Oct. 16, 1962 J. A. FAY ETAL 3,058,479

DISHWASHER

Filed Jan. 4, 1960 3 Sheets-Sheet 1

FIG. 3.

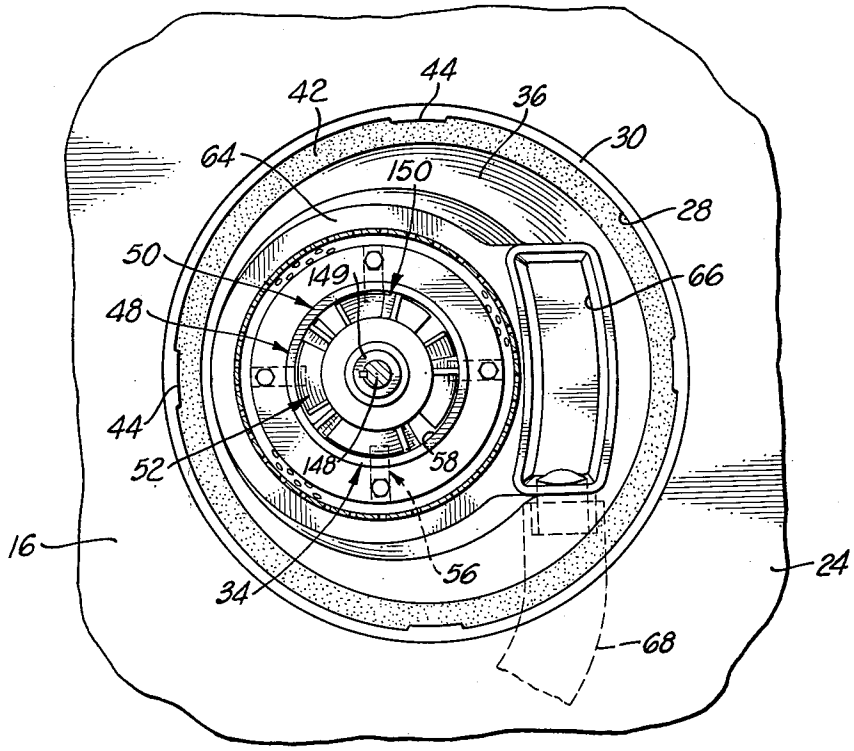


FIG. 1.

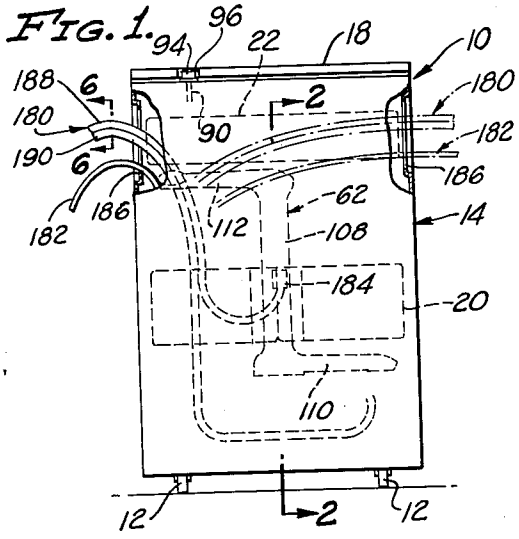
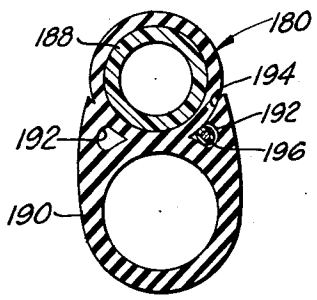


FIG. 6.



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DISHWASHER

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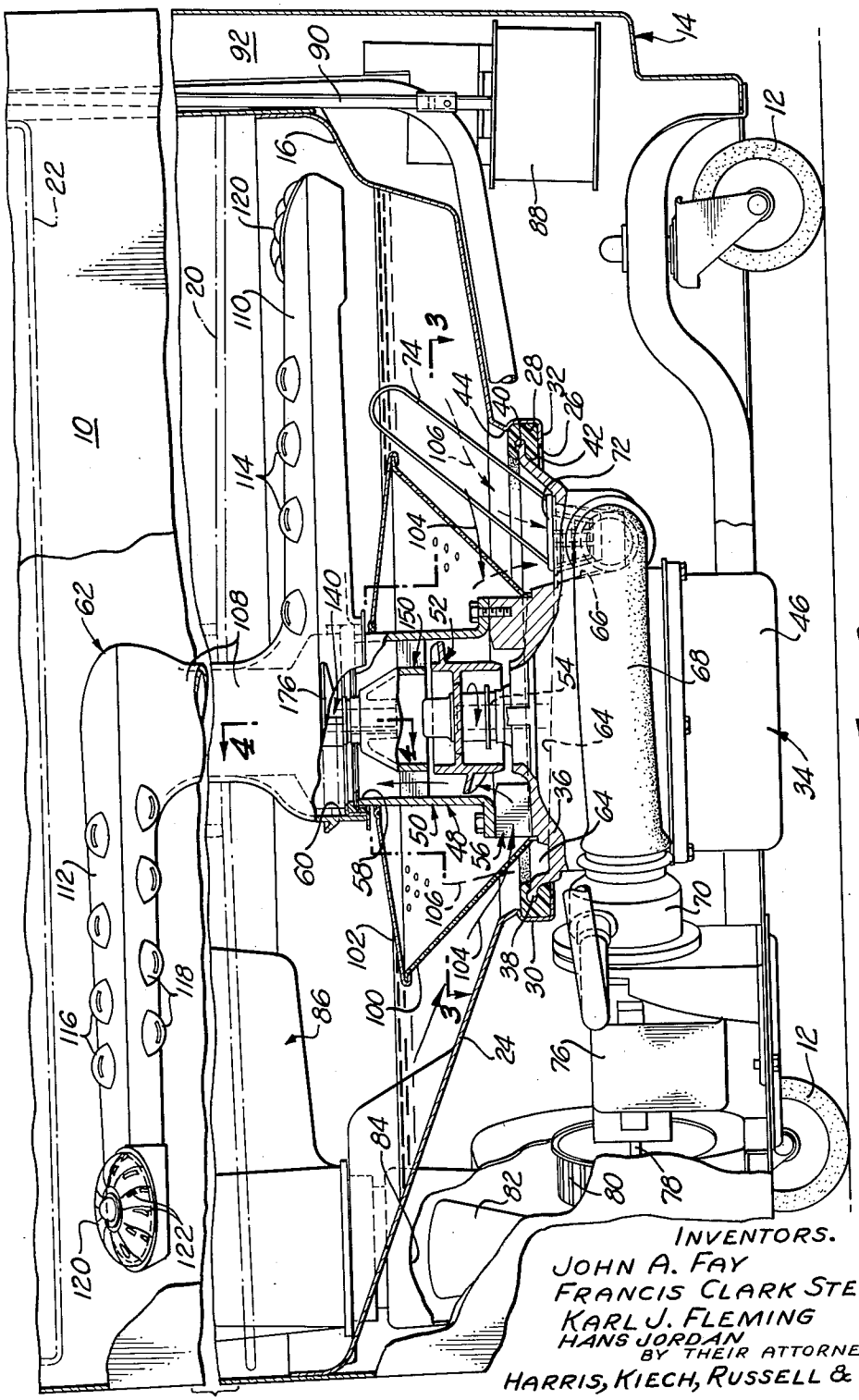


FIG. 2.

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DISHWASHER

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FIG. 4.

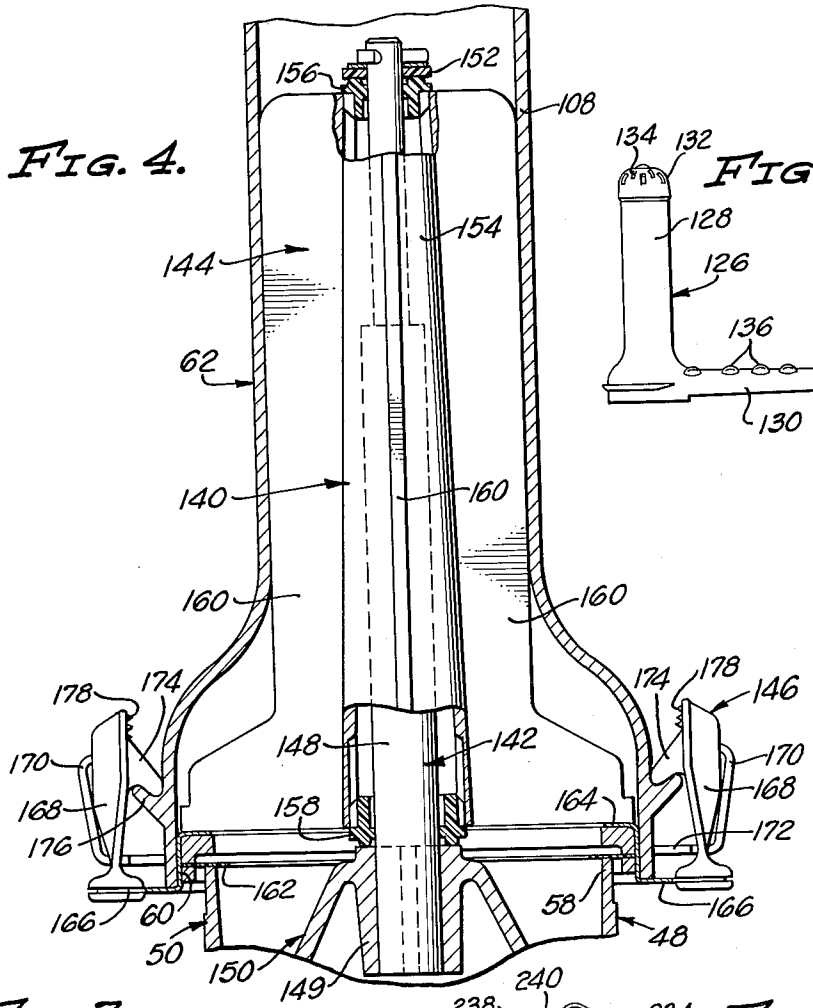


FIG. 5.

FIG. 7.

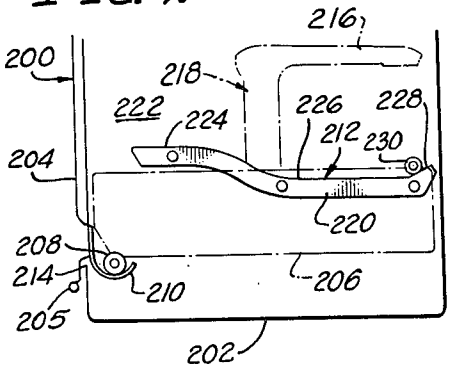
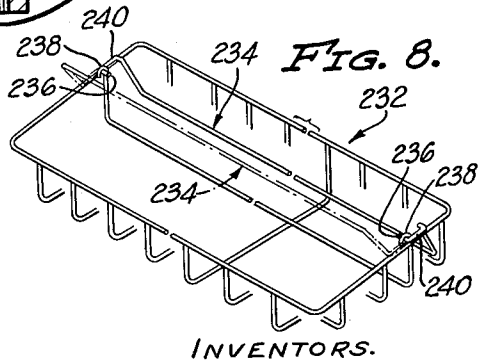


FIG. 8.



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3,058,479

DISHWASHER

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Filed Jan. 4, 1960, Ser. No. 367
8 Claims. (Cl. 134—144)

The present invention relates in general to dishwashers and, more particularly, to improvements in automatic dishwashers which render them more efficient and effective for their purpose.

One object of the invention is to provide a dishwasher having a single motor for driving both a drain pump for draining the tub of the dishwasher and a blower for delivering heated drying air into the tub of the dishwasher. Another object in this connection is to provide a dishwasher wherein the motor is interposed between the drain pump and the blower and wherein the drain pump and the blower are respectively connected to opposite ends of the motor.

Another object is to provide means for distributing water throughout the tub to wash and rinse dishes therein which includes a distributing pump comprising a vertically oriented, axial flow pump having an inlet in communication with the tub at the bottom thereof and having an upwardly directed, axial outlet at its upper end, such axial flow pump being carried by the bottom wall of the tub and being driven by a coaxial electric motor disposed below the bottom wall of the tub and directly connected to the axial flow impeller of the axial flow pump.

Another object is to provide a water distributing means which includes a reaction-type distributing impeller coaxial with and mounted directly on the axial flow pump, the distributing impeller having at its lower end a downwardly directed, axial inlet communicating directly with the axial outlet at the upper end of the axial flow pump. With this construction, the water discharged by the axial flow pump flows directly and axially through the axial flow pump into the distributing impeller so as to minimize losses.

Another object is to provide a dishwasher wherein the inlet of the distributing pump is blocked by a screen in the tub adjacent the bottom thereof and sloping upwardly away from the inlet of the axial flow pump. With this construction, water entering the inlet of the distributing pump must flow through the sloping screen, whereby any food waste entrained in the water is caught on the lower side of the screen.

Another object is to provide a dishwasher wherein the inlet of the drain pump communicates with the bottom of the tub on the opposite side of the screen from the inlet of the distributing pump, whereby water in the tub flowing to the drain pump inlet flows downwardly through the screen to flush into the drain pump inlet food waste caught on the lower side of the screen.

With the foregoing construction, food waste is prevented from entering the inlet of the distributing pump, and thus is prevented from being recirculated over the dishes being washed, and is automatically flushed from the screen into the inlet of the drain pump when the wash water is being drained from the tub.

Another object is to provide a dishwasher wherein the screen hereinbefore discussed is an annular, upwardly divergent, frusto-conical screen which encircles the inlet of the distributing pump, the inlet of the drain pump being outside and below the upwardly divergent, annular screen.

Another object is to provide a dishwasher wherein the top of the upwardly divergent, annular screen is covered by an imperforate dome down which food waste may migrate for eventual delivery to the inlet of the drain pump.

Another object of the invention is to provide a dishwasher having upper and lower dish baskets vertically spaced apart within the tub and to provide a distributing impeller having a lower spraying means below the lower dish basket for spraying water upwardly over dishes in the lower dish basket and having between the dish baskets an upper spraying means for spraying water downwardly over dishes in the lower dish basket and upwardly over the dishes in the upper dish basket. A related object is to provide a distributing impeller wherein the lower spraying means comprises a lower transverse spraying arm of the reaction type.

Another object is to provide a distributing impeller wherein the upper spraying means is located centrally of the distributing impeller and wherein the lower spraying means is a transverse spray arm, the distributing impeller thus being L-shaped.

Still another object is to provide a distributing impeller wherein the upper and lower spraying means are oppositely extending, transverse, spraying arms of the reaction type, the lower spraying arm being disposed below the lower basket and the upper spraying arm being disposed between the upper and lower baskets. With this construction, the distributing impeller is substantially Z-shaped.

Another object of the invention is to provide a distributing impeller having at least one transverse, reaction-type spray arm which includes at the outer end thereof a distributing element disposed substantially entirely within the confines of such transverse arm and having a plurality of water discharge nozzles therein. Thus, the distributing impeller is provided with a concentration of discharge nozzles at the outer end of its transverse arm to insure proper distribution of water to dishes located at the corners of square or rectangular dish baskets. Another object in this connection is to provide a distributing impeller wherein the distributing element at the end of the transverse arm is rotatable relative to such transverse arm about an upright axis, thereby further enhancing the uniformity of water application to dishes at the corners of the dishbaskets.

Yet another object of the invention is to provide manually operable latch means for releasably connecting the distributing impeller to the distributing pump against upward displacement of the distributing impeller. With this construction, the distributing impeller is prevented from being displaced upwardly by the pressure of the water discharged by the distributing pump, but is readily removable for cleaning, and the like.

More particularly, an object is to provide a thrust bearing means for the distributing impeller which includes a stationary component connected to the distributing pump and a rotatable component to which the distributing impeller is releasably connected by the manually operable latch means mentioned.

The invention contemplates, in one of its embodiments, a dishwasher of the front loading type, such a dishwasher having a front doorway in the tub, a door pivotable relative to the tub between a lower, generally horizontal, open position and an upper, generally vertical, closed position, and a lower dish basket movable through the front doorway between a retracted position wherein it is disposed within the tub and an extended position wherein it is located above the door when the door is in its open position. The invention further contemplates, in the embodiment under consideration, a distributing impeller having a transverse spray arm rotatable in a horizontal plane between the lower dish basket mentioned and an upper dish basket thereabove.

An important object of the invention in connection with the embodiment outlined in the preceding paragraph is to provide guide means for lowering the rearward end of the lower basket as it is moved rearwardly from its extended position toward its retracted position, whereby the lower basket dips downwardly under the transverse distributing impeller arm betwen the two baskets as the lower basket is moved rearwardly toward its retracted position. This provides adequate clearance for the transverse distributing impeller arm between the two baskets to permit dishes in the lower basket to extend upwardly thereabove.

Another object in the foregoing connection is to provide a dishwasher wherein the guide means mentioned includes tracks respectively mounted on opposite side walls of the tub and within the tub and includes track followers at the rearward end of the lower basket and respectively engageable with the tracks, the tracks having rearward portions at lower elevations than forward portions thereof so that the rearward end of the lower basket drops downwardly as it is moved rearwardly into its retracted position.

Another object is to provide a dishwasher basket having a pivoted divider movable between a retracted position wherein it is inoperative and an extended position wherein it is operative to handle an extra row of cups, glasses, and the like, thereby providing extra capacity.

An additional object of the invention is to provide a dishwasher having a single, dual-passage hose retractable into the housing of the dishwasher when the latter is not in use, such single hose having therein two side-by-side passages one adapted to supply water to the tub and the other adapted to drain the water from the tub. Incorporating fill and drain passages in a single, dual-passage hose in this manner greatly facilitates retraction of the hose into and withdrawal thereof from the housing of the dishwasher.

Another object is to provide a dishwasher wherein the dual-passage hose mentioned is provided therein with still another passage alongside the first two, the other passage having therein an electrical ground wire connected at one end to a component of the dishwasher and connectible at its other end to the cold water plumbing, for example, of the residence, or other structure, within which the dishwasher is to be used.

Still another object is to provide a dishwasher wherein the housing is provided with two openings therein respectively located adjacent opposite sides thereof and adjacent the front thereof, the dual-passage hose mentioned being withdrawable from the housing through either of the two openings, the same being true of an electrical cord means for powering the dishwasher. With this construction, the dishwasher may be converted readily from a left hand to a right hand model, or vice versa.

The foregoing objects, advantages, features and results of the present invention, together with various other objects, advantages, features and results thereof which will be evident to those skilled in the dishwasher art in the light of this disclosure, may be attained with the exemplary embodiments of the invention described in detail hereinafter and illustrated in the accompanying drawings, wherein:

FIG. 1 is a front elevational view, with parts broken away, of a top loading, portable dishwasher which embodies the invention;

FIG. 2 is an enlarged, fragmentary sectional view taken generally along the arrowed line 2—2 of FIG. 1, the dishwasher being compressed vertically in FIG. 2 because of the fact that portions thereof are broken out;

FIG. 3 is a fragmentary sectional view taken along the arrowed line 3—3 of FIG. 2;

FIG. 4 is an enlarged, fragmentary sectional view taken along the arrowed line 4—4 of FIG. 2;

FIG. 5 is an elevational view illustrating an alternative water distributing impeller of the invention;

FIG. 6 is an enlarged sectional view taken along the arrowed line 6—6 of FIG. 1;

FIG. 7 is a semidiagrammatic elevational view illustrating a guide means for a lower dish basket of a front loading dishwasher of the invention; and

FIG. 8 is a perspective view illustrating another dish basket of the invention.

Referring particularly to FIGS. 1 and 2 of the drawings, the top loading dishwasher illustrated therein is designated generally by the numeral **10** and is shown as mounted on casters **12** for portability. The dishwasher **10** includes an outer housing **14** having therein a tub **16** for dishes to be washed, rinsed and dried. Access to the interior of the tub **16** is provided by opening a top cover or door **18**, the dishes being placed in vertically spaced lower and upper dish baskets or racks **20** and **22**. The upper basket **22** may be formed in sections, similar to the one shown in FIG. 8, pivotable upwardly to provide access to the lower basket **20**.

The tub **16** includes a bottom wall **24** which slopes downwardly to a generally central opening **26** which is encircled by an annular recess **28** having a peripheral wall **30** and a bottom wall **32**, the latter being formed by a radially inwardly projecting flange. Extending upwardly through the opening **26** into the tub **16** is a water distributing means **34** which includes a lower housing **36** having thereon an annular flange **38** disposed in an annular groove **40** in the inner periphery of an elastomeric sealing and mounting ring **42**. The ring **42** is disposed in the annular recess **28** in engagement with the peripheral and bottom walls **30** and **32** thereof, and is retained in such recess by a plurality, e.g., four, inwardly struck retaining lips **44** which are formed integrally with the peripheral wall **30** of the annular recess **28** and under which the ring **42** is inserted. With this construction, the sealing and mounting ring **42** is retained only by the lips **44**, it being unnecessary to secure it by bolts, screws, or the like. The elastomeric ring **42** acts in compression to serve as a floating, shock-absorbing mount for the water distributing means **34**, thereby preventing vibration transmission to the tub **16**.

Carried by the lower housing **36** below the bottom wall **24** of the tub **16** is an electric motor **46** which has its axis of rotation oriented vertically. Mounted on the lower housing **36** within the tub **16** is an upper housing **48** which constitutes the housing of an axial flow distributing pump **50** having therein an axial flow impeller **52**. The axial flow impeller **52** is coaxial with the motor **46** and is connected directly to the shaft **54** of the motor.

The lower housing **36** is provided therein with an inlet **56** for the axial flow pump **50**, the inlet **56** comprising a plurality, e.g., four, circumferentially spaced inlet ports each having an angular extent of nearly 90°. The pump housing **48** terminates at its upper end in an upwardly directed axial outlet **58** with which a downwardly directed, axial inlet **60** of a water distributing impeller **62** registers. The impeller **62** is mounted on and carried by the axial flow pump **50** in a manner to be described hereinafter.

With the constructoin described, the water pumped by the axial flow pump **50** flows directly through the axial flow pump into the distributing impeller **62** in a straight line. This minimizes friction losses, which is an important feature.

The lower housing **36** of the distributing means **34** is provided within the sealing and mounting ring **42** with a generally annular sump **64** encircling the inlet **56** of the axial flow pump **50**. The sump **64** slopes downwardly to a lower sump **66** located at one side of the inlet **56** of the axial flow pump **50** and communicating through a conduit **68** with the inlet of a drain pump **70**. A strainer **72** provided with a handle **74** is disposed in the lower sump **66** and is adapted to prevent large food particles from flowing through the conduit **68** into the drain pump **70**.

The drain pump **70** is coaxial with and is driven by

an electric motor 76 suitably mounted on the structure of the dishwasher 10, the drain pump being connected to one end of the shaft 78 of the motor 76. Connected to the opposite end of the motor shaft 78 and coaxial with the motor 76 is a blower 80 which draws air from under the tub 16 and discharges it through an electrical resistance-type heater 82. Heated air discharged by the heater 82 is conducted into the interior of the tub 16 through a duct 84 and a baffle 86 to dry dishes in the baskets 20 and 22 after such dishes have been washed and rinsed.

It might be pointed out at this juncture that the various components of the dishwasher 10 are caused to wash, rinse and dry dishes in the baskets 20 and 22 by a timer 88 which is shown in FIG. 2 as located below the tub 16. The timer 88 has connected thereto an upright, rotatable and reciprocable shaft 90 which extends upwardly through a space 92 between the front walls of the housing 14 and the tub 16, the shaft 90 having a knob 94, FIG. 1, connected thereto externally of the dishwasher 10. The top door or cover 18 is provided with an opening 96 therein through which the knob 94 projects when the door is closed. Means, not shown, are provided for moving the shaft 90 downwardly to open a main switch incorporated in the timer 88 whenever the top door 18 is opened. Upon subsequent closure of the top door 18, such means is rendered ineffective to prevent closing of the main switch in the timer 88, whereupon such main switch may be closed to start the dishwasher 10, or to ready it for starting, by pulling upwardly on the knob 94.

The lower housing 36 of the distributing means 34 carries an annular, upwardly divergent, frusto-conical screen 100 which encircles and blocks the inlet 56 of the axial flow pump 50. The upper end of the screen 100 is closed by an imperforate dome 102 which encircles the housing 48 of the axial flow pump 50, the dome 102 sloping outwardly and downwardly so that food waste landing thereon can migrate outwardly and ultimately reach the sump 64.

It will be noted that when the water distributing means 34 is in operation during washing and/or rinsing, water is drawn inwardly into the screen 100, as indicated by the solid arrows 104, as it flows into the inlet 56 of the axial flow pump 50. Consequently, any food waste entrained in the water flowing to the inlet 56 of the axial flow pump 50 lodges on the lower or outer surface of the screen 100 to prevent recirculation of such food waste over the dishes being washed or rinsed. Subsequently, when the drain pump 70 is placed in operation, part of the water flowing into the lower sump 66 flows outwardly and downwardly from the interior of the screen 100, as indicated by the broken arrows 106, so as to flush food waste caught on the lower or outer surface of the screen 100 downward into the sloping sump 64 and ultimately into the sump 66 communicating with the inlet of the drain pump 70 through the conduit 68. Thus, the screen 100 is self cleaning, which is an important feature. It will be noted that the strainer 72 in the lower sump 66 traps any large food particles to prevent their entry into the drain pump 70.

The water distributing impeller 62, which is mounted on the housing 48 of the axial flow pump 50 in a manner to be described hereinafter, is generally Z-shaped and includes a hollow central post 108 which is coaxial with the axial flow pump 50 and the motor 46 and which has the axial inlet 60 at its lower end. Integral with the hollow post 108 and communicating therewith are oppositely extending lower and upper transverse, reaction-type spraying or distributing arms 110 and 112. The lower spraying arm 110 rotates in a plane below the lower basket 20 and the upper spraying arm 112 rotates in a plane between the lower and upper baskets 20 and 22 and adjacent the upper basket 22 to clear dishes which may project upwardly above the lower basket. The lower arm 110 is provided with upper, upwardly directed nozzles 114 which are adapted to produce fan-shaped sprays and certain of which are directed rearwardly relative to the desired direction of rotation of the distributing impeller 62 so as to produce such rotation. The upper spraying arm 112 is provided with upper, upwardly directed, and lower, downwardly directed, nozzles 116 and 118 which also are adapted to produce fan-shaped sprays and certain of which are also directed rearwardly with respect to the desired direction of rotation of the distributing impeller 62. It will be noted that the nozzles 114 of the lower spraying arm 110 direct water upwardly over dishes in the lower basket 20, that the lower nozzles 118 of the upper spraying arm 112 direct water downwardly over the dishes in the lower basket, and that the upper nozzles 116 of the upper spraying arm 112 direct water upwardly over dishes in the upper basket 22. Spraying water over the dishes in the upper basket 22 from directly beneath the upper basket and spraying water over the dishes in the lower basket 20 from both above and below the lower basket produce an extremely effective washing action.

Each spraying arm 110 and 112 terminates at its outer end in an upwardly facing, dome-shaped, distributing or spraying element 120 which is located substantially entirely within the confines of the corresponding spraying arm and which has a generally upright axis sloping upwardly and rearwardly relative to the desired direction of rotation of the distributing impeller 62. Each spraying element 120 is provided therein with a plurality of circumferentially spaced nozzles 122, preferably adapted to form fan-shaped sprays.

The spraying elements 120 at the ends of the spraying arms 110 and 112 provide concentrated sprays at the ends of the spraying arms to insure adequate application of water to dishes located at the sides and in the corners of the lower and upper baskets 20 and 22, such baskets and the tub 16 being substantially square in horizontal cross section. Thus, the nozzles 114, 116 and 118 apply water to the dishes located centrally within the baskets 20 and 22, while the concentrated sprays provided by the spraying elements 120 apply water to the dishes located around the peripheries of the baskets, thereby assuring proper washing and rinsing of the dishes irrespective of their locations in the baskets.

The spraying elements 120 may either be stationary relative to the arms 110 and 112, or they may rotate relative thereto about the hereinbefore-discussed axes of such spraying elements. In the latter event, the nozzles 122 slope rearwardly with respect to the desired directions of rotation of the spraying elements 120 relative to the spraying arms 110 and 112. Making the spraying elements 120 rotatable relative to the spraying arms 110 and 112 provides even more uniform water application to dishes located around the peripheries and in the corners of the baskets 20 and 22.

Referring to FIG. 5 of the drawings, illustrated therein is an alternative water distributing impeller 126 which may be substituted for the distributing impeller 62 hereinbefore described. The distributing impeller 126 is identical to the impeller 62 except that it has only a central post 128 and a lower transverse spraying arm 130, the post 128 terminating at its upper end in a spraying dome 132 having spray nozzles 134 therein. The spraying arm 130 has upper spraying nozzles 136 therein similar to the spraying nozzles 114 of the spraying arm 110. The construction shown for the distributing impeller 126 renders it L-shaped, as opposed to the Z-shaped configuration for the distributing impeller 62. The L-shaped impeller 126 may be used where less uniform water application to the dishes in the upper basket 22 in particular is permissible.

The manner in which the Z-shaped impeller 62 is mounted on the axial flow pump 50 will now be consid-

ered with reference to FIG. 4 of the drawings, the L-shaped impeller **126** being mountable on the axial flow pump in the same manner. Basically, the mounting means for the impeller **62** comprises a thrust bearing means **140** having a stationary component **142** connected to the housing **48** of the axial flow pump **50** and a rotatable component **144** rotatable about the common vertical axis of the axial flow pump, the motor **46** and the impeller **62**, the impeller **62** being releasably connected to the rotatable component **144** by a manually operable latching means **146** so that the impeller may be removed from the tub **16** readily for cleaning, or the like.

Considering the thrust bearing means **140** in more detail, the stationary component **142** thereof comprises a rod **148** which is secured at its lower end to a hub **149** of a spider **150**, FIGS. 2 and 4, forming a part of the housing **48** of the axial flow pump **50** and located above the axial flow impeller **52**. The rod **148** projects upwardly along the axis of the water distributing means **34** into the central post **108** of the distributing impeller **62** and carries a downwardly facing thrust bearing **152** at its upper end. The rotatable component **144** of the thrust bearing means **140** includes an elongated central hub **154** which encloses the rod **148** and which carries at its upper end an upwardly facing thrust bearing **156** engageable with the downwardly facing thrust bearing **152**. The hub **154** carries at its lower end a downwardly facing thrust bearing **158** which is engageable with the upper end of the hub **149** of the spider **150**. As will be apparent, the thrust bearings **152** and **156** are engageable to prevent upward displacement of the impeller **62** due to the upward force produced by the water discharged upwardly by the axial flow pump **50**. When the axial flow pump **50** is stopped at the end of a washing or rinsing cycle, the thrust bearing **158** at the lower end of the hub **154** engages the hub **149** to suport the impeller **62** as it coasts to a stop. To minimize friction, the thrust bearings **152**, **156** and **158** are made of polytetrafluoroethylene.

The rotatable component **144** of the thrust bearing means **140** is, in effect, a spider over which the central post **108** of the distributing impeller **62** is telescoped, as shown in FIG. 4 of the drawings. More particularly, the hub **154** is provided with a plurality, e.g., four, radial plates or vanes **160** paralleling the axis of the water distributing means **34**, the outer edges of such vanes being slidably engageable with the inner periphery of the central post **108**. The rotatable component **144** carries adjacent its lower end an annular seal **162** which is rotatable relative to and slidably engageable with the upper end of the housing **48** of the axial flow pump **50** to insure that substantially all of the water discharged by the axial flow pump flows upwardly into the distributing impeller **62**. The annular seal **162** is also preferably made of polytetrafluoroethylene to minimize friction.

Considering the manner in which the distributing impeller **62** is releasably connected to the rotatable component **144** of the thrust bearing means **140** by the latching means **146**, the rotatable component **144** carries an annular, inverted cup-shaped member **164** over which the lower end of the distributing impeller **62** is adapted to be telescoped. The cup-shaped member **164** is provided with outwardly extending, radial lugs **166**, shown as two in number, on which the lower end of the distributing impeller **62** seats. The lugs **166** carry latch elements **168** which are pivotable inwardly and outwardly, being biased inwardly by spring arms **170** carried by a retaining member **172** embracing the latch elements to maintain them in engagement with the lugs **166**. The latch elements **168** are provided with inwardly and downwardly extending lugs **174** which are insertable into an upwardly divergent skirt **176** on the distributing impeller **62** adjacent the lower end thereof.

As will be apparent, when it is desired to remove the distributing impeller **62** from the tub **16** for cleaning, or the like, it is merely necessary to displace the latch elements **168** outwardly to disengage the lugs **174** thereon from the skirt **176**, the latch elements **168** being provided with knurled surfaces **178** on their inner sides for this purpose. When reinstalling the distributing impeller **62**, it is merely necessary to pivot the latch elements **168** inwardly to reinsert the lugs **174** thereon into the skirt **176**, as shown in FIG. 4 of the drawings, this being accomplished automatically by the spring arms **170**. Thus, the latching means **146** provides a very simple means of connecting the distributing impeller **62** to and disconnecting it from the rotatable component **144** of the thrust bearing means **140**.

Referring to FIG. 1 of the drawings, the dishwasher **10** includes a hose means **180** for filling and draining the tub **16** and an electric cord or cord means **182** for powering the various electrical elements of the dishwasher. The hose means **180** is a dual passage hose means one passage **188** of which is a filling passage connected at one end to a water introducing means **184** for introducing water into the tub **16** and the other passage **190** of which is a drain passage connected at one end to the outlet of the drain pump **70**, the other ends of the respective passages **188** and **190** being connected to a source of hot water supply, such as a hot water faucet, and to a suitable point of disposal, such as a kitchen sink. The hose means **180** and the cord means **182** are retractable into the space **92** at the front of the dishwasher **10** when the dishwasher is not in use, a suitable reel, not shown, being provided for the cord means **182**. The hose means **180** and the cord means **182** may be withdrawn from the space **92** through either of two openings **186** in the housing **14**, the openings **186** being located adjacent the front of the housing and on opposite sides thereof. With this construction, the dishwasher **10** may be converted from a left-hand model to a right-hand model, or vice versa, with very little effort, thereby permitting its use in both left-handed and right-handed locations, which is an important feature.

As previously mentioned, the hose means **180** provides the fill passage **188** for introducing water into the tub **16** and provides the drain passage **190**. The portions of the hose means **180** which provide the fill and drain passages **188** and **190** are formed integrally into a single, dual-passage hose, as best shown in FIG. 6, this being done, for example, by simultaneous extrusion. Incorporating the fill and drain passages **188** and **190** in a single, dual-passage hose in this manner greatly facilitates inserting the hose into and withdrawing it from its storage space through one or the other of the openings **186**.

As shown in FIG. 6, the hose means **180** is also provided with additional passages **192** in side-by-side relation with the fill and drain passages **188** and **190** and spaced therefrom. The hose means **180** is shown as provided with a slot **194** communicating with one of the passages **192** to permit insertion into such passage **192** of an electrical ground wire **196** one end of which is connected to a component of the dishwasher **10** suitable for grounding purposes and the other end of which is connected to the plumbing system of the residence, or other structure, in which the dishwasher **10** is used, when the fill passage **188** is connected in communication with the plumbing system. Thus, the hose means **180** also provides an automatic ground connection.

Referring to FIG. 7 of the drawings, semidiagrammatically illustrated therein is a front loading dishwasher **200** having a tub **202** provided at the front thereof with a doorway adapted to be closed by a hinged door **204**. The door **204** is hinged adjacent its lower edge for pivotal movement about a horizontal axis **205** extending across the front of the dishwasher **200** so that the door may pivot from an upper, generally vertical, closed position, as shown, outwardly and downwardly into a lower, generally horizontal, open position, not shown. Within the tub **202** is a lower dish basket **206** which is movable through the doorway between an inner, retracted position, as shown, and an outer, extended position, not shown, where-

in it is disposed above the door 204 when the door is in its open position. The basket 206 is provided with wheels 208, only one of which is shown, at the front and bottom thereof which are engageable by hook-like tracks 210 on the door and which lift the front end of the basket when the door is pivoted downwardly into its open position. Subsequently, the wheels 208 roll outwardly on the inner face of the door 204 as the basket 206 is moved into its extended position for loading or unloading.

The rear end of the basket 206 is guided in such a way that it dips downwardly as it is moved rearwardly into its retracted position, this being accomplished by a guide means 212. The reason for causing the basket 206 to dip downwardly in this fashion as it is moved rearwardly into its retracted position is to permit the use of a higher tub sill 214 than would otherwise be possible, and still maintain a proper vertical clearance between the basket and an upper spraying arm 216 of a distributing impeller 218 similar to the distributing impeller 62 hereinbefore described. It will be understood that the rear half of the basket 26 is bifurcated to accommodate the central post of the distributing impeller 218. Such vertical clearance between the dish basket 206 and the spraying arm 216 is necessary to permit the spraying arm to clear dishes carried by and projecting substantial distances above the dish basket. The higher tub sill 214 permitted by this arrangement is important in that it minimizes the possibiilty of having water splashed over the sill when the dishwasher 200 is in operation.

Considering the guide means 212, it includes two tracks 220 located within the tub 202 and respectively mounted on the inner sides of opposite side walls 222 of the tub 202, only one of the tracks 220 and one of the side walls 222 being shown. Each track 220 has a forward portion 224 at a higher elevation than a rearward portion 226 thereof, such rearward portion terminating at its rearward extremity in an upwardly and rearwardly sloping portion 228. Wheels 230 on the basket 206 at the rear end and top thereof rest on the respective tracks 220.

As will be apparent, when the basket 206 is rolled rearwardly into its retracted position, the rearward end thereof drops downwardly as the wheels 230 engage the rearward portions 226 of the tracks 220, thereby providing the desired dipping or "submarining" of the basket 206 under the spraying arm 216. When the door 204 is subsequently closed, the hooklike tracks 210 thereon drop downwardly to lower the front end of the basket 206. The upwardly and rearwardly sloping portions 228 of the tracks 220 serve to brake the basket 206 when it reaches its retracted position.

Referring to FIG. 8 of the drawings, illustrated therein is a dish basket 232 which, for example, may be one section of the upper dish basket 22 of the dishwasher 10, as hereinbefore mentioned. The dish basket 232 is of the usual open framework construction and includes a pivoted divider 234 which extends from one end of the dish basket 232 to the other. The divider 234 is provided with inturned, reversely bent end portions 236 which extend inwardly into loops 238 at the ends of and at the top of the dish basket 232. Thus, the divider 234 is pivotally connected to the dish basket 232, being pivotable from the position shown in solid lines to that shown in broken lines.

When the divider 234 is in the solid-line position, it is located within and at one side of the dish basket 232 and is inoperative. The operative position of the divider 234 is the broken-line position shown, portions 240 of the divider seating on the top of the rim of the basket to support the divider in its operative position. When the divider 234 is in its operative position, it projects above the dish basket 232 and is located between the sides of the dish basket, the operative position being substantially midway between the sides of the dish basket in the particular construction illustrated.

When the divider 234 is in its operative position, it may be utilized to support two rows of cups, glasses, or the like, one located on either side thereof. Thus, the divider 234, when in its operative position, has the effect of increasing the capacity of the dish basket 232 with respect to such articles as cups, glasses, and the like.

Although exemplary embodiments of the invention have been disclosed herein for purposes of illustration, it will be understood that various changes, modifications and substitutions may be incorporated in such embodiments without departing from the spirit of the invention as defined by the claims which follow.

We claim:

1. In a dishwasher, the combination of:
(*a*) a tub having a door;
(*b*) vertically spaced upper and lower dish racks in said tub;
(*c*) said tub having a lower wall provided therein with a central well having a bottom wall;
(*d*) said lower dish rack being spaced upwardly from said lower wall of said tub;
(*e*) a vertically oriented axial flow pump located above and carried by said bottom wall of said central well and spaced downwardly from said lower dish rack;
(*f*) said axial flow pump including a vertically oriented pump housing carried by said bottom wall of said central well and including an axial flow impeller mounted in said pump housing for rotation about a vertical axis;
(*g*) said pump housing having adjacent its lower end circumferentially spaced inlets communicating with said central well, and having at its upper end an upwardly facing axial outlet below said lower basket;
(*h*) a vertically oriented water distributing means mounted on said pump housing and having a downwardly facing axial inlet in communication with said axial outlet;
(*i*) said distributing means including a reaction-type distributor rotatable about said vertical axis in the space between said lower wall of said tub and said lower dish rack and adapted to spray water upwardly onto dishes carried by said lower dish rack; and
(*j*) a vertically oriented motor carried by and located below said bottom wall of said central well, said motor being rotatable about said vertical axis and being connected to said axial flow impeller.

2. In a dishwasher, the combination of:
(*a*) a tub having a door;
(*b*) vertically spaced upper and lower dish racks in said tub;
(*c*) said tub having a lower wall provided therein with a central well having a bottom wall;
(*d*) said lower dish rack being spaced upwardly from said lower wall of said tub;
(*e*) a vertically oriented axial flow pump located above and carried by said bottom wall of said central well and spaced downwardly from said lower dish rack;
(*f*) said axial flow pump including a vertically oriented pump housing carried by said bottom wall of said central well and including an axial flow impeller mounted in said pump housing for rotation about a vertical axis;
(*g*) said pump housing having adjacent its lower end circumferentially spaced inlets communicating with said central well, and having at its upper end an upwardly facing axial outlet below said lower basket;
(*h*) a vertically oriented water distributing means mounted on said pump housing and having a downwardly facing axial inlet in communication with said axial outlet;
(*i*) said distributing means including a lower reaction-type distributor rotatable about said vertical axis in the space between said lower wall of said tub and said lower dish rack and adapted to spray water upwardly onto dishes carried by said lower dish rack;

(*j*) said distributing means including a hollow central post extending upwardly through said lower dish rack from said lower distributor;

(*k*) said distributing means including an upper reaction-type distributor rotatable about said vertical axis in the space between said upper and lower dish racks, and adjacent said upper dish rack, and adapted to spray water upwardly onto dishes carried by said upper dish rack and downwardly onto dishes carried by said lower dish rack; and

(*l*) a vertically oriented motor carried by and located below said bottom wall of said central well, said motor being rotatable about said vertical axis and being connected to said axial flow impeller.

3. In a dishwasher, the combination of:

(*a*) water pumping means having an upwardly facing outlet;

(*b*) a reaction-type distributing impeller rotatable about a vertical axis and having at its lower end a downwardly facing inlet in communication with said outlet;

(*c*) bearing means rotatably connecting said distributing impeller to said pumping means with said inlet of said distributing impeller in communication with said outlet; and

(*d*) manually operable latch means for releasably connecting the lower end of said distributing impeller to said pumping means against upward displacement of said distributing impeller.

4. In a dishwasher, the combination:

(*a*) pumping means having an axially upwardly directed outlet;

(*b*) a reaction-type distributing impeller rotatable about a vertical axis and having at its lower end a downwardly facing inlet in communication with said outlet;

(*c*) thrust bearing means including a stationary component connected to said pumping means and including a rotatable component; and

(*d*) manually operable latch means for releasably securing said distributing impeller to said rotatable component of said thrust bearing means.

5. A dishwasher according to claim 4 wherein:

(*a*) said stationary component of said thrust bearing means comprises a rod extending upwardly through said rotatable component of said thrust bearing means and into said distributing impeller; and

(*b*) said thrust bearing means includes a thrust bearing interconnecting said rod and said rotatable component of said thrust bearing means.

6. In a dishwasher, the combination of:

(*a*) a tub having a front provided with a doorway having a sill at the bottom thereof;

(*b*) a door pivotable relative to said tub between a generally horizontal, open position and a generally vertical, closed position wherein it closes said doorway;

(*c*) water distributing means within said tub above the bottom thereof;

(*d*) a dish basket movable through said doorway between a retracted position wherein it is disposed within said tub below said water distributing means and an extended position wherein it is located above above said door when said door is in said open position; and

(*e*) guide means for lowering the rearward end of said basket as said basket is moved rearwardly from said extended position toward said retracted position, whereby the rearward end of said basket first clears said sill and then dips downwardly under said water distributing means.

7. A dishwasher according to claim 6 wherein:

(*a*) said guide means includes tracks respectively mounted on opposite side walls of said tub and within said tub and includes track followers at the rearward end of said basket and respectively engageable with said tracks; and

(*b*) said tracks have rearward portions at lower elevations than forward portions thereof.

8. A dishwasher as set forth in claim 7 wherein said rearward portions of said tracks slope upwardly and rearwardly at their rearward extremities.

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