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MULTIPLE SPRAY STRUCTURE FOR DISHWASHERS AND THE LIKE

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This invention relates to liquid spraying structure and more particularly to a structure suitable for use with automatic dishwashers and the like and from which a plurality of sprays at different levels of the machine are simultaneously directed.

Automatic dishwashers of the domestic type are generally designed to employ an operating cycle including a series of separate washing and rinsing operations in each of which a comparatively small amount of water is admitted to the washing compartment, circulated therein, and then discharged from the machine. The washing water is generally sprayed upon the dishes in a plurality of spray streams under a pressure head provided by a pumping mechanism or impeller contained in the dishwasher housing, and another mechanism serves to provide a rapid drainage of the soiled water from the dishwasher at the appropriate time in the cycle of dishwashing operation. The effectiveness of the washing action, moreover, is related not only to the amount of water employed and the number of times it contacts the dishes, but also to the force of the sprays, the directions of the sprays, and the interrelation of these sprays so that all parts of the dishes will receive a thorough washing treatment. This invention was conceived during the development of three and four levels of washing or spraying action to obtain maximum washability without endangering fine china and crystal by overturning and breaking.

A general object of the present invention is to provide a multiple spray structure which employs the available wash liquid in an efficient manner and which gives a substantially uniform washing action at different levels within the machine for a given amount of liquid without interfering with the loading of the dish racks or the movement of the lower rack in the case of a front opening drop door machine.

Another object is to provide a multiple spray structure having both rotating and sliding or extensible parts whose movement is caused by the flow of the washing liquid under the combined action of the spray arms and the liquid within the tub so that the disks from the upper and lower spray arms are in constant motion and the washing liquid is recirculated through the machine without any portion of it being lost.

A further object is to provide a multiple non-clogging spray structure that is mounted on a rotatable spray arm and has an extensible and retractable member arranged to occupy a retracted position during loading of the dishes into a dishwasher and to occupy an extended position during washing of the dishes.

Further objects and advantages of the invention will become apparent as the description proceeds, and the features of novelty which characterize the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

In accordance with one aspect of the invention there is provided a horizontally rotatable spray arm disposed beneath the lower rack of dishes in the dishwasher and rotatable under the reactive force of liquid discharged from that arm. A tubular housing affixed to the rotatable spray arm adjacent the pivotal axis thereof and extending upwardly therefrom also receives liquid and has telescopically mounted thereon a spray tube or other extensible means which moves to an extended position under pressure of liquid entering that housing. The spray tube in turn has one or more orifices arranged to direct rotating sprays of liquid against an upper rack of dishes, and which sprays are interrelated not only to each other but also to the spray from the lower rotatable spray arm, all to the end that any article on either the upper or lower racks will be thoroughly washed from several directions.

For a better understanding of the invention, reference now is made to the following description and accompanying drawings in which:

FIGURE 1 is a side elevation view, with parts broken away and parts in section, of a portable automatic dishwasher incorporating the present invention;

FIGURE 2 is a top plan view of the central portion of the rotatable spray arm and with the vertical spray tube in retracted position;

FIGURE 3 is a sectional view taken on line 3—3 of FIGURE 2;

FIGURE 4 is a sectional view taken on line 4—4 of FIGURE 3 and with the spray tube in fully extended position; and

FIGURE 5 is a fragmentary sectional view of the upper end of the spray tube when it is in its raised position showing the nature of the dissimilar sprays issuing therefrom.

Referring to FIGURE 1 of the drawing, there is shown a portable automatic dishwasher comprising a tub 9 defined by side walls 10, 11, 12 and 13 and having a bottom wall 14 sloping downwardly to form a sump space 15 for the collection of washing liquid. This liquid is supplied to the machine by any suitable means not shown, and which supply forms no part of the present invention.

In the type of dishwasher as shown, the tub is closed at its top by a cover 16 hinged at 17, although the invention as will be understood, is in no way limited to a dishwasher having this type of access opening. A suitable latch 18 may be provided at the front edge of the access cover for locking the cover in closed position during the operation of the dishwasher, and a cover push plate 19 serves to assist in the opening and closing of the cover.

Within the front panel 20 of the cabinet structure the controls of the machine may conveniently be mounted, and a handle 21 for moving the machine on its casters 22 may likewise be mounted on this front panel.

Disposed within the tub is an upper dish rack 23, and suitably spaced therebelow is a separate dish rack 24. In addition, a suitable heating element 25 may be mounted within the confines of the tub below these racks. A pumping mechanism 26, as best disclosed in the co-pending application of Albert L. Hardy et al., Serial No. 108,006, filed May 5, 1961, and assigned to the same assignee as is the present invention, is mounted in the sump 15 through the bottom wall of the tub 9 and includes a reversible electric motor 28 beneath the tub for driving an axial flow pump (not shown) located within the upper pump housing 31 and discharging into a rotatable spray arm 32 later to be described. The single shaft of the motor likewise drives a centrifugal pump (not shown) located within the lower pump housing 33 and discharging into either the recirculating spray conduit 34 or the drain conduit 35, depending upon the direction of the motor rotation. Liquid pumped into conduit 34 serves a washing purpose and passes through a riser conduit 36 into a rotatable spray means 37 mounted to spray downwardly upon the dishes in the upper rack 23, as best disclosed in the co-pending application of Russell M. Sassenet, Serial No. 853,894, now Patent No. 2,987,260, filed November 18, 1959, that is likewise assigned to the same assignee as is the present invention. The liquid enters the pump mechanism 26 through an annular screen 27 that also separates the top axial flow pump from the lower centrifugal pump.

Referring now to FIGURES 2 to 4 wherein the multiple spray structure of the present invention is disclosed, the rotatable spray arm 32 is fabricated of light sheet metal and includes an upper hollow portion 40 and a lower hollow portion 41 joined at their respective peripheral edges by a rolled seam 42. The spray arm is provided
with a centrally located round aperture in its lower portion 41 having a rolled over rim 43. This rim is assembled over a cylindrical bearing 44 formed upon the top surface of the upper pump housing 31. From the inner surface of that housing a plurality of thin arch-like webs 45, 46 and 47. At the top of this boss is a flat portion 49 from which extends a vertical bolt 50 suitably threaded 61 and having an orifice 45 there in. These orifices are uncovered when the spray tube 66 is fully extended and serve in turn to provide a spray B shown in FIGURE 4 at an intermediate level within the tub. In addition, at its upper end the spray tube 66 is formed with an orifice having one or more orifice portions through which additional liquid may be sprayed. A preferred form of this last-mentioned orifice produces a subdivision of the liquid into two dissimilar portions A and B for this purpose the upper end of the spray tube is formed with a restriction 72 having an inwardly directed off-center baffle thereon and containing a curved flow-directing surface 73. Facing this curved surface is a slit orifice portion 74 from which a spray C of liquid as shown in FIGURE 5 is directed liquid into two dissimilar portions A and B. The opposite end of the spray tube 66 is formed with a restriction 75 extending generally from the vertical axis of the spray tube to a horizontal plane and through which a fan-shaped or thin sheet spray D is emitted. It is important to form the orifices of this spray system be large enough not to form obstructions to gross food solids so that the liquid passages are non-clogging in operation. This enables the housewife to merely unload the food waste from the dishes by overturning them over the kitchen sink and avoiding a rinsing step by loading the soiled dishes directly into the racks of the tub.

Although the telescopic arrangement of the above-described tube within the hollow housing is particularly useful in providing an arrangement whereby the lower dish rack may be loaded easily without interference with that tube, it will be understood that other configurations thereof may be employed without departing from the invention. For example, the extensible member into which the water passes upwardly from the spray arm may be mounted on that arm so as to be extended or raised by rotation of the arm and biased to fail to retracted position when the arm ceases rotation, or may be made of soft resilient tubular material of rubber, plastic or fabric which is extensible under the pressure of water entering the same and retractable when water flow ceases, or may take other equivalent forms. Preferably the discharge end of the extensible member will have a nozzle or restriction to form the spray into a thin stream of shear form. Moreover, in each such member receiving liquid from the rotatable spray arm, orifices arranged to spread liquid from the intermediate level within the tub will be employed.

Having thus described the multiple spray structure it will be apparent that when the dishwasher is at rest the spray tube, or its equivalent, is retracted and affords no obstacle to the loading of dishes into the lower rack 24 of a portable machine. In the case of a front opening drop door machine, this invention will enable the lower rack to be withdrawn without any interference from the housing of the spray tube. A funnel would be formed in such a lower rack having an open bottom or slot so as to strengthen the rack against distortion. When liquid is supplied to the spray structure the arm 32 begins to rotate and at the same time the spray tube, or its equivalent, is extended and also partakes of the same rotation. During the rotation of these parts a multiple spraying action occurs with each spray being interrelated to its companion sprays, and an efficient washing action requiring no excess amount of washing liquid is thus effected. The spray arm 32 is the lower level spray, the rotating spinner or nozzle 37 under the cover of the upper level spray, and the spray tube provides a third and fourth level of spray to direct streams of water at all of the necessary areas in the tub where food soil is to be removed from the dishes.

Modifications of this invention will occur to those skilled in this art and it is to be understood, therefore, that this invention is not limited to the particular embodiments disclosed, but that it is intended to cover all modifications which are within the true spirit and scope of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A dishwashing apparatus comprising a washing tub,
an upper and a lower dish rack supported in said tub and a multiple spray structure for said racks comprising a horizontally rotatable spray arm positioned below the lower rack and having a plurality of orifices therein for spraying liquid from a lower elevation, means for supplying liquid under pressure to said arm, said arm and said means for supplying liquid under pressure being formed so that liquid discharging from the orifices provides sufficient reaction force to rotate the arm, a tubular housing mounted on the spray arm adjacent the pivotal axis thereof for rotation therewith and receiving liquid from said arm, a hollow spray tube telescopically mounted within said housing and having a hollow piston adjacent the lower end of said tube and movable upwardly within said housing, said tube having a lower position in which its upper end is approximately at the level of said lower rack and an upper position in which its upper end extends up a substantial part of the distance between said lower rack and said upper rack, means adjacent the upper end of said housing for limiting the extensible movement of said tube under the pressure of liquid acting upon said piston when said tube reaches said upper position, and at least one orifice in said tube adjacent its upper end spraying liquid outwardly from said tube at a higher elevation than the spray from said arm, and an orifice in said tube adjacent its lower end for spraying liquid outwardly from said tube at an elevation intermediate the spray from said upper orifice and the spray from said arm, said piston having a sufficient clearance within this housing to enable said tube to fall to its retracted position upon cessation of liquid flow into said housing.

2. A dishwashing apparatus as recited in claim 1 wherein said orifice in said tube comprises two separate orifice portions one of which directs the liquid generally at a small angle with respect to the outer extremities of the upper rack, and the other portion of which directs the liquid in a fan shaped spray extending from a direction generally axially of said tube to a direction substantially at a 45° angle thereto.

3. A dishwashing apparatus as recited in claim 2 wherein the lower end of the hollow spray tube is provided with a pair of orifices having upwardly sloping surfaces directing the liquid to the sides of the tub adjacent the lower edge of the upper rack.

4. An automatic dishwashing machine as recited in claim 3 wherein the extensible member comprises a hollow housing fixed to the upper surface of the spray arm and a telescopic tube that fits within the housing in the lowered position and rises partially out of the housing to the raised position, the upper end of the telescopic tube having flow restricting means with an off-center baffle to provide a double orifice having different flow characteristics to obtain two thin sheets of liquid spraying upwardly against the bottom of the upper rack.

5. An automatic dishwashing machine as recited in claim 4 wherein the lower end of the telescopic tube is provided with a pair of diametrically opposed slots formed therein, said lower end of said tube being formed with walls of substantial thickness, said slots sloping upwardly through said walls to direct the liquid toward the outer edges of the bottom of the upper rack.

6. Dishwashing apparatus comprising a washing tub, an upper dish rack and a lower dish rack supported in said tub, and a multiple spray structure for said racks comprising a horizontally rotatable spray arm positioned below said lower rack and having a plurality of orifices therein for spraying liquid from a lower elevation, means for supplying liquid under pressure to said arm, said arm and said means for supplying liquid under pressure being formed so that liquid discharging from the orifices provides sufficient reaction force to rotate said arm, a hollow extensible member mounted on said arm adjacent the pivotal axis thereof and receiving liquid from said arm, said extensible member having an upper end with at least a pair of orifices asymmetrically formed therein thereby to provide different flow characteristics to obtain two thin sheets of liquid spraying upwardly in different patterns against the bottom of said upper rack, said extensible member having a lower position in which its upper end is approximately at the level of said lower rack and an upper position in which its upper end extends up a substantial part of the distance between said lower rack and said upper rack, said extensible member moving from its lower to its upper position in response to the pressure of the liquid supplied thereto, and means biasing said extensible member to return to its lower position when the supply of liquid is interrupted.

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