

Sept. 23, 1969

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DISHWASHER WITH MULTIPLE SPRAY ARM

Filed Feb. 2, 1967

2 Sheets-Sheet 1

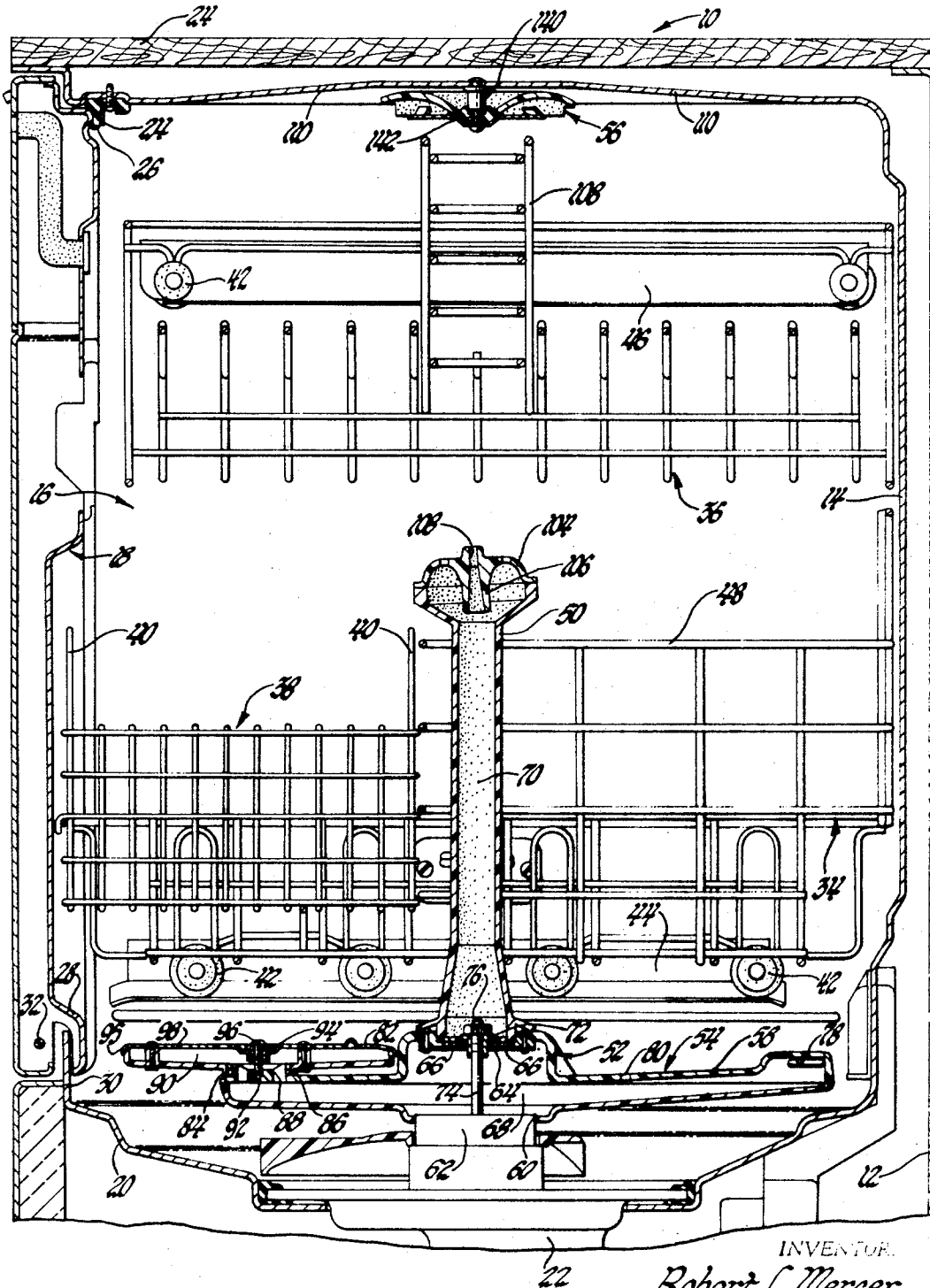


Fig. 1

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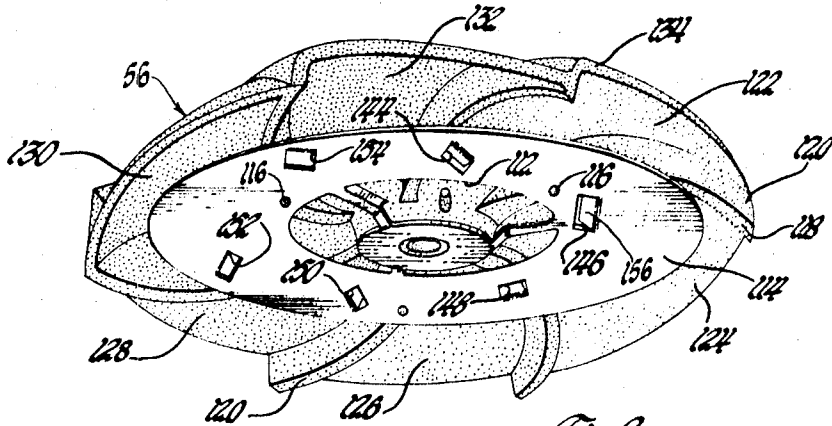


Fig. 2

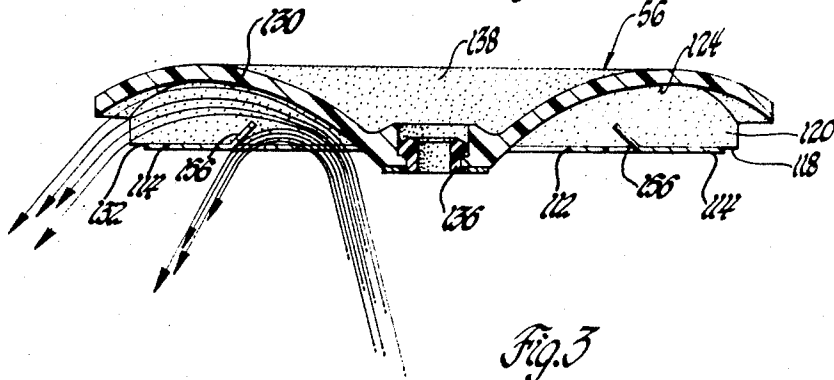


Fig. 3

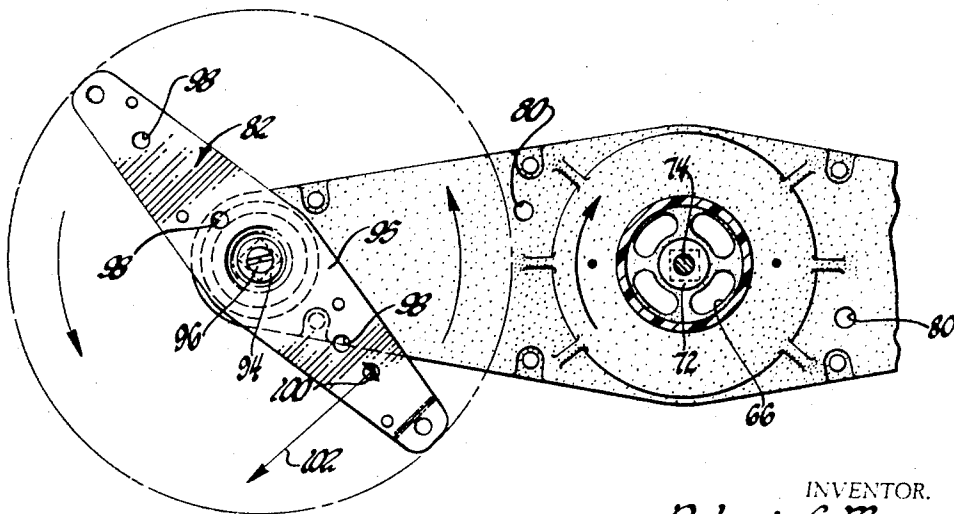


Fig. 4

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DISHWASHER WITH MULTIPLE SPRAY ARM
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3 Claims

ABSTRACT OF THE DISCLOSURE

A domestic dishwasher fluid distributing system including a cleaning chamber in which are located a pair of oppositely rotating lower spray arms driven to produce a high velocity, generally upwardly directed, continually varying spray pattern. The system further includes a vertical spray tube on one of the lower arms with an output nozzle that shoots a fluid stream against an improved, nonsymmetrical wobble type deflector that produces a nonrepeating, high velocity downward spray pattern that cooperates with the upwardly directed spray pattern for producing an improved distribution of cleaning fluid throughout the cleaning chamber.

This invention relates to dishwashing apparatus and more particularly to an improved fluid distributing system for automatically operated domestic dishwasher appliances.

In dishwashing apparatus cleaning chambers, it is desirable to fill most of the space therein with racks and the like to support soiled articles and yet include within a limited remaining space, means for producing a thorough distribution of cleaning fluid to all parts of the dishwashing chamber.

Accordingly, an object of the present invention is to improve dishwasher appliances by the provision therein of an extremely compact water distribution system capable of distributing cleaning fluid through all parts of a dishwashing chamber and defining a highly nonrepeatable fluid distribution pattern for removing soil from articles within the chamber.

Another object of the present invention is to improve dishwashing apparatus of the type including a rotatable horizontal spray arm by the provision of one end of the spray arm of a second horizontal spray arm that is rotated opposite to the first spray arm and at a speed differing from that of the first spray arm to produce a high velocity fluid pattern advancing about the outer periphery of a cleaning chamber of a dishwasher and periodically arranged in close proximity to a special article containing rack within the chamber to direct a multidirectional jet stream against articles therein capable of cleaning soiled surfaces facing at random with respect to the axis of rotation of said first spray arm.

Still another object of the present invention is to improve a fluid distributing system for a dishwasher including a horizontal spray arm having a reactive jet port therein for producing a force on said arm to rotate at about a first axis and thereby advance nonreactive jets from the spray arm through a dishwasher chamber and wherein a second horizontal spray arm is attached to the first spray arm for rotation therewith and for rotation relative thereto in a sense opposite to the direction of rotation of the first arm and wherein the second arm includes reactive jet port means therein operative to drive said second arm at a speed in excess of the speed of rotation of said first arm to produce a higher velocity spray pattern on the outer end of said first arm within the cleaning chamber.

A further object of the present invention is to improve

distributing systems of the type set forth in the preceding objects wherein a rotatable, wobbly deflector is located above the spray arms and includes means to receive a fluid stream therefrom and to return the stream at a high velocity and a highly nonrepeatable pattern across the full planar extent of an upper dish rack located therebelow.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

FIGURE 1 is a view in vertical section of dishwashing apparatus including the present invention;

FIGURE 2 is a view in perspective of a fluid distributing water deflector of the present invention;

FIGURE 3 is a sectional view through the deflector of FIGURE 2; and

FIGURE 4 is an enlarged fragmentary top elevational view of portions of a multiple spray arm arrangement in the present invention.

Referring now to FIGURE 1, a dishwasher 10 is illustrated including an outer casing 12 that surrounds an inner liner 14 defining a dishwashing chamber 16 closed at the front thereof by a dishwasher closure 18 and having at the bottom thereof a depressed sump 20 leading to a pump and motor assembly 22 of a type set forth more particularly in copending United States application Ser. No. 341,209, filed Jan. 30, 1964, and now Patent No. 3,265,311. In the illustrated arrangement, the dishwasher 10 includes a separate top or wood chopping block 24.

The door construction of the closure 18 is more specifically set forth in copending United States application Ser. No. 403,479, filed Oct. 13, 1964 by Braden et al., now Patent No. 3,292,645, and for purposes of the present invention, it is merely necessary to indicate that it closes an access opening 24 to the dishwashing chamber 16 which has a peripheral seal 26 in surrounding relationship therewith that is positioned to engage the top and two sides of the closure 18. The bottom of the closure is sealed with a skirt 28 that overlaps a front strip member 30 extending across the front edge of the sump 20 and defining the bottom edge of the access opening 24. The closure 18 is pivotally mounted by means such as pins 32 for forward and downward movement with respect to the outer casing 12 to a point where a bottom rack 34 within the dishwashing chamber 16 can be pulled outwardly thereof through the access opening 24.

Within the dishwashing space 16 is also located an upper or top article containing rack 36 also movable into and out of the chamber 16 through the opening 24.

The upper rack 36 may be used for cups or bowls, glasses, saucers, and the like, while the lower rack 34 is adapted for retaining plates, bowls, serving dishes, and a removable silverware basket 38 which includes inverted cup-shaped handles 40 at either end thereof for convenience in handling. The silverware basket 38 may be divided into a large number of sections for separating the utensils being washed.

The racks and basket 34, 36, 38 are made of heavy gage steel wires which are coated with white vinyl, and as readily observable from viewing FIGURE 1, are arranged to occupy a substantial portion of the volume of the chamber 16.

In the illustrated arrangement, nylon rollers 42 are provided that glide on stainless steel guides such as 44 for the lower rack and extension guides 46 for the upper rack 36 which are screw fastened to the side walls of the washing chamber. The lower rack 34 includes a guard portion

48 that surrounds an upstanding spray column or tube 50 of a fluid distributing system 52.

The guard portion 48 is U-shaped to provide sufficient relief between the lower rack 34 and the fluid distributing system 52 whereby the rack is readily located in a loading position exteriorly of the dishwashing chamber 16 or in its loaded position as seen in FIGURE 1.

The fluid distributing system 52 connects to the motor driven pump assembly 22 for distributing fluid from the sump region 20 during a predetermined washing cycle of operation which follows a fill phase and is followed by a rinsing and drying cycle as is typically the case in automatically operated domestic dishwashers. A typical dishwashing operating sequence is more specifically set forth in the above mentioned Braden et al patent application.

For purposes of describing the present invention, however, it is only necessary to consider the washing phase of the washer operation giving particular attention to the operation of the fluid distributing system 52 which includes an improved multiple spray arm configuration 54 and an improved water deflector 56 cooperating with one another to produce an unusually complete and thorough fluid washing pattern within the dishwashing chamber 16. This pattern is especially suited for cleaning the upwardly directed surfaces of articles located at any point on the upper rack 36 and also will more thoroughly clean the randomly located soiled surfaces on silverware located within the basket 38.

As seen in FIGURE 1, the multiple spray arm configuration 54 includes a first lower horizontal hollow spray arm 58 located beneath the lower rack 34. The arm 58 has a downwardly opening inlet 60 that circumscribes the top of an axial flow pump housing 62 of the pump and motor assembly taught in the aforementioned application Ser. No. 341,209. Above the inlet opening 60 the lower spray arm 58 has a plate 64 attached thereto including a plurality of ports 66 therein arranged circumferentially thereabout to place the interior 68 of the hollow arm 58 in communication with the interior 70 of the vertically extending spray tube 50.

A square shanked bearing 72 indexes in a square opening in the spray arm plate 64 and is retained at the top of a spindle 74 on the motor pump assembly 22 by suitable fastening means such as a nut 76. When the pump is operating to direct water to the interior of the spray arm 54 as during a wash or rinse cycle of dishwashing operation, a spray pattern is produced which is unusually well suited for cleaning articles within the upper rack 36 and the silverware basket 38. More particularly, water issuing into the interior 68 of the lower spray arm 54 will be directed therefrom at one end of the arm 54 through a fluid reaction port 78 that is configured to produce a reactive force on the arm 54 that in the illustrated arrangement, produces clockwise rotation of the arm 54 about a first axis of rotation defined by the spindle 74. The arm 58 includes a plurality of upwardly facing spaced apart ports 80 on either side of the axis of rotation thereof which direct fluid upwardly into the dishwasher chamber 16 without the imposition of a noticeable reaction on the spray arm 54.

The water issuing from the ports 80 sweeps with the rotating arm 54 to define a continually clock-wise advancing sheet of cleaning fluid on either side of the axis of rotation of the lower arm 54 for removing soil from many of the articles within the lower basket 34.

Because of the uni-directional character of the rotation of the arm 54, the sheet of water is most effective in cleaning surfaces that directly face the sheet as it is advanced by the arm 54. In order to more adequately clean opposed surfaces on articles facing in a direction opposite to that of the rotation of the arm 54, in accordance with certain principles of the present invention, on the opposite end of the arm 54 is located a secondary horizontal spray arm 82 that is attached to the lower spray arm 54 for rotation therewith. As best illustrated in FIGURES 1 and 4, the

secondary spray arm is also a horizontally disposed arm that is located above the arm 54. The arm 82 is hollow and includes an interior opening 84 thereto which circumscribes an upstanding hub 86 on the end of the arm 54 opposite port 78 therein. An opening 88 in hub 86 communicates the interior 68 of arm 54 with the interior 90 of arm 82 and thus communicates the interior 90 with the outlet from the pump of the motor pump assembly 22. In the illustrated arrangement, the arm 82 has a screw 92 directed through a center opening therein. The screw 92 passes through a square shanked bearing 94 that indexes against flat surfaces in the opening through an upper metal cover 95 of the arm 82. The end of the screw 92 is threadably secured to the hub 86 and the head 96 of the screw 92 and engages the top of bearing 94.

In the illustrated arrangement, the upper cover 95 of the arm 82 includes a plurality of spaced apart upwardly opening ports 98 that will direct fluid from the interior of the arm 82 upwardly through the dishwashing chamber 16 without producing any noticeable reactive force on the arm 82. The arm 82 in addition to rotating with arm 54, also includes means thereon for causing it to rotate about an axis defined by the screw 92 relative to the rotating arm 54 and more specifically in a direction of rotation opposite to the rotation of the arm 54. The cover 95, thus, includes a reactive port 100 at one side thereof which faces in a direction and is configured so that a jet of fluid 102 will issue from the interior of the auxiliary arm 82 and impose a reactive force thereon causing the arm 82 to rotate in a counter-clockwise direction and at a speed greater than the speed of rotation of the arm 54. As a result, a sheet of fluid will exist above the arm 82 formed by water issuing through the upwardly facing openings 98 in the cover 95 which sheet of fluid advances to define a circular pattern as outlined in FIGURE 4. Moreover, the velocity of the arm 82 will at times be additive with the velocity of the arm 54 whereby fluid issuing from the opening in the cover 95 will, relative to articles within the chamber 16, have an amplified velocity found to be extremely effective in removing soil.

Moreover, by virtue of the oppositely rotating plurality of horizontal spray arms, a continually varying fluid flow pattern will be produced within the chamber 16 capable of producing an extensive coverage of articles within the washer. When the secondary spray arm 82 underlies the silverware basket 38, the water issuing upwardly from the openings 98 therein will have a continually varying velocity and a resultant cleaning pattern especially suited for removing soil from the randomly oriented surfaces on forks, knives, spoons, and the like.

In addition to the improved spray pattern resulting from the above described multiple spray arm configuration, the fluid distributing system 52 of the present invention also includes a downward flow of fluid that is produced by water passing upwardly from the hollow interior 70 of the spray tube 50 which is formed with an enlarged bulb shaped housing 104 at the upper end thereof which may include a plurality of nonreactive ports therein of a type more specifically set forth in the above mentioned Braden et al. patent. Additionally, the housing 104 includes a nozzle 106 cocked at an angle to the vertical axis of the spray tube 50 and aimed through a passageway defining guard 108 on the upper rack 36 against the rotatable water baffle or deflector 56 that is attached to the top 110 of the inner liner 14 of the dishwasher.

As the spray tube 50 rotates, a jet of water issuing from a nozzle outlet 108 therein will trace an orbiting path around the center of the deflector 56.

In accordance with certain other principles of the present invention, this orbiting jet of water is directed through a central opening 112 in a circular plate 114 secured by suitable fastening means such as pins 116 depending from the bottom edge 118 of a plurality of angularly spaced vanes 120 that cooperate to form a plurality of completely different shaped concave pockets 122, 124, 126,

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128, 130, and 132 in a deflector member 134 which is a round molded plastic part including a bearing 136 fit in the center thereof and a cavity 138 between the top wall 110 and the deflector. The form and shape of the diverter member 134 in the water deflector assembly 56 of the present invention is more specifically discussed in the above mentioned Braden et al. patent wherein it is explained that by virtue of the irregularly shaped pockets the diverter member 134, when secured to the top wall 110 by an adapter 140 having a reduced diameter spindle section 142 directed through the bearing 136 to clear the inner diameter of bearing 136 so that the deflector member 134 will rock and wobble about the spindle 142 as it rotates in response to reacting of the orbiting jet of the nozzle 106 against the irregularly shaped pockets therein.

While the movement of diverter member 134 will cause an irregular and nonrepeating return of water downwardly through the dishwashing chamber 16, the provision of the lower cover plate 114 improves this irregular distribution of fluid in the following manner. As best seen in FIGURE 3, the orbiting jet of fluid will pass through the central opening 112 in the cover 114 and follow the concave surface of a particular one of the pockets such as 130 as seen in FIGURE 3. The fluid fills the pocket 130 between the concave surface thereof and the cover 114 so that a jet of fluid will issue from a peripheral opening such as 132 between the peripheral edge of the circular cover plate 114 and the outer periphery of the pocket 130 and shoot toward the outer wall of the dishwashing chamber 16 more or less as seen in FIGURE 3. In addition to the peripheral jets of fluid issuing between the pockets 122, 124, 126, etc. and the peripheral edge of plate 114, the water baffle 56 includes a plurality of randomly placed slots 144, 146, 148, 150, 152, 154 that communicate the interior of each of the pockets 122, 124, 126, 128, 130, 132 respectively. The slots in the cover plate 114 are formed therein completely at random without any repeatable pattern and each of the slots has a tab 156 located in overlying relationship therewith and extending upwardly from the plate 114 inwardly toward the axis of movement of the diverter member 134 whereby when the orbiting jet fills one of the pockets 130 with fluid, a part of the fluid will be diverted by tab 156 and forced as a downwardly directed jet through the water chamber 16 at a sharper angle than the peripheral jets thereby to produce a more thorough coverage on the upper surfaces on articles in the top rack 36 to more effectively remove soil therefrom.

Because of the irregular form of each of the pockets and the irregular spacing of the slots therein, the pattern of the orbiting jet as it is deflected from the water baffle assembly 56 of the present invention is unusually complex and is obtained without unnecessarily reducing the space within a dishwasher chamber occupied by articles being cleaned and without modifying a known orbiting jet supply of fluid of the type that occupies a limited amount of space within a lower part of a cleaning chamber of a dishwasher.

While the particular pattern produced by the multiple arm configuration 54 and the improved water baffle 56 is unusually suited for removing soil from articles placed at specific points in the chamber 16, the complex and non-repeatable continually varying fluid pattern produced thereby also will result in an unusually thorough and complete distribution of water from the sump region 20 throughout the upper chamber 16 during both washing and rinsing cycles of dishwasher operation.

While the embodiment of the present invention as herein disclosed constitutes a preferred form it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. In combination, casing means defining a dishwashing chamber having a sump adapted to contain water and means in communication with said sump for distributing

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water into said chamber for washing dishes or the like, said distributing means including a first rotatable horizontal spray arm having an inlet opening facing downwardly and a spray port facing upwardly in said chamber, a vertical spray tube attached to said spray arm for rotation therewith and extending upwardly to a central part of said chamber, said spray tube including a hollow column connected to said spray arm and in communication with the inlet thereof, said column having a hollow spray header on the top thereof with a spray port on the bottom thereof facing downwardly and a port on the top thereof facing upwardly and outwardly, said last named port comprising a nozzle having an axis at an angle to the axis of said hollow column, deflector means above said nozzle having a plurality of downwardly facing pockets at least one of which is in alignment with the axis of said nozzle and configured reactingly to rotate said deflector means in response to impingement thereon by a jet of water distributed from said nozzle, and means for rotatably and universally supporting said deflector means whereby said deflector means wobbles as it rotates in response to said jet, said deflector means including a cover underlying said downwardly facing pockets in spaced relationship thereto, said cover having an inlet port therein through which said jet of water from said nozzle is passed into said pockets, said cover and downwardly facing pockets having an outlet therefrom at the periphery of said distributing means, said cover cooperating with each of said downwardly facing pockets to form a space between said inlet opening of said cover and said peripheral openings on said distributing means for producing a high velocity jet of fluid from the outer periphery of said distributing means directed downwardly through said chamber and outwardly of the axis of said vertical spray tube.

2. In the combination of claim 1, said first horizontal rotatable arm having a central hub thereon defining the axis of rotation of said first arm, said arm having a port in one end thereof reactingly configured to cause rotation of said arm, said first arm including a plurality of outlet ports configured to pass a nonreactive stream of fluid from said arm upwardly through said chamber at a point closely adjacent the axis of rotation of said first arm, a second horizontal spray arm attached to the opposite end of said first arm, means for rotatably supporting said second arm on said first arm to define an axis of rotation for said second arm with respect to said first arm, said second arm including an inlet port communicating with the inlet to said first arm, said second arm having a plurality of nonreactive outlet ports therein directed upwardly through said chamber for distributing fluid from said sump region interiorly of said chamber at a point radially outwardly of the region of said chamber covered by said nonreactive ports in said first arm, means forming a port in one end of said second arm configured to reactingly rotate said second arm about said second axis in a direction opposite to the sense of rotation of said first arm, said first and second driving ports having a relative flow area whereby said arms are rotated at different speeds, said differential speed of rotation of said arms and the opposite direction of rotation thereof producing a continually varying relative velocity between the water passing through said nonreactive ports in said first arm and water passing through the nonreacting ports in said second arm.

3. In combination, casing means defining a dishwashing chamber having a sump adapted to contain water and means in communication with said sump for distributing said water in said chamber for washing dishes or the like, said distributing means including a first rotatable horizontal spray arm having an inlet opening facing downwardly and a spray port facing upwardly in said chamber, a vertical spray tube attached to said spray arm for rotation therewith and extending upwardly to a central part of said chamber, said spray tube including a hollow column con-

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 nected to said spray arm and in communication with the inlet thereof, said column having a hollow spray header on the top thereof with a spray port on the bottom thereof facing downwardly and a port on the top thereof facing upwardly and outwardly, said last named port comprising a nozzle having an axis at an angle to the axis of said hollow column, deflector means above said nozzle having a plurality of downwardly facing pockets at least one of which is in alignment with the axis of said nozzle and configured reactingly to rotate said deflector means in response to impingement thereon by a jet of water distributed from said nozzle, and means for rotatably and universally supporting said deflector means whereby said deflector means wobbles as it rotates in response to said jet, said deflector means including a cover underlying said downwardly facing pockets in spaced relationship thereto, said cover having an inlet port therein through which said jet of water from said nozzle is passed into said pockets, said cover and downwardly facing pockets having an outlet therefrom at the periphery of said distributing means, said cover cooperating with each of said downwardly facing pockets to form a space between said inlet opening of said cover and said peripheral openings on said distributing means for producing a high velocity jet of fluid from the outer periphery of said distributing means directed downwardly through said chamber and outwardly of the axis of said vertical spray tube, said cover of said deflector means including a plurality of slots there-

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 in located outwardly of said inlet port in said cover, means extending from said cover in overlying relationship with each of said slots for intercepting a part of the fluid flowing through velocity increasing passageways between each of said downwardly facing pockets and said cover and diverting said part downwardly through said chamber and at a lesser included angle with respect to the axis of said vertical spray tube for increasing the extent of distribution of water downwardly from said distributing means through said chamber.

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25 ROBERT L. BLEUTGE, Primary Examiner

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