May 11, 1954 W. I. KNAPP 2,678,050

PORTABLE DISHWASHING MACHINE

Filed Dec. 17, 1948 4 Sheets-Sheet 1

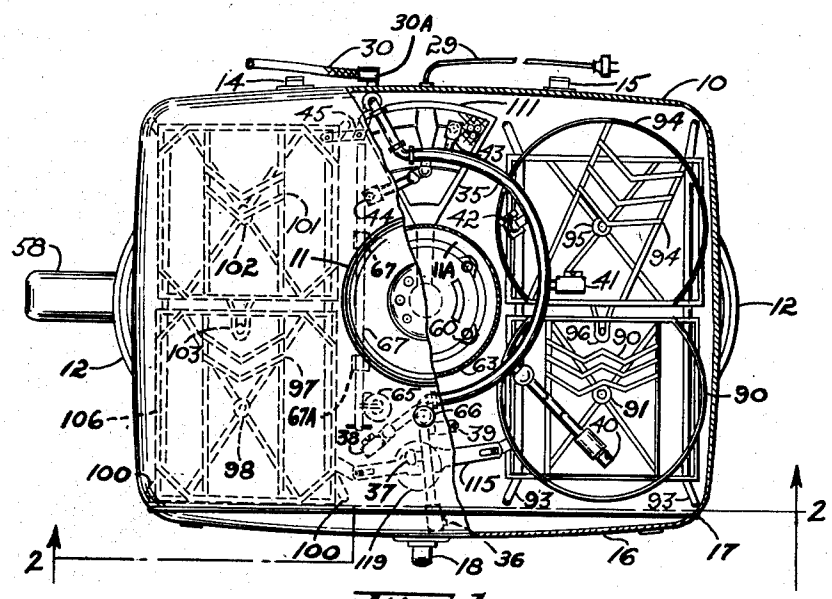


Fig. 1

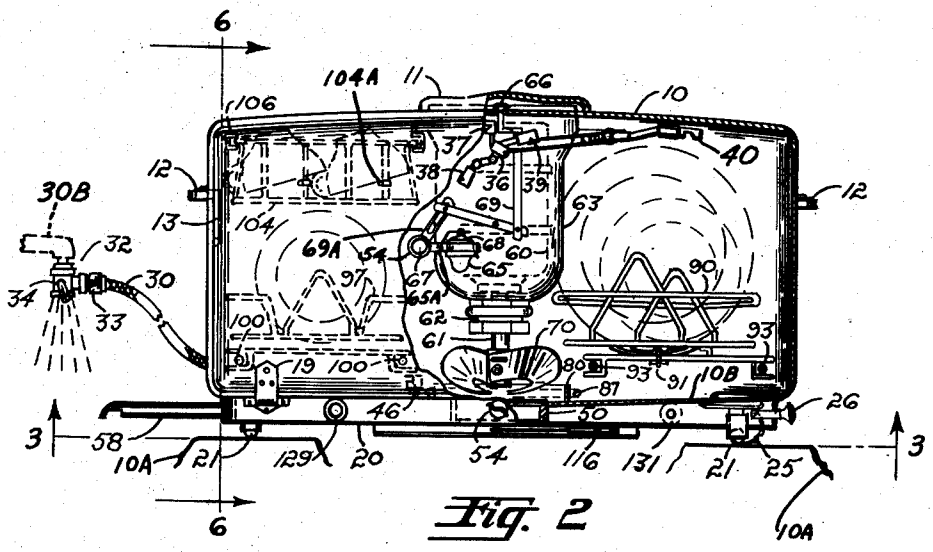


Fig. 2

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Filed Dec. 17, 1948 4 Sheets-Sheet 2

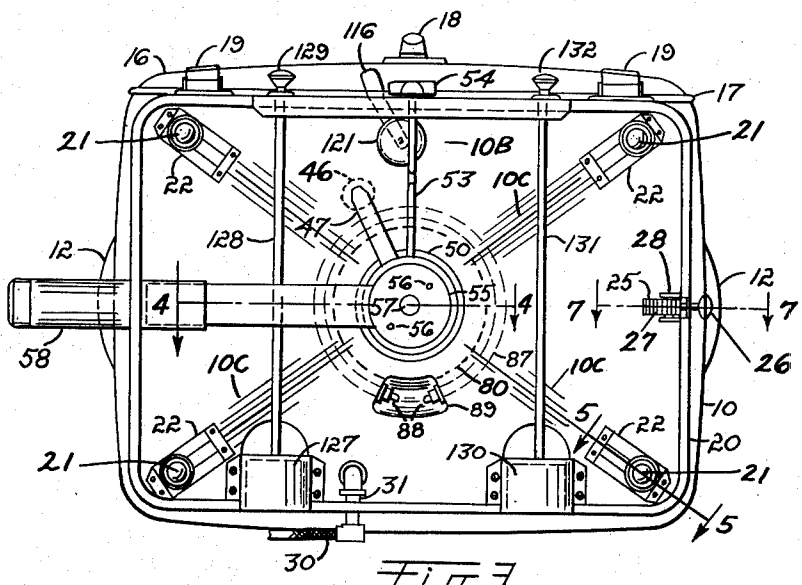


Fig. 3.

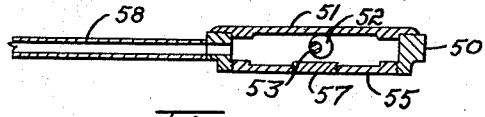


Fig. 4

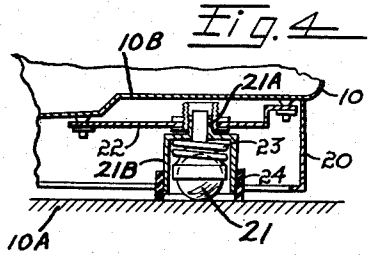


Fig. 5

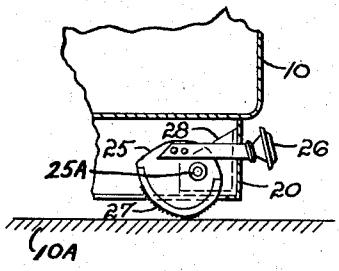


Fig. 7

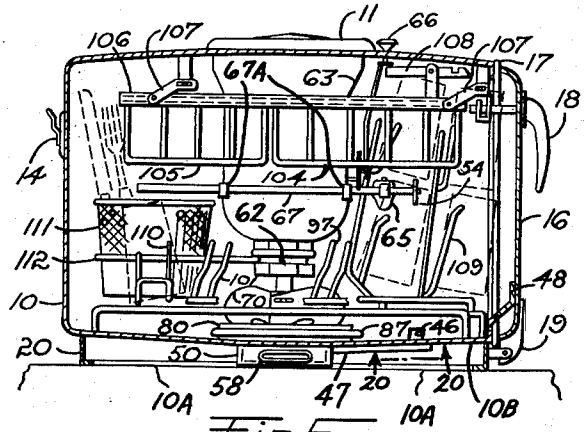


Fig. 6

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PORTABLE DISHWASHING MACHINE

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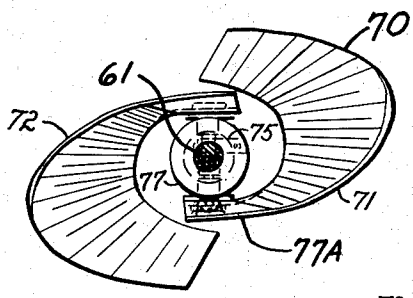


Fig. 8

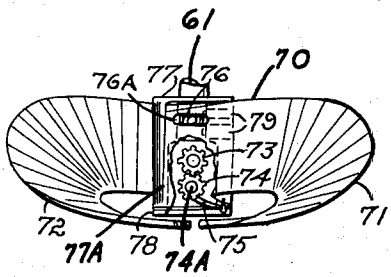


Fig. 9

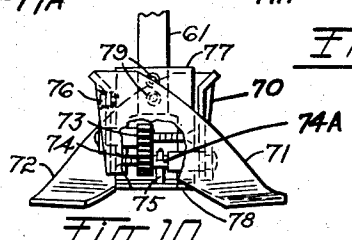


Fig. 10

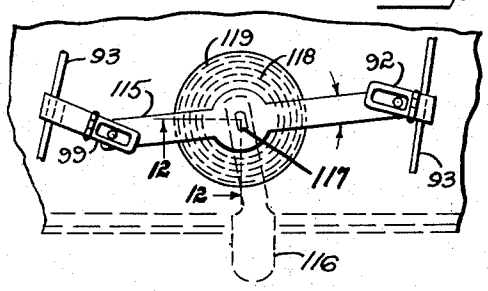


Fig. 11

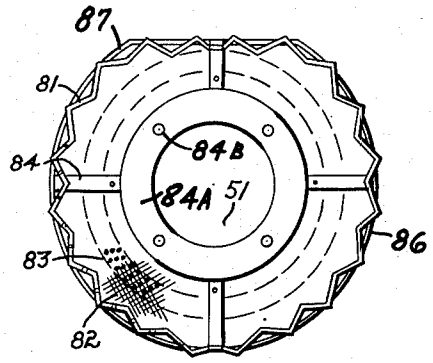


Fig. 14

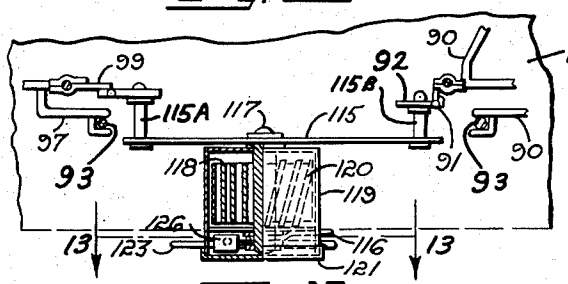


Fig. 12

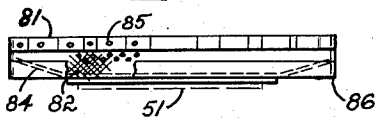


Fig. 15

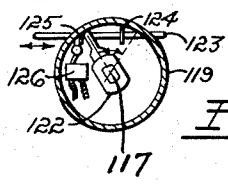


Fig. 13

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PORTABLE DISHWASHING MACHINE

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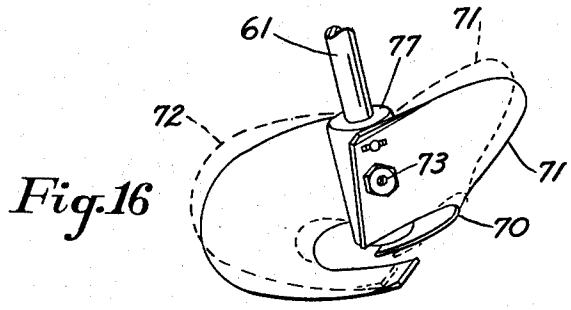


Fig. 16

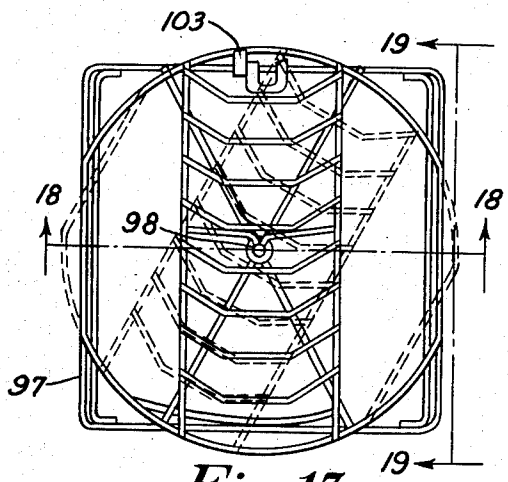


Fig. 17

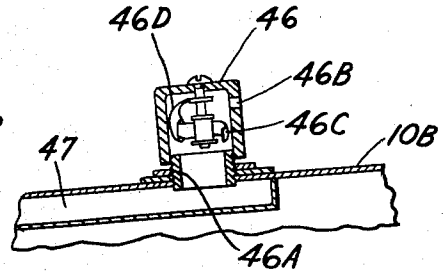


Fig. 20

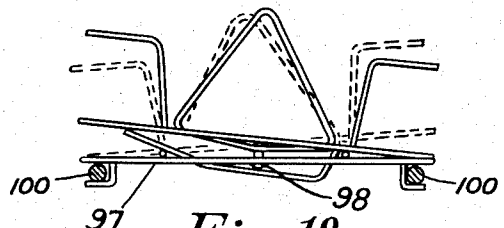


Fig. 18

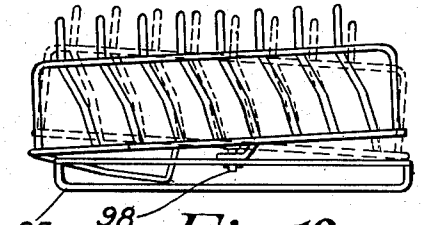


Fig. 19

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Patented May 11, 1954

2,678,050

UNITED STATES PATENT OFFICE

2,678,050

PORTABLE DISHWASHING MACHINE

Walter I. Knapp, Detroit, Mich.

Application December 17, 1948, Serial No. 65,899

17 Claims. (Cl. 134—57)

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This invention relates to dish washing machines, and has particular reference to a device of that character which is portable, or may be built-in as a permanent installation in a kitchen or the like.

An object of the invention is to generally improve dish washing and rinsing machines, and to provide a machine which is simple in construction, economical to manufacture and maintain, and highly efficient in operation because of its novel shape and construction.

Another object of the invention is to provide a dish washer which is compact, yet provided with a maximum dish and silverware capacity, and one which may readily be used on a conventional, domestic kitchen sink drainboard, and counter top, and when not in use, may be rolled to a storage position beneath the wall cabinets.

Another object of the invention is to provide a dish washing machine which has a high degree of portability, and which is provided with means for rolling the device from one position to another, and means for locking the device in any predetermined position.

Another object of the invention is to provide a dish washing machine which is constructed with a cambered wall housing which is arranged to assist in imparting a highly effective swirling action to the water.

Another object of the invention is to provide a dish washer having a heat activated bi-metal element which controls a spring loaded variable pitch blade type impeller, which together with the other features of the device imparts a highly effective change of pattern action to the water, with a result that there are no "blind spots" in the washing and rinsing operations.

Another object of the invention is to provide a dish washing machine which is constructed and arranged with rotatable and tiltable trays, which may be removed from the dish washer with the dishes remaining in the trays to facilitate the easy storing of the dishes in the cupboard after the dishes have been washed and dried.

Another object of the invention is to provide a device of the character indicated in which the rotatable and oscillatable dish trays are automatically oscillated and tilted by thermostatic means, or may be manually operated if so desired to effect different positions of the dishes during the washing and rinsing operations.

Another object of the invention is to provide a dish washing machine in which the dish trays are slidably supported on tracks provided for them, whereby the loaded trays may readily be

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removed from the machine, there being locking means for securing the trays on the tracks and means for keeping the cups and dishes in predetermined positions on the trays.

Another object of the invention is to provide a dish washing machine having an immersion heating element incorporated therein to quickly increase the temperature of the water introduced into the machine for efficient dish washing operation, and to control the action of the bi-metal element which in turn effects the action of the impeller blades.

Another object of the invention is to provide a dish washing machine having a rotatable pipe and multiple fan and cone spray nozzle assembly arranged for efficient rinsing of the dishes, with means to synchronize its movement with the movement of the rotating trays.

Another object of the invention is to provide a dish washing machine having means to prevent the siphoning back into the fresh water line of the dish water, and to provide a fresh water bypass for external use at the sink while the dish washer is connected to the water tap, and to provide an efficient electrical ground contact with the water faucet while the machine is in use.

Another object of the invention is the provision of a dish washing machine which is provided with a non-loading sediment screen which is self cleaning during the draining cycle.

Another object of the invention is to provide a dish washing machine having a built-in sump incorporating therein an efficient and readily accessible cleanout plate.

Another object of the invention is to provide a dish washing machine which is constructed with a maximum capacity drain outlet including a right or left hand reversible telescoping drain spout for discharging the dish water into the sink.

Another object of the invention is the provision of a dish washing machine having an internally discharging detergent applicator arranged to deposit the detergent near the center of the impeller actuated water surge, whereby to increase the speed of dissolution of the detergent, and to facilitate the refilling of said detergent applicator.

Another object of the invention is to provide a dish washing machine having means to facilitate its permanent installation into conventional base cabinets and sink cabinets by providing readily accessible standard pipe fittings in the water intake and the sump.

Another object of the invention is to provide a dish washing machine having a tightly sealed and hinged drop open type front wall to provide convenient loading of the machine when positioned on a sink, drainboard, or counter top.

Another object of the invention is to provide a dish washing machine having an audible measuring overflow pipe assembly to facilitate its use when permanently installed in a conventional base or sink cabinet.

The foregoing and other objects and advantages of the invention will become more apparent as the description proceeds, reference being made from time to time to the accompanying drawings, forming part of the within disclosure, in which drawings:

Fig. 1 is a top plan view of the device embodying the invention with parts broken away to illustrate the relation of other parts.

Fig. 2 is a front elevational view with parts in section, and taken substantially on the line 2—2 of Fig. 1.

Fig. 3 is a bottom plan view of the device illustrated in Fig. 1.

Fig. 4 is an enlarged fragmentary detail in section taken substantially on the line 4—4 of Fig. 3.

Fig. 5 is an enlarged fragmentary detail in section taken substantially on the line 5—5 of Fig. 3.

Fig. 6 is a vertical section taken substantially on the line 6—6 of Fig. 2.

Fig. 7 is an enlarged fragmentary detail in section taken substantially on the line 7—7 of Fig. 3.

Fig. 8 is an enlarged top plan view of the automatic thermostatically controlled oscillating impeller.

Fig. 9 is an enlarged view in elevation of the thermostatically controlled impeller shown in Fig. 8 with parts broken away to illustrate the interior of the impeller hub.

Fig. 10 is an enlarged view in elevation of the impeller with parts broken away and turned substantially 90 degrees from the position shown in Fig. 9.

Fig. 11 is an enlarged fragmentary detail in plan view of the bottom of the device showing the electric thermostatic tray oscillation control with the manual control and setting lever.

Fig. 12 is an enlarged fragmentary detail with parts in section showing the tray oscillating control mechanism, the heating element, and the bimetal coil taken substantially on the line 12—12 of Fig. 11.

Fig. 13 is a section taken substantially on the line 13—13 of Fig. 12, showing the limit control switch in linkage for the thermostatic mechanism.

Fig. 14 is an enlarged plan view of the sediment screen.

Fig. 15 is a side elevation of the sediment screen illustrated in Fig. 14 with parts broken away to more clearly illustrate its construction.

Fig. 16 is a perspective view of the thermostatically controlled impeller with dotted lines showing the degree of impeller blade oscillation.

Fig. 17 is a plan view of one of the slidably removable dish carrying trays with dotted lines to illustrate the degree of rotation.

Fig. 18 is a section taken substantially on the line 18—18 of Fig. 17 with dotted lines to illustrate the degree of the tilting action of the tray.

Fig. 19 is a side elevational view of the device shown in Fig. 17 with lines dotted in to show the degree of rotation and tilt.

Fig. 20 is an enlarged fragmentary detail taken substantially on the line 20—20 of Fig. 6 illustrating the audible measuring overflow pipe assembly.

Referring now more particularly to the drawings, it will be understood that in the embodiment herein disclosed, the reference character 10 indicates the tank, or housing, of the dish washer, which is shown in Figs. 1, 2, 3, 5, 6 and 7 as resting on a sink drainboard 10A. The tank 10 is provided at the top with a removable cap 11 which is adapted to cover a central opening 11A, which is provided for the motor assembly as hereinafter described.

A handle 12 is positioned at either end of the tank 10 so that the device may be lifted. A baffled opening 13 is positioned at one end of the tank 10 beneath the handle 12, and serves as a ventilator for the interior of the tank, and allows the escape of steam and acts as a vacuum break in the event of possible siphoning back of dish water from the tank 10 into the inlet pipes.

Hooks 14 and 15 are provided on the rear exterior of the tank 10, and serve as means to support the hose and extension cord elements hereinafter described.

The front of the tank 10 is closed by means of a drop down front wall 16 which is sealed by means of a gasket 17 and locked by means of a suitable tongue latch 18. Hinges 19 connect the bottom of the wall 16 with the tank 10, and permit the wall to be dropped so that the interior of the tank 10 may be loaded with dishes as hereinafter described.

A drip baffle 48 (Fig. 6) deflects the water out of the cambered section of the wall 16, and allows any condensed water on the wall to drain back into the interior of the tank 10.

The rear wall of the tank 10 and the wall 16 are cambered in order to increase the effective swirling action of the water during the washing and rinsing operations. The bottom 10B (Fig. 3) of the tank 10 is inclined as at 10C to form a hopper like structure which slopes toward the center. The bottom 10B of the tank 10 rests on an integral base 20 which serves as a housing for the sump and the ball casters 21 (Figs. 2, 3 and 5) hereinafter described.

The ball casters 21 (Fig. 5) are mounted in suitable fittings 21A which are threadedly mounted in adjustable plates 22 which are secured to the under surface of the bottom 10B. The casters 21 are sheathed in cuplike members 21B, the lower ends of which are protected by rubber elements 24 which serve as shock absorbing, non-skid elements when the device is in operation. The ball casters are spring loaded, as at 23.

In order to prevent the shifting of the dish washer on the sink drainboard 10A (Fig. 7), I provide a friction brake 25 which is eccentrically pivoted, as at 25A, to a bracket 28, which in turn is secured to the base 20. A brake handle 26 is secured to the eccentric brake 25, and extends to the exterior of the device so that the brake 25 may be rotated into and out of locking engagement. A suitable anti-friction tread 27 encompasses substantially the lower one-half of the periphery of the brake 25.

An extension cord 29 extends through a suitable opening formed in the rear wall of the tank 10, and connects the motor assembly herein-

after described to a suitable source of electrical power. A flexible metal hose 30 connects to a suitable fitting 30A which in turn communicates with the interior of the tank 10, and to a conventional water tap 30B through means hereinafter described. The metal hose 30 is electrically grounded for the purpose of protecting the user of the dish water from possible electric shock.

Interposed between the water tube 30B and the flexible hose 30 is a specially designed automatic by-pass and anti-back pressure valve 32, which is provided with a spring loaded ball 33 and a by-pass cock 34, whereby water may be drawn directly from the tap 30B.

The fitting 30A communicates, among other elements, with an overhead rinsing conduit 35 which in turn communicates with a cone spray nozzle 36 arranged to direct a powerful spray to the front of the plates, and a fan spray nozzle 37 which is adapted to direct the spray against the top of cups and cone spray nozzles 38 and 39, which are arranged to also direct sprays to the dishes and glasses carried in the trays as hereinafter described.

A fan spray nozzle 40 is arranged to direct a spray to the top of plates, and cone spray nozzles 41, 42, 43 and 44 also communicate with the conduit 35, and are arranged to respectively spray the dishes in the right rear tray, the silver basket, and the left rear trays as hereinafter described.

The applicant desires to emphasize the importance of the above described overhead rinsing arrangement, which is not only useful in the pre-rinse operation, but is particularly effective on the final rinse which is necessary to knock off the final food sediment which often remains on the dishes in conventional impeller rinse operations.

The flat dishes are held in individually removable, wire trays and racks 90, 94, 97 and 101, which are arranged so that each oscillates in an arc about its own axis, while at the same time the axis is given a rocking motion. The trays and rocks slide in and out of the tank 10 on rods 93 and 100. Cups are held in a tilted position on removable racks 104 and 105 which are equipped with flexible cup tilting rods 104A. The racks 104 and 105 slide in and out on tracks 106 which are held in position for loading by a pivoted latch 108, and are arranged to swing back and up and be held in locked position by arms 107. Water glasses are supported on the removable tilted rack 109 and a hook 110 which comprises part of a swing bracket 112 which is adapted to support the silver ware basket 111, the latter being formed of metal having variable size holes pierced therein, the said basket being provided with separate and different depth compartments.

The racks 90, 94, 97 and 101 are tilted and oscillated in the following manner:

The respective racks are provided with pivot pins 91, 95, 98 and 102 (Figs. 1, 2 and 17). The racks 90 and 97 (Figs. 11 and 12) are connected together by means of an arm 115 having posts 115A and 115B, which are adapted to engage slotted and hinged hasps 92 and 99. The oscillating and rocking motion is transferred from rack 90 to rack 94 by means of a loop coupling 96 (Fig. 1). The oscillating and rocking motion is transferred from rack 97 to rack 101 through the loop coupling 103 (Fig. 1).

Secured to the arm 115 is a shaft 117, which shaft is adapted to be rotated by means of a bi-metal coil ribbon 118 which is arranged to be flexed by means of heat generated in electrical heating element 120. The heating element 120 is controlled by means of an electrical switch 126, which is alternately opened and closed by means of a rod 123, which is slidable in the walls of the housing 119 and which is actuated by the arm 122 secured to the lower end of the shaft 117. The arm 122 is slotted to engage the rod 123 which carries limit elements 124 and 125. When the limit element 124 is contacted by the arm 122, the rod 123 moves to the right turning off the switch 126. This permits the bi-metal ribbon 118 to unflex returning the arm 122 to the left. When the limit element 125 is reached, the switch 126 is turned on and the operation repeats, and is automatically continued through the dish washing operation. This action provides a smooth oscillation of the racks without danger of damage to or rattling of the dishes.

The bottom 10B (Figs. 3 and 4) is provided with a drain sump 50 which communicates with a telescoping drain tube 58 through which the tank may be drained into the sink. The drain tube 58 is mounted for left and right hand operation. The sump 50 is fitted with a threaded cleanout plate 55, which is screwed into the bottom of the sump 50 and is easily removed by inserting a spanner wrench in the holes 56. A pipe size threaded flat plug 57 is screwed into the cleanout plate 55, the latter to accommodate a standard drain pipe for stationary or built-in installation. A drain plate 51 covers the sump 50 and is adapted to be lifted by a cam 52 carried at the end of the rod 53.

It is desired to call particular attention to the comparative ease of removing the cleanout plate 55, simply by turning the dish washer on its side rather than having to go through many parts to get at the drain sump 50, as is the case in most conventional dish washer equipment.

Positioned on top of the drain plate 51 is a non-clogging sediment screen 80 (Figs. 2, 6, 14 and 15) which is constructed as follows:

A ring 84A and straps 84 are secured to the plate 51 by rivets 84B, and support the screen. The screen 80 is formed of a sheet of perforated metal with see-saw shape side walls 81, and a drop apron 86. The apertures in the screen vary from comparatively small apertures 83 around the bottom to much larger holes 85 which are positioned in the see-saw side walls 81.

In operation, sediment lodges in the crevices formed by the see-saw shape of the side walls permitting water to flow each side of the sediment, which sediment remains in the crevices until the flushing action takes place in the draining of the tank 10.

The construction of the see-saw walls 81 and the hole size variation in the screen permits water to pass through the screen in spite of the sediment load, thereby assuring sufficient water for the impeller surge.

An overflow cap 46 (Fig. 20) is threadedly secured, as at 46A, to the bottom 10B and communicates with a channel 47, which in turn is connected to the drain sump 59. The overflow 46 has a side opening 46B and measures the correct amount of water to be left in the tank 10 for the different washing and rinsing operations. A water spinner 46C is rotatably secured to the inside of the cap 46, and is adapted to be impelled by water flowing through the cap, and is arranged to impinge on a reed 46D to effect an

audible signal indicating a properly filled tank. This audible signaling device is particularly advantageous when the dish washer is permanently built-in to a sink cabinet or the like.

A detergent dispenser cup 65 is mounted on an arm 65A which in turn is secured to a rod 67 rotatably mounted in suitable brackets 67A which are secured by any suitable means to the outside of the motor chamber 63. The dispenser cup 65 is adapted to be tripped by means of an externally positioned knob 66, which connects to suitable linkage 69 which is slidably secured to an arm 69A carried by the rod 67.

The dispenser cup 65 is covered by means of a rubber stopper 68 which swings out after the cup 65 is tilted allowing the detergent contents to be spilled into and near the center of the water surge at the start of the washing cycle. I have found that the detergent is more quickly and completely dissolved when it is injected near the center of the water surge generated by the impeller 70.

A spherically terminated, vertically elongated motor chamber 63 is mounted in the opening 11A of the housing, and contains a suitable electric motor 60, which is electrically connected to the lead 29, and has a shaft 61 which is adapted to actuate an impeller 70 which is constructed and arranged as hereinafter described.

The chamber 63 is provided with a stuffing box 62 which is adapted to prevent water from entering the interior of the motor chamber 63. A suitable timer clock (not shown) is enclosed in a water tight housing 127 (Fig. 3) which is mounted on the bottom 10B of the tank 10, and is controlled from the front of the tank by a knob 129 and a rod 128. This timer clock is electrically connected to the motor and is adapted to shut off the electric motor at a predetermined time.

The impeller 70 (Figs. 2, 8, 9, 10 and 16) mounted at the end of he motor shaft 61 consists of two blades 71 and 72 which oscillate as herein described to effect a varying surge pattern in the water contained in the tank 10. This variation in surge pattern eliminates entirely the blind washing spots which occur in presently known dish washing devices. The blades 71 and 72 are respectively mounted off and on center which adds to the irregularity of the water surge pattern. The rising and falling of the temperature in the surrounding water or air causes the blades to automatically oscillate as herein described varying the angle of and shape of the water surge, and the result of the spray on the dishes. It will be noted by dotted lines 71 and 72, Fig. 16, the different positions taken by the impeller blades 71 and 72 on their respective axes 73 and 74. This up-and-down action is imparted to the blades through axis shafts and gears 73 and 74, by the coiling or uncoiling of the bi-metal 75, Fig. 9, which coiling or uncoiling is controlled by the rising or falling of the temperature of the surrounding water or air. The above thermostatic action does not directly control the speed of rotation except as a by-product of the changed angle of the blades, the motor might speed up or slow down slightly, but it does definitely control the varying angle which the impeller blades assume at the different ambient temperatures. The thermostatic bi-metal controls the varying angle of the impeller blade settings.

The detailed construction of the impeller 70 is shown in Figs. 8, 9 and 10 in which 71 indicates the center heel connected blade and 72 the off-center heel connected blade which cause the unsymmetrical changing surge and spray pattern with a differing speed of angle change between the respective blades. The impeller is provided with a hub 77 which is axially bored to accommodate the motor shaft 61 to which the hub is secured by set screws 79. A counter bore 77A extends through the remainder of the hub 77 and is arranged to accommodate pinions 73 and 74 which respectively operate the blades 71 and 72.

The teeth of the pinions 73 and 74 mesh with one another causing the blades 71 and 72 to rotate in opposite directions continuously changing the angle of the water surge. The pinions 73 and 74 are actuated by a flexing bi-metal strip 75, one end of which is attached to the bottom of the hub 77, and the other end of which is attached to the shaft 74A. As the temperature of the water surrounding the impeller hub 77 rises or falls, the bi-metal strip 75 flexes and unflexes causing the pinions to be actuated changing the angle relation of one blade with reference to the other. In order to reduce vibration and eliminate the possibility of excessive angle travel, a spring 76 is mounted on the hub 77 and engages the walls of slot 76A (Fig. 9).

In order to boost the temperature of the water from conventional water heating sources to that desired in successful mechanical dish washing, and to stimulate the action of the bi-metal controlled impeller blades 71 and 72, I provide an immersion heating element 87 which is installed close to the bottom of the tank 10 and surrounds the lower part of the impeller 70. The heating element 87 is of conventional make and is electrically connected to the electrical inlet 29.

A conventional clock timer is mounted in a water tight housing 130 positioned on the bottom 10B and is adapted to control the heating element 87, and is arranged to be set by a rod 131 at the end of which is a knob 132.

I will now describe a complete operating cycle of the dish washer:

The machine is placed upon the drainboard 10A, or counter top, or a table adjacent to the sink within reach of an electric outlet. The swivel hose connection 32 is attached to the sink faucet 30B, and the extension cord 29 is plugged into the electrical outlet.

The shallow dishes are placed in racks 99, 94, 97 and 101. The cups are placed in trays 104 and 105, and water glasses are placed in rack 109 and on the basket bracket 110. The silverware is placed in basket 111, and the basket and all of the trays are then inserted in the tank 10. Inasmuch as the racks, trays and silverware basket are removable and portable, it is more convenient to load them outside of the dish washer and then insert them fully loaded in the machine for the washing, rinsing, and drying operations.

The detergent cup 65 in its untripped position is moved toward the front of the dish washer by means of the knob 54, and rod 67. The cup 65 is then loaded and moved rearwardly where it is ready for use.

The front wall 16 is closed and with the drain plate 51 in open position, hot water is introduced to the dish washer through the hose 30, and the over rinse pipe 35. The hot water is permitted to enter the dish washer through the over spray nozzles for approximately 30 seconds. This serves as a pre-rinse washing down and out through the open drain plate 51, and into the sink the loose

rough food particles on the dishes. This pre-rinse operation also serves as a tempering agent gradually bringing the dishes up to a proper washing temperature.

The drain plate 51 is then closed by the knob 54 and proper temperature hot water is permitted to enter the tank 10 until it starts to overflow through the overflow tube 46, which overflow is detected by means of the audible overflow indicator previously described. The faucet water is then shut off and the motor timer clock switch is turned on and set for a five minute interval by means of the knob 129 and rod 128.

The detergent knob 66 is then pulled up tripping the cup 65, the action of which ejects the cap 68 and permitting the detergent to be spilled into the surge stream.

The motor 60 through the shaft 61 rotates the impeller 70 causing a surge and spray of water upwardly and outwardly in varying oscillating angles, over, under and along the sides of the dishes and silverware. The food particles thus washed from the dishes being trapped in the sediment screen 80 as hereinbefore described.

At the termination of the five minute interval, the timer 127 shuts off the motor 60 and the operator then opens the drain plate 51 allowing the dirty water to be discharged through the telescoping tube 52 into the sink at the same time flushing the sediment screen. The operator then closes the drain plate 51 and opens the hot water tank as before until a suitable water level is obtained as indicated by the audible overflow indicator previously described.

The motor timer is then set for a one minute interval providing an impeller surge rinse. At the end of the one minute interval, the motor is automatically turned off. The operator then opens the drain plate 51 allowing the first after rinse water to discharge as before.

The operator then turns on the hot water with the drain plate 51 open for approximately 30 seconds to provide a second after rinse. This second after rinse knocks off the last remaining food particles resulting in a particularly efficient dish washing and rinsing operation heretofore unobtainable in conventional domestic dish washing machines.

The immersion heating element 87 is used as a booster for the water temperature where the washing or rinsing water from the faucet is below the temperature required for proper dish washing operation, and is also used to stimulate the action of the bi-metal which in turn effects the impeller blades. The heater timer clock 130 is adjusted from the front of the dish washer base for needed time intervals according to the operator's desire.

During the pre-rinsing, the washing operation, and the two after rinses the rotatable racks 90, 94, 97 and 101 are constantly oscillated and change tilted by means of the bi-metal coil 118 and its linkage previously described.

After the rinsing has been completed, the operator drops the front wall 16 and the dishes are permitted to dry from the heat stored in them. The racks containing the dishes may then be removed from the tank and placed in the cupboards, or elsewhere for storage. With multiple sets of racks and trays, the dishes may be left in them in the cupboards and succeeding batches of dishes may be washed and stored conveniently.

Pots and pans may be washed in this machine by leaving out some or all of the racks and resting the pots and pans on the tank bottom where they are held in position by means of the rods 93 and 100.

At the close of the above operation, the hose fitting 32 is disconnected from the faucet and coiled on hook 14, and the extension cord 29 is disconnected from the outlet and coiled on the hook 15. The brake 25 is then released and the dish washer may be rolled on the ball casters 21 to the back of the counter top or elsewhere out of the way until it is desired to use it again.

Having described my invention, what I claim and desire to secure by Letters Patent is:

1. A dish washing and rinsing machine of the character described comprising a tank having cambered side walls and top, a hopper like bottom, said top having a centrally positioned motor compartment, a motor in said compartment, and a variable pitch blade impeller mounted for rotation on said motor, said impeller being connected by intermediate linkage to a bi-metal element which is actuated by the change in temperature of water surrounding it, whereby on the flexing and unflexing of said bi-metal element the pitch of said impeller blades is changed.

2. The combination defined in claim 1, including a heating element located in close proximity to said impeller.

3. A dish washing machine comprising an elongated tank having a cambered side wall and top, a hinged drop open cambered front wall and a hopper like bottom having a sump therein, means for opening and closing said sump, a motor driven variable pitch impeller mounted above said sump, a bi-metal element connected to said impeller by intermediate linkage, and a heating element positioned in said tank adjacent said impeller, and arranged to actuate said bi-metal element, whereby upon the flexing and unflexing of said bi-metal element the pitch of said impeller blades is changed.

4. The combination defined in claim 3, including a plurality of removable racks oscillatable about one axis and tiltable about a different axis, positioned in said tank within the surge area of said impeller.

5. A dish washing machine comprising a tank having elongated cambered wall and top, a hinged drop open cambered front wall and a hopper like bottom, water connections for introducing water to said tank including a plurality of overhead positioned nozzles, a plurality of trays, each oscillatable about one axis and tiltable about another, positioned in the spray area of said nozzles, means for oscillating and tilting said trays, and a motor driven impeller positioned in said tank and arranged to direct a changing pattern surge of water into and about said trays.

6. The combination defined in claim 5, in which there is a bi-metal element arranged to change the pitch of the blades of said impeller, a heating element positioned in said tank adjacent said impeller and arranged to actuate said bi-metal element.

7. The combination defined in claim 5, in which there is a sump positioned in said bottom, said sump having a removable cover plate with externally controlled means for operating the same.

8. The combination defined in claim 5, in which there is a sump positioned in said bottom, said sump having a removable cover plate with externally controlled means for operating the same, and a non-clogging variated mesh sedi-

ment screen secured to said cover plate, said screen having see-saw side walls and a drop apron.

9. The combination defined in claim 5, in which there is a detergent carrying vehicle positioned in said tank, and arranged to discharge a detergent into the water surge of said impeller, there being means positioned on the exterior of said tank for actuating said detergent vehicle.

10. A dish washing machine comprising an elongated dish receiving tank, a motor chamber in the upper center of said tank, a motor in said chamber, a two bladed variable pitch impeller mounted for rotation on the shaft of said motor, a bi-metal element for varying the pitch of the blades of said impeller, a plurality of removable racks, each oscillatable about one axis and tiltable about another, positioned about said impeller, and overhead spray means for directing water sprays over and about said racks.

11. The combination defined in claim 10, including means for maintaining a predetermined water level in said tank, and a heating element positioned in the bottom of said tank and arranged to change the temperature of the water immediately surrounding said impeller.

12. The combination defined in claim 10, including means for oscillating and tilting said racks, and means connecting at least one of said racks to the overhead spray means whereby the latter will oscillate in unison with said racks.

13. A dish washing machine comprising a dish receiving tank, a motor centrally positioned in said tank, said motor having an impeller mounted for rotation therewith, a plurality of shallow dish receiving racks each oscillatable about one axis and tiltable about another, a multiple cone and fan spray nozzle and pipe assembly positioned for directing an overhead spray on to and about said racks, a bi-metal member for rotating and tilting said racks, a heating element positioned near said bi-metal member, and an externally controllable timing means for operating said heating element.

14. The combination defined in claim 13, including a linkage from at least one of said racks to said nozzle and pipe assembly arranged to oscillate said nozzle and pipe assembly in unison with said racks.

15. A dish washing machine comprising an elongated cambered tank, an electric motor positioned in said tank, said motor having a two bladed variable pitch impeller mounted for rotation therewith, heat responsive means for changing the pitch of the blades of said impeller, electrical means for controlling the operation of said motor, a heating element in said tank adjacent said impeller and timing means for controlling the heating of said heating element.

16. A dish washing machine comprising a tank having an electrically operated impeller therein, a heat responsive element for changing the pitch of the blades of said impeller, and electric heating element for actuating said heat responsive element, water intake means for said tank, said water intake means including an anti-friction pressure spring loaded valve having a bypass element and a flexible metallic inlet hose connecting said valve to said tank, said flexible metallic hose serving as a ground for the electric elements of said machine.

17. A dish washing machine comprising an elongated tank having a cambered side wall and top and a hopper like bottom, handles on the end walls of said tank, a hinged cambered drop open front wall having a drip baffle associated therewith, a spherically terminated, vertically elongated motor chamber secured in the top of said tank, a vented cover plate for said motor chamber, an electric motor mounted in said chamber said motor chamber being spherically terminated at the lower end thereof, and an impeller mounted for rotation on the shaft of said motor.

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