April 14, 1953 W. R. WALKER 2,634,739

WASHING MACHINE

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Fig. 1.

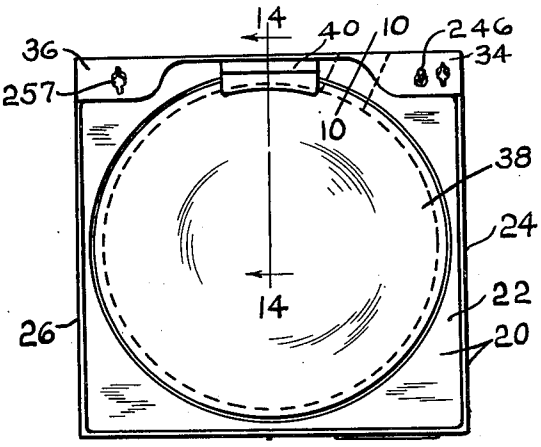
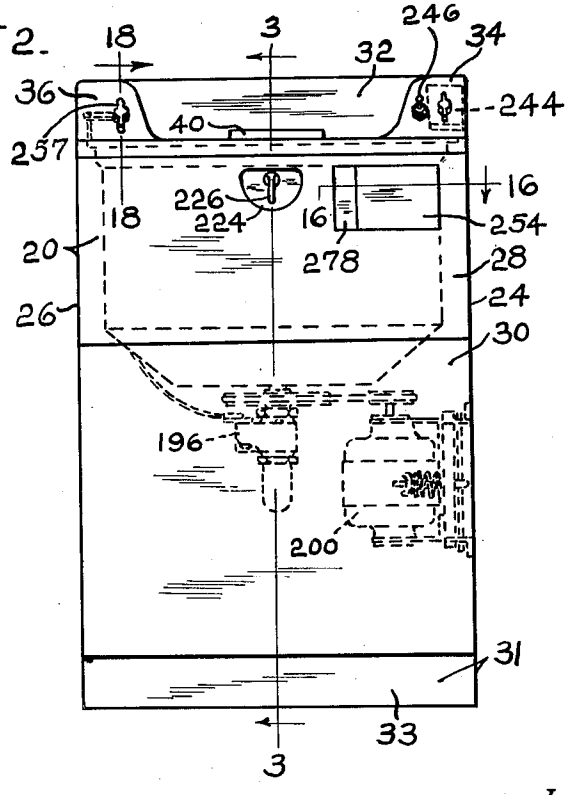


Fig. 2.



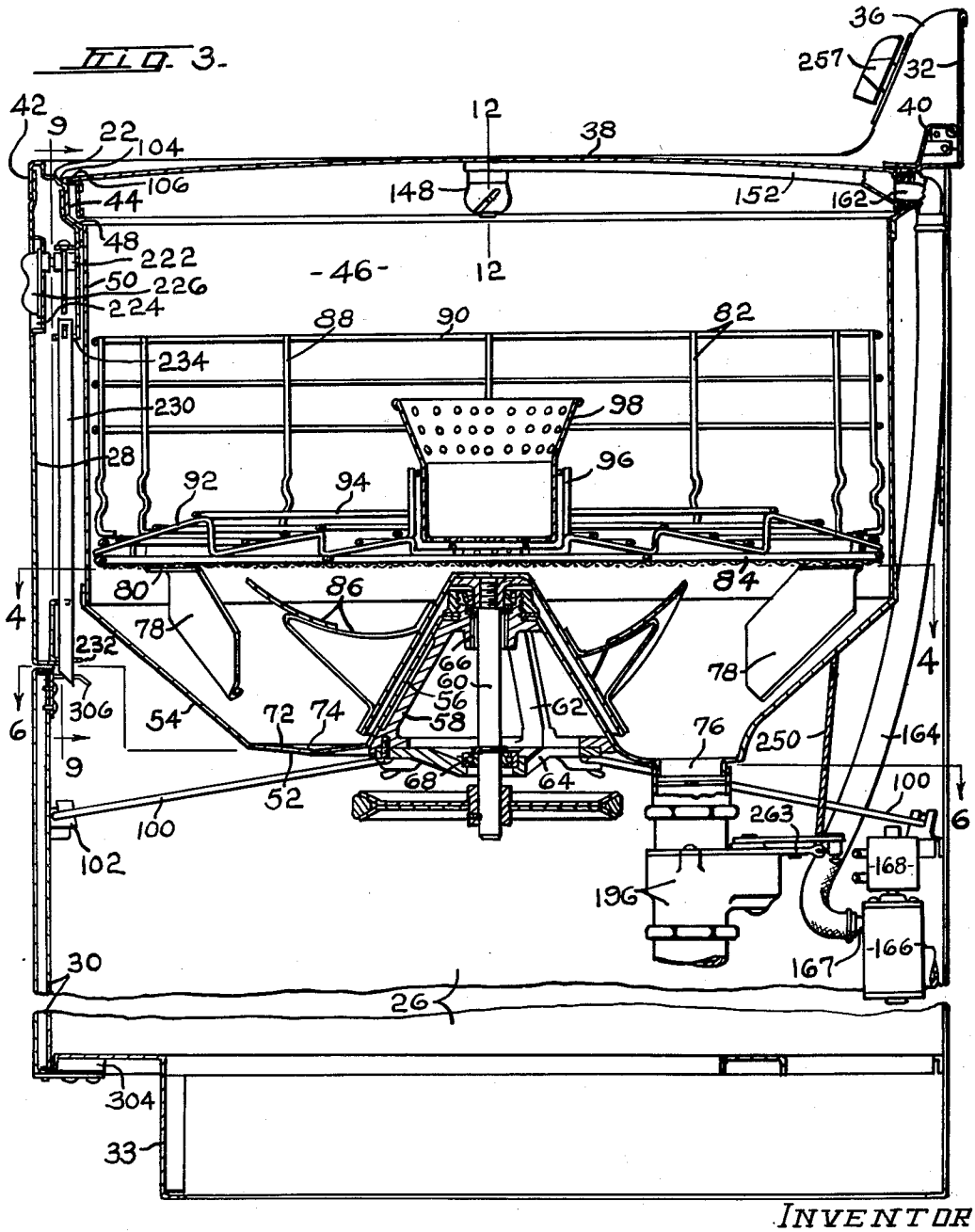
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WASHING MACHINE

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Fig. 3.



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WASHING MACHINE

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FIG. 4.

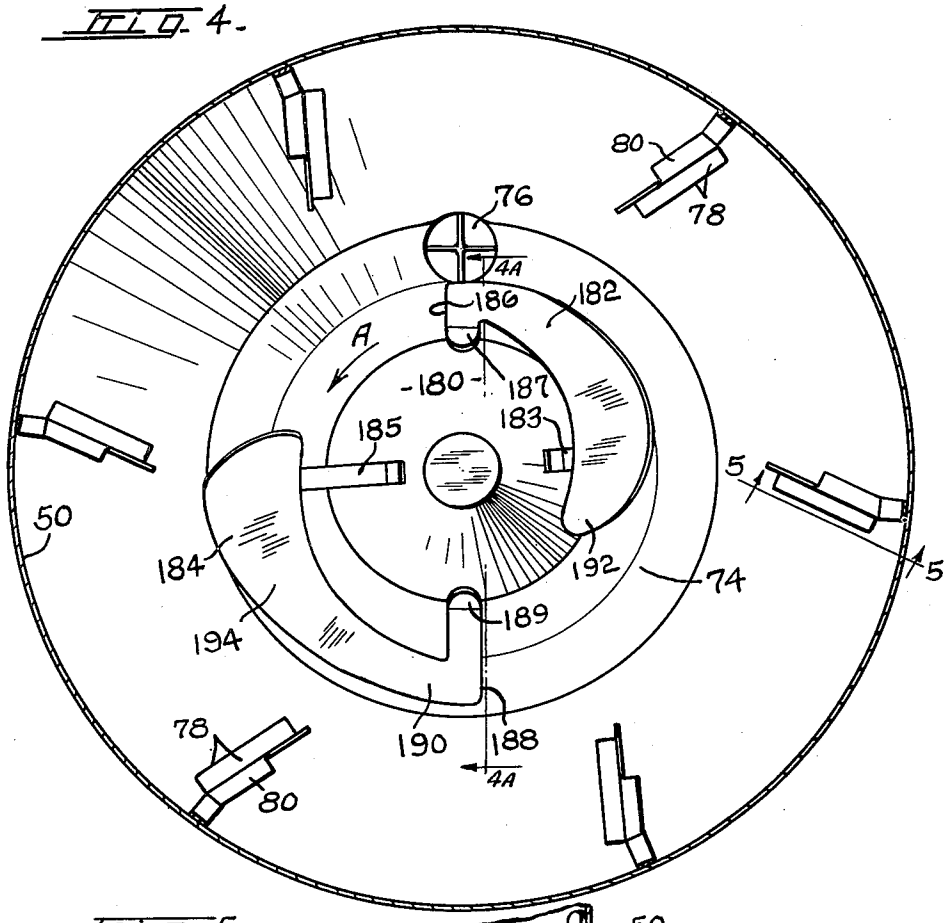
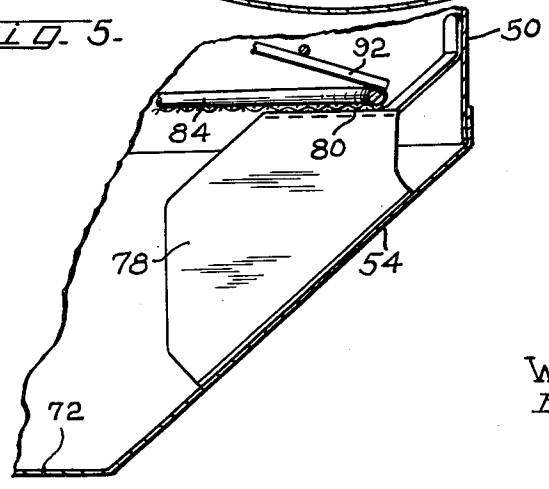


FIG. 5.



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WASHING MACHINE

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FIG. 6.

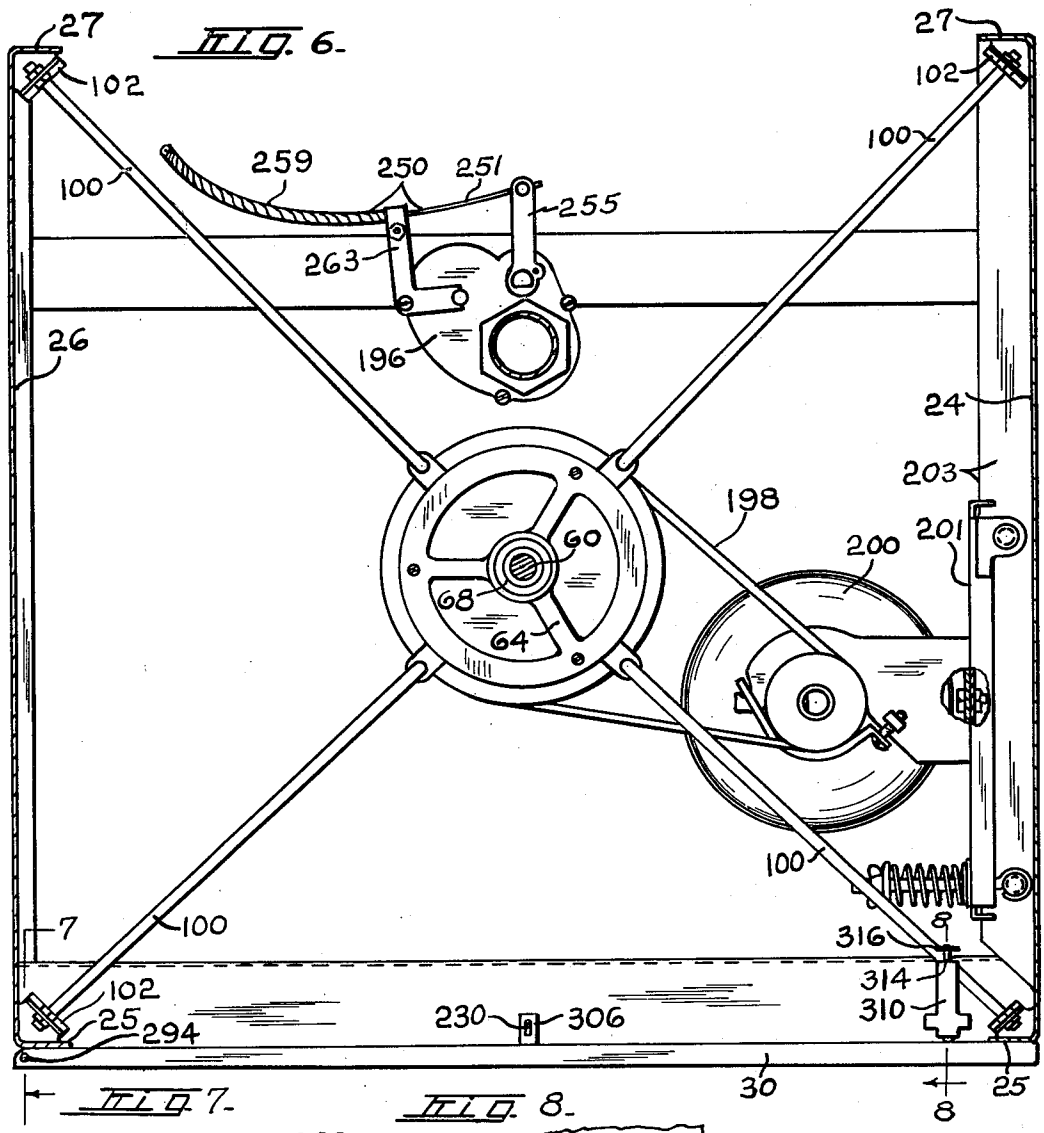


FIG. 7.

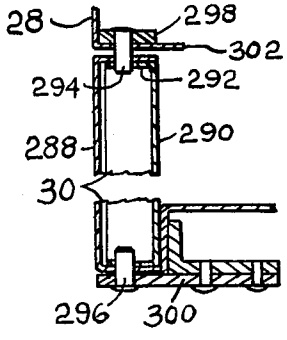
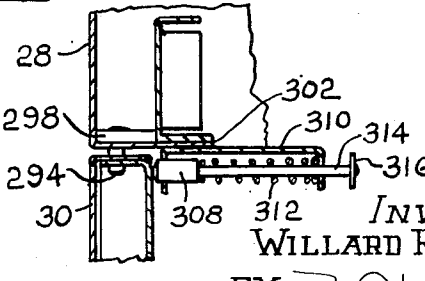


FIG. 8.



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WASHING MACHINE

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FIG. 9.

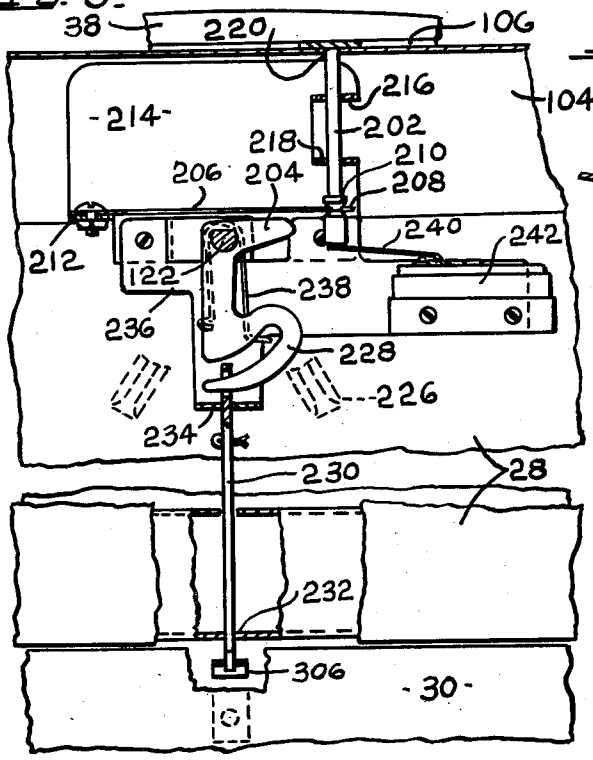


FIG. 11.

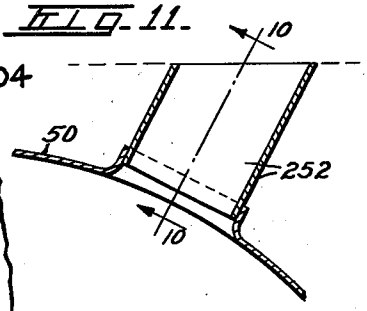


FIG. 10.

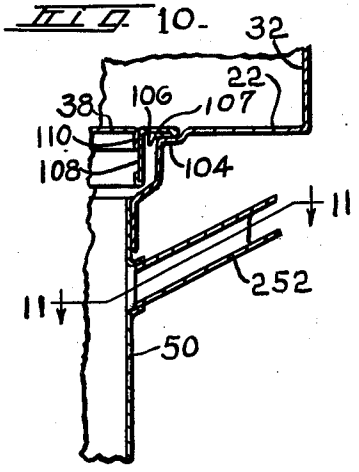
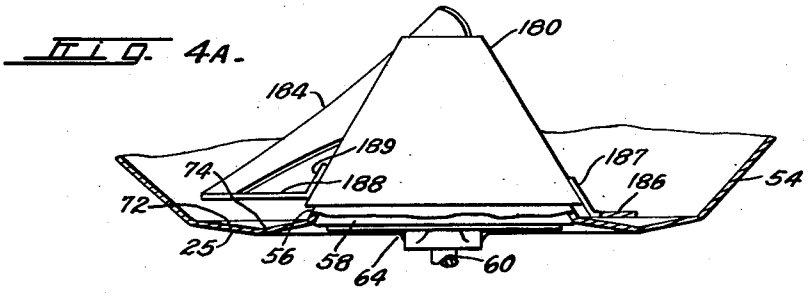


FIG. 4A.



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WASHING MACHINE

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FIG. 12.

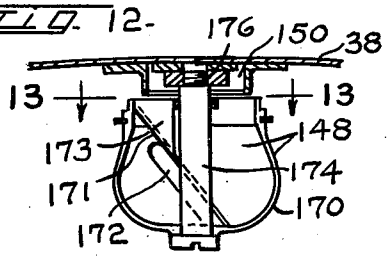


FIG. 13.

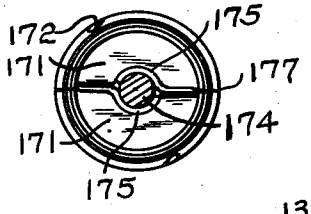


FIG. 14.

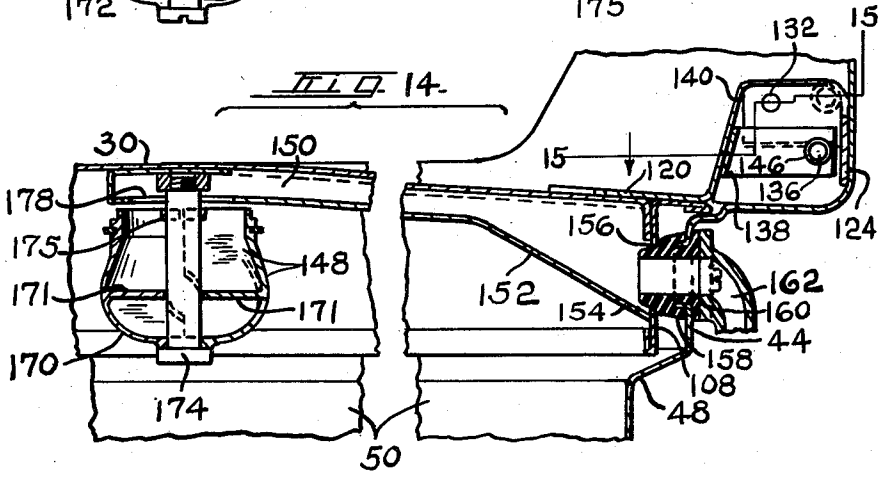
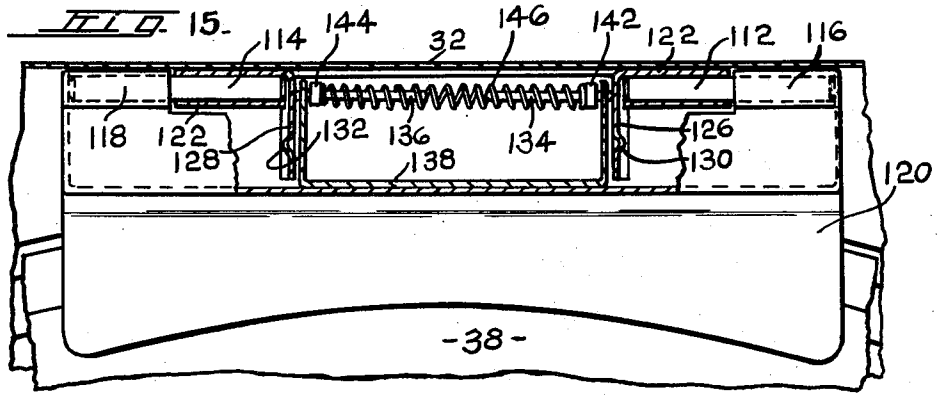


FIG. 15.



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FIG. 16.

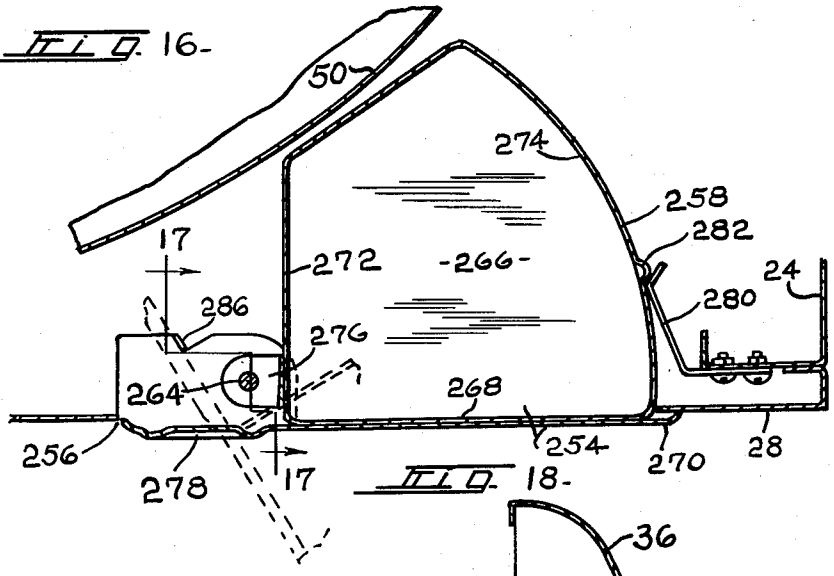


FIG. 18.

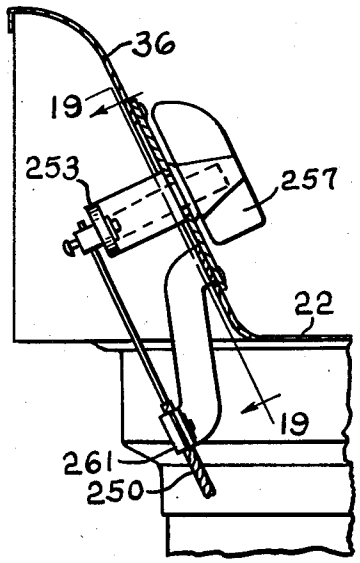


FIG. 17.

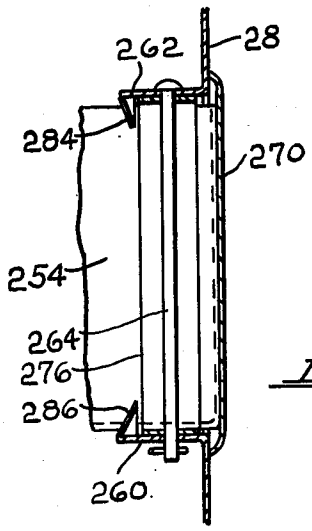
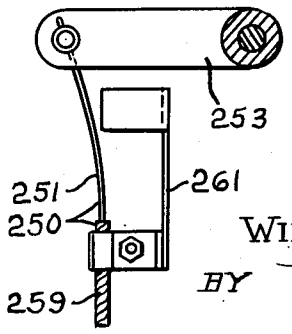


FIG. 19.



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FIG. 20.

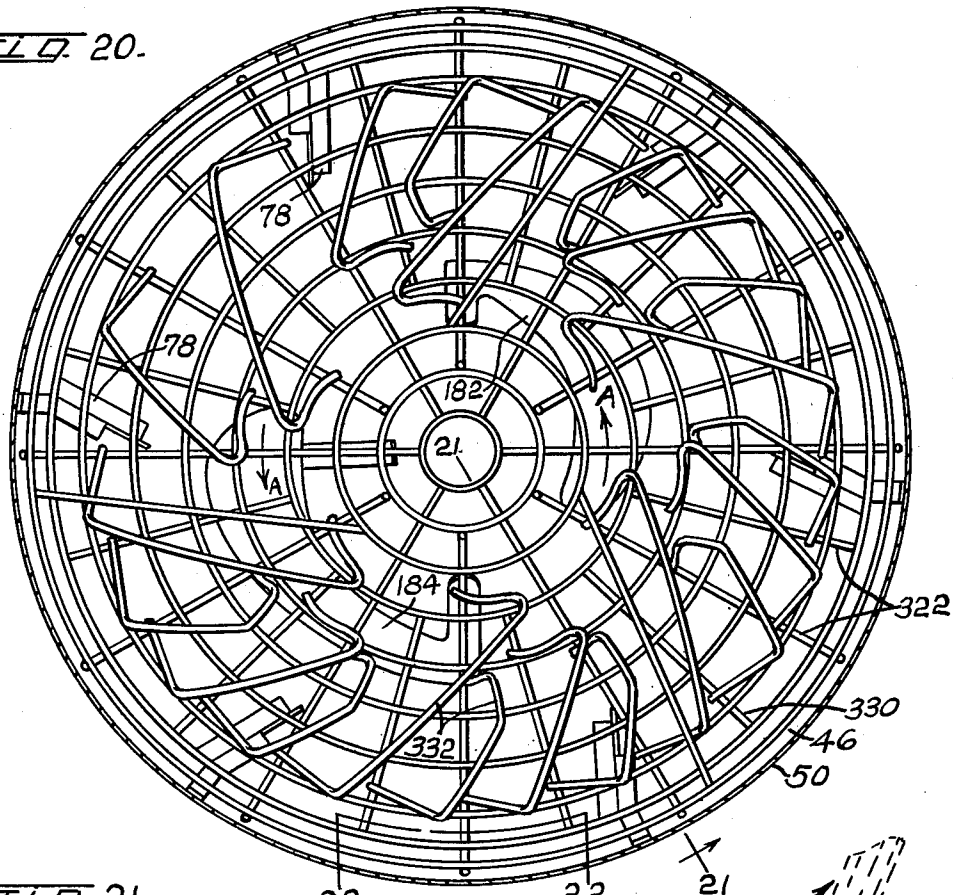


FIG. 21.

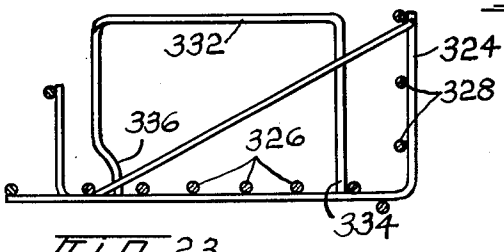


FIG. 22.

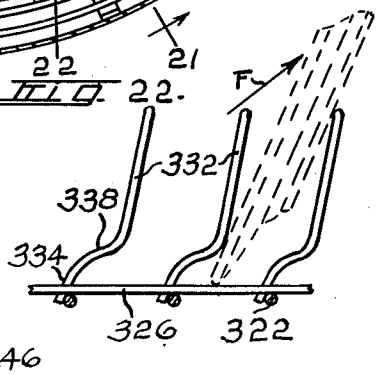
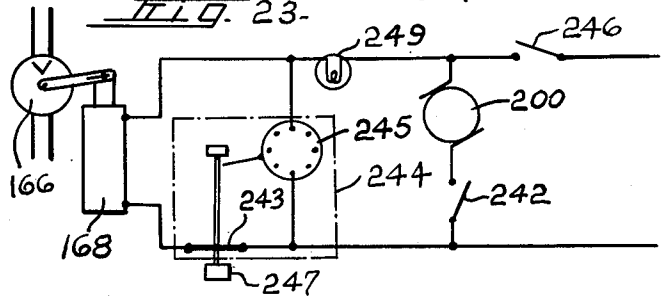


FIG. 23.



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Patented Apr. 14, 1953 2,634,739

UNITED STATES PATENT OFFICE

2,634,739

WASHING MACHINE

Willard R. Walker, Syracuse, N. Y., assignor to Easy Washing Machine Corporation, Syracuse, N. Y., a corporation of Delaware

Application March 20, 1948, Serial No. 15,985

9 Claims. (Cl. 134—182)

1

This invention relates to washing machines, and more particularly to a machine for washing dishes.

In dish washing machines, it has been proposed to provide a circulation of water over dishes by the use of a power driven impeller submerged or located within the lower portion of the washing compartment. Circulation of wash fluid within the compartment by such means in general has failed to provide a satisfactory washing action due to failure to place a sufficient quantity of water in circulation under sufficient force and in such a manner as to reach all essential surfaces of the dishes subjected to washing action.

The present invention is directed to a combination of elements including an impeller so constructed and arranged as to provide movement of large quantities of washing fluid in a flush action adapted to reach all surfaces to be washed. The arrangement is such that a minimum amount of wash fluid is required. The invention further has to do with the admission of washing fluid to a washing compartment through a central top supported spray. Additionally, the invention is directed to a control mechanism for metering the washing fluid and for interrupting washing action upon opening the wash compartment lid.

Further features of the invention have to do with cabinet construction including top deck, from which the washing compartment is substantially suspended and in which the deck is provided with a flush top lid. Further features relate to interlocking mechanism for initially opening the lid and suspending washing operation, and other details of cabinet including a lid hinge construction and soap and other storage compartment spaces advantageously located within the confines of the cabinet.

The invention also has to do with the simplification of the dish washing machine and cabinet construction as a whole, with a view to facilitating the manufacture thereof economically and at the same time providing durability and ruggedness.

The above and other novel features of the invention will appear more fully hereinafter from the following detailed description when taken in conjunction with the accompanying drawings. It is expressly understood that the drawings are employed for purposes of illustration only and are not designed as a definition of the limits of the invention, reference being had for this purpose to the appended claims.

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In the drawings, wherein like reference characters indicate like parts:

Figure 1 is a top plan view of the dish washing machine;

Figure 2 is a front elevation;

Figure 3 is a transverse vertical section through the machine taken substantially on the line 3—3 of Figure 2;

Figure 4 is a transverse horizontal section taken on the line 4—4 of Figure 3;

Figure 4a is a fragmentary view of the impeller partly in section, taken substantially on line 4a—4a of Figure 4, and partly in elevation.

Figure 5 is a fragmentary section taken substantially on the line 5—5 of Figure 4;

Figure 6 is a horizontal transverse section taken substantially on the line 6—6 of Figure 3;

Figure 7 is a fragmentary sectional view taken substantially on the line 7—7 of Figure 6, and showing door hinge details;

Figure 8 is a fragmetary section taken substantially on the line 8—8 of Figure 6, showing details of the initial door opening mechanism;

Figure 9 is a vertical section taken substantially on the line 9—9 of Figure 3 immediately inside the front panel and showing door and lid interlocking mechanism;

Figure 10 is a section taken on the line 10—10 of Figures 1 and 11;

Figure 11 is a section taken substantially on the line 11—11 of Figure 10;

Figure 12 is a transverse section taken substantially on the line 12—12 of Figure 3, showing the lid-supported spray nozzle;

Figure 13 is a transverse section taken on the line 13—13 of Figure 12;

Figure 14 is a fragmentary section taken on the line 14—14 of Figure 1, showing the fluid connections to the spray nozzle;

Figure 15 is a broken section taken substantially on the line 15—15 of Figure 14, to illustrate the lid hinge details;

Figure 16 is a transverse section taken on the line 16—16 of Figure 2, illustrating a soap compartment feature;

Figure 17 is a broken section taken on the line 17—17 of Figure 16, showing the hinge construction of the soap compartment;

Figure 18 is a section taken on the line 18—18 of Figure 2, through the control panel, showing the drain valve remote control;

Figure 19 is a transverse section taken on the line 19—19 of Figure 18, showing the cable and conduit drain valve operator;

Figure 20 is a top plan view of a flat dish sup-

porting basket with impeller schematically shown;

Figure 21 is a radial transverse section taken substantially on the line 21—21 of Figure 20;

Figure 22 is an arcuate section taken substantially on the line 22—22 of Figure 20; and

Figure 23 is a control circuit adapted for use in conjunction with the apparatus.

In the drawings, the dish washer proper is shown as contained within a cabinet 20, having a top deck 22, side walls 24 and 26 and a front panel 28 with a door panel 30 included if desired. The top deck 22 has a rear substantially upright splash panel 32 formed at its opposite ends to provide inclined control receiving panels 34 and 36. The top is provided with a circular lid 38 hinged as at 40 to cover the circular dish washing container disposed immediately therebelow.

At the base, below the door panel 30 is provided a foot recess 31 formed from an angle member 33 extending from one side wall to the other and suitably joined thereto as by flanges. The side walls are formed with forward and rearward angle portions 25 and 27, which may be integral, or in the form of angle members secured to the side panels, to provide stiffness.

In Figure 3, the top deck 22 is shown as formed with a rectangular external depending marginal flange 42 adapted to overlap the side and front walls. A circularly extending and depending flange 44 forms the upper rim of the dish washing compartment 46. The flange is offset as at 48 and secured to the cylinder wall 50 of the compartment 46. The lower end of the cylinder wall 50 is provided with a bottom member 52 having a conical or sloped outer portion 54 and an annular central cone 56 within which is mounted a frame 58 for journaling an impeller shaft 60. The frame 58 is composed of conical and flat spiders 62 and 64, respectively, providing support for spaced bearings 66 and 68 on the shaft 60. The annular trough 72 between the inner cone 56 and the conical wall 54 may be slightly dished as at 74 and may be dished to a somewhat greater extent and pitched progressively toward the drain outlet 76, a pitch amounting to about a half inch drop in level to the drain port 76, being satisfactory.

The conical outer portion of the bottom is provided with a plurality of bracket plates 78, also acting as baffles, having dish containing basket receiving flats 80, the flats being adapted to support a basket 82 with its bottom grid 84 slightly above and clear of the impeller 86 carried on the impeller cone and shaft 60. The basket is composed of upwardly extending wires 88 joined by circular wires 90. The bottom grid thereof is formed from radial step-like wires 92 joined by a plurality of circular wires 94 of varying diameter, the circular wires 94 providing an inclined base for receiving glassware and cups, it being desired that such be supported at an angle so that any flat surface thereon will naturally drain. The center portion of the base is provided with a grid cup 96 into which is removably positioned a perforated container 98 for holding silverware and the like. A second basket, hereinafter disclosed (see Figures 20–22, inc.), may be employed for flat dishes, the same being so constructed as to support the flat dishes on edge, and tangentially arranged, such that water splashed upwardly from the impeller will strike the face of the dishes substantially normal from beneath, and thus flush upwardly across the dishes.

The compartment 46 will be seen to be suspended from the top deck flange 44 through the side wall 50 and braced by means of stays 100 reaching from brackets 102 in the corners of the cabinet and secured to the spider 64. The stays extend at a slight angle to the horizontal preferably to give the effect of holding the compartment and top deck 22 down, as well as steadying the impeller bearing housing with respect to the cabinet structure.

The top deck 22 is provided with a lid receiving offset 104 (see Figures 3 and 10) of a sufficient depth to receive the return bent circular edge 106 formed on the ring extension 107 of the lid 38 with the top lid surface lying substantially flush with the adjoining deck surface. The ring extension 107 is provided with a depending skirt 108 the upper portion of which is secured to a flange 110 of the lid 38 and the lower portion of which extends downwardly substantially the distance of the offset 48 previously described in connection with the top deck circular flange 44.

The lid 38 is hinged at the rear upon spaced hinge pins 112 and 114 received in rolled sleeves 116 and 118 formed in the plate-like hinge strap 120 which is secured to the lid 38 as seen in Figures 14 and 15. The hinge pins are received in stationary pin-receiving sleeves 122 which are in turn spot-welded or otherwise secured to the back panel 32 as at 124. The sleeves 122 have forward extending arms 126 and 128 having detent receiving dimples 130 and 132 adapted to cooperate with spring-pressed detent pins 134 and 136 carried in a double bent bracket 138 secured to the upwardly extending portion 140 of the hinge strap 120. As will be seen, the detent pins 134 and 136 are provided with collars 142 and 144 against which the opposite ends of a compression spring 146 act. It will also be seen that the dimples 132 and 130 are so positioned as to receive the detent pins 142 and 144 when the lid is swung to a substantially upright position.

The lid 38 supports substantially in the center thereof a spray nozzle 148 supplied by water through a duct 150 formed by the under side of the lid and a channel member 152. The duct extends to the rear or hinged edge of the lid and is enlarged as at 154 and terminates with the skirt 108. The skirt is provided with a rectangular aperture 156 adapted to cooperate with a rectangular rubber nipple 158 molded to an aperture 160 in the top deck flange 44 immediately above the offset 48. A suitable conduit 162 is connected to the nipple 156 and is connected by a flexible hose or other conduit 164 to a valve controlled source of supply 166, the valve being actuated preferably by electrical means such as a solenoid 168.

The spray nozzle may be of inverted crown shape as at 170 with one or more spiral slots 172 in the side wall thereof. The nozzle is rotatably secured in place upon a center screw 174 extending into a threaded recess member 176 fastened upon the under side of the lid 38, centrally located within the conduit 150. The nozzle may be formed in any desired manner as two similar halves, and include therebetween two similar members so formed as to provide opposed identical inclined internal partitions or blades 171, and integral radial vanes 173, the vanes each having an integral curved extension forming together two halves of an upper bearing sleeve 175. In such a construction, two slots 172 are em-

ployed, such slots being located tangent to the under side of the vanes 173. The members may be soldered, brazed, mechanically locked or otherwise secured together along the seams such as 177, to form an integral whole.

The channel member 152 is provided with a circular aperture 178 in the lower wall thereof and at its end, the aperture being in alignment with the spray nozzle 176. The water, being directed downward under pressure into the nozzle, produces rotation thereof by impinging upon the inclined partitions 171.

Wash water admitted to the compartment 46 is agitated and thrown in substantially all directions by the action of the impeller 86. In Figure 4, the impeller is shown as comprising a conical supporting hub structure 180 to which are secured opposite impeller blades 182 and 184. The impeller is adapted to rotate in the direction of the arrow A and in practice, may rotate at a speed in the order of 700 R. P. M. The blades are supported upon slip-like brackets 183 and 185 secured to the cone 180, and radial extensions 187 and 189 of the leading edge ends of the vanes, which are likewise secured to the cone 180.

The blades 182 and 184 differ in shape both at their trailing edges and at their leading edges as may be seen from Figures 4 and 4a. The leading edge 186 of the blade 182 is horizontal and is adapted to travel in an orbit slightly above and over the inner radial half of the drain channel 74. The leading edge 188 of the impeller 184 is located at a somewhat greater height above the drain channel 74 and is so arranged that the active portion of the blade 190 at the leading edge sweeps in an orbit over the radially outer portion of the channel 74. The trailing edge 192 of the blade 182 is cupped inwardly so as to throw the liquid scooped by such blade across the center axis as well as upwardly in the central portion of the compartment 46. The trailing edge 194 of the impeller blade 184 has a lesser slope and is adapted to throw wash liquid in the outer region of the compartment 46.

A basket for holding flat dishes such as plates, platters and saucers is shown in Figure 20. Such basket is formed of relatively stiff wire of stainless steel or other metal noncorrosively treated, and the elements may be welded, soldered or otherwise secured. The basket comprises a plurality of radial wires 322 having upstanding end portions 324 at their outer ends. The wires are tied together by a plurality of concentric wire rings 326, forming a grid base, and rings 328 attached to the upstanding portion 324 to form a substantially cylindrical basket wall. Between the radial wires 322 are positioned additional radial stiffening wires 330.

A plurality of return bent wire loops 332 are positioned with the free ends 334 and 336 extending downwardly and terminating at the grid base, the outer end 334 being secured to a radial wire in advance (as indicated by the direction of rotation of the impeller 86) of the radial wire to which the inward end 336 is attached as illustrated. The loops are of varied length to accommodate various sizes and shapes of comparatively flat dishes, and are slightly inclined in the direction of rotation as is shown in Figure 22. The lower portion of the loop ends may be offset as at 338 to in effect conform to the generally well-known shape of plates and saucers and other shallow flat dishes. It will be seen that dishes in the rack will be supported in what may be termed a slightly inclined tangential arrangement, the tangential arrangement being such as to place the concave side of the dishes in a direction to receive the full force of the upward and tangential flush of wash water set in motion by the impeller. This wash water in large quantities will flow across the surface of the dishes in the general direction as indicated by arrow F, the inboard portion of the dish being flushed primarily by wash water from the impeller blade 182 and the outboard portion of the dish being flushed primarily by wash water from the outer impeller blade 184.

In practice, a limited amount of wash liquid will be employed, the same being retained within the compartment 46 by closure of a gate valve 196 located in the drain pipe 76. The impeller blades 182 and 184 are arranged to throw such water with considerable force into substantially every portion of the compartment 46 and such water will thereafter drain past deflectors 78 downward into the channel 74. It will be seen that, by reason of the leading edge 188 of the blade 184 being somewhat higher than the leading edge 186 of the blade 182, only a limited amount of wash fluid will be scooped by such blade and particularly the top stratas of the water contained in the channel 74. Thus, there is a considerable layer of liquid allowed to remain in the channel which is subsequently acted upon by the leading edge 186 of the impeller 182. Thus, two impellers may be employed, each acting upon which is in effect a separate supply of liquid and permitting such liquid ample time to flow into the channel 74 by the edge revolution of the impeller.

Since the leading edges of the blades do not fall in the same path and do not interfere with one another in acting upon liquid received in the channel 74, large quantities of liquid are thrown by the blades as compared with a two-bladed impeller in which the blades are identical. Because of the large quantity of liquid which may thus be thrown, the extreme velocities heretofore thought essential may be reduced because of the greater quantity of water actually thrown into splash circulation. Impellers heretofore have been rotated at high velocity to increase the washing action, but the amount of water which could find its way to the impeller for scooping was so slight as to defeat the desired result.

By eliminating the interference between the succeeding impeller blades as they move in their respective paths, that is by having them act in different orbits, great quantities of wash fluid are put in circulation, resulting in faster washing action with maximum cleaning efficiency. The channel has more time to fill, since the blade only scoops the channel once in a revolution, instead of twice as two similar blades would. At the same time, the impeller may, and will be, substantially balanced in practice. The washing efficiency is enhanced by the distributive effect of the impeller blades in that the inner blade is adapted to deflect or throw the water discharged therefrom centrally of the compartment, whereas the outer blade is adapted to discharge its water in the outer and surrounding portion of the compartment. The overall effect is to put into the splash part of the circulation nearly the entire fluid content of the washing machine. But a small quantity of wash water is inactive at any time as during its return to the sump along the side and conical walls.

It will be seen that by employing two racks, one for glasses and cups and the other for dishes, the disk rack will be loaded while the glasses and cups are undergoing the relatively brief wash

cycle within the machine. Immediately upon completion of the washing of the cups and glasses, the rack containing these items is removed from the machine and the disk rack inserted, after which the washing cycle is repeated. It will be appreciated that it may be desirable to employ a somewhat longer washing period for the dishes and that this is under the complete control of the operator.

The impeller 60 is driven through a belt drive 198 from a motor 200 suitably mounted upon the side members of the cabinet side wall 24. The motor is mounted with its axis vertical, upon a bed plate 201, the latter being pivoted between spaced angle irons 203 secured to the side wall 24, only one of which angle irons is shown.

The top lid, due to its flush arrangement with the top deck, is provided with a lifting pin 202 (see Figure 9) adapted to initially raise the outer edge of the lid a sufficient distance to permit grasping the edge by the operator's fingers. The pin 202 is lifted by a knob-actuated cam 204 acting upon a leaf spring 206, the free end of which is notched as at 208 to engage an annular groove 210 in the pin 202. The leaf spring 206 is supported at its other end upon an ear 212 of the plate 214, the plate also being provided with ears 216 and 218 having apertures through which the pin 202 may freely slide. The plate 214 is secured to the outer side of the flange 104 and the pin 202 projects upwardly through an opening 220 in the offset 104 to engage the return bent flange 106 of the ring extension 107.

The cam 204 is mounted upon a short stub shaft 222 extending through a knob receiving recess 224 in the front panel. The shaft has affixed thereto a knob 226. The cam 204 is further provided with a second cam extension arm 228 for actuating a sliding door release bar 230. The bar is slidable in a guide 232 located immediately above the door 30 and in an ear 234 formed on the plate extension member 236 secured to the plate 214. The cam arm 228 is such that upon rotation of the stub shaft 222, as seen in Figure 9, counterclockwise, the lid is opened; whereas upon rotation of such shaft by the knob in a clockwise direction, the bar 230 is lifted. A hair pin spring 238 in combination with the leaf spring is adapted to normally hold the arms 204 and 228 substantially in the position shown.

In order to provide an interlock between the impeller driving motor 200, the lid 38, and the spray nozzle carried thereby, to prevent accidental flooding of the operator by accidental opening of the lid, the pin 202, which is adapted to lift the lid a slight distance to make it possible to open the lid, engages at its lower end the actuating arm 240 of a cut-out switch 242. The cut-out switch may be in circuit with the valve solenoid 168 as well as the motor 226, so that the water inlet is cut off and the impeller action brought to a stop. It will be appreciated that the depending skirt 110 of the lid is of sufficient length to telescope the upper compartment wall, to prevent splash from the compartment when the lid is elevated to the initial open position by the pin 202. The relatively slow speed of the impeller and the damping action of the wash water in which it operates, tends to immediately bring the motor to rest so that danger of opening the lid too quickly is minimized.

Control of the washing operation is accomplished through a manually actuated timer 244 on the back panel 32 and an adjacent motor switch 246. A circuit suitable for controlling the operation of the machine is shown in Figure 23, wherein it will appear that the switch 246 is located in the supply lines in a position to cut off the motor as well as the water time control. A lid-operated switch 242 is in circuit with the motor only, so that while operation of the motor is immediately stopped, should the lid be raised for any reason, the time controlled metering of wash water will not be interrupted by inadvertent opening or slight raising of the lid. It will be appreciated that the danger of an operator lifting the lid while wash water is flowing from the spray nozzle is remote, since the entering wash water spray furnishes a warning against such opening of the top. Further, it is important that a proper amount of water be introduced into the machine and any interruption would disturb the action of the timer in providing the correct amount of water. The timer 244 includes an electrically driven clock motor 245 which acts to open the switch 243 which is initially closed by the panel knob 247. A signal light 249 is provided in circuit with the timer so as to warn the operator against opening the main control switch 246 inadvertently while wash fluid is being metered. Copending application of Swayze, Serial No. 793,065, filed December 22, 1947, now Patent No. 2,562,481, issued July 31, 1951, discloses a timer manually initiated such as may be employed in the circuit described.

There is also provided a drain control actuating the swinging gate valve 196 through a Bowden wire control 250 comprising a cable 251 attached to the lever arms 253 and 255 on the manual knob 257 and valve 196 respectively, the conduit 259 being supported at its end by fixed brackets 261–263, respectively. A wide opening valve of the swinging gate type is desirable in order to allow for fast drainage approaching a flush. The pitch of the channel or trough 72 facilitates flush operation so that any tendency for particles of food to remain in the compartment is minimized. It will be understood that a motor driven drain pump of large capacity may be utilized to discharge waste, if desired, where gravity drainage is not available, or where the drainage would otherwise be sluggish. If drainage is had into an adjoining sink of an elevated level, the valve could be dispensed with where such a pump is employed.

The timer 244 is connected in circuit with the inlet valve actuating solenoid 168, and controls, by fixing the time of flow, the amount of wash water admitted to the compartment. Where pressure of the line varies substantially, a constant flow regulating valve may be inserted in the outlet 167 of the valve 166. In a normal washing operation, the quantity of water may be limited to approximately one gallon. The motor switch controls the motor driven impeller and assuming a proper quantity of soap or detergent and water has been introduced into the compartment, the motor is operated for approximately 3 minutes to effect washing operation. Thereafter, through a manual actuation of the drain valve, the wash water is drained. Subsequently, the drain valve is closed and a rinsing operation effected, the rinsing operation resulting from the admission of rinse water through the spray and the actuation of the impeller. Following the rinse operation, the drain is again opened and the washing operation is complete. The rinsed dishes may be left in the dishwasher, and to facilitate the drying of such dishes, the compartment is provided with a vent 252 located in the

rear wall near the top. The vent is inclined upwardly to prevent leakage therefrom, but permits the interchange of air within the compartment to facilitate drying and to keep the air therein fresh.

The front wall of the cabinet can be provided with a soap compartment 254, the same being constituted by a pivoted drawer-like construction swinging on a vertical axis. The front panel is provided with an aperture 256 to receive the drawer 258. Adjacent the top and bottom margins of the aperture 256 are inwardly struck hinge brackets 260 and 262 through which extend a hinge pintle 264. The drawer 258 has a bottom 266, a forward wall 268 having a panel 270, inside walls 272 and a curved wall 274. The inside wall 272 has a hinge bracket 276 having apertures to receive the hinge pintle 264. The curved wall 274 is cylindrical and of a curvature having uniform radius about the pintle 264. The panel 270 extends to the left of the hinge axis of the pintle 264 and is recessed as at 278 to receive fingers of an operator, it being observed that by pushing the recessed portion of the drawer, it will be swung open. A suitable latch to hold the drawer in closed position may be formed by a leaf spring member 280 supported from the side wall 24, bearing against blister 282 formed in the curved side wall 274. The opening movement of the drawer is limited by inwardly struck fingers 284 and 286.

The access door 30 located beneath the front panel 28 may be composed of front and back members 288 and 290 having telescopic flanges 292 around their marginal edges. The door is hung on upper and lower hinge pins 294 and 296 supported in stiffening plates 298 and 300. The stiffening plates are secured to a lower flange 302 of the panel 28 and to a bracket 304 secured to the recessed base, respectively. As has been previously described, the door is normally held shut by the latch bar 230 acting upon a door-carried bracket 306. The door is adapted to be initially opened by the limited movement of a spring plunger 308 (see Figure 8). The spring plunger is mounted for horizontal movement in a bracket 310 arranged on the flange 302 so as to bear against the inner surface adjacent the free end of the door. The plunger 308 has a compression spring 312 threaded on a guide rod 314 which extends through the end of the bracket 310 and is fitted with an end stop 316. It will thus be seen that upon movement of the latch bar 230 upward to disengage the bracket 306, the door will be sprung open a short distance by the plunger 308 to facilitate its further opening by manually grasping the same.

Although a single practical embodiment of the invention has been illustrated and described, it is to be understood that the invention is not limited thereto. As various changes in construction, selection and arrangement of the parts may be made without departing from the spirit of the invention, as will be apparent to those skilled in the art, reference will be had to the appended claims for a definition of the limits of the invention.

What is claimed is:

1. In a dish washing machine, a casing forming a dish washing compartment, having side walls and a bottom wall, said bottom wall having an annular substantially flat-bottomed sump formed therein, and sloping walls extending to said side wall, an impeller mounted for rotation on an axis concentric with said annular sump, said impeller having two blades the leading edges of which sweep said sump, one leading edge sweeping a path axially spaced above the other, said blades being diametrically opposed from one another.

2. In a dish washing machine, a casing forming a dish washing compartment, having side walls and a bottom wall, said bottom wall having an annular substantially flat-bottomed sump formed therein, and sloping walls extending to said side wall, an impeller mounted for rotation on an axis concentric with said annular sump, said impeller having two blades the leading edges of which sweep said sump, one leading edge sweeping a path radially inward and axially spaced with respect to the other, said blades being diametrically opposed from one another.

3. In a dish washing machine, a casing forming a dish washing compartment, having side walls and a bottom wall, said bottom wall having an annular substantially flat-bottomed sump formed therein, and sloping walls extending to said side wall, an impeller mounted for rotation on an axis concentric with said annular sump, said impeller having two blades the leading edges of which sweep said sump, one leading edge sweeping a path axially spaced above the other, and one having a trailing portion adapted to impel fluid in a region radially spaced from the other, said blades being diametrically opposed from one another.

4. In a dish washing machine, a casing forming a dish washing compartment, having side walls and a bottom wall, said bottom wall having an annular substantially flat-bottomed sump formed therein, and sloping walls extending to said side wall, an impeller mounted for rotation on an axis concentric with said annular sump, said impeller having two blades the leading edges of which sweep said sump, one leading edge sweeping a path radially inward and axially spaced with respect to the other, and one having a trailing portion adapted to impel fluid in a region radially spaced from the other, said blades being diametrically opposed from one another.

5. In a dish washing machine, a casing forming a dish washing compartment, having side walls and a bottom wall, said bottom wall having an annular substantially flat-bottomed sump formed therein, and sloping walls extending to said side wall, a plurality of vane-like angularly spaced baffles lying substantially in axial planes secured to said sloping walls, and acting as supporting brackets for a dish containing basket, an impeller mounted for rotation on an axis concentric with said annular sump, said impeller having two blades the leading edges of which sweep said sump, one leading edge sweeping a path radially inward and axially spaced with respect to the other, said blades being diametrically opposed from one another.

6. In a dish washing machine, a casing forming a dish washing compartment, having side walls and a bottom wall, said bottom wall having an annular substantially flat-bottomed sump formed therein, and sloping walls extending to said side wall, a plurality of vane-like angularly spaced baffles lying substantially in axial planes secured to said sloping walls, and acting as supporting brackets for a dish containing basket, an impeller mounted for rotation on an axis concentric with said annular sump, said impeller having two blades the leading edges of which sweep said sump, one leading edge sweeping a path radially inward and axially spaced with re-

spect to the other, and one having a trailing portion adapted to impel fluid in a region radially spaced from the other, said blades being diametrically opposed from one another.

7. In a dish washing machine, a casing forming a dish washing compartment, having side walls and a bottom wall, said bottom wall having an annular substantially flat-bottomed sump formed therein, an impeller mounted for rotation on an axis concentric with said annular sump, said impeller having two blades the leading edges of which sweep said sump, one leading edge sweeping a path axially spaced above the other, said blades being diametrically opposed from one another.

8. In a dish washing machine, a casing forming a dish washing compartment, having side walls and a bottom wall, said bottom wall having an annular sump, an impeller mounted for rotation on an axis concentric with said annular sump, said impeller having two blades the leading edges of which sweep said sump, one leading edge sweeping a path radially inward and axially spaced with respect to the other, said blades being diametrically opposed from one another.

9. In a dish washing machine, a casing forming a dish washing compartment, having side walls and a bottom wall, said bottom wall having an annular sump, an impeller mounted for rotation on an axis concentric with said annular sump, said impeller having two blades the leading edges of which sweep said sump, one leading edge sweeping a path radially inward and axially spaced with respect to the other, and one having a trailing portion adapted to impel fluid in a region radially spaced from the other, said blades being diametrically opposed from one another.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
909,604	Jaycox	Jan. 12, 1909
1,390,223	Wolcott	Sept. 6, 1921
1,449,000	Hicks	Mar. 20, 1923
1,459,079	Anthony	June 19, 1923
1,502,131	Vaudreuil	July 22, 1924
1,620,671	Merseles	Mar. 15, 1927
1,645,815	Murdoch	Oct. 18, 1927
1,664,084	Nash	Mar. 27, 1928
1,724,910	Cromwell	Aug. 20, 1929
1,823,583	Biskamp	Sept. 15, 1931
1,853,589	Walker	Apr. 12, 1932
1,884,181	Pauly	Oct. 25, 1932
1,946,536	Kohler	Feb. 13, 1934
2,000,720	Snyder	May 7, 1935
2,003,003	Marbury	May 28, 1935
2,013,387	Johnson	Sept. 3, 1935
2,032,156	Stoddard	Feb. 25, 1936
2,143,039	Stoddard	Jan. 10, 1939
2,155,271	Jones	Apr. 18, 1939
2,257,436	Walker	Sept. 30, 1941
2,264,713	Reifenberg	Dec. 21, 1941
2,385,264	Ferris	Sept. 18, 1945
2,418,366	Powers	Apr. 1, 1947