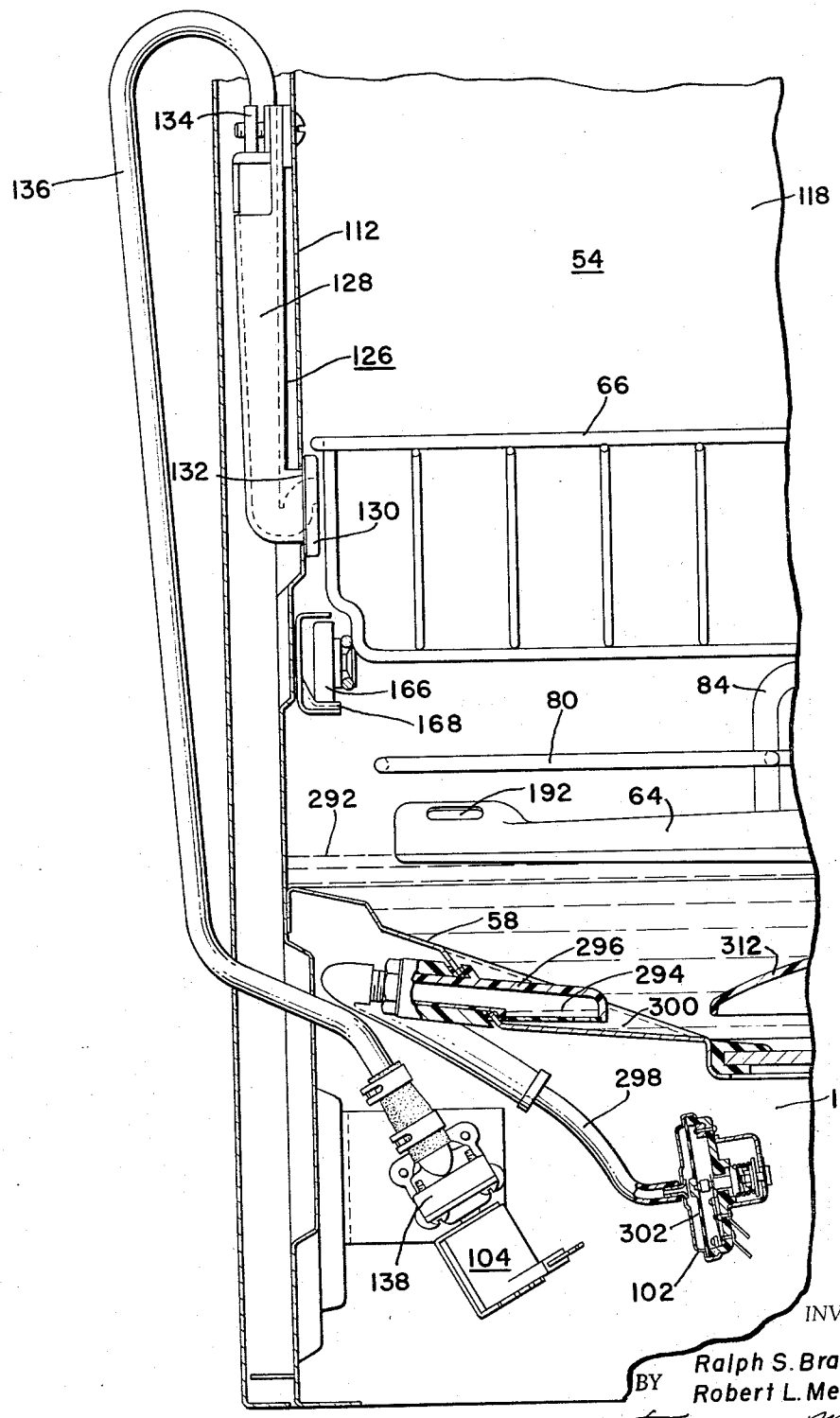


Fig. 14

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REACTION SPRAY DISHWASHER HAVING AN IMPROVED WATER FILL SYSTEM

Filed Oct. 13, 1964 8 Sheets-Sheet 7

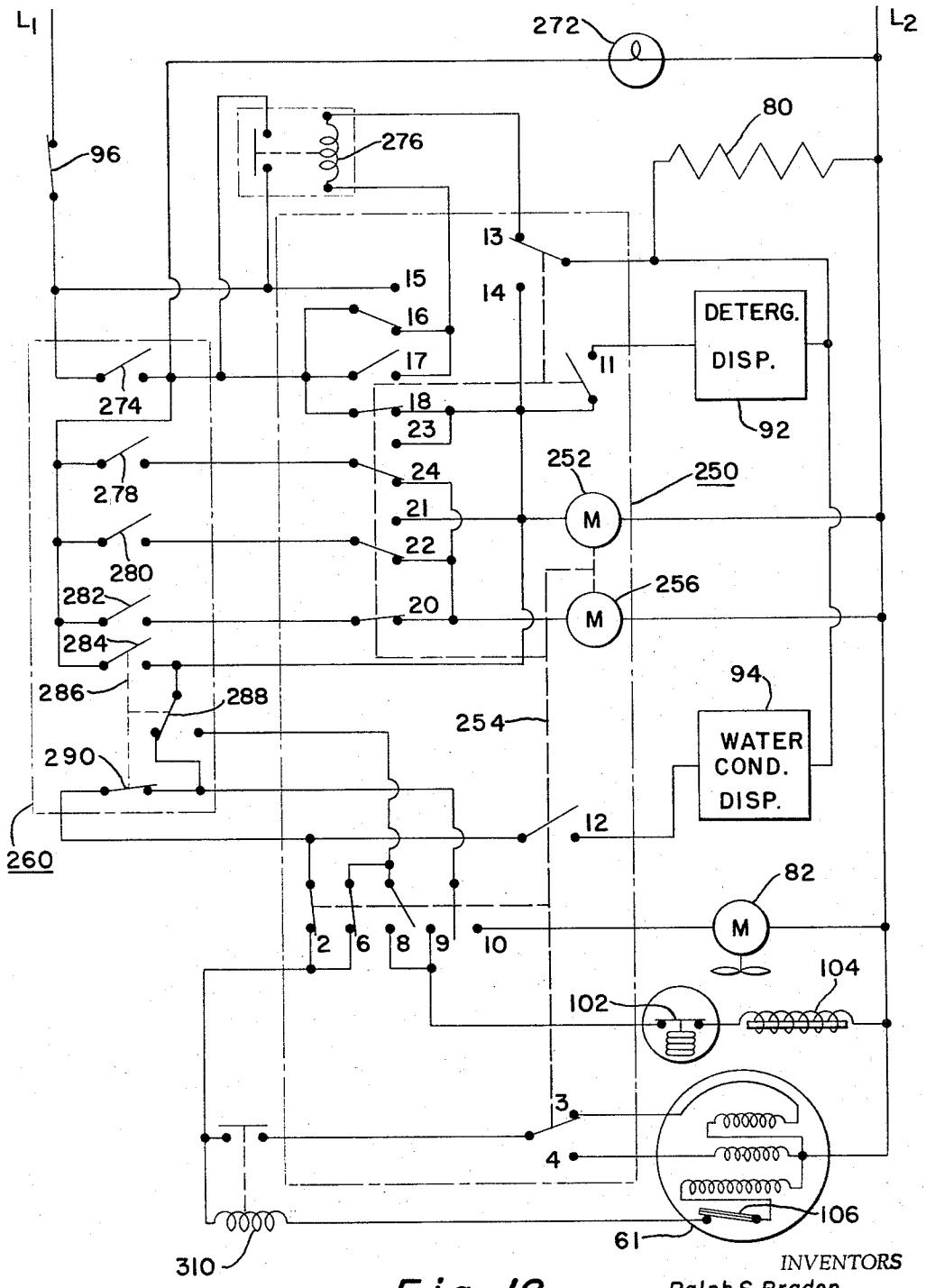


Fig. 18

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REACTION SPRAY DISHWASHER HAVING AN IMPROVED WATER FILL SYSTEM

Filed Oct. 13, 1964 8 Sheets-Sheet 8

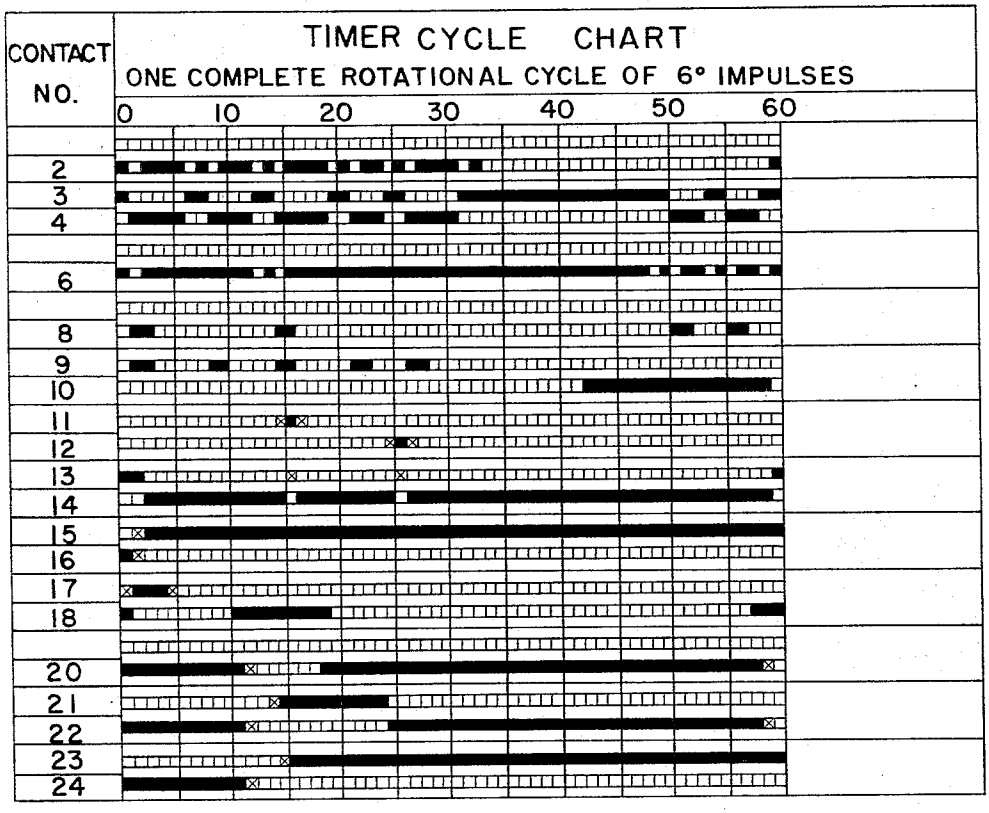


Fig. 19

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United States Patent Office 3,292,645 Patented Dec. 20, 1966

3,292,645

REACTION SPRAY DISHWASHER HAVING AN IMPROVED WATER FILL SYSTEM

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Filed Oct. 13, 1964, Ser. No. 403,479
9 Claims. (Cl. 134—57)

This invention relates to a domestic appliance and more particularly to a dishwasher having an improved water fill system, water distribution system, drying system and operating cycle.

In a dishwasher, it is desirable to keep the components associated with the water distribution system as simple and compact as possible in order to keep the cost of the appliance at a minimum. It is also desirable to effect a thorough distribution of the wash water during a washing cycle so that the dishes or the like being washed are thoroughly scrubbed by high speed jets of washing fluid. It is also desirable in dishwashers wherein the washing spray is directed toward the door for the dishwashing chamber to provide means for assuring that the water distribution will be inoperative when the door is open.

Accordingly, it is an object of this invention to provide a dishwasher with an improved water distribution system.

A further object of this invention is the provision of a dishwasher with an improved drying system for the dishes washed.

A more specific object of this invention is the provision of a vertically oriented water distribution system for a dishwasher including means for concealing stagnant wash fluids in the dishwasher.

A further specific object of this invention is the provision of an improved washing system for a dishwasher utilizing in combination a cocked nozzle means spaced from and in functional cooperation with a universally mounted rotatable and nutatable or wobbly baffle.

A further object of this invention is the provision of an improved water fill system for a dishwasher including an inverted water pressure sensitive housing in control relationship with the water fill valve.

Another object of this invention is an improved timer controlled operating cycle for a dishwasher including means for rapidly advancing the dishwasher through certain portions of an operating cycle, thereby to obtain other shorter cycles of operation.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

FIGURE 1 is a front elevational view of the dishwasher of this invention with parts broken away to disclose certain dispensing apparatus for use therewith;

FIGURE 2 is a fragmentary front perspective view of the dishwasher with the dishwasher door removed to illustrate the improved water distribution system of this invention;

FIGURE 3 is a fragmentary sectional view taken generally along the line **3—3** in FIGURE 2 and including the dishwasher door in a closed position as well as components of the dishwasher which are normally disposed within the dishwashing chamber;

FIGURE 4 is a fragmentary sectional view of the dishwasher taken along line **4—4** in FIGURE 3 and partly in elevation to show the operating components in the dishwasher sump;

FIGURE 5 is a top elevational view of the spray tube;

FIGURE 6 is a fragmentary sectional view of the spray tube taken along line **6—6** in FIGURE 5;

FIGURE 7 is a fragmentary sectional view of the spray tube taken along the line **7—7** of FIGURE 5 to illustrate the cocked orientation of the outlet nozzle thereof;

FIGURE 8 is a bottom perspective view of the water deflector;

FIGURE 9 is a bottom elevational view of the water deflector;

FIGURE 10 is a sectional view of the water deflector taken along line **10—10** in FIGURE 9 and including the means for mounting the deflector to the top of the dishwashing chamber for universal movement;

FIGURE 11 is a sectional view of the deflector taken along line **11—11** in FIGURE 9;

FIGURE 12 is a sectional view of the deflector taken along the line **12—12** in FIGURE 9;

FIGURE 13 is a schematic panoramic view of the deflector showing the completely unsymmetrical formation of the deflector pockets;

FIGURE 14 is a fragmentary front sectional view of the dishwasher showing the water fill arrangement therefor and with the fill tube shown outside the dishwasher for clarity;

FIGURE 15 is a fragmentary sectional view, partly in elevation of the drying system of this invention;

FIGURE 16 is a fragmentary front elevational view taken along line **16** in FIGURE 15 and showing the drying air grille;

FIGURE 17 is a fragmentary sectional view taken along line **17—17** in FIGURE 15;

FIGURE 18 is a schematic wiring diagram suitable for use with the dishwasher of this invention; and

FIGURE 19 is a timer cycle chart showing the functional relationships of the timer switches in FIGURE 18 in accordance with the improved operating cycle of this invention.

General

In accordance with this invention and with reference to FIGURE 1, an improved dishwasher **50** is illustrated generally. The dishwasher **50** is comprised of casing means **52** defining a dishwashing chamber **54** closed at the front thereof by a dishwasher door **56** and having at the bottom thereof a depressed sump **58** leading to a pump and motor assembly **60** of the type taught in the commonly assigned copending application, Ser. No. 341,209, filed January 30, 1964. The pump and motor assembly is connected to the sump **58** by means of a novel mounting arrangement taught in the commonly assigned concurrently filed copending application, Ser. No. 403,480. In general, the dishwasher **50** may be adapted with a separate top or wood chopping block **62** when the appliance is portable or for installation under a counter wherein the top **62** would represent a portion of the counter top.

In general, and with reference to FIGURES 2 and 3, the water distribution system includes a revoluble spray arm **64** beneath the lower rack **66** and a rotating spray column or spray tube **68** affixed to said spray arm and extending upwardly through a guard portion **70** of the lower rack permits the removal of the lower rack from the dishwashing chamber. The spray tube has a cocked nozzle portion **10** having an outlet **72** aimed through an open passageway **74** formed by a central wire network on an upper dish rack **76**. The jet stream from the nozzle **72** is aimed at a rotatable and freely nutating swirl spray impeller or wobble plate water deflector **78** above the upper rack **76**. A reversible motor **61** in the pump and motor assembly **60** directly drives an axial flow pump in one direction in accordance with the aforementioned copending application Ser. No. 341,209 to recirculate the water for washing or rinsing, and, when reversed pumps the water to drain. A 1000-watt (115 volt) heater element **80** is periodically energized throughout the operating cycle to provide recovery heat to the wash and rinse

water and for adding heat to the dishwashing chamber for the drying cycle. A blower fan **82** blows air from a grille **84** substantially in line with the heater **80** for blowing moisture laden air from the dishwashing chamber **54** during the drying cycle through a vent duct **86** in the door **56**.

Various dispensers are periodically energized throughout the dishwashing cycle for providing desired washing or rinsing agents at effective points in the operating cycle represented in the timer cycle chart of FIGURE 19. For instance, and with reference to FIGURE 1, a detergent dispenser **92** of the type taught in the patent to Barbulesco et al. 3,126,131, issued March 24, 1964, includes a perforated cover through which detergent is gradually flushed during a first wash and another cover which is energizable for opening to dispense a second quantity of detergent during a second wash. A water conditioner dispenser **94** of the type taught in the copending application, Ser. No. 403,480, filed concurrently herewith and assigned to the same assignee as this invention, automatically dispenses a wetting agent or surfactant into the final rinse cycle.

The following components provide for the safe operation of the dishwasher **50**. With reference to FIGURES 1 and 18, a door switch **96** stops all washing, rinsing, draining heating and/or filling operations whenever a door latch **100** is in the unlatched position. So that the switch **96** may not be closed while the dishwasher door is open, the latch **100** may be of the type taught in the patent to Jacobs et al. 3,007,479, issued November 7, 1961. As a guard against flooding, a pressure actuated fill safety switch **102** automatically opens the electrical circuit to a fill valve solenoid **104** in the event the water level in the tub is above normal. The switch **102** automatically closes itself when the overfill condition has been eliminated. The motor **61** is protected with an overload protector switch **106** which automatically opens the electrical circuit to the motor windings in the event an overload condition should exist. The protector **106** is self-resetting after several minutes.

Construction

With reference now to FIGURES 2 and 3, the wash tank or dishwashing chamber **54** is comprised of a welded assembly of steel panels **110**, **112**, **114**, **116** and **118** which give a sturdy framework for mounting the other components of the dishwasher thereon. The entire steel assembly is preparatory phosphate treated and prime coat treated to prevent corrosion. The interior surfaces of the dishwashing chamber **54** have a finish coating of blue vinyl organisol to provide a tough durable lasting finish. The panels **110**, **112**, **114** and **116** define a front opening **120** to the dishwashing chamber in which a seal **122** is positioned for engagement by the top and two sides of the dishwasher door **56**. The areas on the outside of the dishwashing chamber which are adjacent to the openings for the tub vent **86** and the fill funnel **128** are also finish coated with blue vinyl organisol.

With reference to FIGURE 14, the fill funnel assembly **126** is comprised of a bakelite fill funnel **128** and a bakelite cover **130** which are cemented together to prevent water leakage through the sidewall **112** of the dishwashing chamber—a gasket **132** between the wall **112** and the cover **130** serving this purpose. A fill tube clamp **134** on the top of the fill funnel **128** holds the fill tube **136** a spaced distance from the funnel **128** thereby to provide a one-inch air gap, in accordance with conventional plumbing codes, to prevent back up of wash water from the dishwater into the domestic water supply system. The fill tube **136** is connected to a valve **138** operated by the fill solenoid **104**, which is, in turn, energized selectively by the pressure switch **102**.

The door assembly **56** (FIGURES 1 and 3) has an outer door panel **140** which is spray painted with enamel, and an inner door panel **142** which is preparatory phosphate treated, prime and finish coated with blue vinyl organisol. The two panels are held together at the bottom with screws whereas the top of the outer door panel fits under the lower front lip of the escutcheon **144** which extends across the top of the door and includes a substantially coextensive handle or grip **146** just above the latch **100**. Absorbent material (not shown) is cemented at the areas of the handle **146** where condensation from the door vent assembly **86** may occur, thereby to prevent condensation on the metal parts of the door. Attached to the inner door panel **142** are the door vent assembly **86**, detergent dispenser **92**, water conditioner dispenser **94**, door latch assembly **100** and the door switch assembly **96**. The door **56** opens downwardly approximately 90° from its vertical closed position and has connected thereto a counterbalance spring (not shown) which hooks on to the inside end of each of the door hinges **150**, **152** (FIGURE 2) in accordance with conventional practice.

The door vent assembly **86** is mounted to the upper left-hand corner of the inner door panel **142**. When installed, the door vent extends vertically upwardly between the inner and upper door panels with the air being vented from the dishwashing chamber **54** from under the handle **146** of the control panel escutcheon **144**.

In general, the door latch assembly **100** serves the two functions of locking the door **56** shut an operating cycle and of operating the door switch depending on whether the door is open or closed. When the door **56** is open, the switch **96** cannot be operated and when the door is closed and the latch handle is swung to lock the door shut, a portion of the latch mechanism **100** engages the door switch such that the electrical contacts on the door switch **96** become closed.

A lower front panel **156** is removable for easy access to the motor compartment **158**. Sound deadening insulation **160** can be cemented to the back of the access panel as well as to other panels defining the dishwashing operation.

The upper rack **76** may be used for cups, bowls, glasses, saucers, etc., while the lower rack **66** is adapted for retaining plates, bowls, serving dishes and the silverware basket shown in phantom at **162**. The racks are made of heavy gage steel wires which are coated with white vinyl. Each rack has Nylon rollers, such as **166**, riveted in place to allow easy movement of the racks in and out of the dishwashing chamber during loading and unloading thereof. The Nylon rollers glide on stainless steel guides, such as **168**, for the lower rack and extension guides, such as **169**, for the upper rack which are screw fastened to the sidewalls of the washing chamber as at **170** (FIGURE 2). The center front area of the lower rack **66** is arranged to carry the separate silverware basket **162** which includes inverted U-shaped handles **172** at each end thereof for convenience in handling. The basket **162** may be divided into fifteen sections for separating the silverware being washed.

Water distribution system

The water distribution system of this invention for washing and rinsing can best be understood with reference to FIGURES 2 and 3. Note that the lower horizontal spray arm **64** includes a downwardly opening inlet **174** which circumscribes the top of an axial flow pump housing **176** of the pump and motor assembly taught in the aforementioned copending application Ser. No. 341,209. Above the opening **174**, the lower spray arm has a plate **178** attached thereto and including four ports **180** arranged circumferentially thereabout and placing the interior of the spray arm **64** in communication with the interior of the spray tube **68**. A square shanked bearing **182** indexes with a square opening in the spray arm plate **178** and is retained at the top of a spindle **184** on the pump and motor assembly **60** by a nut **186**. When the pump is operating to supply water to the interior of the spray arm **64** the spray arm will be lifted free of the pump housing **176** in a manner whereby the top of the plate **178** will bear against the flanged top of the bear-

ing 182, some of the water being pumped entering the interior of the spray tube 68 through the plate ports 180.

With water being supplied to the spray arm 64 and with reference to FIGURE 2 the substantially illustrated spray pattern will result. More particularly, the horizontal spray arm 64 includes reaction ports 190, 192 for causing the arm 64 and the attached spray tube 68 to rotate. Nonreaction type ports 194, 196 and 198 in the spray arm, and nonreaction ports 200, 202, 204 and 206 in the spray tube will provide jets of washing fluid in a spray pattern substantially as shown. Note that the spray tube 68 is formed with an enlarged or bulbous housing portion 208 at the top thereof in which the ports 202, 204 and 206 are positioned. Moreover and with reference to FIGURES 5, 6 and 7, the housing 208 is formed in a central portion thereof with a nozzle means 210 cocked at an angle to the vertical axis of the spray tube 68 and aimed through the guard 74 in the top rack 76 at the rotatable water baffle or deflector 78 on the top wall 114 of the dishwasher. As the spray tube rotates, the jet of water issuing from the outlet 72 of the nozzles 210 will trace a path around the deflector and spaced from the center thereof.

The deflector 78 and the mounting thereof comprise an important part of this invention and will be described more particularly with reference to FIGURES 8–13. The deflector 78 is a round molded plastic part having a bearing 216 press fit in the center thereof and including a plurality of completely differently shaped concave pockets 218, 220, 222, 224, 226 and 228. The shape of the deflector 78 leaves a cavity 230 between the top wall 114 of the dishwashing chamber and the deflector and for this reason weep holes 232, 234 are left in the casting to drain any water which gets trapped above the deflector. FIGURE 13 schematically emphasizes the complete lack of symmetry between the pockets. Thus, the spray pattern issuing from the peripheral edges of each of the pockets is different.

The novel spray pattern of this invention is particularly enhanced by a novel mounting arrangement of the deflector 78, a wobbly mounting which is completely lacking in the prior art dishwashers. More particularly and with reference to FIGURE 10, the deflector 78 is carried on an adapter 236 fastened as at 238 to the top wall of the dishwashing chamber. The adapter 236 has a reduced diameter spindle section 240 which is smaller than the interior diameter of the bearing 216 so that the deflector 78 can rock, wobble or undulate on the stub shaft or spindle 240 as it rotates thereabout in response to the impingement thereon of the jet of water from the cocked nozzle outlet 72. This combination of undulation or non-uniform wobbling plus completely variable swirl inducing pockets creates a spray pattern which is substantially nonrepeatable.

Now returning to FIGURE 2, the lower spray arm 64 is shown to include the reaction ports 190 and 192 which effect the rotation of the spray arm and the spray tube attached thereto as well as providing an oblique spray directed toward the bottom of the lower rack 66. Further, the vertically directed ports 194, 196 and 198 of the lower spray arm direct their jets of washing fluids directly upwardly into the bottom of the lower rack 66 while the port 200 in the spray tube essentially supplies water from a point within the center of the lower rack. The top of the spray tube 68 is positioned between the upper and lower racks in a manner whereby the spray port 202 sprays downwardly on the lower rack 66 while the ports 204 and 206 spray upwardly and outwardly on the upper rack 76. The top of the upper rack 76 is completely washed by the spray pattern created by the jet of water from the cocked nozzle 210 aimed through the guard 74 toward the universally mounted water deflector 78 which undulates between a representative solid line position A to phantom line position B (FIGURE 2).

Operation

The operation of the dishwasher will best be understood with reference to FIGURES 18 and 19. The door interlock switch 96 is a single pole, single throw type which controls power supply to all of the electrically operated components in the dishwasher. The internal contacts of the switch 96 are spring loaded so that the contacts open as the force on the switch actuator is removed when the latch mechanism 100 is moved into an unlatched position.

A timer 250 programs the squence of operation for all dishwashing cycles. Its automatic advance is accomplished by an electric timer motor 252 which, through an escapement mechanism, sequentially operates a plurality of timer switches by means of a cam actuated timer shaft 254—the motor 252 incrementally advancing the cycle in sixty-second intervals.

Occasionally, it is desired to advance the dishwasher through certain of its functions while retaining other functions. For this purpose, an additional rapid advance timer motor 256 cooperates with the cam shaft 254 to advance the shaft at a rate of three seconds for each increment of regular advancement. In other words, during normal automatic timer advance, each incremental advancement takes sixty seconds, while on rapid advance, each incremental advancement takes place every three seconds. Irrespective of which motor 252 or 256 is driving the cam shaft 254, the timer contacts 2–4, 6, 8–18 and 20–24 will be opened and closed in accordance with the timer cycle chart of FIGURE 19.

Although FIGURE 19 is representative of the switch operation in the timer, the following sequence notes apply to the design of the timer 250. At timer increment or impulse line 1, contact 18 must open before contact 9 closes. At timer interval line 2, contact 15 must close before contact 13 opens. At timer interval line 10, contact 9 must open before contact 18 closes. The timer interval line 60, contact 15 must open before contact 17 closes, but contact 17 must close before contact 16 opens at timer interval line 1. Also at timer interval line 60, contact 16 must close. In accordance with the rapid advance concepts embodied in the dashwasher timer of this invention, the timer must stop at timer interval lines 11 and 58 following rapid advance through contacts 20 or 22. Further, the timer must stop at timer interval line 11 following rapid advance through contact 24.

A push button user's control 260 is provided for selecting a particular cycle for the dishwasher. More particularly, the cycles are identified on the respective push buttons 262 (Regular Wash), 264 (Light Wash), 266 (Pots and Pans), 268 (Rinse and Hold), 270 (Cancel for those situations where you want to cancel any of the previous push buttons selected) and a signal light 272 which indicates whether or not the dishwasher is in operation. The push button cycle selector 260 includes a switch 274 which is closed momentarily to energize a holding coil 276 whenever any of the push buttons 262, 264, or 268 are pushed. A switch 278 is closed whenever the push button 264 is selected; a switch 280 is closed whenever the push button 268 is selected; a switch 282 is closed whenever the push button 270 is selected; and a switch 284 is closed whenever the push button 262 is closed. When the Pots and Pans switch 266 is selected, a linkage 286 connected thereto serves to close switch 284, move a switch 288 to its opposite contact, and open a switch 290.

With the foregoing circuitry, the fill valve 104 is electrically operated to allow hot water to enter the dishwashing chamber for any wash or rinse cycle. During the two minutes of flow, a flow washer in the valve 138 will allow 2.7 gallons of water into the sump 58 of the washer. When the water reaches a proper level 292 in the sump, a water level 294 will exist in the inverted pressure sensing housing 296 which creates a pressure within the housing which is reflected at the pressure switch 102 for deenergizing the

solenoid **104**. In the event of an over charge of water in the sump, a fill safety switch **102** will operate to open the circuit of the solenoid **104**, thereby stopping the flow of additional water. Interconnecting the pressure switch **102** and the inverted housing **296** is a rubber hose **298** routed in high loop fashion along the side of the dishwasher sump. The housing **296** extending into a recess **300** in the side of the sump **58** acts as a cavity area to trap air. When the water level rises high enough to create 2.6 inches water column pressure (about four gallons), the pressure is transmitted through the rubber hose **298** to the pressure sensitive diaphragm **302** of the fill safety switch for opening the contacts thereof. When the water level is reduced to a level whereby only .4 inch of water column air pressure (minimum) is sensed by the diaphragm of the fill safety switch (about three gallons), the diaphragm allows the pressure switch to again close, thus allowing the fill valve to become energized for successive fill cycles.

Whenever the pump motor **61** is started through the energization of the relay coil **310**, water will be pumped through the pump outlet **176** into the interior of the lower spray arm **64**. The force of the water against the under side of the plate **178** will lift the spray arm off the pump housing, the relative shifting of adjacent wall portions self cleaning away any debris which might exist in the opening **174** between the spray arm **64** and the pump housing **176** which could bind up the spray arm. Then the reaction effect of the water spray from ports **190** and **192** will cause the water distributing means, including the spray arm **64** and the spray tube **68**, to rotate. Water pressure will fill the interior of the spray arm **64** and the spray tube **68** substantially equally throughout so that a dish covering spray will issue from the spray arm ports **194**, **196** and **198** directed upwardly over the dishes in the bottom rack **66**. This is in addition to the spray cleansing force of the spray from the reaction ports **190** and **192**. At the same time, a spray jet issuing from the port **200** on the spray tube will be directed toward the dishes in a lower rack from a more central position. The spray pattern afforded by the housing **208** on the top of the spray tube will spray down on the dishes in the lower rack from the spray port **202** and will spray upwardly on the bottom of the upper rack **76** by means of spray ports **204** and **206**. In order to spray the dishes in the upper rack from above, the cocked nozzle outlet **72** is aimed toward a radially outer portion of the water deflector or baffle **78**. As the jet traces a circular path around the axis of the deflector **78**, the force of the jet will cause the deflector to rotate as well as wobble due to the sloppy fit of the pivot pin **240** in the deflector. As the deflector wobbles or nutates in response to the action of the jet, the spray will be returned to the top of the upper dish rack **76** in an ever changing nonrepeatable spray pattern.

As aforesaid, the inlet **174** of the spray arm **64** loosely overfits the top of the pump housing. Thus, a cylindrical curtain of water issues downwardly from this annular slot. If the curtain of water were allowed to persist, the water flowing toward the inlet to the pump would be retarded by the force of the water curtain and the pump would tend to be starved for water. For this reason, a deflector or sump water cover **312** is carried on a shoulder **314** of the pump outlet to deflect the curtain of water coming out of the space between the spray arm inlet and the pump housing. The deflecting means **312** may have flow straighteners **316** thereon and a cutout portion **318** for retrieving any lost items which may get under the cover **312**. Note that the cover is slidably rotatable on the shoulder **314** of the pump housing, but note further that the solid portion of the cover is intended to face the opening to the dishwashing chamber as a means for concealing any stagnant water which may exist in the dishwasher sump.

After a plurality of wash and rinse cycles in the dishwashing chamber, the soiled water is pumped from the dishwashing chamber and the fan motor energized at the timer interval line **42** to initiate a drying cycle which forces air from the inlet grille **84** at the bottom of the dishwashing chamber over the energized heater **80**—the exhaust of the heated air and steam occurring by means of the front vent **86** in the dishwasher door.

While the embodiment of the present invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. In combination, casing means defining a dishwashing chamber having a sump, means for supplying water to said sump including a pressure sensitive means in said sump for controlling the supply of said water, means for concealing the water in said sump, and means for distributing said water in said chamber for washing dishes or the like, said distributing means including rotatable horizontal spray arm means having an inlet opening overlying said water concealing means and a spray port facing upwardly in said chamber, a vertical spray tube attached to said spray arm for rotation therewith and extending upwardly to a central part of said chamber, said spray tube including a hollow column connected to said spray arm and in communication with the inlet thereof, said column having a spray port in a lower portion of the side thereof facing sidewardly and having a bulbous hollow spray header on the top thereof having a spray port in the bottom thereof facing downwardly and three ports in the top thereof facing upwardly and outwardly, one of said ports comprising a nozzle having an axis at an angle to the axis of said hollow column, deflector means on the top of said chamber having a plurality of downwardly facing pockets at least one of which is in alignment with the axis of said nozzle and configured reactingly to rotate said deflector means in response to the impingement thereon of a jet of water from said nozzle, and means for rotatably and universally supporting said deflector means whereby said deflector means wobbles as it rotates in response to said jet.

2. The combination of claim **1** wherein said pressure sensitive means includes an inverted housing means in said sump having a bottom opening in communication with said sump, the water level in said housing means above said bottom opening being lower than the water level in said sump and rising and falling in response to the water level in said sump.

3. The combination of claim **1** including a vertically oriented pump outlet means extending into the inlet of said horizontal spray arm means and including a spindle for journaling said water distributing means when water is being supplied through said pump outlet means, said pump outlet means being spaced from the edges of said inlet to permit limited vertical movement of said spray arm means, the concealing means for said sump water having means in vertical alignment with the space between said pump outlet means and said spray arm inlet to deflect water issuing from said space when water is being supplied through said pump outlet.

4. In combination, casing means defining a dish-washing chamber having a sump adapted to contain water and means in communication with said sump for distributing said water in said chamber for washing dishes or the like, said distributing means including rotatable horizontal spray arm means having an inlet opening facing downwardly and a spray port facing upwardly in said chamber, a vertical spray tube attached to said spray arm for rotation therewith and extending upwardly to a central part of said chamber, said spray tube including a hollow column connected to said spray arm and in communication with the inlet thereof, said column having a spray port in a lower portion of the side thereof facing sidewardly and having a hollow spray header on the top thereof with a spray port in the bottom thereof facing down-

wardly and a port in the top thereof facing upwardly and outwardly, said last named port comprising a nozzle having an axis at an angle to the axis of said hollow column, deflector means above said nozzle having a plurality of downwardly facing pockets at least one of which is in alignment with the axis of said nozzle and configured reactingly to rotate said deflector means in response to the impingement thereon of a jet of water distributed from said nozzle, and means for rotatably and universally supporting said deflector means whereby said deflector means wobbles as it rotates in response to said jet.

5. The combination of claim 4 wherein said water distributing means includes a vertically oriented pump outlet means extending into the inlet of said horizontal spray arm means and including a spindle for journaling said water distributing means when water is being supplied through said pump outlet means, said pump outlet means being spaced from said inlet to permit limited vertical movement of said spray arm means.

6. The combination of claim 4 including a cover for concealing water in said sump and wherein said water distributing means includes a vertically oriented pump outlet means extending into the inlet of said horizontal spray arm means above said cover and including means for journaling said water distributing means when water is being supplied through said pump outlet means, said pump outlet means being spaced from said inlet to permit limited vertical movement of said spray arm means, said cover for concealing said sump water having means in vertical alignment with the space between said pump outlet means and said spray arm inlet to deflect water issuing from said space when water is being supplied through said pump outlet.

7. In combination with means forming a water distribution chamber, means for supplying water to said chamber, and means for controlling the supply means, said control means including a pressure sensitive means in said chamber comprising an inverted housing means having a downwardly facing lower opening in said chamber and configured in a manner to trap air in an upper portion thereof, the pressure of the air trapped in said inverted housing varying in response to the level of water in said chamber, the level of water in said housing means being different than the level of water in said chamber.

8. In combination, casing means defining a chamber having a sump adapted to contain water or the like and means in communication with said sump for distributing said water or the like in said chamber for washing dishes or the like, said distributing means including spray means rotatable about an axis in said chamber and having a spray port, said spray port comprising a nozzle having an axis at an angle to the axis of said spray means, deflector means having a pocket facing said nozzle and in alignment with the axis of said nozzle and configured reactingly to rotate said deflector means in response to the impingement thereon of a jet of water distributed from said nozzle, and means for rotatably and universally supporting said deflector means whereby said deflector means wobbles as it rotates in response to said jet.

9. In combination with a dishwashing chamber having a sump in the bottom thereof adapted to contain a washing fluid, vertically oriented pump means having housing means extending into said sump, said housing means having upper and lower portions, spray arm means rotatably mounted relative to said upper portion a spaced distance therefrom for freely rotating to distribute said washing fluid in said chamber and forming with said upper portion by the spaced distance an opening in communication with washing fluid being distributed from said upper portion of said pump housing means, and cover means on said pump means between said upper and lower portions for concealing stagnant washing fluid in said sump when said washing fluid is not being distributed and aligned with said opening for diverting washing fluid issuing from said opening when said washing fluid is being distributed for preventing said lower portion of said pump housing means from being starved for washing fluid.

References Cited by the Examiner

UNITED STATES PATENTS

1,511,661	10/1924	Dantzebecher	134—183 X
1,681,322	8/1928	Cave	134—176 X
3,064,664	11/1962	Warhus	134—176

OTHER REFERENCES

Frigidaire Service Tech-Talk, volume IX No. 2A, April 1958, pages DW–31, DW–32 and DW–53 relied on.

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