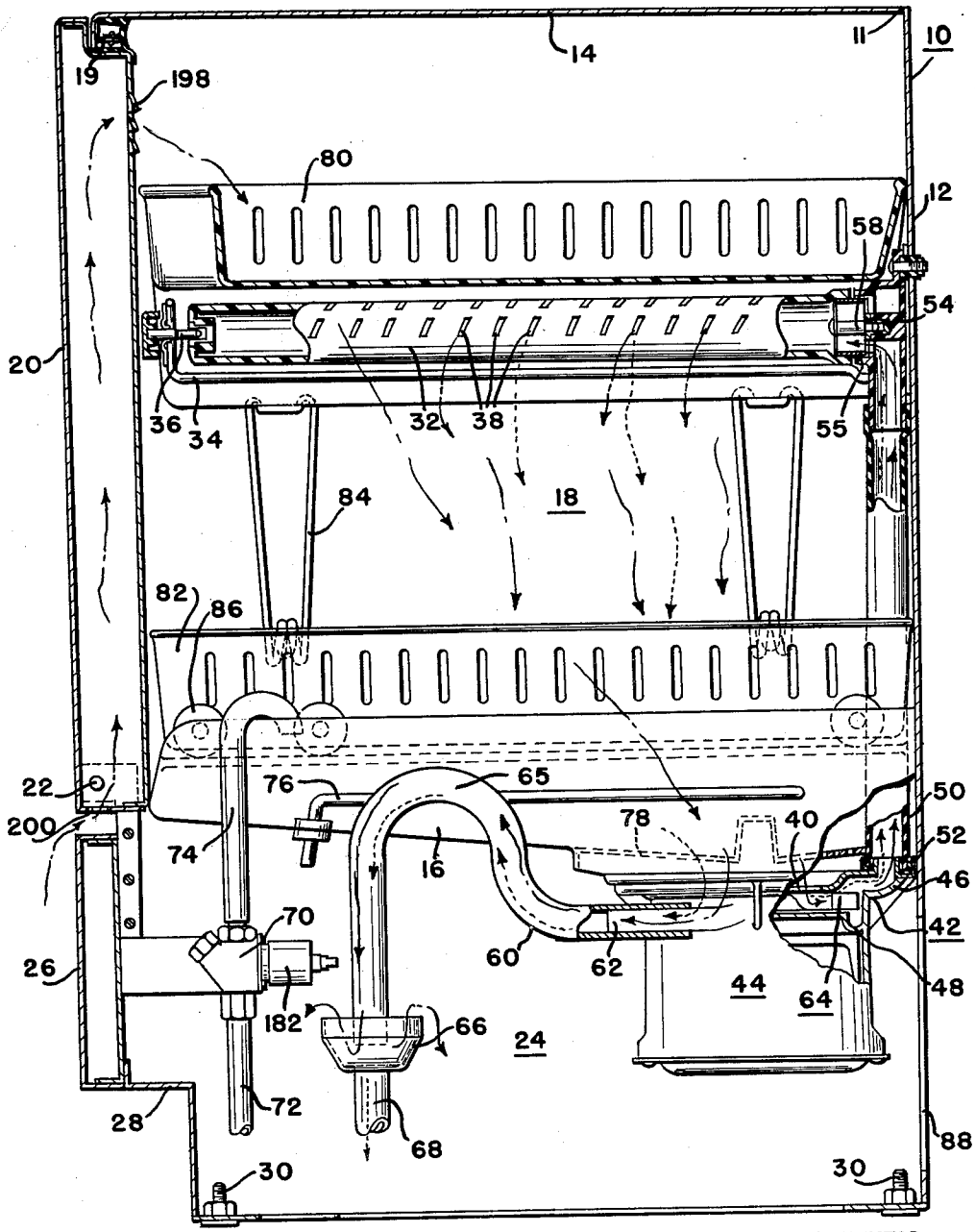
March 26, 1963 J. W. JACOBS 3,082,779

DISHWASHING MACHINE

Filed Feb. 9, 1959 6 Sheets-Sheet 1



--------- Water
——-—— Air or vapor

Fig. 1

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DISHWASHING MACHINE

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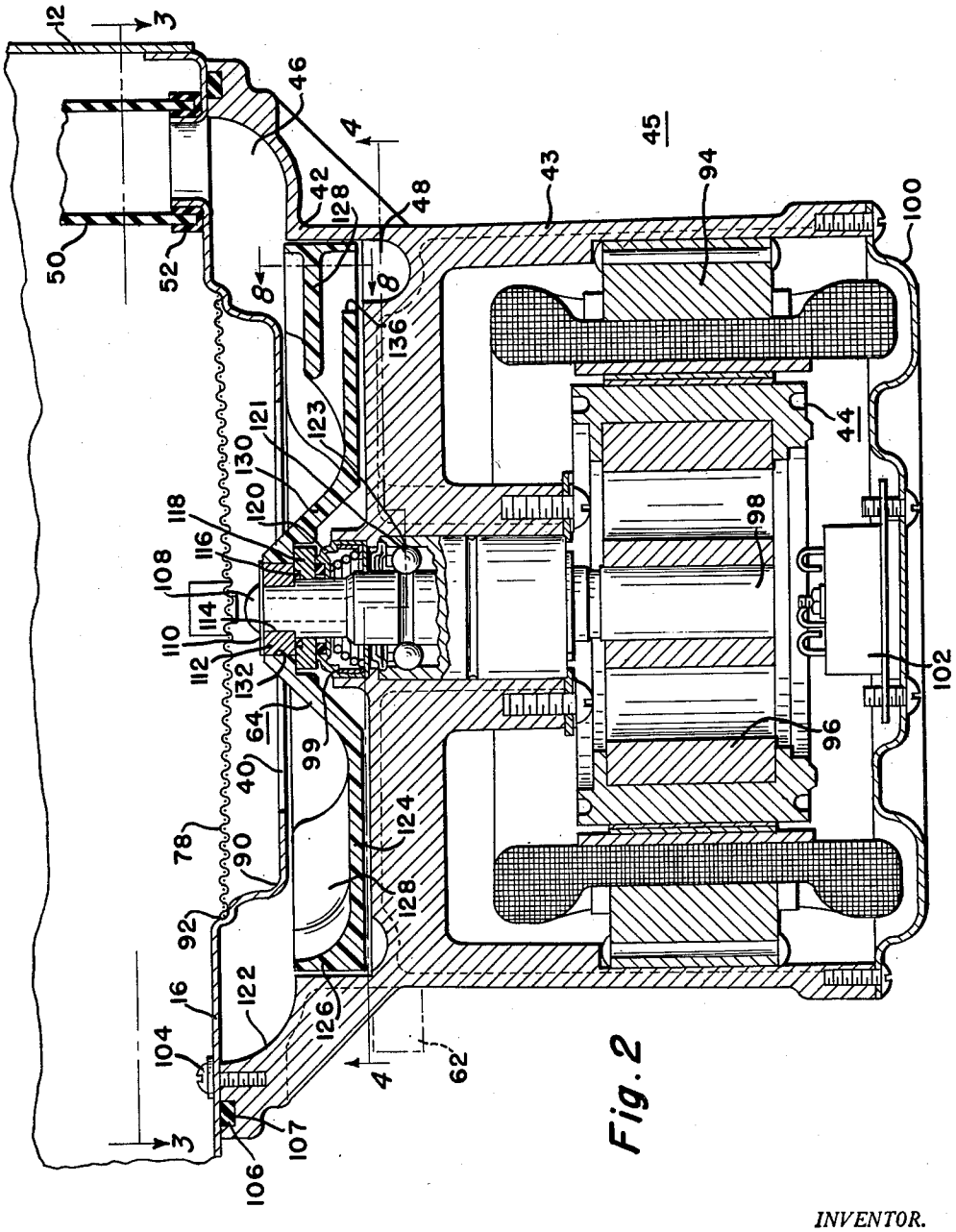


Fig. 2

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DISHWASHING MACHINE

Filed Feb. 9, 1959 6 Sheets-Sheet 3

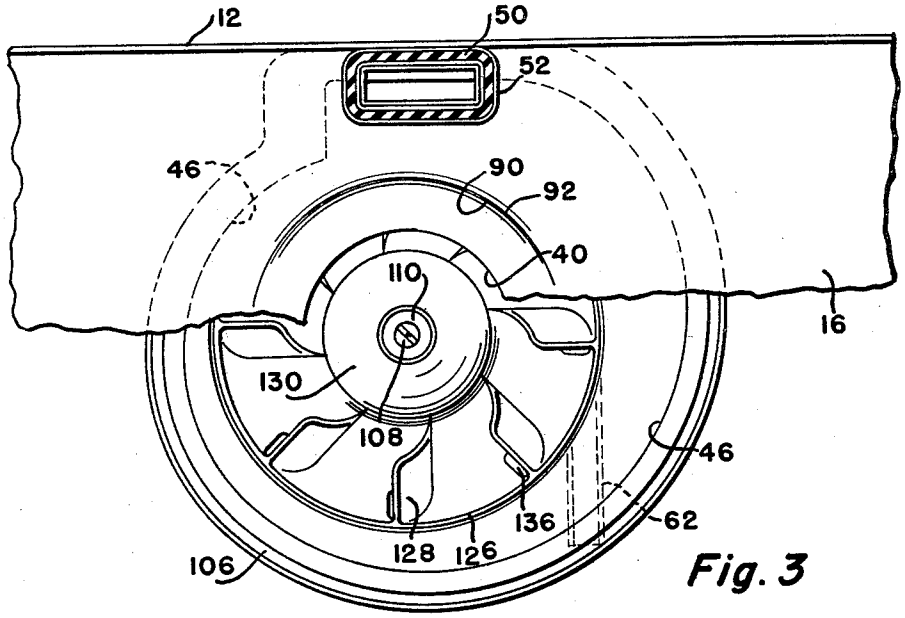


Fig. 3

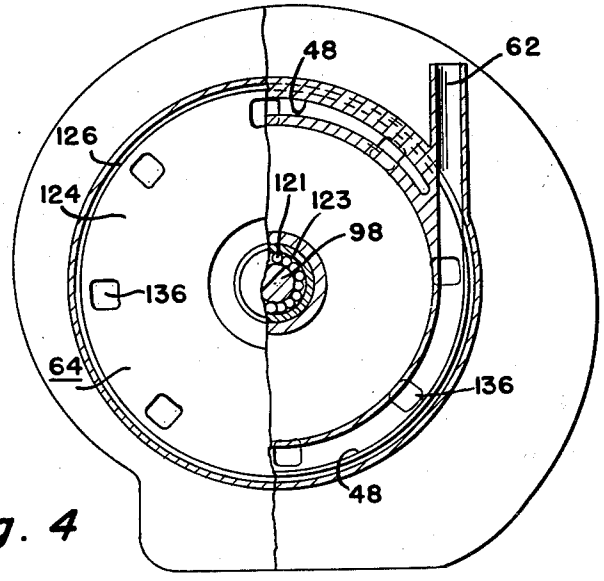


Fig. 4

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DISHWASHING MACHINE

Filed Feb. 9, 1959 6 Sheets-Sheet 4

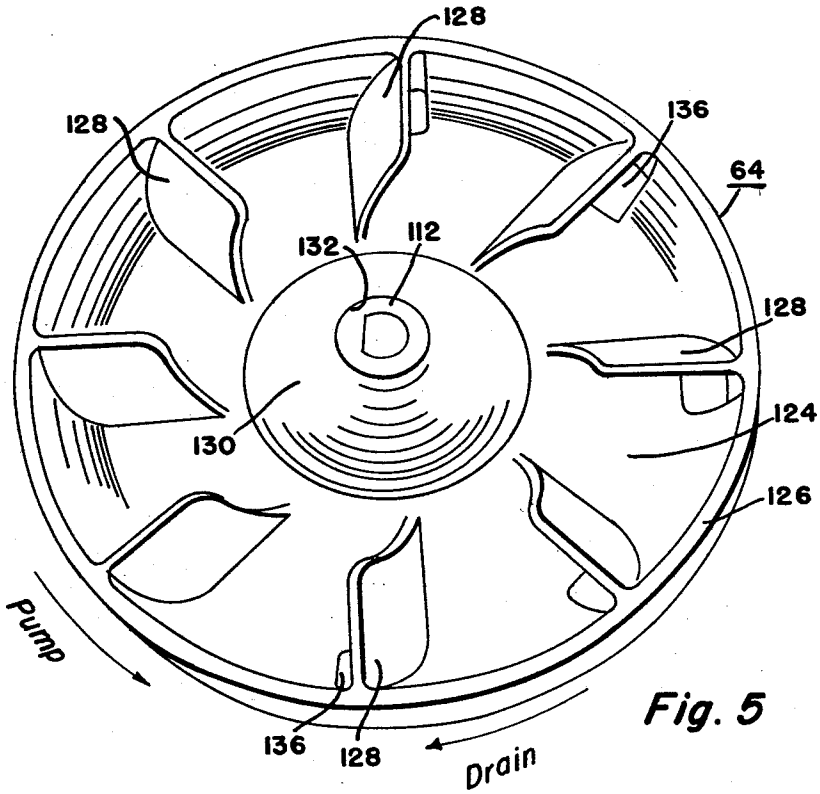


Fig. 5

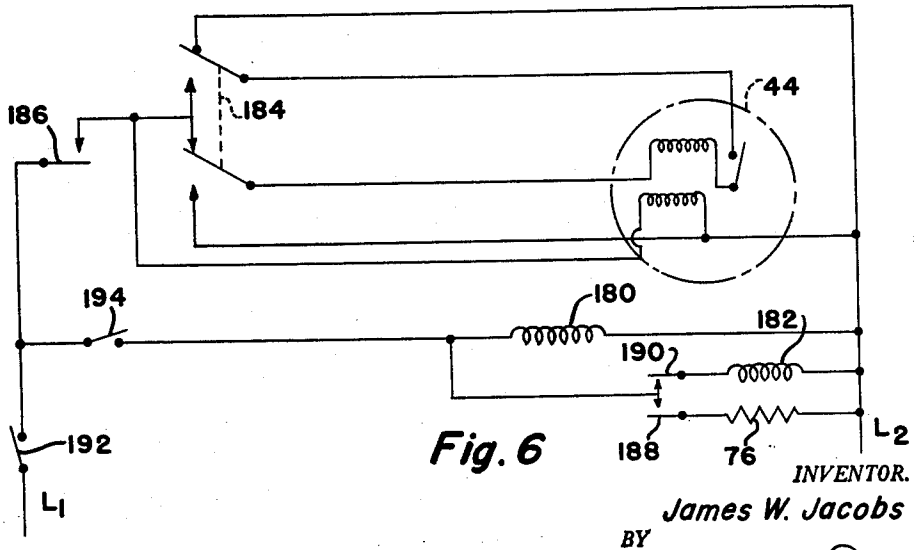


Fig. 6

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DISHWASHING MACHINE

Filed Feb. 9, 1959 6 Sheets-Sheet 5

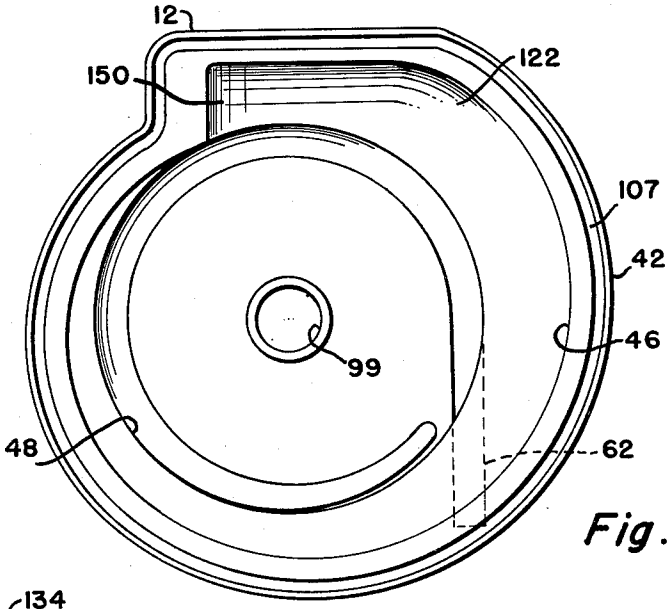


Fig. 7

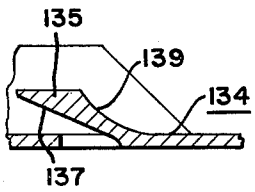


Fig. 11

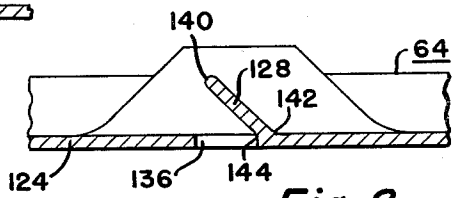


Fig. 8

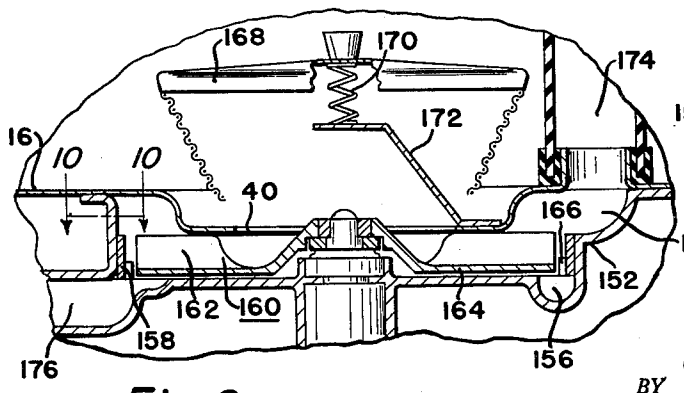


Fig. 9

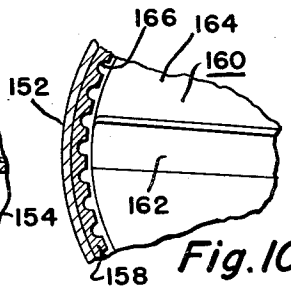


Fig. 10

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DISHWASHING MACHINE

Filed Feb. 9, 1959 6 Sheets-Sheet 6

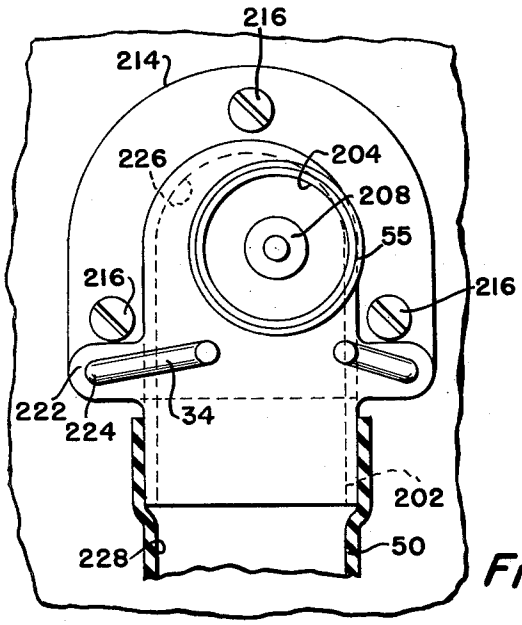


Fig. 13

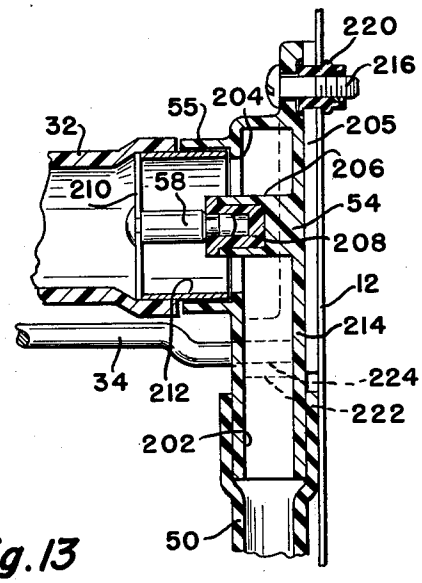


Fig. 12

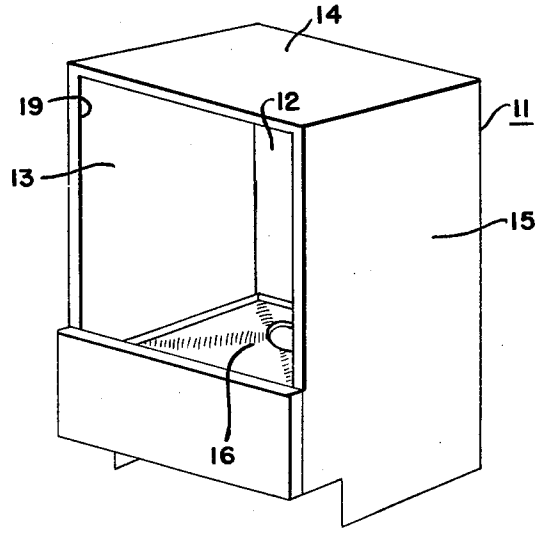


Fig. 14

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United States Patent Office 3,082,779 Patented Mar. 26, 1963

3,082,779

DISHWASHING MACHINE

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Filed Feb. 9, 1959, Ser. No. 792,158
6 Claims. (Cl. 134—174)

This invention relates to a domestic appliance and more particularly to an improved fluid distribution system therefor.

Current design of appliances in which pumps are utilized includes a system of selectively actuated valves which control the directional flow of fluids pumped during an appliance cycle. The inclusion of such valves adds cost to the manufacture of the appliance and gives rise to potential servicing problems. In addition conventional appliance water distribution systems include many connections and flexible conduits which create leakage problems.

Accordingly it is an object of this invention to provide a pump with an impeller which serves as a means for recirculating fluid and for eliminating auxiliary fluid valves in an appliance.

It is also an object of this invention to provide an appliance having a cleansing chamber with internal fluid conduits to eliminate the need for conduit connections outside of the cleansing chamber.

Another object of this invention resides in a cleaning and drying appliance having a fluid distribution system wherein a single impeller serves to circulate a cleaning fluid during a wash cycle and a drying fluid during a drying cycle.

A more specific object of this invention is in the provision of a drying system for a dishwashing chamber having an air inlet, an air and water outlet, a pump connected to said outlet, a drain conduit leading from said pump, an air gap in said drain conduit and a reversible impeller for said pump to selectively draw air through said chamber.

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

In the drawings:

FIGURE 1 is a side sectional view of a dishwasher adapted to include the novel fluid distribution system of this invention;

FIGURE 2 is a side sectional view of the impeller, pump and motor housing of this invention;

FIGURE 3 is a fragmentary sectional view with parts broken away taken along line 3—3 of FIGURE 2 to show the impeller top surface in relation to the water recirculating side of the pump of this invention;

FIGURE 4 is a sectional view taken along line 4—4 of FIGURE 2 with parts broken away to show the impeller bottom surface in relation to the exhaust or drain side of the pump of this invention;

FIGURE 5 is a perspective view of the impeller of this invention;

FIGURE 6 is a schematic wiring diagram for operating a dishwasher in accordance with the concepts of this invention;

FIGURE 7 is a top plan view of the pump and motor housing with the impeller removed;

FIGURE 8 is a fragmentary side sectional view of the impeller and one of the impeller vanes taken along line 8—8 in FIGURE 2;

FIGURE 9 is another embodiment of this invention wherein the pump housing is provided with a triturating means;

FIGURE 10 is a fragmentary sectional view taken along line 10—10 in FIGURE 9 to show the triturating element in said pump housing;

FIGURE 11 is a fragmentary sectional view similar to FIGURE 8 of a modified impeller.

FIGURE 12 is a sectional view of the spray tube fluid swirl inducing mounting head;

FIGURE 13 is a front elevational view of the spray tube mounting head of FIGURE 12; and

FIGURE 14 is a perspective view of the wrap-around single wall construction adapted for use with this invention.

In accordance with this invention and with reference to FIGURE 1 a dishwasher 10 is provided with a cabinet 11 having a rear wall 12, a top wall 14, side walls 13 and 15, and a sump or bottom wall 16. Wall members 12 to 16 serve to partially define a dishwashing chamber 18 having a front opening 19 closed by a door 20 hingedly mounted at 22 for horizontal pivotal opening movement. Since the chamber 18 is formed of single wall construction, a coating of vinyl plastic (to be explained more fully hereinafter) may be sprayed over the exterior and/or the interior thereof to waterproof the welded seam and to aid in deadening sound during operation. In addition to the dishwashing chamber 18 the dishwasher or appliance 10 includes a machine or motor compartment 24 beneath the sump 16. A cover panel 26 closes the front portion of the machine compartment 24 and is supported on a panel 28 which defines a toe space at the bottom front of the appliance. Conventional leveling bolts 30 may be provided for leveling the appliance 10 during installation thereof. Within the dishwashing or cleansing chamber 18 a spray tube 32 is rotatably supported. A bracket 34 attached at one end to the rear wall 12 of the dishwasher carries a pin 36 which rotatably journals one end of the spray tube 32. A plurality of ports 38 are formed in the spray tube 32 for distributing water or any circulated fluid in a selected pattern within the chamber 18. The bottom wall or sump 16 is sloped or tapered to direct fluid within the dishwashing chamber 18 to an opening 40 in one portion of the sump wall 16. Underlying the opening 40 is a pump shown generally at 42 which is powered by a reversible motor 44. The pump 42 has a fluid recirculating or supply portion 46 and a fluid drain portion 48. The fluid recirculating portion 46 connects to a conduit 50 within the dishwashing chamber 18. To facilitate a vibration-free and watertight connection a U-shaped channel seal 52 is interposed between the sump wall 16 and the lower end of conduit 50. The conduit 50 extends upwardly along the rear wall 12 of the dishwashing chamber 10 and connects at its upper end with a spray tube support housing portion 54 having a cylindrical flange 55. Within the housing 54 may be located a swirl device such as a set of vanes (not shown) which serves to impart a swirling motion to fluid traversing the conduit 50 prior to the time that the fluid enters the spray tube 32. With the spray tube 32 rotatably journalled at 58 in the housing 54 the water swirl imparts a rotating motion to the spray tube 32, thereby effecting a thorough distribution pattern for any fluid being ejected from the spray tube openings 38.

The drain system of the dishwasher 10 includes a drain conduit 60 connected to a drain outlet 62 which is in turn connected to the drain portion or volute 48 of the pump housing 42. Interposed between the supply portion or volute 46 of the pump 42 and the drain portion 48 is an impeller 64 which may be operated either clockwise or counter-clockwise to selectively direct fluid to drain conduit 60 or to recirculating conduit 50. The drain conduit 60 is formed with a loop portion 65 which extends above the normal level of water in sump 16 and

terminates in an air gap receptacle 66. Receptacle 66 is then connected to a drain outlet 68 which leads to any domestic sewage system.

Water is supplied to the dishwashing chamber 18 by means of selectively actuated water supply valve 70 which is connected to any convenient domestic water supply by means of a conduit 72. Water is carried from the valve 70 by means of a conduit 74 which extends through the sump wall 16 in any water-tight fashion to direct the supply of water to the sump 16. The amount of water supplied will be determined in accordance with the timing operation of a conventional dishwasher timer (not shown). To supply heat for sterilizing and drying within the dishwashing chamber 18, a heater 76 may be utilized. Also desirable within the apparatus 10 is a strainer 78 which overlies the outlet opening 40 from the sump to restrain large pieces of refuse from entering the pump housing 42.

Items to be washed within the chamber 18 may be supported on a dish support structure having an upper basket 80 and a lower basket 82. Brackets such as 84 may be utilized to support the basket 80 on the basket 82, rolling members such as wheels 86 then serving to provide easy simultaneous removal of both baskets 80 and 82 onto the door 20 when the door is in a horizontally open position. Of course, the baskets 80 and 82, shown as plastic in this instance, must be highly perforated to permit free flow of the washing fluid being sprayed from the spray tube 32.

In the design just described for the dishwasher 10 it should now be seen that the water conveying conduits such as 50 are contained within the dishwashing chamber 18. There are no fluid connections in the water recirculating system outside of the chamber 18. Consequently service problems relating to leakage are reduced and a more dependable dishwasher design is accomplished. Further a reduction in the cost of manufacture is possible when the chamber 18 is formed by a single wall construction—a construction which eliminates additional parts such as outside panels, and which enlarges the capacity of the dishwashing chamber 18 without enlarging the size of the appliance 10. To further simplify the servicing of the dishwasher 10 an opening 88 is formed in the rear wall 12 adjacent the machine compartment 24.

Reference may now be had to FIGURE 2 wherein a complete understanding of the novel pump of this invention will be set forth. The sump portion 16 of the dishwasher 10 is shown with an inset 90 having a shoulder 92 for supporting the strainer 78 in a position overlying the pump inlet opening 40. It should be noted that the pump housing 42 and motor housing 43 form an integral pump-motor unit 45. However, it is within the purview of this invention to make the housings 42 and 43 separate. The motor 44 is installed within the motor housing portion 43 of the combination housing 45. The motor 44 has a stator 94 press-fit within the motor housing portion 43 and a rotor 96 which is press-fit on a shaft 98. At the lower end of the motor housing 43 a cover plate 100 is utilized to close the open end of the housing 43 and to support a motor overload protector of conventional design such as 102. The combination housing 45 is attached to the sump 16 adjacent the outlet opening 40 as by any conventional fastening means such as a bolt 104 fastened into the combination housing or pump-motor unit 45. A ring seal 106 is placed in a groove 107 of the pump housing 42 and interposed between the sump 16 and the pump housing to effect a water-tight connection of the pump and motor assembly to the sump 16 of the dishwasher 10. With the motor 44 mounted in a vertical position the shaft 98 extends upwardly through a cylindrical opening 99 into the pump housing 42 where the impeller 64 is attached by means of a bolt 108 and a clamp washer 110. The impeller 64 is formed with a bronze insert 112 which has a flat sided central opening 114 which fits over a complementarily formed upper end of the shaft 98. Completing the impeller shaft assembly is an O-ring 116, a sintered bronze seal washer 118 and a seal assembly 120 of conventional design. In this relationship a water-tight connection is effected between the sump 16 and the pump housing 42 by the seal 106, whereas water is sealed from the motor itself through the sealing arrangement at 120. Beneath the seal 120 a thrust bearing 121 is carried in an outer race 123 to complete the assembly of pump impeller 64 to pump motor 44.

In accordance with one aspect of this invention the impeller 64 is interposed between a large water supply or recirculating volute portion 46 and a smaller drain volute portion 48. The supply volute 46, it should be noted, is formed with arcuately formed radially outer peripheral edge portions 122 and 150 which aid in reducing duct resistance to the recirculating water being forced by the impeller 64 to the conduit 50. With this arrangement the impeller 64 when rotated in one direction by motor 44 serves to force water from the sump 16 around the upper volute supply portion 46 through the supply conduit 50 to the spray tube 32. At the same time water is prevented from entering the drain conduit 60 by a slight suction placed thereon by the rotation of impeller 64. This double action of a single impeller thereby effectively blocks outflow of the circulating fluid to drain. This novel valving action eliminates the need for any auxiliary solenoid or mechanically operated drain valve.

The novel configuration of the impeller 64 of this invention is best seen in FIGURE 5. In this view the impeller 64 is shown with a dished-out portion having a bottom wall 124 and an upstanding peripheral edge wall 126. Formed integral with the wall portions 124, 126 are a plurality of vanes 128. A raised central portion or hub 130 has an opening 132 in which the bronze hub insert 112 is press-fit. Beneath each of the vanes 128 is a drain outflow port 136. The perspective of FIGURE 5 shows the vanes 128 lying at an acute angle overlying the drain outflow ports 136. As noted on FIGURE 5 a clockwise rotation of the impeller 64 will force fluid downwardly through outflow drain ports 136. On the other hand a counter-clockwise rotation of the impeller 64 will cause the fluid being impelled to lift upwardly. When the impeller 64 is placed between the supply volute 46 and the drain volute 48 the selective rotation of the impeller 64 will set up either a water recirculating and valve action to conduit 50 or a drain operation to conduit 60.

A more detailed description of the impeller 64 is seen in FIGURE 8. In a 6-inch diameter impeller 64 the vane 128 is formed with a 3/64 inch radius at 140, a 1/8 inch radius at 142 and a 1/4 inch radius at 144. The outflow drain port 136 is approximately 1/2 inch square while the angle which the vane 128 makes with the bottom wall 124 is 45°. It has been found that an impeller formed as described hereinabove will provide a satisfactory pumping operation in either direction in a dishwashing appliance. However the angular relationship and the configuration of the vane 128 may be changed to alter the pumping pressure without departing from the teachings of this invention. A changed blade configuration may be desired when it is required to pump the drain water to a higher adjacent sink, i.e. the loop 65 would be above the level of the sink and would require a greater pumping pressure to be exerted by the impeller 64 than would be necessary in the arrangement of FIGURE 1. It is well within the purview of this invention to achieve any desired performance characteristics for the impeller 64 by selective adjustment of the size and angles of the impeller components. For instance, a high pressure, low volume pump would result from the use of the impeller 134 of FIGURE 11 wherein an impeller blade 135 is formed with a gradual drain side slope 137 and a steeper recirculating side slope 139.

A clear understanding of the volute configuration of the pump housing **42** will now be gained with reference to FIGURES 3, 4 and 7. In FIGURE 7 for instance a top view of the pump-motor housing **45** shows how the drain or outlet volute **48** is formed in the casting in the pump housing **42** to connect with the outlet **62**. The water recirculating or supply volute **46** is also formed in the integral casting **45**, thus comprising a novel double pump housing casting. Note how the peripheral edge walls are curved at **122** to aid in the smooth movement of the fluid about the volute **46**. A curved section **150** is also formed in the recirculating or supply volute **46** to aid the flow transition from the volute **46** upwardly into the conduit **50**. The configuration of the pump housing is combined effectively with the novel design of a single impeller **64** to effect a pumping operation in both directions.

FIGURE 4 shows a view looking upwardly at the impeller **64** from the drain volute **48**. With the casting broken away the drain outlet openings **136** are seen from the underside of the impeller **64**. Note how the openings **136** overlie the drain volute **48** throughout its length. This arrangement provides for smooth pumping action to drain.

Another embodiment of this invention is seen in FIGURES 9 and 10 and adds to the described invention a triturating arrangement to disintegrate pieces of waste suspended in the water being directed to drain. The elimination of particles from the water being drained will serve to minimize drain stoppages and thus aids in dependable appliance operation. In this arrangement a pump housing **152** is provided with an upper supply volute portion **154** and a drain volute portion **156**. A triturating element **158** is attached to a vertical wall portion of the housing **152** radially outwardly of the impeller **160**. The impeller **160** is formed with a plurality of vanes **162** which are supported on a base portion **164** of the impeller **160**. The triturating element **158** has teeth **166** which serve to triturate solid particles being thrown radially outwardly by the rotation of impeller **160**. The opening **40** of the sump **16** may include a strainer basket **168** which is spring biased upwardly at **170** and supported on a bracket **172**. In this relationship a rotation of the impeller **160** in a counter-clockwise direction will pull the strainer **168** downwardly to place the strainer in straining relationship to the opening **40**. This same rotation can cause fluid moving through the opening **40** to be pumped upwardly through a conduit **174**. At the same time a slight vacuum is pulled on a drain conduit **176** to serve as a valve against permitting fluid to move to drain. In a clockwise rotation of the impeller **160** the pumping volume is less and the strainer **168** will be biased upwardly. The water is thrown radially outwardly with a downward component of pumping pressure. This movement causes any solid matter washed from the surface of the strainer **168** and being pumped to drain to be impaled upon the teeth **166** of the triturating element **158** and a thorough disintegration of the matter is accomplished. This action will thus eliminate the possibility of drain stoppage.

In operation the dishwasher **10** may be provided with the control circuit of FIGURE 6 for sequentially controlling the components of the dishwasher. These components may include the reversible motor **44**, a timer motor **180**, a solenoid **182** for the supply valve **70** and the heater **76**. A conventional timer may be utilized having a set of reversing contacts **184** for the motor **44**, a motor energizing contact **186**, a heater switch **188** and fill valve switch **190**. As a safety measure on the dishwasher **10** a door interlock switch **192** may be included in conjunction with a main line switch **194**. To initiate the washing operation the racks **80**, **82** may be removed from the dishwashing chamber **18** on the hingedly opened horizontally arranged door **20**. After loading the baskets they may be

returned to the chamber **18** and the door **20** closed thus effecting a closure of the door interlock switch **192**. The initiation of the wash cycle is started after a manual closing of the line switch **194** which starts the timer motor **180**. As the cam actuated switches are selectively positioned the fill valve switch **190** will be closed to supply a predetermined amount of water to the sump **16** by way of conduit **74**. At the same time or shortly before the motor **44** will be energized to rotate the impeller **64** in the direction for recirculating fluid placed within the sump **16**. Motor **44** will be energized continuously during the washing process. In this way water will be picked up from the sump **16** by way of opening **40** in the pump housing **42**. The impeller will pump water upwardly through the interior conduit **50** to the spray tube **32**. As the water passes the swirl inducer the rotating motion imparted to the water will cause a rotation of the spray tube **32** and a thorough distribution of the water ejected from ports **38** throughout the washing chamber **18**.

The novel pump arrangement of this invention eliminates the need for a valve on drain line **60**. To effect this the rotation of impeller **64** in the recirculating direction draws a slight vacuum on the drain line **60** through the impeller ports **136**. This slight vacuum prevents any of the water in sump **16** from being directed to drain during the washing portion of the cycle. At the conclusion of the wash cycle the timer will reverse the contacts **184** to reverse the operation of motor **44**. In this fashion the impeller **64** is rotated in an opposite or drain direction. The vanes **128** urge the water remaining in the sump **16** downwardly through the ports **136** to the lower drain volute **48** and outwardly through the drain outlet **62** to the drain conduit **60**. At the air gap **66** the water continues downwardly to drain line **68** by gravity. Another wash cycle or a rinse cycle may follow.

Subsequent to the wash cycle a drying cycle is initiated by the timer actuated switch **188** to energize the heater **76**. It is at this time that another aspect of this invention is utilized. The pump impeller **64** is used when rotated in one direction to recirculate heated air throughout the dishwashing chamber **18** to speed the drying cycle and to sterilize the dishes. With counter impeller rotation air is supplied through an opening **200** in the bottom of door **20** and the louvers **198** by the sucking action of the impeller **64** as it is being rotated in its drain direction (see dot-dash arrows in FIGURE 1). The moisture-laden air is pumped outwardly by means of the conduit **60** to the air gap **66** fitting where the air discharges into the machine compartment **24**. This multiple action of the single pump impeller **64** is seen to provide a water recirculating system, a forced drain system and an air drying system without the need for valves. Further the single wall construction in a dishwasher encloses the interior water conduits to eliminate connections outside of the dishwasher and to minimize leakage.

As set forth hereinbefore the cabinet **11** is formed of single wall construction as seen more clearly in FIGURE 14. The side walls **13** and **15** and the top wall **14** are formed from a single sheet of metal in what may be termed a wrap-around construction. Both the sump section **16** and the rear wall **12** are then welded to flanges formed on the integrally formed top and side walls. Thus a strong single-wall cabinet results which achieves maximum interior dimensions with a given exterior size.

Another aspect of this invention is embodied in a novel swirl producing arrangement for the spray tube **32**. As seen in FIGURES 12 and 13 the swirl inducing spray head **54** may be formed of molded plastic such as molded phenolic. The housing **54** is molded with an inlet portion **202** and an outlet **204**. The outlet **204** leads into the cylindrical flange portion **55** which lays adjacent the rear end of the spray tube **32**. A central boss **206** supports the bearing **208** in which the spray tube shaft **58** is journalled. Since the shaft **58** is carried on a web **210** which is held in place by a mounting cylinder **212**, the

spray tube 32 rotates relatively to the flange 55 of the spray tube swirl head 54.

For mounting the swirl head 54 to the cabinet 11 a peripheral flange 214 is provided through which fastening means 216 may attach to the cabinet rear wall 12. Of course the interior wall of the cabinet will have been spray coated with plastisol prior to installing the header 54 and a vinyl coated metal spacer 205 positioned to hold the header 54 in correct relationship to duct 50. Vibration may be minimized with any conventional anti-vibration arrangement such as resilient bushing 220. The housing 54 is formed also with bosses 222 drilled at 224 to receive the rearward ends of support bracket 34.

The swirl inducing design of spray header or housing 54 is best seen in FIGURE 13 wherein the opening 204 is shown offset from the inlet 202. This arrangement provides for a duct having a curved terminal portion 226. As aforesaid, the spray tube supply volute 46 of the pump 42 has a curved section 150. Thus as water is pumped to the spray tube 32, the configuration of the volute will cause the fluid being pumped to hug the wall 228 of the duct 50. Then as the fluid enters the spray header 54, the tendency thereof will be to follow the curved terminal portion 226 of the header. This, it should be seen, will induce a swirl in the water being pumped as it passed through the opening 204. This swirl, as it moves down the spray tube 32 will cause the tube to rotate. A complete spray pattern will result in this manner without the addition of auxiliary swirl inducing vanes to the housing 54.

While the forms of embodiment of the invention as herein disclosed constitute preferred forms, it is to be understood that other forms might be adopted, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. In combination, a dishwasher comprising a single wall cabinet enclosing a dishwashing chamber, a spray tube in said chamber, said chamber having a sump, said sump having a tapered wall defining an opening, a strainer over said opening, a pump having only a single inlet means connected to said opening, said pump having a water recirculating volute and a water drain volute, a conduit within said chamber connected from said water recirculating volute to said spray tube, means for rotatably supporting said spray tube, means in said conduit for imparting a rotation to said spray tube, a single impeller for said pump interposed between said water recirculating volute and said drain volute, and selectively reversible means for rotating said impeller in one direction to pump water entering by way of said single inlet means to said spray tube and to close effectively said drain volute and for rotating said impeller in the opposite direction to pump said water entering by way of said single inlet means to said drain.

2. In combination, a dishwasher comprising a cabinet enclosing a dishwashing chamber, a spray tube in said chamber, said chamber having a collecting portion, said collecting portion having an opening, a pump having only a single inlet means connected to said opening, said pump having a water recirculating volute and a water drain volute, a conduit connected from said water recirculating volute to said spray tube, means for rotatably supporting said spray tube, means in said conduit for imparting a rotation to said spray tube, a single impeller for said pump having a base portion interposed between said water recirculating volute and said drain volute, said impeller base portion having a port interconnecting said volutes and a vane extending from one side only of said base portion toward said single inlet means and angularly disposed relative to the plane of said base portion in a manner to partially cover said port and reversible means for rotating said impeller in one direction to pump water entering by way of said single inlet means to said spray tube and to close effectively said drain volute and for rotating said impeller in the opposite direction to pump said water entering by way of said single inlet means to said drain.

3. In combination, a dishwasher comprising a casing having a dishwashing chamber, a spray tube in said chamber, a pump having only a single inlet means connected to said chamber, said pump having a fluid supply portion and a fluid drain portion, means connecting said fluid supply portion to said spray tube, a single impeller for said pump having a base portion rotatable in a plane interposed between said fluid supply portion and said fluid drain portion and coaxial with said portions, said base portion having a port means for interconnecting said fluid supply portion and said fluid drain portion and a vane means extending from one side only of said base portion at an angle to said plane and toward said single inlet means in a manner partially to cover said port means, and reversible means for rotating said impeller in one direction to pump fluid entering by way of said single inlet means to said spray tube and to block effectively said fluid drain portion and for rotating said impeller in the opposite direction to pump said fluid entering by way of said single inlet means to said drain.

4. In combination, an appliance having a washing chamber and a drain, an access door for said chamber having an internal passage connecting said chamber to the atmosphere, a spray tube in said chamber, means to supply a fluid to said chamber, a heater for said chamber, a pump having only a single inlet connected to said chamber and said internal passage and outlet means connected selectively to said spray tube and said drain, said pump having a recirculating portion and a drain portion, a single impeller for said pump having a base portion rotatable in a plane interposed between said recirculating portion and said drain portion, said base portion having a port means for interconnecting said recirculating portion and said drain portion and a vane means extending from one side only of said base portion at an angle to said plane toward said single inlet in a manner partially to shield said port means, means for reversibly rotating said impeller, and means for sequentially operating said rotating means, said fluid supply means and said heater to effect a recirculating fluid washing operation, a recirculating vapor sterilizing operation, and a forced air drying operation.

5. In combination, a dishwasher comprising a cabinet defining a dishwashing chamber, spray means in said chamber, said chamber having a sump means, said sump means having wall means defining an opening, pump means having only a single inlet means connected to said opening, said pump means having a water recirculating volute and a water drain volute, conduit means within said chamber connected from said water recirculating volute to said spray means, a single impeller for said pump means interposed between said water recirculating volute and said drain volute, and selectively reversible means for rotating said impeller in one direction to pump water entering by way of said single inlet means to said spray means and to close effectively said drain volute and for rotating said impeller in the opposite direction to pump said water entering by way of said single inlet means to said drain.

6. In combination, a dishwasher comprising a cabinet defining a dishwashing chamber, spray means in said chamber, said chamber having a sump means, said sump means having wall means defining an opening, pump means having only a single inlet means connected to said opening, said pump means having a water recirculating volute and a water drain volute, conduit means connected from said water recirculating volute to said spray means, a single impeller for said pump means interposed between said water recirculating volute and said drain volute, and selectively reversible means for rotating said impeller in one direction to pump water entering by way of said single inlet means to said spray means and to close effectively said drain volute and for rotating said impeller in the

opposite direction to pump said water entering by way of said single inlet means to said drain.

References Cited in the file of this patent

UNITED STATES PATENTS

2,066,531	Holden	Jan. 5, 1937
2,368,883	Roth	Feb. 6, 1945
2,375,403	Croce	May 8, 1945
2,611,318	Wahlmark	Sept. 23, 1952
2,678,845	Fitter	May 18, 1954
2,704,082	Jackson	Mar. 15, 1955
2,715,410	Ruspino	Aug. 16, 1955
2,729,219	Smith	Jan. 3, 1956
2,734,520	Abresch et al.	Feb. 14, 1956
2,858,236	Asselin	Oct. 28, 1958
2,916,997	Terrie	Dec. 15, 1959
2,946,286	Sholtes et al.	July 26, 1960
2,955,304	Noe	Oct. 11, 1960
2,981,267	Stoddard	Apr. 25, 1961