Sept. 2, 1952 J. G. IDLE 2,608,983

DISHWASHING APPARATUS HAVING A PROPELLER AND A FLUID DEFLECTING BAFFLE ASSOCIATED THEREWITH

Filed Nov. 23, 1945 3 Sheets-Sheet 1

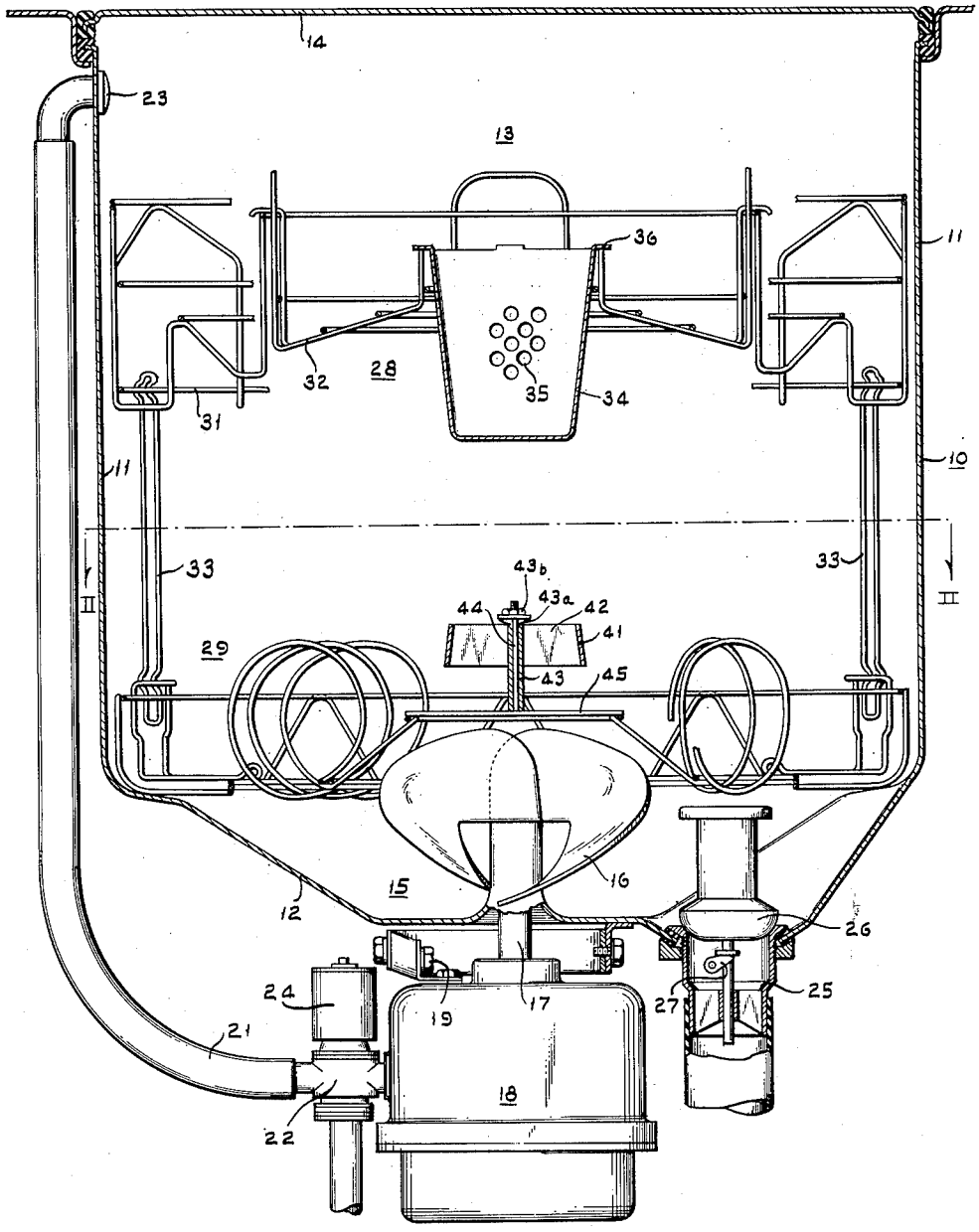


FIG. 1.

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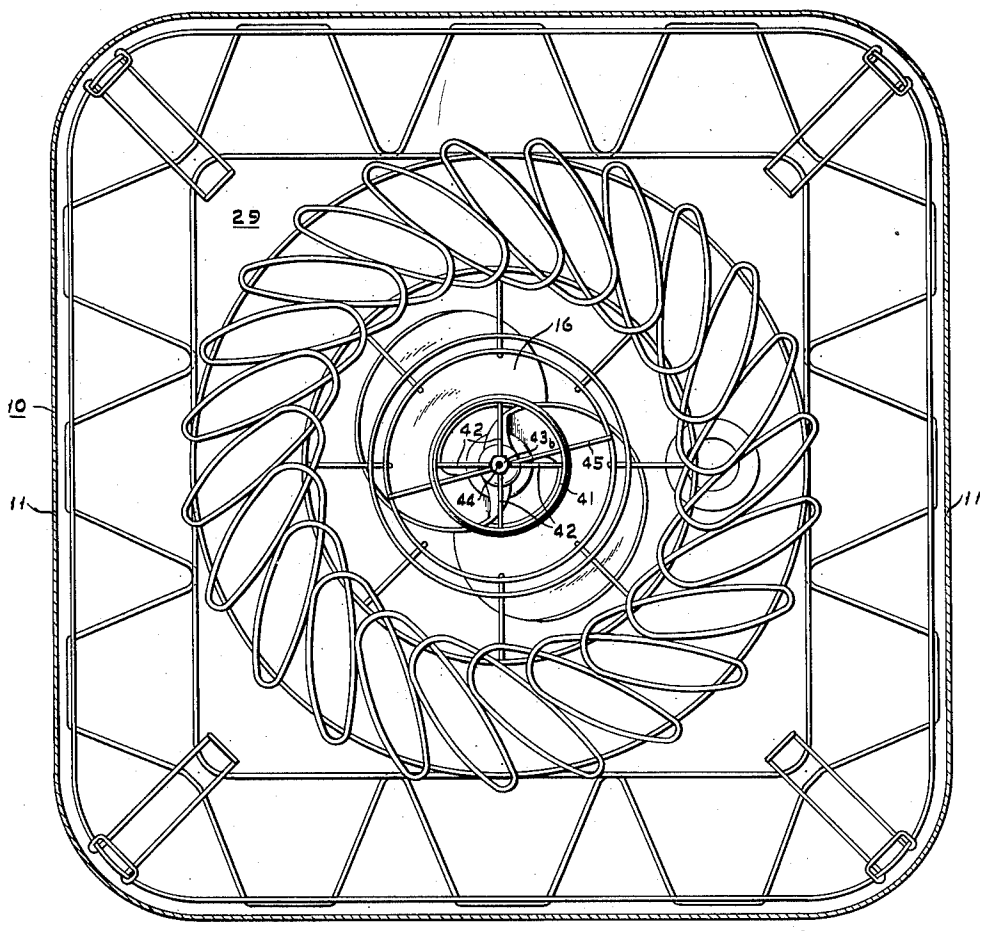


FIG. 2.

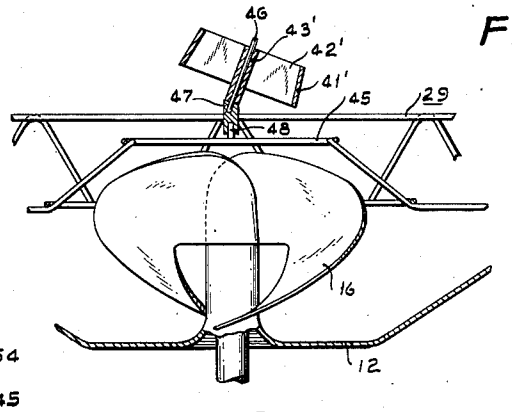


FIG. 3.

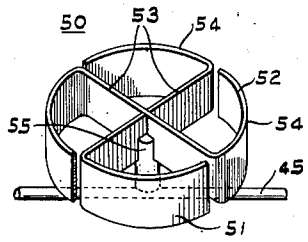


FIG. 4.

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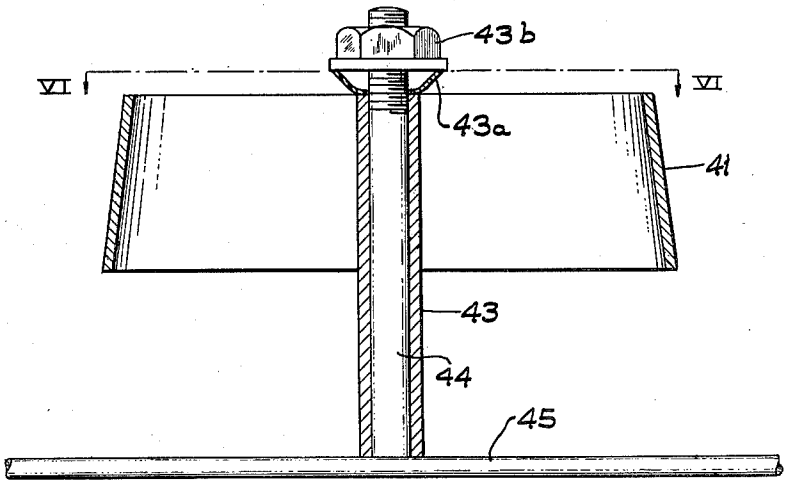


FIG. 5.

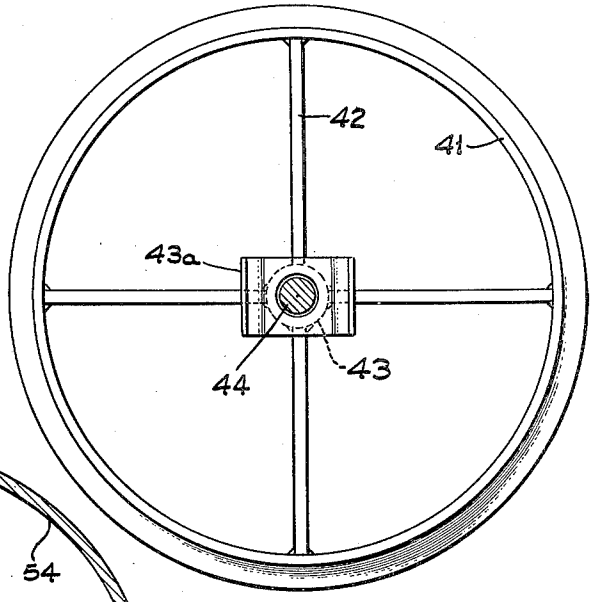
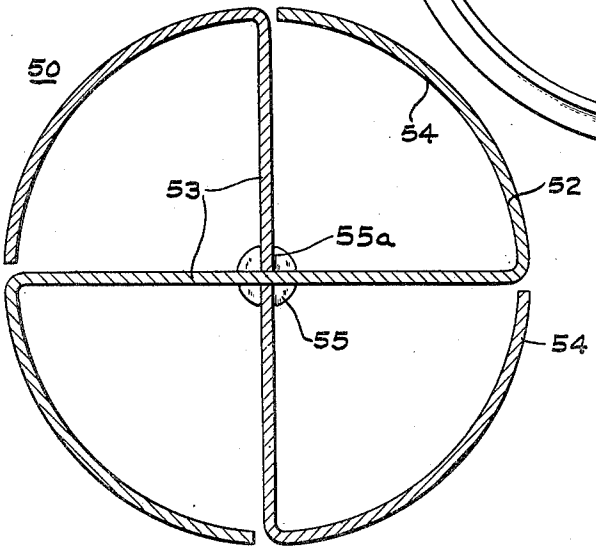


FIG. 6.

FIG. 7.



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DISHWASHING APPARATUS HAVING A PROPELLER AND A FLUID DEFLECTING BAFFLE ASSOCIATED THEREWITH

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Application November 23, 1945, Serial No. 630,344

4 Claims. (Cl. 134—183)

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My invention relates to apparatus for washing dishes and has for an object to provide improved apparatus of this kind.

A further object of the invention is to provide substantially uniform distribution of cleaning fluid which is projected by a rotary impeller over the dish-storing racks of a dishwasher.

It is a further object of the invention to uniformly distribute cleaning fluid over the dishes stored in the various regions of a rack which is spaced above the water-projecting impeller of a dishwashing machine.

These and other objects are effected by my invention as will be apparent from the following description and claims taken in connection with the accompanying drawings, forming a part of this application, in which:

Fig. 1 is a vertical sectional view of a dishwashing machine of the rotary impeller type constructed and arranged in accordance with my invention;

Fig. 2 is a sectional view taken from the plane II—II of Fig. 1;

Fig. 3 is a view showing a second embodiment of the invention and discloses a part of the apparatus in Fig. 1;

Fig. 4 is a perspective view of a modified form of the deflectors shown in Figs. 1 and 3;

Fig. 5 is an enlarged axial sectional view of the fluid deflecting baffle shown in Figs. 1 and 2;

Fig. 6 is a section viewed from the plane VI—VI of Fig. 5; and

Fig. 7 is a horizontal section taken through the modified baffle shown in Fig. 4.

Referring now to Figs. 1 and 2 of the drawings, I have shown my invention applied to a dishwasher of the domestic type and including a generally rectangular vat structure 10 having side walls 11 and a bottom wall 12 which enclose a washing chamber 13, the latter being open at its top and closed by a suitable gasketed cover 14. The bottom wall 12 of the vat is sloped downwardly and inwardly to define a sump 15 for washing water. A rotatable impeller 16 is disposed centrally of the sump for projecting water throughout the washing chamber 13. The impeller 16 is carried by the upper end of a shaft 17 driven by an electric motor 18, the latter being carried by a suitable bracket structure 19 from the bottom of the vat.

Washing water is conducted to the chamber 13 through a conduit 21 having a valve 22 connected therein, the conduit 21 terminating in a spray nozzle 23 arranged in the uppermost region of the washing chamber 13. The valve 22 may be

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electrically operated and is provided with a solenoid 24, the energization of which may be controlled by a switch, not shown. Vitiated water is discharged from the chamber 13 through a drain conduit 25, a suitable valve 26 being employed to control the discharge of water. The valve is opened and closed by a cam 27 which may be actuated manually or in any other suitable manner well known in the art.

Dishes are supported within the washing chamber 13 by upper and lower rack structures generally indicated at 28 and 29, respectively. These racks may be of any well-understood construction and, as the racks per se form no part of the present invention, their construction need not be described in detail. Suitable upper and lower rack structures of the type shown are disclosed, respectively, in my copending applications, Serial No. 613,768, filed August 31, 1945, and which issued as Patent Number 2,469,966, and Serial No. 593,921, filed May 15, 1945, and now abandoned. The lower rack 29 is carried by the bottom wall 12 of the vat and supports relatively large dishes, such as dinner plates, vegetable dishes and meat platters during operation of the washer. The upper rack 28 is preferably made in two sections, the outer section being shown at 31 and the inner section at 32. The outer section 31 is carried by wire columns 33 disposed in the corners of the washing chamber and clipped to the lower rack. The upper ends of the columns 33 are clipped to the outer rack section 31. The inner rack section 32 is carried by the outer rack section 31 and is removable in order to gain access to the lower rack 29 without removing the outer rack section 31.

The outer and inner rack sections 31 and 32 are usually employed to support lighter tableware, such as cups, saucers and drinking glasses during the washing operation. Silverware to be washed is carried by a removable cup-shaped container 34, the side and bottom walls of which are perforate throughout their extent, a few of the perforations being shown at 35. The silverware container 34 is provided with outwardly-extending fingers 36 which are supported by the upper inner rack section 32. As shown, the silverware basket or container 34 is centrally disposed with respect to the upper rack.

During the operation of a washer of the type disclosed, the impeller 16 is rotated at a relatively high velocity of, for example, 1750 R. P. M., and picks up water from the sump 15 and projects it upwardly and outwardly within the washing chamber 13. The upward movement of the

water is imparted, of course, by the rapidly rotating inclined blades which define segments of a helix, and the outward movement of the water is due to the centrifugal force of the water which is given a rotary movement as it is elevated by the blades 16. The two forces imparted to the water cause it to rise in an upward and outward direction so that a vortex of water is produced. This movement of water is produced by all impellers known to me and which have been designed to move a large body of water at high efficiencies. Such impellers deliver large quantities of water to the lower rack and are highly effective in cleaning the dishes therein and also project copious quantities of water to the outer portions of the upper rack structure 28. The water rising to the upper rack is carried there in part directly from the impeller, but a large portion of this water is deflected to the upper rack by the plates carried by the lower rack, usually in annular configuration about the impeller. The result is that the center of the upper rack receives less water than the outer portion thereof and it has been found by test that dishes located adjacent the center of the upper rack are cleansed less than the dishes in the remaining portion of the washer.

In accordance with my invention, means is provided for deflecting water from the upwardly-moving vortex and for directing said water in a generally vertical direction toward the center of the rack. The means which I employ for effecting this water-deflecting operation comprises a baffle or skirt 41 which is generally cylindrical and spaced above the impeller 16 a distance determined by the pattern of water projected by the impeller. The arrangement is such that the lower edge of the skirt 41 is disposed within the vortex of water and deflects a portion of the water upwardly through the skirt toward the center of the upper rack. The skirt 41 is supported by a plurality, four in number, of spokes or vanes 42 which are fixed at their inner ends for example, by brazing, to a hub 43. The latter is hollow and fits over a vertically-extending pin 44 having its lower end brazed or otherwise secured to a supporting cross member 45. The latter is carried by the lower rack structure 29 and may, for example, be soldered thereto. The hub 43 of skirt 41 may be fixed upon the pin 44, as described hereinafter, or may be mounted so that it can rotate relative the pin 44, as shown in Figs. 1, 2, 5 and 6.

Numerous tests conducted by me have indicated that the results obtained with the skirt 41 stationary are superior to those obtained when the skirt 41 is rotated, although satisfactory distribution of water to the upper rack structure is obtained with a rotating skirt. With the stationary skirt 41, the water moves upwardly from within the skirt 41 in a generally vertical direction while with a rotating skirt, the upwardly-moving pattern of water forms a helix of relatively long pitch because of the rotating motion imparted to the skirt 41 by the vortex of water projected from the impeller. When employing a rotating skirt, the speed or R. P. M. thereof must be maintained at relatively low values in order to reduce the centrifugal force of the water discharged from the skirt. For example, a skirt of the type disclosed when operating at approximately 10 R. P. M. gave best results. If unrestrained, the skirt will rotate at a high speed of the order of 600 R. P. M. The speed may be reduced by suitable braking means. For example, a spring 43a may bear on the hub 43 of the skirt, the bias of the spring 43a and the amount of friction provided thereby being adjustable by a nut 43b. Where a stationary skirt is employed, the nut 43b is drawn tightly on the spring 43a so that the friction between the spring 43a and the hub 43 is sufficient to prevent rotation of the hub 43.

The amount of water deflected to the upper rack is determined by the spacing of the skirt above the impeller. More water may be deflected by reducing this spacing and, conversely, by increasing the spacing, less water is deflected. By varying the diameter of the skirt, the area of the upper rack which is subjected to the deflected water is varied; said area being relatively small when a small diameter skirt is employed, and vice versa.

The second embodiment of my invention is disclosed in Fig. 3 wherein the skirt 41' is mounted with its axis oblique or at an acute angle to the vertical and, in this embodiment, the hub 43' is carried by an oblique pin 46. The latter is carried by a member 47 disposed above the impeller 16. The member 47 is supported by a pivot 48 which is fixed, as by soldering, to the supporting cross member 45 of the lower rack 29, which pivot 48 is coaxial with the impeller. In this embodiment as in the first embodiment, the deflecting skirt 41' may be fixed to or may rotate about its oblique pin 46 under the influence of the water deflected thereby. The means for retaining the skirt 41' stationary with respect to the pin 46 or permitting rotation thereof relative the pin 46 may be the same as disclosed heretofore in connection with the skirt 41 of Figs. 1 and 2. In this embodiment, only an arcuate portion of the lower edge of the skirt 41' dips within the vortex of water projected by the impeller 16. In employing a deflector as shown in Fig. 3, with its axis oblique, it is preferable that the deflector 41' not only rotate about the oblique pin 46 but that it gyrate about a vertical axis. Accordingly, the member 47 is mounted on the pivot 48 to provide rotation of the member 47 about a vertical axis. In the rotary and gyrating operation of the deflecting structure of the type shown in Fig. 3, it will be found that the skirt 41' will rotate about its oblique axis at a relatively high speed and will gyrate about the vertical axis at a lower speed. For example, with one form of deflector of this type which I have tested, the skirt 41' rotated at a speed of approximately 300 R. P. M. about its oblique axis and gyrated about its vertical axis 48 at a speed of approximately 100 R. P. M.

The pattern of water projected in a generally vertical direction by the inclined skirt 41', as shown in Fig. 3, when rotating and gyrating defines an inverted vertical cone within the main vortex of water projected by the impeller. When the deflector skirt 41' is maintained stationary in its oblique position or is permitted to rotate only about the pin 46 without gyration about the pin 48, the latter is secured as, by soldering, to the member 47. The water deflected by the skirt 41' under these conditions, while generally vertical towards the center of the upper rack, is not as uniformly distributed as when gyration about the vertical axis is permitted.

The skirt 41 which I have shown has been described as generally cylindrical and may be formed as a true cylinder. As shown, the skirts 41 and 41' are tapered or frusto-conical in configuration with its smaller end uppermost. The shape of the skirt depends upon the area of the

portion of the upper rack to be subjected to the deflected water, the pattern of the water projected by the impeller and the amount of spacing between the impeller and the skirt which is permitted by the washer structure. Therefore, the term "generally cylindrical" which I employ throughout the specification and claims is to be interpreted as covering not only true cylindrical structures but frusto-conical and other structures which are approximately cylindrical.

In this connection, I have shown in Fig. 4, a relatively inexpensive deflector 50 which may be employed instead of the deflectors shown in Figs. 1 and 3. The deflector 50 is formed of a pair of S-shaped members 51 and 52, each of which include diametrically-extending portions 53 and arcuate portions 54, the latter complementing each other to form a water-deflecting skirt. A hub 55 with a cruciform slot 55a receiving the crossed portions 53 of the members 51 and 52 is brazed or otherwise secured to the portions 53. The hub 55 is carried by the cross member 45 of the lower rack in the manner disclosed heretofore in connection with the hub 43.

From the foregoing description, it will be apparent to those who appreciate the great importance of proper water distribution in a dishwasher of the type disclosed, that I have provided an effective and inexpensive device for improving the washing efficiency of such dishwashers. All tableware stored in the upper rack is subjected to the uniformly projected water and is thoroughly cleansed. The construction I have provided is inexpensive to fabricate and requires no maintenance or adjustment by the operator. Furthermore, less care is required in loading the lower rack of a dishwasher constructed in accordance with this invention, as the distribution of water to the upper rack is not dependent upon any particular arrangement of plates in the lower rack. The construction also permits the washing of silverware in the upper rack of a machine where they may be readily removed by the operator for toweling if desired.

While I have shown my invention in several forms, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications without departing from the spirit thereof.

What I claim is:

1. In a dishwashing machine, the combination of a vat having a sump formed in the bottom thereof for containing a body of washing water, a dish-supporting rack disposed in an upper region of the vat, a rotatable impeller disposed within the sump for projecting water upwardly and outwardly in a vortex within the vat, means for rotating the impeller, a skirt arranged substantially coaxially with respect to the impeller and spaced thereabove, and means for rotatably supporting said skirt, said skirt having its lower edge adapted to dip in the vortex of water projected by the impeller for deflecting a portion of the projected water from the vortex, said skirt having an axial length which is effective to direct the deflected water engaging the inner surfaces of the skirt in a generally vertical direction toward the center region of the rack.

2. In a dishwashing machine, the combination of a vat having a sump formed in the bottom thereof for containing a body of washing water, upper and lower dish-supporting racks disposed within the vat, a basket for silverware carried by the upper rack and disposed centrally thereof, a rotatable impeller disposed within the sump for projecting water upwardly and outwardly through a predetermined region of the vat, means for rotating the impeller, a water-deflecting skirt arranged substantially coaxially with respect to the impeller and spaced thereabove, said skirt having its lower edge disposed within said region of the vat for deflecting a portion of the projected water therefrom and said skirt having an axial length effective to direct the deflected water generally vertically toward said silverware basket, and means carried by the lower rack for supporting the water-deflecting skirt.

3. In a dishwashing machine, the combination of a vat having a sump formed in the bottom thereof for containing a body of washing water, upper and lower dish-supporting racks disposed within the vat, a basket for silverware carried by the upper rack and disposed centrally thereof, an impeller centrally disposed within the sump for projecting water in a vortex upwardly and outwardly within the vat, means for rotating the impeller about a generally vertical axis, a cylindrical band arranged substantially coaxially with and above the impeller, said band having a spoke extending radially inwardly therefrom for support of the band and a vertical pin carried by the lower rack and supporting said spoke; said band having its lower margin extending within said vortex of water for deflecting a portion of the water from the vortex and said band having an axial length effective to direct the deflected portion of water generally vertically within the vat and towards said silverware basket.

4. In a dishwashing machine, the combination of a vat having a sump formed in the bottom thereof for containing a body of washing water, spaced upper and lower dish-supporting racks disposed within the vat, a rotatable impeller disposed within the sump for projecting water upwardly and outwardly through a predetermined region of the vat, means for rotating the impeller, a water-deflecting skirt arranged substantially coaxially with respect to the impeller and spaced thereabove, said skirt having its lower edge disposed within said region of the vat for deflecting a portion of the projected water therefrom and said skirt having an axial length effective to direct the deflected water generally vertically toward the center of the upper dish-supporting rack and means carried by the lower rack for supporting the water-deflecting skirt.

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