Jan. 4, 1955 H. M. RUMBAUGH 2,698,626

DISHWASHER

Filed Oct. 18, 1952 3 Sheets-Sheet 1

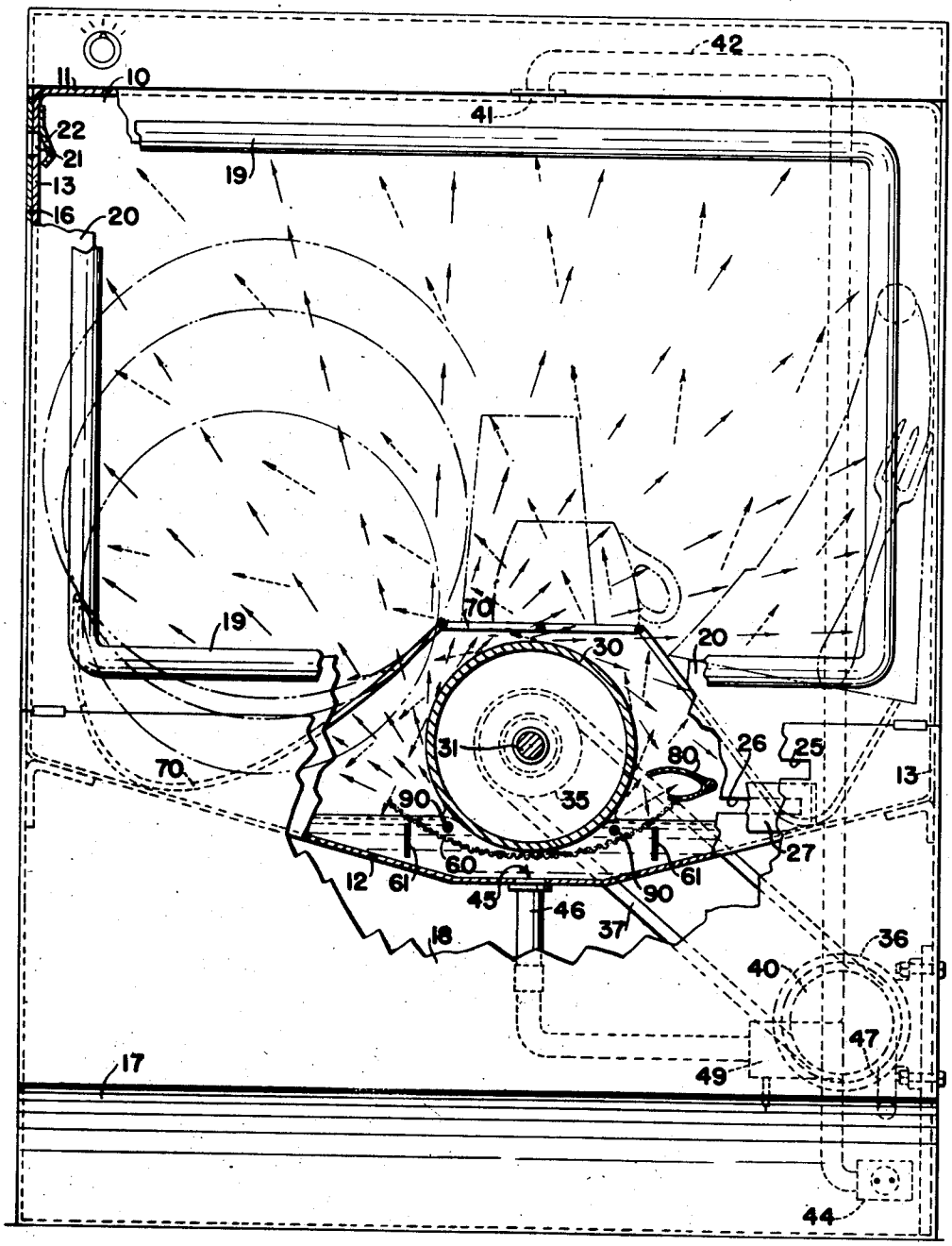

FIG. 1

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DISHWASHER

Filed Oct. 18, 1952 3 Sheets-Sheet 2

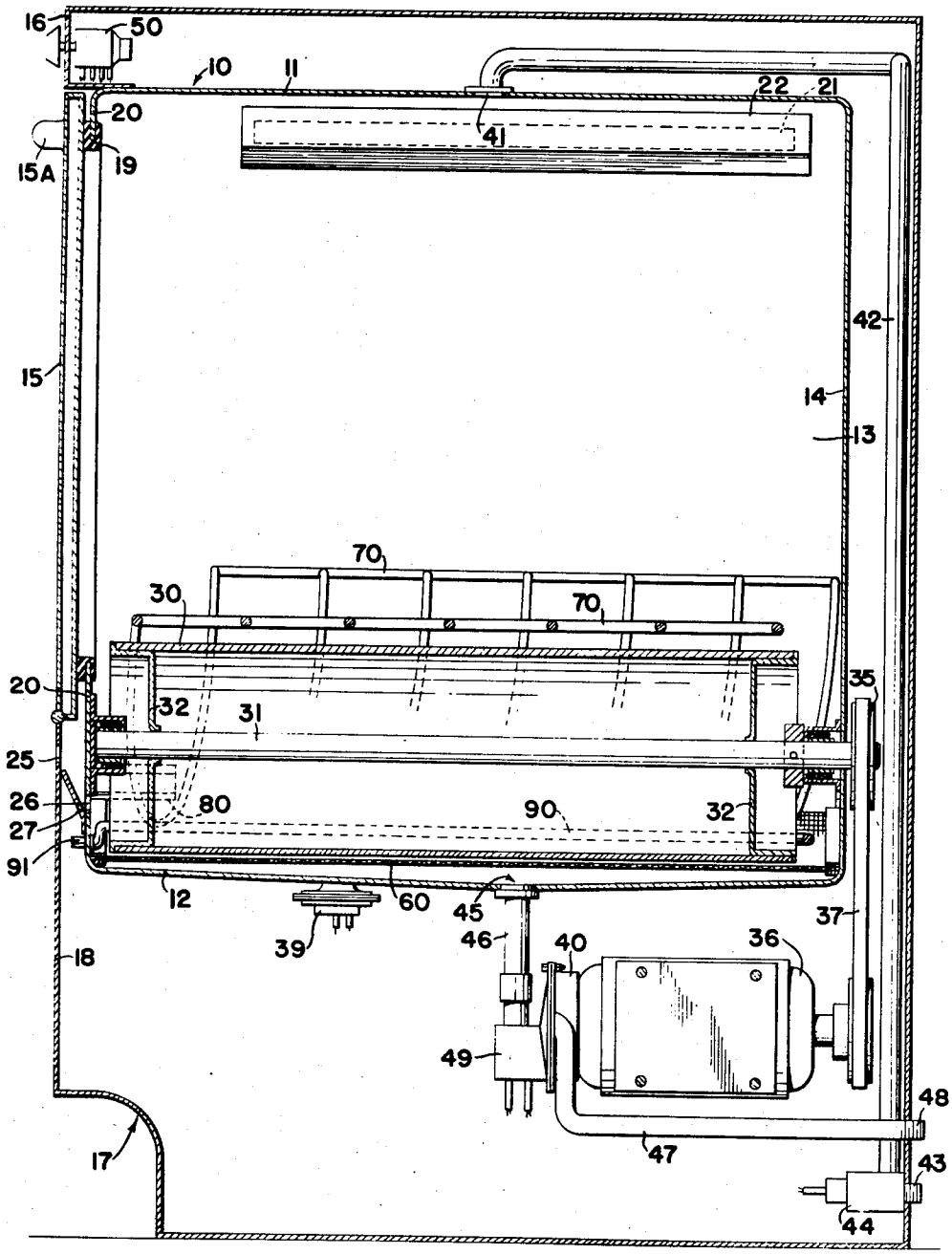

FIG. 2

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DISHWASHER

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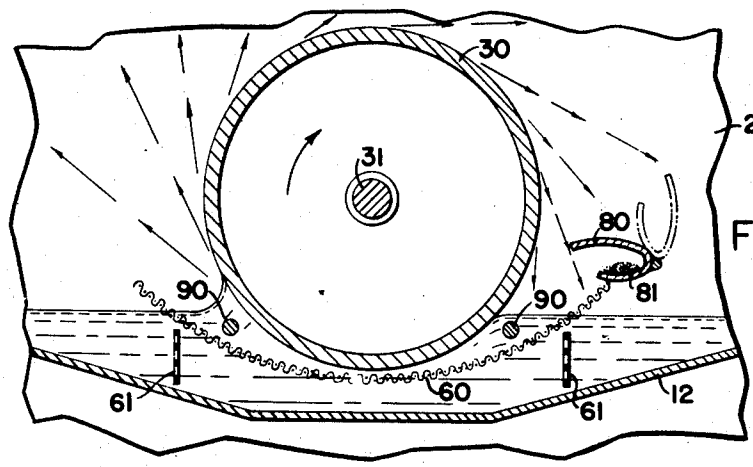

FIG. 3

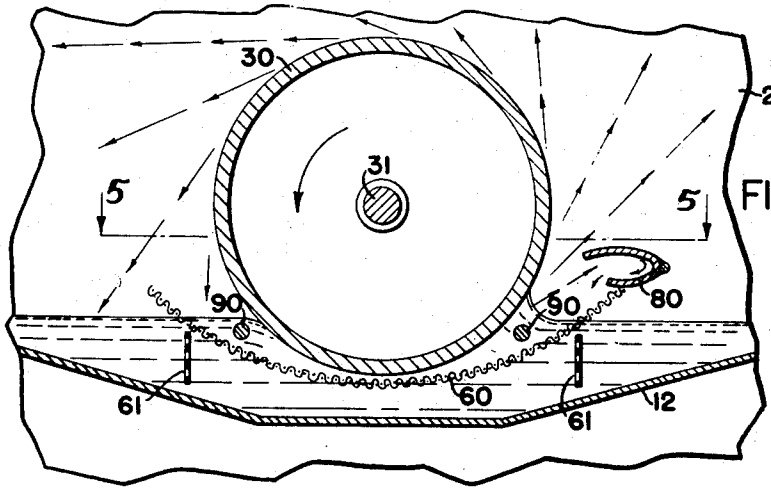

FIG. 4

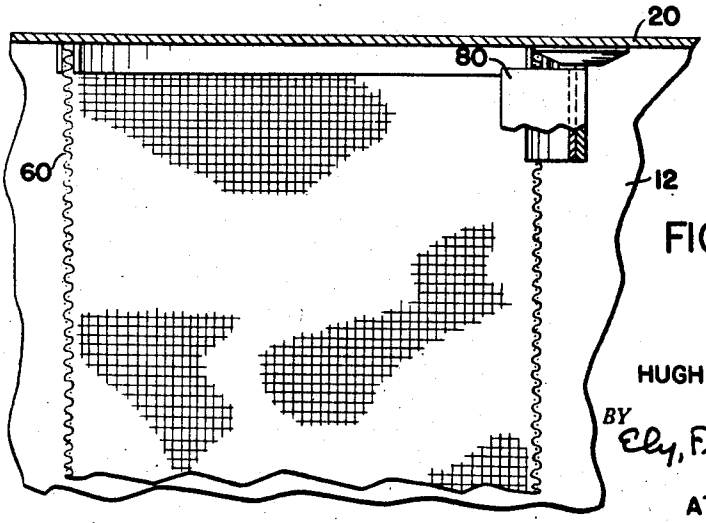

FIG. 5

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2,698,626

DISHWASHER

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Application October 18, 1952, Serial No. 315,454

16 Claims. (Cl. 134—93)

The present invention relates to dishwashers and particularly dishwashers of the automatic type in which ware to be washed is subjected to a series of pre-washing, washing, rinsing and drying operations according to a predetermined cycle. This application is, in part, a continuation of my co-pending application Serial No. 137,509 for Smooth Impeller Dishwasher filed January 9, 1950, now U. S. Patent No. 2,624,356, issued January 6, 1953.

The general object of my invention is to provide a dishwasher which combines effectiveness and economy of operation to an extent not heretofore achieved. To attain this object, I have departed sharply from the conventional spatter-blade dishwasher construction now almost universally in use and have provided a dishwasher of radical design which is far more efficient, more economical, and quieter in operation than are conventional machines.

A more specific object of my invention is to attain washing effectiveness of a wholly new order by providing a dishwasher in which each piece of ware to be washed is subjected from two different directions to impinging wash water thrown directly from a single impeller without intervening impeller guard screens or other water-velocity-dissipating obstacles.

Another object of my invention is to effect operating economy by providing an impeller and washing chamber so constructed that the volume of washing water required in the chamber comprises a smaller percentage of the total usable volume of the washing chamber than has heretofore been achieved.

The present invention employs a water impeller whose impelling surface comprises a substantially smooth surface of revolution as disclosed in my copending application referred to above. The bight of this impeller on the body of sump water through which it turns and which it is to throw is more shallow than the bight of conventional impellers, both because of the conformation of my impeller and because of the far smaller degree of turbulence of the sump water caused by rotation of my impeller. My smooth impeller displaces a large volume of sump water and therefore raises the sump level for a given volume of sump water. This displacement makes possible a substantial reduction in the ratio of total wash water to total usable washing volume. Stated another way, at any given moment when my impeller is operating the volume of water being projected through the washing chamber comprises a higher proportion of the volume of sump water than has heretofore been attainable. This proportion may be increased by dishing of the water sump floor, as will be more fully set forth below. Nevertheless, there are limiting factors. Too small a volume of total wash water in the washing chamber will tend to become "loaded up" with waste particles removed from the ware (and with waste-trapping suds) so that, in continuing to operate following the initiation of a washing cycle, the washer merely redistributes over the ware the waste particles which agglomerate in the sump.

The provision of screening through which the wash water must pass at some time during its return from the ware to the impeller has been suggested as an apparent remedy for the tendency of a low volume of wash water to load up with waste particles. However, such screening must have a small mesh in order to effectively trap the waste particles. A small mesh tends to clog up with waste particles thereby impairing the flow of the wash water and destroying washing efficiency and also necessitating cleaning of the screen after each wash. For these reasons, prior dishwasher designs have been limited in any attempt to reduce sump capacity because they have had to provide an oversupply of sump water to act, in effect, as a reservoir for waste particles in order to prevent loading up of the wash water.

I have provided a screen structure which overcomes the above difficulties. My screen is so constructed and related with other elements of the dishwasher as to constitute a self-cleaning strainer, as will be more fully explained below. Furthermore, any momentary clogging of my screen will not interfere with operation of the washer because my screen is so designed as to provide for a very low rate of water flow per unit area of screen. This low rate of water flow per unit screen area is attained despite the shallowness of the water sump I employ.

Accordingly, another important object of my invention is to improve economy and effectiveness of washing through the provision of a self-cleaning screen which will permanently dispose of loose food particles and which may have a relatively fine mesh but which at the same time allows full advantage to be taken of a dishwasher design adapted to employ a minimal volume of wash water for a given ware capacity. The screen I employ further cooperates with my smooth roll to control sudsing, the screen trapping suds in return water and the smooth impeller minimizing turbulence and sudsing of water which is about to be thrown. Sudsing control in domestic dishwashers is important because the spray pattern varies according to the degree of sudsing and the degree of sudsing in turn varies with the softness or hardness of water employed. With poor sudsing control, a machine which has an effective spray pattern at one geographical location will have a less effective pattern at another location having a different water hardness. Control of sudsing not only minimizes pattern variation, but also eliminates waste particle flotation, as will be more fully disclosed below.

A further object of my invention is to provide for the automatic discharge of detergent into the dishwasher following certain pre-wash or pre-rinse operations without the necessity of providing any mechanism or control circuit whatsoever for opening or dumping the detergent container.

Another object of my invention is to provide for effective heating of water and drying air employed in my dishwasher. Conventional dishwashers utilize water immersible heating elements to maintain high water and air temperatures within the washing chamber. However, as used in conventional dishwashers, such elements are of limited effectiveness for several reasons. No way has been found to limit fluid distribution by the impeller to only those fluids which are leaving the heat source. Even if the heating element surrounds and is adjacent to a conventional impeller, the turbulence created by the impeller will prevent selective distribution of only that fluid which has just been in contact with the heating element. Furthermore, immersion of the heating element adjacent the impeller is impractical because the concentration of waste particles to which it is thus exposed tends to bake on the element. Locations of an immersed element further away from the impeller greatly reduce the wiping velocity of water moving over the heating element and require an inordinately high relative volume of sump water. The heating effectiveness of those machines having heating elements arranged in the path of the spray rather than in immersed position is particularly poor.

I have discovered that the effectiveness of heat transfer between the heating element and the fluid is increased if the fluid is moved in relatively turbulence-free condition past the heating element by means of a smooth roll such as the smooth impeller I employ in my dishwasher. This heat transfer mechanism may be adaptable to many uses, but it is particularly suited to use in my smooth impeller dishwasher.

It should be noted that the self-cleaning screen structure which may be provided with my smooth impeller dishwasher as herein disclosed is adapted to preclude any problem of waste particles baking on the heating element,

as will be more fully set forth below. Through the combination of my smooth impeller and a co-extending heating element, the heating of both wash water and drying air is more effective in my dishwasher than in any previous machine.

Other objects and advantages of my invention will appear in the following specification and in the accompanying drawings in which:

Figure 1 is a front view, partly broken away, of a dishwasher embodying my invention. For clarity, the dishwasher door is removed in this view.

Figure 2 is a side view in section of the dishwasher shown in Figure 1. In this view the dishwasher door is included and is in its closed position. For clarity, the perforated screening plates referred to in the following specification are not shown in this view.

Figure 3 and 4 are schematic views illustrating certain features of my invention.

Figure 5 is a view taken along line 5—5 of Figure 4, the impeller roll 30 being excluded from this view.

The dishwasher I have illustrated as embodying my present invention comprises a chest or chamber 10 having a top wall 11, a floor or deck 12, side walls 13 and a rear wall 14. The front wall of the chamber 10 is generally open and closure of the front of the chamber is effected by the door 15 which has a suitable handle 15A.

The chamber 10 is supported within a generally rectangular housing 16, the side walls of the housing 16 and the chamber side walls 13 being welded together to suspend the chamber in its illustrated position. A suitable toespace 17 may be formed along the bottom front of the housing 16. The door 15 is hinged to the front wall 18 of the housing and closes against a suitable resilient strip 19 of rubber or other material carried on the front flanges 20 of the washing chamber 10. The chamber 10 is vented to atmosphere through a slot 21 cut through one of the side walls 13 and the corresponding side wall of the housing 16. The slot 21 is shielded by a suitable splash shield 22. Another vent for dish drying purposes may be provided in the forward lower portion of the chamber 10. This vent may consist of a slot 25 in the front wall 18 and a slot 26 in the front flange 20, retaining plate 27 being welded to the flange 20 outside the slot 26 to prevent escape of water held in the lower portion of the chamber 10.

In the lower portion of the chamber 10 and extending transversely thereof is an impeller 30 mounted concentrically on a shaft 31 by means of the internal spacer discs 32 recessed within the ends of the impeller 30. The shaft is supported on suitable bearings carried on the lower front flange 20 and the rear wall 14. The shaft 31 extends through the rear wall 14 and carries a V-pulley 35 driven by a reversible motor 36 by means of a V-belt 37. The motor 35 also drives the drain pump 40.

Water is admitted to the chamber 10 through an inlet 41 which is connected through line 42 to an inlet connection 43, a solenoid operated valve 44 being interposed in the line 42. The inlet connection 43 is connected to a suitable source of hot water.

Drainage is effected through a drain opening 45 connected by a line 46 to a solenoid operated drain valve 49 which is integral with the drain pump 40. A discharge line 47 leads to the discharge connection 48 which is connected to a suitable sewer line. The maximum water level in the chamber 10 may be controlled by a pressure-sensitive, diaphragm-operated switch 39 which opens into the bottom of the chamber 10. At a given pressure of the free water within the chamber 10, the switch 39 is actuated to break a circuit to the solenoid operated inlet valve 44. The switch 39 is, of course, adjusted so that the actuating pressure is that pressure which obtains when the water in the chamber has reached the desired maximum level.

The remainder of the control system comprises the manually started timer switch 50 which automatically controls the starting, stopping and direction of the motor 36, the energization and de-energization of the drain valve 49, and the energization of the inlet valve 43. Timer control switches of the type of the switch 50 are well known to the appliance industry.

Suitably supported within the chamber 10 and extending underneath the impeller 30 from one side to the other is a screen 60. The screen is preferably dished so as to both be suspended in spaced relation between the bottom of the impeller and the chamber deck 12 and to extend upwardly on either side to a point above the sump water level.

As outlined previously, the smooth relatively turbulence-free action of my impeller requires a much shallower bight than do conventional impellers, my impeller displacing a considerable volume of sump water so that I am able to minimize the total amount of wash water required by minimizing the amount of "idle" sump water which must be maintained during each moment of washing operation. This advantage of my impeller is fully exploited by dishing or depressing the deck 12 so as to further reduce the amount of water necessary to keep the impeller sufficiently immersed during washing operation. Because a significant part of the cost of operating a dishwasher is the expense of heating the water used by it, this feature affords a real economy in that it reduces the amount of hot water used in washing operation. In the appended claims, the term "concave" includes such a dished or depressed shape of the lower deck, whether such dishing or depression is in the form of a smooth curve or in the form of series of sharply defined downward steps or a combination of the two.

The screen I have disclosed prevents the relatively small amount of wash water I employ from being loaded up with waste particles washed from the ware and allows full advantage to be taken of my shallow-bight impeller. The screen is so designed as to be automatically purged upon draining of the washing chamber. The large area of screening obtained by passing the screen under the impeller also assures that the volume of water flow per unit area of screen is relatively low so that any temporary clogging of given areas of the screen is of no consequence. The fact that my impeller is spaced from the bottom of the washing chamber makes it possible to provide this large area of screening despite the fact that there is only a relatively shallow body of sump water at the bottom of the washing chamber.

The ware to be washed is positioned on suitable racks 70 above and on either side of the impeller 30. The racks 70 are preferably so arranged so that they minimize interference with water thrown from the impeller. Since my smooth impeller requires no impeller guard screen, the inertia of thrown water is unimpeded by obstructions, as is fully disclosed in the parent application referred to above. It will be apparent that during washing operation practically all waste particles that are washed off ware held in the racks 70 fall or are carried by return water into the water sump outside the screen 12. These particles are then trapped on the outer side of a first half of the screen as water is drawn in through that half of the screen by the impeller. At the same time, particles previously trapped on the other half of the screen (when the impeller was rotating in the opposite direction) are freed. Finally, when the chamber is drained, the direction of water flow through all the screen is outward (downward) and the waste particles on the outer (under) side of the screen are thereby carried off with the drain water.

Relatively light waste particles may tend to be trapped in suds floating on the surface of the sump water and thus to agglomerate at the water line of the screening 60 or to be carried over the screening by piling up of suds. This tendency is overcome by the action of the reversible impeller 30. As schematically shown in Figures 3 and 4, the impeller throws water downwardly toward the screen waterline on each side of the impeller, on one side when it is rotating in one direction and on the other side when it is rotating in the other direction. This downward throw of water scavanges the suds and drives the light particles below the water line where the majority of them are thereupon carried to underwater portions of the screen by the predominant recirculating current which is flowing in through the screen. Upon drainage, purging of these particles along with the other heavier particles takes place.

Many waste particles will be heavy enough to settle directly to the bottom of the sump during washing operation and to thus avoid all contact with the screen. This sedimentation feature of my invention further reduces and simplifies the problems of loading up and screen clogging outlined above in that such heavy particles are disposed of upon drainage without having had any contact with the screen whatsoever.

Additional screening in the form of perforated plates

61 may be supported below the screen 60 as illustrated in Figures 1, 3 and 4 to prevent clogging of the drain line by unusually bulky waste particles such as pieces of bone or paper wrappings that may have inadvertently been left on ware placed in the machine for washing. To allow drainage of all normal waste particles, the plates 61 are preferably spaced from the deck 12 as illustrated. The provision of the screening plates 61 is merely a safety measure. On the relatively rare occasions when abnormal waste is caught in these plates, they may be easily cleared of such waste upon removal of the ware from the machine at the conclusion of the cycle of operation.

The schematic showing of racked dishware in Figure 1 illustrates how each piece of ware held within the washing chamber is subjected to direct water impingement from two different directions depending on the direction of rotation of the impeller 30. Thus, washing effectiveness of a wholly new order is attained through the provision of the reversible smooth impeller because each piece of ware to be washed is subjected from two different directions to impinging wash water thrown directly from the impeller without intervening guard screens or other inertia-dissipating obstacles.

The bi-directional spray attainable with my reversible smooth roll impeller makes possible the provision of a detergent storing and discharge device that requires no additional special mechanical linkages or electric central circuits whatsoever to automatically discharge detergent at a desired time after initiation of a washing cycle. My detergent storing device comprises any suitable baffle such as the baffled container 80 which is selective with respect to the spray patterns caused by rotation of the impeller 30 in alternate directions. Detergent 81 remains dry within the container 80 when the impeller is rotated in a first direction as in Figure 3 and the detergent is wetted and washed out of the container when the impeller is rotated in a second direction as in Figure 4. Thus, if there is to be pre-wash operation of the washer, the pre-set control cycle is arranged so that rotation of the impeller during such pre-wash operation will be in the direction shown in Figure 3 and initial rotation of the impeller during the subsequent wash operation will be in the direction shown in Figure 4. The detergent will thus remain unused during the pre-wash operation and will automatically be released or washed out into the chamber 10 at the initiation of the wash operation. For ease of loading, the container 80 may be pivotally supported on the lower front flange 20 as shown in Figure 2 so that it may be turned to the dotted line position shown in Figure 1. In this position, detergent may be conveniently dropped into the container from above.

The waste-free volume of sump water surrounding the bottom of the impeller 30 and bounded by the screen 60 serves as an ideal location for heating element 90 which extends from leads 91 along the sides and across one end of the impeller 30. Proper sequential energization of this heating element during a complete cycle of operation may be controlled by the timer switch 50.

The location of the heating element 90 in relation to the impeller 30 is seen most clearly in Figures 3 and 4. Fluid adjacent the roll 30 tends, perhaps due to the Bernoulli effect, to cling to the surface of the rotating roll until it attains sufficient velocity to escape tangentially from the roll. Fluid drawn in toward the roll is thus caused to pass smoothly and rapidly over both sides of the heating element 90 before being carried on up around the roll for distribution into the chamber 10. During washing operation, this arrangement provides for highly effective heating of the wash water; during drying operation, equally effective heating of dry air drawn in through the vent slot 26 is afforded.

In my co-pending application Serial No. 137,509, referred to at the beginning of this specification, I disclosed that the included angle of water thrown from my smooth impeller could be controlled by directing vanes extending parallel to the impeller surface. I have discovered that by reducing the spacing between the deck 12 and the impeller 30 much the same effect can be attained without the use of directing vanes. This directional selectivity enables me to exploit my heating element 90 to the fullest advantage. As impeller-deck spacing is decreased, the included angle of fluid thrown by the impeller tends to become limited to the side of the chamber 10 towards which the impeller 10 is upwardly

rotating. By reversing the impeller, the distribution of fluid which has just passed the heating element 90 may be thus concentrated on alternate sides of the washing chamber 10. In this manner, for a given heat input, maximum water and air temperatures at the surface of the ware are attained. The time required for both washing and drying operations is thereby substantially reduced.

Many variations in the disclosed water control system may suggest themselves. The impeller 30 may be of varying diameter along its length. The screen 60 may be dished to a greater or less degree than that illustrated or it may be given some different shape. The location and conformation of the baffle container 80 may vary. Still other modifications will suggest themselves, particularly to those familiar with appliance design, including some who may be diligent to appropriate to their own advantage the benefits of my invention. Accordingly, the exclusive privileges conferred on me by the patent laws are not to be rendered nugatory by restricting my invention to the specific embodiment disclosed but are to be given reasonable effect by fair construction of the following claims.

What is claimed is:

1. A dishwashing machine comprising a washing chamber having a bottom that is concave in cross-section to define a water sump, rack means in said chamber, rotatable water slinging means in said chamber, said water slinging means having an outer periphery of substantially constant radius in any given plane of rotation, the axis of rotation of said water slinging means extending transversely across said chamber along said sump, means to supply water along the length of said water slinging means to scour ware supported in said rack means, means to successively rotate said water slinging means in a first direction and in a second direction, screen means extending downwardly under said water slinging means from points beyond each lower side of said water slinging means, detergent storing means in said chamber, said storing means comprising baffle means to prevent substantial wetting of stored detergent when said water slinging means is rotated in said first direction and to allow washing out of stored detergent when said water slinging means is rotated in said second direction, whereby, when said water slinging means is rotated in said first direction, water is thrown in one tangential direction directly from said water slinging means to ware supported in said rack means, the upper portion of one side of said screen means is subjected to a downward purging wash and stored detergent remains substantially dry, and when said water slinging means is rotated in said second direction, water is thrown in another tangential direction directly from said water slinging means to ware supported in said rack means, the upper portion of the other side of said screen means is subjected to a downward purging wash and stored detergent is washed out into said chamber.

2. A dishwashing machine comprising a washing chamber, rack means in said chamber, rotatable water slinging means in said chamber, said water slinging means having an outer periphery of substantially constant radius in any given plane of rotation, the axis of rotation of said water slinging means extending transversely across said chamber, means to supply water along the length of said water slinging means to scour ware supported in said rack means, means to successively rotate said water slinging means in a first direction whereby water is thrown in one tangential direction directly from said water slinging means to ware supported in said racks and in a second direction whereby water is thrown in another tangential direction directly from said water slinging means to ware supported in said racks so that all food receiving portions of the ware are subjected to a direct scouring action.

3. A dishwashing machine comprising a washing chamber having a bottom that is concave in cross-section to define a water sump, rack means in said chamber, rotatable water slinging means in said chamber, said water slinging means having an outer periphery of substantially constant radius in any given plane of rotation, the axis of rotation of said water slinging means extending transversely across said chamber along said sump, and means to supply water to the sump and to said water slinging means substantially throughout its length whereby water is thrown outwardly from points throughout the length of said water slinging means to scour ware supported in said

racks and at any given moment during washing operation the ratio of water being thrown in the chamber to total water in the chamber is maximized.

4. A dishwashing machine comprising a washing chamber, rack means in said chamber, rotatable water slinging means in said chamber, said water slinging means having an outer periphery of substantially constant radius in any given plane of rotation, the axis of rotation of said water slinging means extending transversely across said chamber, means to supply water along the length of said water slinging means to scour ware supported in said rack means, means to successively rotate said water slinging means in a first direction and in a second direction, detergent storing means in said chamber, said storing means comprising baffle means positionable to prevent substantial wetting of stored detergent when said water slinging means is rotated in said first direction and allow washing out of stored detergent when said water slinging means is rotated in said second direction.

5. In a dishwashing machine, a washing chamber, rack means in said chamber, rotatable water slinging means in said chamber, said water slinging means having an outer periphery of substantially constant radius in any given plane of rotation, the axis of rotation of said water slinging means extending transversely across said chamber, means to supply water along the length of said water slinging means to scour ware held in said rack means, screen means extending downwardly under said roll from points beyond each lower side of said roll, means to successively rotate said water slinging means in a first direction whereby the upper portion of one side of said screen means is subjected to a downward purging wash and in a second direction whereby the upper portion of the other side of said screen means is subjected to a downward purging wash.

6. A dishwasher comprising a chest having a bottom that is concave in cross-section to define a water sump, a horizontal substantially smooth generally cylindrical impeller extending transversely across said chest along said sump, rack means in said chest, journal means for supporting said impeller, means to maintain during washing cycles a maximum water level in said chest below said rack means and the axis of said journal means and to maintain said impeller sufficiently submerged in said water to produce a scouring throw of water upon rotation of said impeller, means to successively rotate said impeller in a first direction and in a second direction, screen means extending under said impeller from a location outwardly from one lower side of said impeller at said water level to a location outwardly from the other lower side of said impeller at said water level, detergent storing means in said chest, said storing means comprising baffle means to prevent substantial wetting of stored detergent when said impeller is rotated in said first direction and to allow washing out of stored detergent when said impeller is rotated in said second direction, whereby, when said impeller is rotated in said first direction, water is thrown in one tangential direction directly from said impeller to ware supported in said rack means, the upper portion of one side of said screen means is subjected to a downward purging wash and stored detergent remains substantially dry, and when said impeller is rotated in said second direction water is thrown in another tangential direction directly from said impeller to ware supported in said rack means, the upper portion of the other side of said screen means is subjected to a downward purging wash and stored detergent is washed out from said detergent storing means into said chest.

7. A dishwasher comprising a chest, a horizontal substantially smooth generally cylindrical impeller extending transversely across said chest, rack means in said chest, journal means for supporting said impeller, means to maintain a maximum water level in said chest below said rack means and the axis of said journal means and to maintain said impeller sufficiently submerged in said water to produce a scouring throw of water upon rotation of said impeller, means to successively rotate said impeller in a first direction whereby water is thrown in one tangential direction directly from said impeller to ware supported in said racks and in a second direction whereby water is thrown in another tangential direction directly from said impeller to ware supported in said racks so that all food receiving portions of the ware are subjected to a direct scouring action.

8. A dishwasher comprising a chest, a horizontal substantially smooth cylindrical impeller extending transversely across said chest, rack means in said chest, journal means for supporting said impeller, means to maintain a maximum water level in said chest below said rack means and the axis of said journal means and to maintain said impeller sufficiently submerged in said water to produce a scouring throw of water upon rotation of said impeller, said chest having a bottom that is concave in cross-section to define a water sump whereby, at any given moment during washer operation, the amount of water required to maintain said impeller sufficiently submerged in said water to produce a scouring throw is minimized and the ratio of water being thrown in the chest to total water in the chest is maximized.

9. A dishwasher comprising a chest, a horizontal substantially smooth generally cylindrical impeller extending transversely across said chest, rack means in said chest, journal means for supporting said impeller, means to maintain a maximum water level in said chest below said rack means and the axis of said journal means and to maintain said impeller sufficiently submerged in said water to produce a scouring throw of water upon rotation of said impeller, means to successively rotate said impeller in a first direction and in a second direction, detergent storing means in said chest, said storing means comprising baffle means positionable to prevent a substantial wetting of stored detergent when said impeller is rotated in said first direction and allow washing of detergent out of said storing means into said chest when said impeller is rotated in said second direction.

10. A dishwasher comprising a chest, a horizontal substantially smooth generally cylindrical impeller extending transversely across said chest, rack means in said chest, journal means for supporting said impeller, means to maintain a maximum water level in said chest below said rack means and the axis of said journal means and to maintain said impeller sufficiently submerged in said water to produce a scouring throw of water upon rotation of said impeller, means to successively rotate said impeller in a first direction and in a second direction, screen means extending under said impeller from a location outwardly from one lower side of said impeller at said water level to a location outwardly from the other lower side of said impeller at said water level whereby when said impeller is rotated in said first direction one side of said screen means is subjected to a downward purging wash and when said impeller is rotated in said second direction the other side of said screen means is subjected to a downward purging wash.

11. A dishwasher comprising a chest, an impeller extending transversely across said chest and journalled for rotation in substantially vertical planes of rotation, rack means in said chest, means to maintain a maximum sump water level in said chest below the axis of rotation of said impeller, drain means in the bottom of said chest, screen means in said chest extending under and partially around said impeller to define a screen-bounded portion of said sump water adjacent said impeller and an unbounded portion of said sump water which latter portion receives the great majority of impeller-thrown water falling from the upper reaches of said chest whereby during washing operation water is drawn through said screen into said screen bounded portion to trap waste particles on the outside of said screen and during drainage water drains from said screen-bounded portion to carry off trapped waste particles from outside said screen to said drain means.

12. A dishwasher comprising a chamber, rack means in said chamber, means to maintain a water level in the lower portion of said chamber, impeller means in said chamber rotatable in a first direction to throw water in a first pattern and in a second direction to throw water in a second pattern, detergent containing means within said chamber, said containing means comprising detergent shielding means penetrable by said second pattern but not by said first pattern, whereby not until said impeller is rotated in said second direction will contained detergent be distributed in wash water held in said chamber.

13. A dishwashing means comprising a washing chamber, rack means in said chamber, a horizontal substantially smooth generally cylindrical impeller extending transversely across said chamber, the periphery of said impeller being spaced from the bottom of said chamber a distance of the order of less than half the radius of said impeller, and means to supply water along the length of said impeller whereby water is thrown outwardly from

points throughout the length of said impeller to scour ware supported in said racks and at any given moment during washing operation the ratio of water being thrown in the chamber to total water in the chamber is maximized.

14. A dishwashing machine comprising a washing chamber having a bottom that is concave in cross-section to define a water sump, rack means in said chamber, rotatable water slinging means in said chamber, said water slinging means having an outer periphery of substantially constant radius in any given plane of rotation, the axis of rotation of said water slinging means extending transversely across said chamber along said sump, the radially outermost portions of said water slinging means being spaced from the bottom of said chamber a distance substantially less than the average of the major radii around the periphery of said water slinging means, and means to supply water to the sump and to said water slinging means substantially throughout its length whereby water is thrown outwardly from points throughout the length of said water slinging means to scour ware supported in said racks and at any given moment during washing operation the ratio of water being thrown in the chamber to total water in the chamber is maximized.

15. A dishwashing machine comprising a washing chamber having a bottom that is concave in cross-section to define a water sump, rack means in said chamber, rotatable water slinging means in said chamber, said water slinging means having an outer periphery of substantially constant radius in any given plane of rotation, the axis of rotation of said water slinging means extending transversely across said chamber along said sump, the radially outermost portions of said water slinging means being spaced from the bottom of said chamber a distance of the order of less than half the major radius of said water slinging means and means to supply water to the sump and to said water slinging means substantially throughout its length whereby water is thrown outwardly from points throughout the length of said water slinging means to scour ware supported in said racks and at any given moment during washing operation the ratio of water being thrown in the chamber to total water in the chamber is maximized.

16. A dishwasher comprising a chest, a horizontal substantially smooth cylindrical impeller extending transversely across said chest, rack means in said chest, journal means for supporting said impeller, means to maintain a maximum water level in said chest below said rack means and the axis of said journal means to maintain said impeller sufficiently submerged in said water to produce a scouring throw of water upon rotation of said impeller, said chest having a bottom that is concave in cross-section to define a water sump, the periphery of said impeller being spaced from the bottom of said sump a distance of the order of less than half the radius of said impeller whereby, at any given moment during washer operation, the amount of water required to maintain said impeller sufficiently submerged in said water to produce a scouring throw is minimized and the ratio of water being thrown in the chest to total water in the chest is maximized.

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