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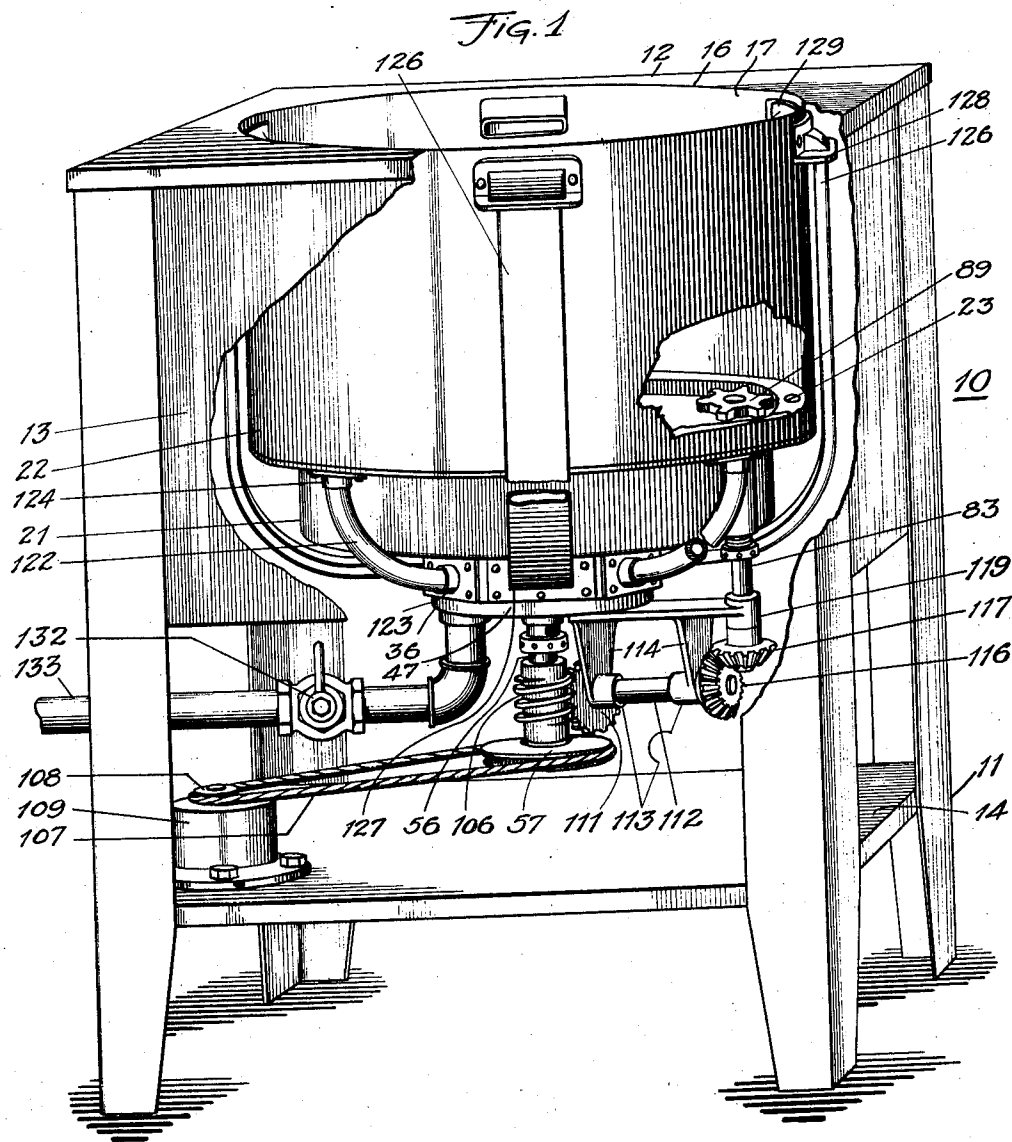
R. W. FRANKLIN

2,054,797

WASHING MACHINE

Filed Feb. 6, 1933

3 Sheets-Sheet 1



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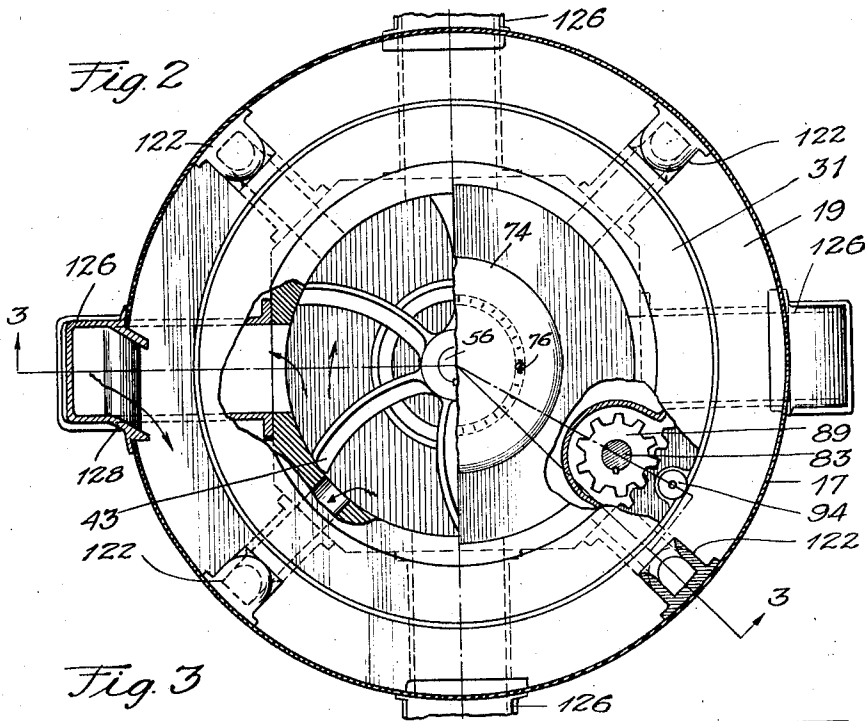
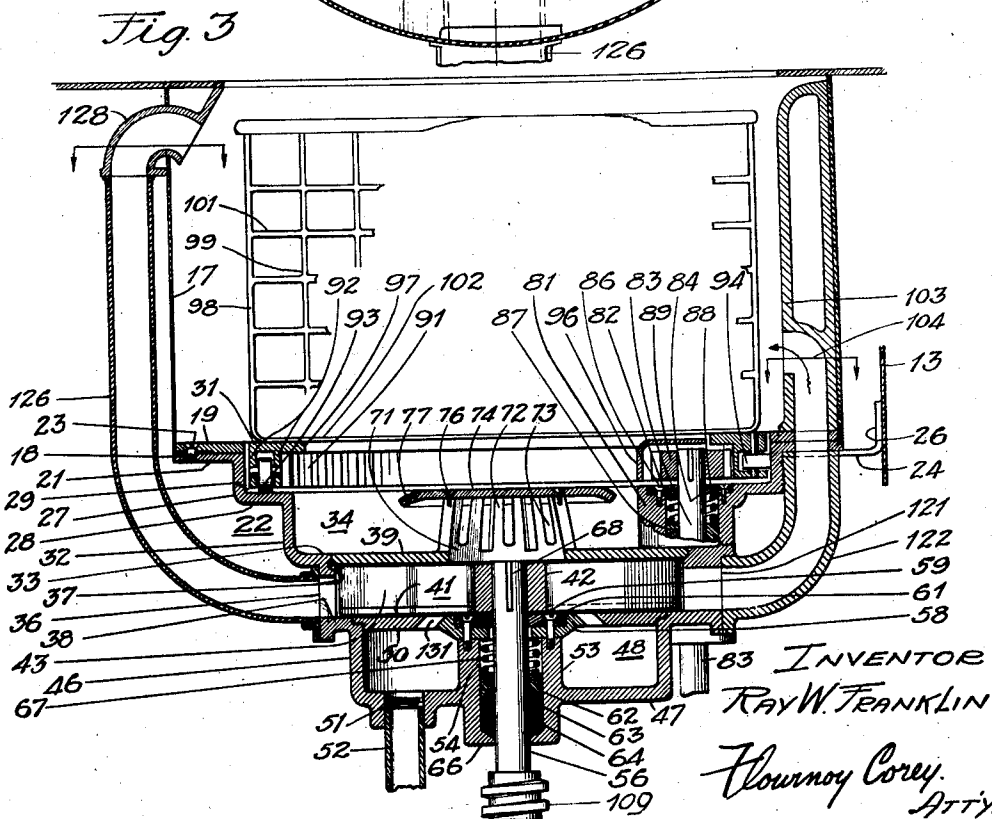
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WASHING MACHINE

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3 Sheets-Sheet 2



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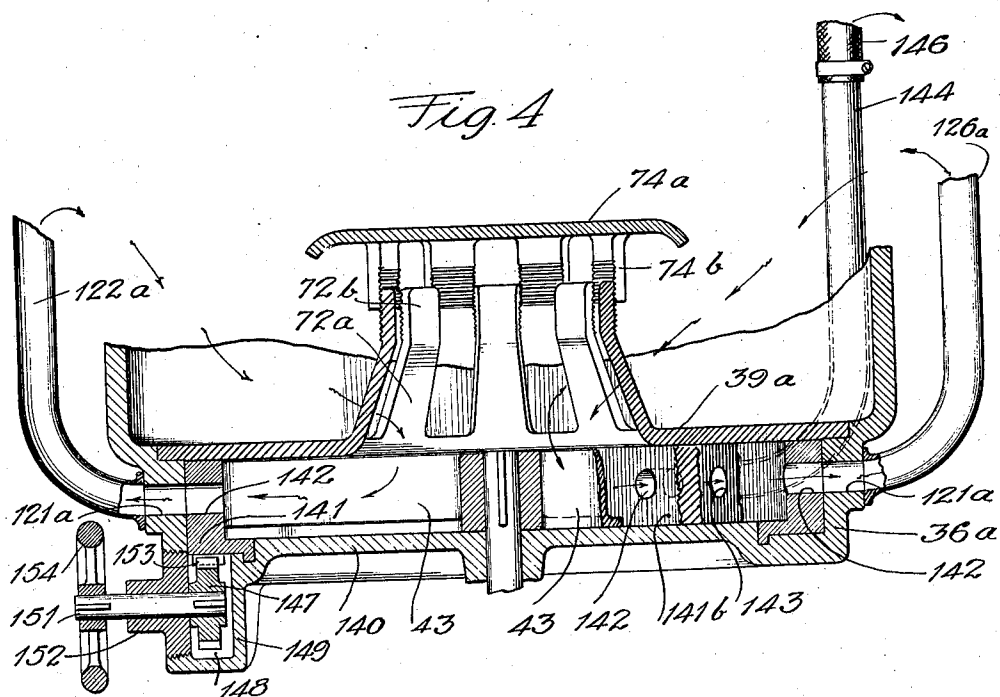
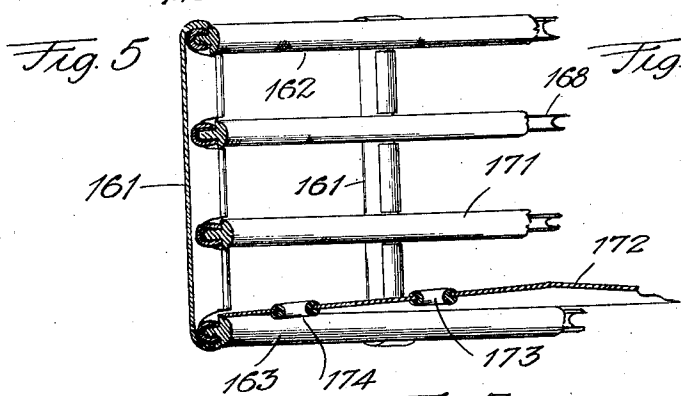
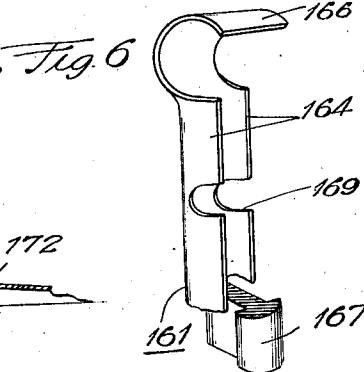
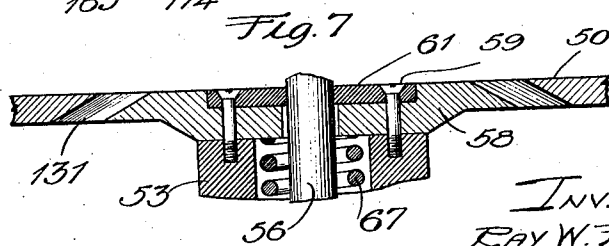
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WASHING MACHINE

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,054,797

WASHING MACHINE

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Application February 6, 1933, Serial No. 655,407

5 Claims. (Cl. 141—9)

This invention relates to washing machines and particularly to washing machines of the hydraulic type in which the articles are washed by the impact and subsequent scrubbing action of the washing fluid.

The washing machine shown in the drawings and hereinafter described is particularly applicable for use in washing dishes, eating and cooking utensils, and the like, but its principles of operation and structure may readily be adapted for other uses.

I have observed in the washing of dishes and like articles that tubs have been utilized in which the dishes are placed either by means of a basket or by setting them inside of the tub and the dishes are washed by passing water over the surfaces thereof.

These dishwashing machines were not satisfactory for several reasons. While these devices may have employed motor driven pumps and the like for flowing water over the dishes, it was extremely difficult to obtain high velocity and high volume of water flow. Furthermore large volumes of hot water were needed and the difficulty and expense of heating the water was high. It was oftentimes necessary that considerable hand labor be used in cleaning the dishes of food material before they were placed in the washing machine because the machine was not adapted for handling or taking care of this solid material.

Another difficulty was that the dishes were not well washed on all sides, as one dish might shield another from the washing action of the water. Another difficulty was that air and foam became mixed with the water while it was being circulated thus detracting from the efficiency of the machine as a washing agency. The machines were noisy because air was sucked in through the passageways of the water circulating system. No provision was made for withdrawing the solid material which collected in the water circulating system.

I have thoroughly studied the problems met with in the devices of the prior art and, after considerable experimentation and thought, have devised means for overcoming the difficulties of the devices of the prior art.

An object of my invention is to provide, in a dishwashing machine of the above character, means whereby all sides of the dishes are presented at one time or another to the currents of water.

Another object of my invention is to provide

means whereby a small volume of water may be used in the operation of washing a batch of dishes, but such that a high velocity and volume per unit of time of the washing solution may be secured; that is, means whereby with a relatively small total supply of washing fluid, an extraordinarily high speed of circulation and a large volume of water flow is secured.

Another object of my invention is to provide means whereby when the machine is stopped the washing fluid is withdrawn into a chamber well below the dishes which have been washed.

Another object of my invention is to provide means for separating the solid material out of the washing fluid and for discharging it from the machine.

Another object of my invention is to provide means for supplying water to the pump without permitting the admission of air. This result is of particular importance because it is extremely desirable that a solid current of water only should strike the dishes. If air is mixed with the water the efficiency of the machine as a washing device is materially lowered and the machine becomes noisy by reason of the flow of air through the various conduits and passageways.

Another object of my invention is to provide means for selectively discharging washing fluid from the machine or for directing the fluid onto the dishes for washing them.

Another object of my invention is to provide adjustable means for regulating the flow of washing fluid to the pump.

Still another object of my invention is to provide in a basket or like device for holding the dishes, means for cushioning the dishes to prevent them from being broken and to prevent them from being marked by the basket.

Other and further features and objects of my invention will be more apparent to those skilled in the art upon a consideration of the accompanying drawings and following specification, wherein is disclosed several exemplary embodiments of the invention, with the understanding, however, that such changes may be made therein as fall within the scope of the appended claims without departing from the spirit of the invention.

In said drawings:

Figure 1 is a view in perspective of a device constructed according to one embodiment of my invention. Portions of the cabinet and tub have been broken away to show the parts of the device.

Figure 2 is a plan view of the device shown in Figure 1 with the cabinet removed and parts of the device broken away for a better illustration of the remaining parts.

5 Figure 3 is a view in elevational section of the device shown in Figures 1 and 2 and taken along the line 3—3 of Figure 2.

Figure 4 is a view partly in section and partly in elevation of a washing machine constructed according to another embodiment of my invention.

Figure 5 is a view partly in elevation and partly in section of a portion of a modified form of basket structure constructed according to one embodiment of my invention.

15 Figure 6 is an enlarged perspective view of a portion of one of the vertical members of the basket shown in Figure 5, and

Figure 7 is a view in section of a fragmentary portion of the lower wall of the pump housing of the device shown in Figures 1 to 3.

Referring now to Figure 1 there is shown at 10 generally a cabinet which acts as a housing for the washing machine and as a support for the driving motor and with the top portion adapted to act as a drain board. The cabinet may be of sheet metal such as the non-rusting alloys. The cabinet here shown is comprised of angle iron legs 11, a flat top 12, side walls 13, and a shelf 14. The parts may be bolted or welded together in any desired manner.

The top 12 is provided with a circular opening 16, and a cylindrical tub 17 is located within the enclosure formed by the walls 13 of the cabinet, with the upper edge of the tub 17 projecting through the opening 16 in the top 12.

The bottom edge of the cylinder 17 (see Figures 2 and 3) is bent inwardly to form a flange 18 and this inwardly bent flange is clamped between a ring 19 and the outwardly projecting flange 21 of a bowl 22 which forms a housing for the operating and actuating parts of the device. The flange 21 and the ring 19 are clamped on the flange 18 by means of screws 23 thus forming a water tight joint. The flange 21 is provided with a plurality of outwardly projecting ears 24 and the ears are provided with suitable upwardly projecting flanges 26 to permit fastening the machine as a unit to the walls 13 of the cabinet 10.

The bowl 22 is comprised of four concentric cylinders of decreasing diameter. The uppermost of these cylinders 27, with the inwardly projecting flange 28 which joins it to the next cylinder, defines a chamber 29 in which a basket carrier ring 31, hereinafter more particularly described, is housed. The next smaller cylinder 32, with its inwardly projecting flange 33 defines a chamber 34 which may be termed the intake chamber. The third and next smaller cylinder 36 is provided with a relatively narrow inwardly projecting flange 38 at its lower edge and with a ledge 37 at its upper edge to receive a circular plate 39 hereinafter described. The cylinder 36, the flange 38, and the plate or disk 39 define a chamber 41 which may be termed the pump chamber and an impeller type pump 42 having impeller blades 43 is located within this chamber.

The smallest cylinder 46 is entirely closed at the bottom by means of the disk 47, and the chamber 48 defined by these parts may be termed the drainage well or drainage chamber. A ledge is provided at the upper inside edge of the cylinder 46 for the reception of a ring like plate 50. Outlet from the drainage chamber 48 is provided by means of a tapped opening 51 and drainage conduit 52.

A large boss 53 is located at the center of the disk 47 and portions thereof project both above and below the disk. The boss 53 is vertically drilled as at 54 to provide a bearing for the impeller drive shaft 56. The drive shaft is driven by means of a pulley 57, (see Fig. 1) the driving means being hereinafter more particularly explained.

A cap 58 is fastened to the top of the boss 53 as by means of screws 59. A washer 61 is located within a suitable recess in the cap 58 and this washer closely embraces the shaft 56 and is held in place by the screws 59 which secure the cap 58 to the boss 53.

A packing washer 62 is located within the chamber 54 of the boss 53 and this washer is provided with an outwardly and downwardly sloping beveled edge 63 adapted when the washer is driven downwardly to drive packing material 64 in about the shaft 56 to form a water tight packing. The lower end of the chamber 54 is closed by means of a beveled flange 66 which is also adapted to drive the packing material into a close fit about the shaft 56. Downward pressure on the washer 62 is accomplished by means of a spring 67 which is located within the chamber 54 and bears against the lower side of the cap 58 and the upper face of the washer 62. The hub of the impeller 42 is secured to the upper end of the shaft 56 by means of a key 68 and the blades 43 of the impeller occupy the chamber 41 as previously stated. The blades are curved in accordance with the usual practice so that when the blades are rotating in the direction shown in Figure 2 water entering near the hub is thrown out radially to enter various water circulation passages hereinafter described.

The plate 39 is provided with a circular central opening 71 and the opening is surrounded by a domed structure 72 having louver openings 73 adapted to permit water to pass therethrough and through the circular opening into the pump chamber. The top of the domed member 72 is closed off by means of a disk 74 which is secured thereto by means of screws 76. The outer edge of the disk 74 droops downwardly as shown at 77 to assist in controlling the flow of water into the pump.

The location and configuration of the dome 71 and the height, location, and configuration of the plate 77 are of extreme importance because these members control the flow of water into the pump and if these members are properly constructed and located a solid stream of water having few or no air bubbles mixed therewith will flow from the pump thus resulting in high washing efficiency and very little noise while if these parts are not properly shaped and located the washing machine will be inefficient and noisy. This point will be hereinafter further explained.

A second boss 81 is formed inside the cylinder 32 and on the bottom flange 33 and projects upwardly to a level substantially even with the top of the plate 74 and the top surface of the flange 28 of cylinder 27. The boss 81 is vertically drilled as at 82 and a basket-carrier-drive-shaft 83 is rotatably mounted within the boss by means of a washer 84 held in place by screws 86 and pump packing 87 and springs 88 in substantially the same manner as the pump packing previously described.

A pinion 89 is keyed to the upper projecting end of the shaft 83 and this pinion is in mesh with gear teeth 91 formed on the inner wall of the basket carrier ring 31. The basket car-

rier ring is provided with depending flanges shown at 92 adapted for rotatably mounting a plurality of rollers 93 which roll on the flange 28 of cylinder 27 and thus permit the ring 31 to be rotated by the pinion 89. Other rollers 94 are horizontally disposed in suitable recesses in the ring 31 and are so positioned as to engage the inner wall of the cylinder 27. It may readily be understood that the ring 31 may be placed within the basket carrier ring chamber 29 and the teeth 91 will be in engagement with the teeth of the pinion 89 so that when the shaft 83 is rotated the ring will be rotated within the chamber. A shield 96 is placed over the pinion 89 to prevent entrance into the teeth of particles of material.

The ring 31 is provided with an inwardly projecting flange 97 which forms a means for supporting the basket 98. The conventional basket 98 here shown is formed of a web of uprights 99 and horizontally-extending bars 101 and a lattice-work bottom 102.

Referring now more particularly to Figure 1, the shaft 56 is driven by means of the pulley 57 which is rotated by means of a belt 107 from the pulley 108 on motor 109. The motor may be fastened to the shelf 14 of the cabinet 10 or to any other convenient part of the cabinet as by means of bolts or the like. A worm 106 located on the lower end of the shaft 56 is in mesh with a worm wheel 111 which is mounted on a cross-shaft 112. The cross-shaft 112 is mounted for rotation in suitable bearings 113 which are a part of a bracket 114 which is fastened to the bottom of the drain-chamber bottom-closure-plate 47. A bevel gear 116 is mounted on the shaft 112 at the opposite end from the worm 111 and this bevel gear is in mesh with a second bevel gear 117 which is mounted on a shaft 83, which in turn is rotatably mounted within a bearing 119, which is also a part of the bracket 114. The shaft 83 is the basket-carrier-drive-shaft previously mentioned.

It is apparent that when electric power is furnished to the motor 109 the shaft 56 will be rotated at a relatively high speed thus rotating the blades 43 of the pump impeller at a speed sufficient to pump a considerable volume of water at high velocity to the tub of the dishwasher.

The basket-carrier-drive-shaft 83 will also be rotated through the train of gears 117, 116, 111 and 106, but of course at a much lower speed because of the gear reduction. Rotation of the basket-carrier-ring-drive-pinion 89 produces rotation of the basket-carrier 31 and since the ratio of the number of teeth on the basket-carrier ring to the number of teeth on the drive pinion is high, the basket-carrier ring will rotate at a speed of rotation considerably lower than that of the speed of rotation of the shaft 83.

There are a plurality of openings such as the openings 121 in the side wall of the pump chamber 41. While any number of these openings may be employed I prefer to use eight openings and to use two sets of conduits for conducting water forced through these openings from the pump up into the tub. One set of conduits, comprised by the pipes 122, are provided with flanges 123 at their lower ends adapted to be bolted to the side wall of the cylinder 36, and are provided with other flanges 124 at their upper ends adapted to be bolted to the under side of the flange 21 at the upper edge of the bowl 22. The conduits 122 communicate with the channels 104 in the uprights 103 and water issuing from the pump

passes through these conduits, up through these channels 104, and out into the tub where the water plays on the dishes and other articles supported within the basket.

I provide a number of other conduits 126 and these conduits are preferably flattened so that they may be brought up on the outside of the tub 17 between the tub and the walls 13 of the cabinet. The conduits 126 are also provided with flanges 127, similar to the flanges 123, which are also bolted to the side wall of the cylinder 36 to cover the remaining four openings therein. The upper ends of the conduits 126 are secured within a hollow bracket 128 which communicates with a plurality of openings 129 at the top of the tub. In a preferred embodiment of the invention more particularly illustrated in Figure 2, I shape the walls of these brackets in such a manner that water is directed tangentially into the tub. I have found that by directing the water tangentially less splashing occurs and the articles in the basket are struck with higher velocity and through a wider angle.

The circulation of the washing fluid through the machine will now be described. In operation hot water is poured into the machine until the water reaches a level slightly above the top of the plate 74. It is apparent from inspection of the drawings that the bowl 22 requires only a very small amount of water in relation to the size of the tub 17, and this quantity of water is all that is necessary or desirable in the washing operation. When the motor 109 is energized the impeller blades 43 revolve throwing the water outwardly through the openings 121 in the wall of cylinder 36. The water rushes upwardly through the conduits 122 and 126 and is discharged into the tub in two sets of four streams each. The streams of water flow smoothly and with high velocity onto the articles in the basket 98 and the impact and scrubbing action of the water washes the articles thoroughly in a very few minutes.

As has been stated, it is highly important that the streams of water be free of bubbles of air and without trying to explain the theory of hydraulics involved, I have found that the shape and configuration of the dome 72 and the position and configuration of the plate 74 is highly important. It is found that the dome and plate constructed according to my invention so regulate the influx of water to the pump that air is not permitted to enter, and I have found that merely to vary the size of the openings 73 has no appreciable result in preventing the entry of air into the circulating system. With the plate 74 in place on the dome and spaced at a proper distance from the plate 39, it is found that no air enters into the washing fluid and that the very small amount of water contained in the bowl 22 is quite sufficient for providing solid streams of water which are highly efficient as a washing agency. The fact that by this construction I am enabled to use a very small amount of water is highly important because a small volume of water is more readily introduced into and discharged from the tub, and it is much less expensive and takes less time to heat the small amount of water necessary.

Another decided advantage of my invention is that the large passageways, the construction of the dome 72 and plate 74 and the drainage chamber 48 are effective to cause separation of the particles of solid food material from the washing fluid. Such material passes downwardly

through the openings 73 and 71, through the space between the blades of the pump, and through the opening 131 between the cap 58 and the ring 50 at the top of the chamber 48 and into the drainage chamber 48. This solid material readily separates from the washing fluid and may be drained off from the drainage or settling chamber 48 by opening a suitable valve 132 at the lower end of the pipe connection 52, thus permitting the material to be discharged through the discharge pipe or conduit 133. If desired the co-acting walls of the ring 50 and cap 58 may slope outwardly as illustrated in enlarged detail in Figure 7 so that the projecting edge of the ring 50 will separate the solid material from the washing fluid as it is discharged from the vanes of the pump and pass the material through the openings 131 into the settling chamber 48 by reason of the fact that such material, being usually heavier than water, tends to settle toward the bottom. A separator action is thus set up which materially assists in separating the solid material from the washing fluid and this separating action is a very important function of my device.

As has been hereinbefore stated the location of the cap 74 with relation to the bottom plate 39 is very important and, therefore, in Figure 4 I have illustrated a means whereby the position of this cap may be adjusted. In this embodiment of my invention the dome 72a is provided with threads on its outer wall. The cap 74a is provided with a depending flange 74b adapted to fit over the flange 72b of the dome and is provided with suitable threads on its inner wall adapted to engage the threads on the outer wall of flange 72b. The cap 74a may thus be rotated to move it up and down with relation to the plate 39a and thus the position of the cap, which will insure most effective and efficient washing fluid flow control, may be secured.

It is sometimes desirable, as for instance when the machine is installed in a recess which does not have a drain, that means be provided for pumping water out of the tub through an upwardly-extending pipe of some character.

The device shown in Figure 4 illustrates a means by which water may be pumped from the machine by the same pump which is employed to circulate water within the machine. In the modified embodiment of my invention shown in Figure 4 I utilize substantially the same water inlet construction and water pumping mechanism, but in order to utilize the pump 42 for pumping water from the tub, I eliminate the drain chamber 48 and close off the bottom of the pump chamber 41 by means of a disk 140 and insert a ring 141 between the outer ends of the impeller blades 43 and the walls of the bowl 36a.

There may be any number of openings through the walls of the ring 141 corresponding to the number of conduits for conducting water to the tub, but the device shown in Figure 4 is provided with two diametrically disposed openings 142 so that when the ring is in its normal position, the openings 142 coincide with the openings 121a in the walls of the cylinder 36a, and when the pump is actuated, water is driven through the openings 142, 121a and through conduits 122a and 126a, and back into the tub where the water drains through the openings in the dome 72a. The direction the water normally takes is shown by the arrows. A third opening 143 is provided in the wall of the cylinder 36a at a spaced distance

from one of the openings 142 and the ring may be rotated to a position illustrated by the section 142b so that the opening 142 will coincide with the opening 143 and the openings 121a will be covered by the ring 141 whereby water from the pump is driven out through the opening 142, the opening 143, and up through an additional conduit 144 and out through any suitable drainage connection such as the hose illustrated at 146 so that water from the tub may be conducted to any point such as a sink, a drain, or the like, where it may be discharged.

The ring 141 is adapted to be rotated by means of a pinion 147 which is located in a suitable chamber 148 provided by extending the plate 140 downward to form a cup-like member 149. The pinion 147 is mounted upon a shaft 151 which passes through a suitable packing nut indicated at 152 which is threaded to permit its close threaded engagement into the cup-like member 149. The ring 141 is provided with teeth 153 through a small sector at its lower edge and these teeth are in geared engagement with the teeth of the pinion 147. Rotation of the shaft 151 is secured by means of a hand wheel 154.

By means of the structure just described the machine may be drained of water by the same pump which is used to circulate the water, which is, of course, a decided advantage.

I have found also that the baskets usually used for holding dishes and the like are not entirely satisfactory for the reason that the dishes may be broken by the basket or frequently are marked by the zinc or other metal which forms the basket framework. Furthermore the baskets of the prior art are not always satisfactory for draining water off the dishes and their construction is an expensive manufacturing operation.

I have therefore devised a basket which I feel has considerable advantage over the usual construction. This basket is illustrated in Figures 5 and 6. Figure 3 illustrates a conventional basket. The main supporting members of the basket are comprised by the uprights 161 and rings 162 and 163. The uprights 161 are preferably made of metal stampings the sides of which have been bent toward each other to form a U-shaped channel as indicated at 164 and the ends of which, as indicated at 166, are curved in order that they may engage the rings 162 and 163. I prefer to insert T-shaped members 167 preferably of resilient material such as rubber in the channels 164 with the top of the T-shaped member rounded as shown and projecting from the channel to form a buffer which prevents the dishes or other articles from striking the uprights 161. The base of the T-shaped member, of course, is inserted in the channel 164 and is held there by friction since there is practically no force acting to drive the T-shaped members from the channel.

The rings 162 and 163 which may also be of V-shaped cross section may also have T-shaped inserts, as indicated in Figure 5, which also serve to prevent the dishes from being broken or marked. Other rings 168 are provided which are adapted to be received within suitable recesses 169 which are provided in the walls of the uprights 161 and these rings, too, may be of U-shaped cross-section and have T-shaped inserts of resilient material as illustrated at 171.

The bottom of the basket is preferably formed of a disk 172 the diameter of which is such that the disk rests on the ring 163. The disk, which may be called the drain disk, is preferably convex on its upper surface so as to cause water to drain

freely therefrom, and openings may be provided as illustrated at 173 to assist in draining water from the basket. The edges of these openings are preferably covered by means of grommets 174 of resilient material such as rubber which also aid to prevent the dishes and other articles being washed from coming into contact with the metal parts of the basket.

The shape and location of the drain disk 172 of the area of the openings therein are of importance as the disk forms a control means for controlling the flow of washing fluid when the machine is in operation. With the disk in place the washing fluid does not pass as quickly from the tub and the washing action is improved. The action of the disk in the basket is similar to that of the dome 72 and plate 74 previously described. The total area of the openings 173 should be such that the flow of washing fluid therethrough is hindered but not choked to such an extent to interfere materially with the flow of fluid to the pump. The openings 173 permit the washing fluid to drain quickly from the basket after the machine has been stopped so that the basket can be lifted out.

It is apparent that I have devised a washing machine of high utility and efficiency and that a high velocity and large volume of water flow is secured with a relatively small total volume of washing fluid. The device constructed according to my invention is simple, durable, and relatively inexpensive.

Although I have described several embodiments of my invention it is apparent that the invention is susceptible to a wide modification and variation in structure and usage. Such modifications may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

I claim as my invention:

1. In a washing machine, a tub, a basket within the tub, and a support for the basket comprising a flanged member in the shape of a circular track having vertically and horizontally extending walls mounted in the bottom of the tub and a ring mounted within the flanged member and having rollers in the periphery of the ring for rotatably supporting it on the flanged member, some of the rollers being adapted to roll on the vertical walls of the flanged member and other of the rollers being adapted to roll on the horizontally-extended portion of said flanged member, and means for rotating said ring.

2. In a washing machine, a tub, a basket with-

in the tub, a bowl beneath the tub consisting of a plurality of communicating cylindrical chambers of decreasing diameter from top to bottom to constitute a basket carrier ring support, an intake chamber, a pump chamber, and a drainage chamber, conduits for conducting water from the pump to the tub, a basket carrier ring rotatably mounted on the basket carrier ring support, a pump rotatably mounted within the pump chamber, means for controlling the flow of water to the pump, and means for driving the pump and rotating the ring.

3. In a washing machine, a tub, a bowl beneath the tub consisting of a plurality of communicating cylindrical chambers, of decreasing diameter from top to bottom, to provide an intake chamber, a pump chamber and a drainage chamber, a pump within the pump chamber, means for controlling the flow of water to the pump comprising a plate covering the pump and having a central opening therein, a dome shaped member having a plurality of vertical slots arranged around its outer face in fixed spaced relationship therein and located about the central opening of the plate and a second plate adjustably mounted on top of the dome member and having its outer edge curved downwardly and conduits for conducting fluid from the pump to the tub.

4. In a washing machine, a tub, a bowl located beneath the tub, a pump within the bowl, the bowl being formed with a cylindrical drainage chamber beneath the pump, the bowl having a wall between the pump and the drainage chamber and the wall having radial openings therethrough the sides of which are adapted to separate the solid material from the washing fluid as it is discharged from the pump, means for controlling the flow of washing fluid to the pump and discharge conduits from the pump to the tub.

5. In a washing machine, a tub, and a bowl below the tub, the bowl being provided with walls arranged to provide four chambers, the diameters of which are successively less from top to bottom, a basket carrier ring disposed in the uppermost of these chambers, a fluid control means located within the next of these chambers and connecting with a pump, a centrifugal pump located within the next smaller chamber, discharge conduits leading from the pump to the tub, and a separating disk having radial openings therethrough arranged to divide off the last mentioned chamber from the lowest or drainage chamber.

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