

Oct. 7, 1941.

D. E. YOCHEM

2,257,930

APPARATUS FOR WASHING DISHES, SILVERWARE, AND THE LIKE

Filed Jan. 11, 1940

2 Sheets-Sheet 1

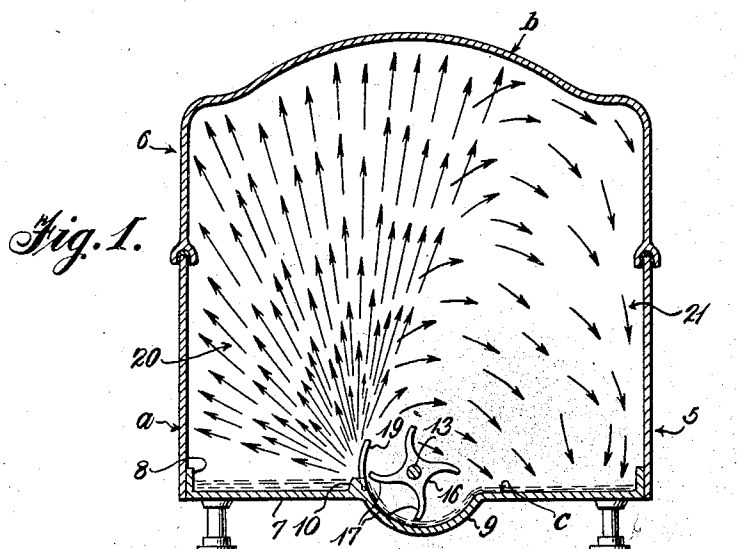
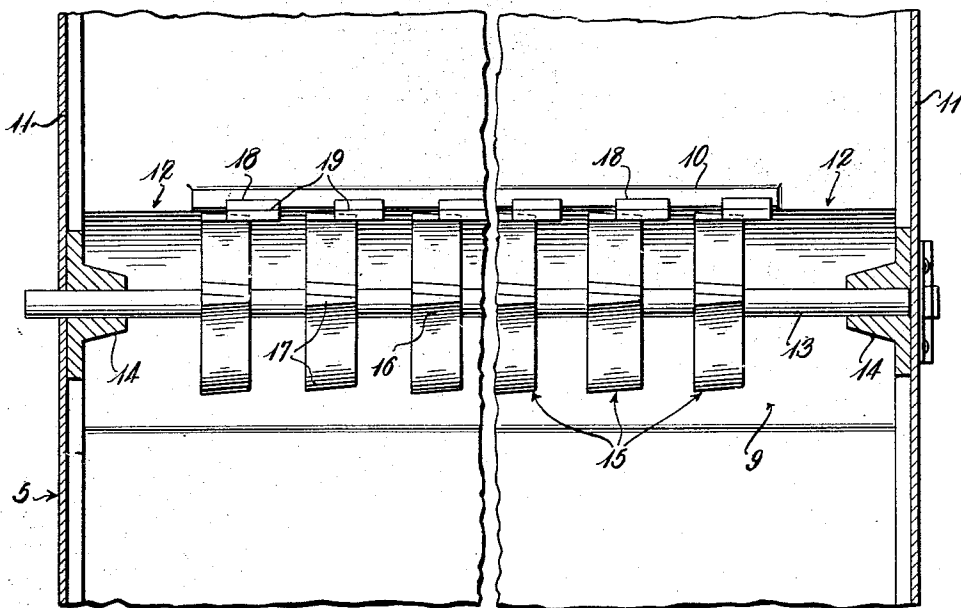


Fig. 2.



Inventor

Donald E. Yochem

By

James P. Burns

Attorney

Oct. 7, 1941.

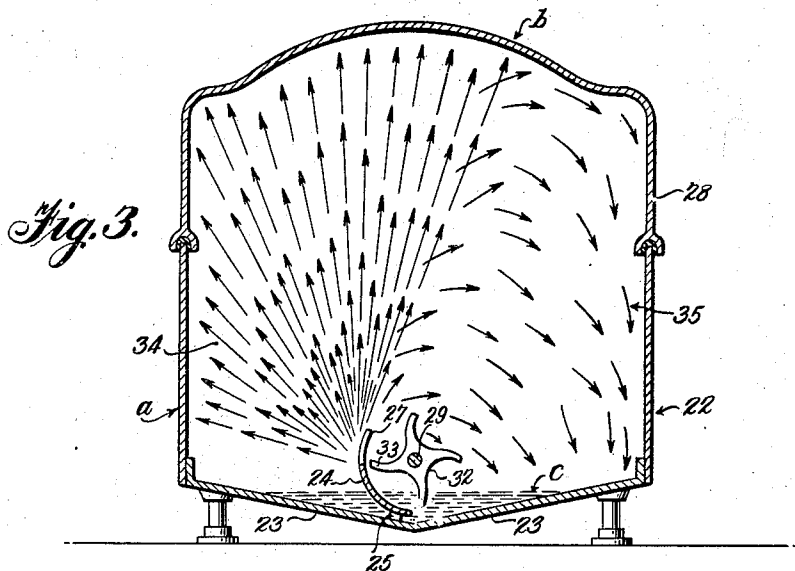
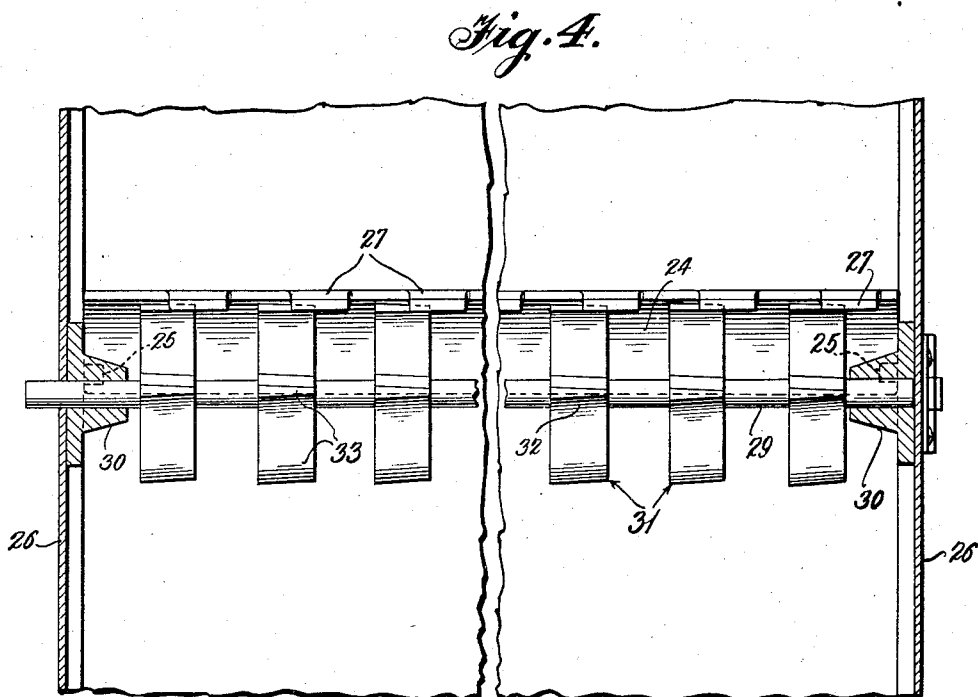
D. E. YOCHEM

2,257,930

APPARATUS FOR WASHING DISHES, SILVERWARE, AND THE LIKE

Filed Jan. 11, 1940

2 Sheets-Sheet 2



Inventor

Donald E. Yochem

By

James P. Burns

Attorney

UNITED STATES PATENT OFFICE

2,257,930

APPARATUS FOR WASHING DISHES,
SILVERWARE, AND THE LIKEDonald E. Yochem, Columbus, Ohio, assignor to
L. S. D., Inc., Dayton, Ohio, a corporation of
Ohio

Application January 11, 1940, Serial No. 313,443

7 Claims. (Cl. 299—63)

This invention relates to new and useful improvements in apparatus adapted for washing, rinsing, and/or drying such objects as dishes, silverware, glassware, and the like. More particularly, it relates to apparatus for impelling or dispersing washing, rinsing, and drying fluids throughout the interior of a housing or casing in which the objects to be treated are confined. The various fluid impelling mechanisms embodying this invention may be considered as modifications of the impelling mechanism disclosed and claimed in my Patent No. 2,137,971, issued November 22, 1938. The application is a continuation-in-part of my application Ser. No. 246,702, filed December 19, 1938.

In my aforesaid patent, I have not only disclosed fluid impelling means, but I have also disclosed a rack structure which is capable of supporting different styles and types of dishes, glassware, silverware, and the like in a very efficient and effective manner so as to take full advantage of the movement of the treatment fluids in the various portions of the housing interior; means for supplying the housing with the required amount of treatment fluid; means for readily draining the treatment fluid from the housing; and power means for driving the impeller mechanism. It is to be understood that the various impeller mechanisms embodying this invention are to be employed in combination with the additional apparatus disclosed in my patent, or its equivalent.

Impeller mechanism for dishwashing machines of the prior art may be arranged generally in two groups. One of these groups involves rotatable impeller means having its axis arranged vertically. The other group involves rotatable impeller means having its axis arranged horizontally.

Impeller mechanism of the first group, which have vertical axes of rotation, operate most effectively in combination with housings which are of circular or cylindrical formation in top plan. This type of impeller mechanism can be designed so that the treatment fluid can be uniformly distributed throughout the entire interior of the cylindrical or circular housing. This type of impeller mechanism, however, possesses several undesirable features of construction which may be referred to as follows:

(1) A cylindrical housing cannot be employed to the best advantage in confining dishes, silverware, glassware, and the like.

(2) Impeller mechanism having a vertical axis of rotation must be associated with the bottom

wall of the housing, and it is necessary, therefore, to provide and maintain a water-tight joint between the bottom wall of the housing and the bearing for the impeller shaft which must pass through said bottom wall.

(3) The impeller must be submerged to a considerable extent in the treatment fluid and the impeller, therefore, operates to either splash or project the treatment fluid in a concentrated stream or body. It has been determined that for the most effective action the treatment fluid should be projected in a subdivided condition and with the individual drops of fluid traveling at a very high velocity. It has been found to be impossible to obtain this type of action with a rotatable impeller which is submerged to an appreciable extent in the treatment fluid and which is rotated about a vertical axis.

Impeller devices of the second group, i. e., impellers rotating about a horizontal axis, are usually associated with a housing or casing of rectangular or square shape in top plan. Housings of this shape or design are capable of confining more effectively a larger number of dishes, and the like, to be treated. It, also, is possible to operate an impeller device of this character so that its blades will merely dip from a trough a comparatively small amount of treatment fluid and disperse this fluid in a properly divided condition and at a high velocity to the treatment zone of the housing. Prior art impeller devices of this type, however, possess the very serious disadvantage of being unable to project the treatment fluid throughout the entire interior of a housing of satisfactory width. Because of this fact, it has been necessary to employ two or more impeller units operating in side by side relation or with their horizontal axes arranged in parallelism. This dual type of impeller mechanism is objectionable because of the increased cost of providing two impeller units instead of one and because of the transmission problem made necessary by the driving of two shafts from a single motor.

Impeller mechanisms of the type disclosed in my aforesaid patent and of the type embodying this invention are capable of dispersing or projecting the treatment fluid throughout the entire interior of a rectangular or square housing and yet employs only one rotatable impeller mechanism. These improved mechanisms, therefore, take advantage of all of the desirable features of an impeller having a horizontal axis and overcome all of the disadvantages possessed by the prior art mechanisms of this type.

It is the primary object of this invention to provide impeller mechanisms for effecting washing, rinsing, and/or drying of dishes, silverware, glassware, and the like, which is capable of dispersing or projecting treatment fluid in a properly divided condition and at a high velocity throughout the entire interior of a rectangular or square housing by means of a single rotatable impeller mechanism which operates with its axis of rotation arranged horizontally.

A further important object of this invention is to provide impeller mechanisms of the character wherein the treatment fluids are projected through the treatment zone of the associated housing by means of a plurality of rotatable impeller wheels operating in combination with fluid dispersing controlling means.

A more specific object of the invention is to provide fluid impelling mechanism in which rapidly rotated impellers cooperate with surfaces, or the like, which operate to so confine, release, and control the direction of dispersion or discharge of the fluid set in motion by the impellers, that substantially the entire interior of a square or rectangular housing will receive uniform portions of the treatment fluid.

Another object of the invention is to provide improved mechanism for controlling the return of the dispersed fluid so that it will not interfere with the action of the impellers in picking up the fluid and the action of the aforesaid confining, releasing, and direction controlling means which cooperate with the impellers.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings forming a part of this specification and in which like numerals are employed to designate like parts throughout the same,

Figure 1 is a transverse vertical sectional view illustrating the action of one form of impeller mechanism embodying this invention in projecting the treatment fluid at a high velocity and in a properly divided condition so that all portions of the interior of the housing will fall within the effective range of the dispersed fluid.

Figure 2 is a fragmentary view, partly in plan and partly in section, of the impeller mechanism and its enclosing housing illustrated in Fig. 1.

Figure 3 is a view similar to Fig. 1 but illustrates a modified form of impeller mechanism, and

Figure 4 is a view similar to Fig. 2 but illustrates the impeller mechanism disclosed in Fig. 3.

In the drawings, wherein for the purpose of illustration are shown the preferred embodiments of this invention, and first particularly referring to the disclosure of the modification illustrated in Figs. 1 and 2, the reference character 5 designates the main body portion of a washing machine housing. This main body portion is open at its top and is adapted to be closed by the removable cover 6.

Referring particularly to the main body portion 5 of the housing, the bottom wall of the same may either consist of an aluminum casting 7 having an upstanding marginal flange 8 or this bottom wall may be suitably formed of other cast materials or of sheet metal. Extending longitudinally of the bottom wall 7 is a shallow trough 9 which is adapted to cooperate with a rotatable impeller unit in a manner to be described at a later point.

The trough 9, at the discharge side of the il-

lustrated impeller mechanism, is provided with an upstanding flange 10 which functions as a dam to prevent the treatment fluids which have been returned to the bottom of the housing from flowing back into the trough 9 along the operating zone or discharge side of the rotatable impeller mechanism. This flange 10 is of less length than the length of the trough 9 and terminates at its opposite ends short of the end walls 11 of the housing 5 to provide at the opposite ends of the trough return passages 12. The remaining side of the trough 9 is unobstructed or in open communication with the bottom portion of the housing lying on that side of the trough.

The impeller mechanism illustrated in Figs. 1 and 2 includes a horizontal shaft 13 which extends longitudinally of the trough 9 and is journaled at its opposite end portions in the bearings 14. This shaft projects beyond one end wall 11 of the housing for suitable connection with an electric motor, or other prime mover, which will be employed to drive the shaft. The bearings 14 should be located at a proper elevation with respect to the bottom wall 7 of the housing so that their bearing openings will at all times be located above the level of the fluid in the housing when the machine is in operation. The shaft 13 has mounted thereon a plurality of axially spaced impeller wheels 15 which are suitably secured to the shaft for rotation therewith. As is clearly illustrated in Fig. 1, each one of these impeller wheels 15 includes a hub portion 16 and a plurality of longitudinally curved impeller blades 17.

At suitably spaced intervals along the length of the upstanding flange 10, pockets or recesses 18 are formed in the inner face thereof. These pockets or recesses are provided to receive and have suitably secured therein the lower end portions of the several upstanding, longitudinally curved deflector blades 19. It will be noted by considering Fig. 2 that the deflector blades 19 are arranged with respect to the impeller wheels 15 so that the deflector blades will partially overlap the impeller wheels in a radial direction. This overlapping preferably includes about half the width of each impeller wheel and each deflector blade. It will be understood, however, that greater or less degrees of overlap may be employed if desired.

It is the purpose of this impeller mechanism to impel, discharge, or disperse the treatment fluids uniformly throughout the entire interior of the housing 5 and its cover 6. The dispersed fluid preferably should be properly subdivided into drops or particles which are caused to travel at a high velocity through the treatment zone provided by the housing. This desired velocity of travel and subdivision of the fluid is obtained as a result of the high speed of rotation of the shaft 13 with its impeller wheels 15 and the comparatively shallow layer of treatment fluid which lies on the top surface of the trough 9 during the operating period of the impeller mechanism. It has been determined that the speed of rotation of the impeller shaft may range from 1,750 to 3,500 R. P. M. and that the most effective speed lies between 3,000 and 3,500 R. P. M. Fig. 1 discloses the level of the fluid in the housing bottom 7 during operation of the impeller mechanism. It will be noted that the liquid level is very low in the trough 9 and in the right-hand portion of the bottom of the housing. The level of the liquid is higher, however, in the left-hand portion of the housing, and this difference in level

is due to the presence of the flange 10 which restricts the return of fluid to the end passages 12, which passages empty into the trough beyond or axially outwardly of both of the end impeller wheels 15.

Fig. 1 discloses by straight arrow lines 20 the direction of movement or travel of the fluid throughout the portion of the interior of the housing, and its cover, extending from approximately the point a to the point b. The curved direction arrows 21 indicate the direction of travel of the treatment fluid through the remainder of the interior of the housing or approximately from the point b down to the point c. This particular type of delivery of the treatment fluid is due to the manner in which the discharge side of the trough 9, the inner face of surface of the flange 10, and the curved deflector blades 19 cooperate with the fluid impelling blades 17. It will be noted that the discharge side or half of the trough 9 takes the form of an uninterrupted curved surface which extends from below the level of the fluid, during operating periods of the impeller mechanism, to a point above the level of the liquid and that this curved surface extends axially throughout the entire operating zone of all of the impeller wheels 15. It further will be noted that the deflector blades 9 are so longitudinally curved that they act as an extension of the arc of the curved bottom wall of the trough 9 and that these deflector blades extend partly around the operating zone of the impeller wheels. The uninterrupted curved surface provided by the trough 9, naturally, prevents the fluid from being dispersed or impelled radially until after the fluid has been lifted to the level of the upper edge of the curved surface provided by the trough and the flange 9 and 10, respectively. The fluid, however, is permitted to be dispersed or impelled radially after it passes above the upper edge of the flange in the spaces left between the deflector blades 19. These deflector blades in turn prevent radial dispersion or discharge of the fluid set in motion by the impeller mechanism until after this fluid is elevated above the upper ends of these deflector blades. The straight direction arrows 20 indicate the path of movement of the fluid which is discharged over the upper edge of the flange 10 and through the spaces left between the deflector blades 19. The direction arrow lines 21 indicate the path of movement of the fluid which is dispersed or discharged from the ends of the deflector blades. It will be appreciated that the curvature of the deflector blades 19 determines the upper margin of the treatment zone; i. e., the point b, for the fluid which is discharged from the upper ends of the deflector blades 19.

Of course, the fluid dispersed throughout the two portions of the interior of the housing is set in motion by the rapidly rotating impeller wheels. Some of the dispersed fluid is actually picked up by the impeller blades 17 as they dip into the fluid lying on the top surface of the trough 9. Additional fluid is picked up and set in motion in the spaces between the impeller wheels as a result of the high speed of rotation of these impeller members. As the fluid picked up and set in motion by the impeller wheels will escape or travel radially outwardly of the zone of operation of the impeller wheels as soon as it is permitted to do so, the inner surfaces of the trough 9, the flange 10, and the deflector blades 19 control or determine when the fluid can escape. The fluid which is picked up by the impeller blades 17 will

travel longitudinally outwardly of these blades to be discharged from their tips. As the deflector blades partially overlap the individual operating zones of the respective wheels 15, a portion of the fluid moving longitudinally outwardly of the impeller blades will be permitted to escape from between adjacent deflector blades, or as soon as the tips of the impeller blades pass beyond the upper edge of the flange 10. Escaping with this portion of fluid picked up by the impeller blades is a portion of the fluid which is set in motion between adjacent impeller wheels. This fluid also is permitted to escape or be discharged radially outwardly as soon as it passes over the upper edge of the flange 10. The remainder of the fluid on the surfaces of the impeller blades 17 and that which is set in motion between adjacent impeller wheels will be permitted to escape radially as soon as it passes beyond the upper ends or tips of the deflector blades 19. It has been determined that some of the fluid set in motion between the impeller wheels and moving longitudinally outwardly of the deflector blades 19 is drawn or sucked into the paths of movement of their respective impeller wheel blades and is projected or dispersed by these blades after they pass the upper ends of the deflector blades 19.

It also has been determined that the travel of the fluid through the curved paths, indicated by the arrow lines 21, is not produced as a result of the pull of gravity or as a result of the particles striking against the inner surfaces of the housing and cover wall and being deflected downwardly thereby. The velocity of the fluid traveling through these curved flow paths is too high for either of these actions to be responsible. It is very obvious that the high speed of rotation of the impeller wheels will bring about or cause a circulation of air within the housing and the cover. Air movement is possible because the interior of the housing is not completely filled with treatment fluid to the exclusion of air. Unquestionably, it is this movement of air within the housing which creates a low pressure or suction zone or area which increases in intensity or value as it approaches the receiving side of the trough 9, and it is this low pressure or suction condition which operates to pull the fluid delivered from the ends of the deflector blades downwardly and inwardly with the result that the fluid travels through the indicated curved flow paths.

Coming now to the disclosure of Figs. 3 and 4, it will be seen that this mechanism differs from the mechanism illustrated in Figs. 1 and 2 in two respects only; i. e., the shape of the bottom wall of the housing and the type of fluid dispersing controlling means which cooperates with the impeller wheels. This modified mechanism will be described in detail as follows:

The housing is generally designated by the reference character 22. This housing includes a bottom wall which is formed by the two downwardly sloping side portions or halves 23. These sloping portions collectively form a trough which accumulates the treatment fluid in the bottom of the housing so that it may be picked up and dispersed by the impeller wheels. This type of bottom wall and trough structure may be manufactured at a considerably lower cost than the bottom wall and trough structure illustrated in Figs. 1 and 2.

Instead of using a portion of the top surface of the trough as the fluid dispersing controlling means, this modification of the invention em-

plays a curved blade or plate 24 which has its lower edge portion supported in spaced relation from the bottom wall of the housing by means of the supporting blocks 25, see Figs. 3 and 4. As the supporting of this plate or blade 24 allows the fluid to be returned to the deepest portion of the trough beneath the said blade or plate, it is possible to have this blade or plate extend throughout the entire length of the housing, as is clearly illustrated in Fig. 4, or up to the end walls 26 of the housing. This deflector plate 24 has a series of laterally spaced deflector blades 27 projecting from its upper edge. These curved deflector blades are shaped to act as a continuation of the arc of the plate 24.

The remainder of this dishwashing mechanism corresponds identically with the mechanism disclosed in Figs. 1 and 2 and will be briefly described as follows:

The body portion 22 of the housing is closed by the cover 28, in the same manner as disclosed and described in connection with Fig. 1. An impeller shaft 29 extends longitudinally of the deepest portion of the trough formed by the bottom wall sections 23 and is journaled at its opposite ends in the bearings 30 which are carried by the end walls 26 of the housing. One end of this shaft projects outwardly of one end wall of the housing so that it may be operatively connected with an electric motor, or other suitable prime mover.

The impeller shaft 29 has rigidly secured thereto a plurality of axially spaced impeller wheels 31. Each one of these impeller wheels includes a hub portion 32 and a suitable number of longitudinally curved blades 33. The impeller wheels 31 are arranged on the shaft 29 so that they partially overlap in a radial direction the deflector blade portions 27 of the curved plate 24. These rapidly rotating impeller wheels 31 dip into the fluid in the trough formed by the bottom wall of the housing for setting this fluid in motion so that it may be dispersed or projected throughout the entire interior of the housing and its cover. The fluid is set in motion and dispersed with this mechanism in identically the same manner as has been described in connection with the mechanism disclosed in Figs. 1 and 2. In this mechanism, the solid or uninterrupted body portion of the plate 24 functions in the same manner as the curved top surface of the trough 9 and the inner surface of the flange referred to in connection with Figs. 1 and 2. The deflector blades 27 function in the same manner as the deflector blades 19 of Figs. 1 and 2. It will be unnecessary, therefore, to describe in detail this mode of operation. It should be sufficient to state that the fluid which is expelled radially over the upper edge portions of the plate 24 which lie between the deflector blades 27 is dispersed through straight flow paths, as indicated by the arrow lines 34, through the portion of the housing interior lying between the points a and b. The fluid dispersed from the ends or beyond the ends of the deflector blades 27 travels through curved flow paths, indicated by the arrow lines 35, and covers the portion of the interior of the housing which extends from the point b to the point c.

The spacing of the impeller wheels for both modifications of the invention is considered to be very important. It has been determined that these wheels must be spaced from approximately $\frac{1}{2}$ inch to approximately $1\frac{1}{2}$ inches from each other and that the best results are obtained when

they are spaced approximately one inch. The impeller wheels preferably should be approximately three inches in diameter, and the respective blades should be approximately one inch in width. The impeller shafts should be mounted so that the tips or extremities of the blades 17 and 33 will clear the inner surface of the upstanding flange 10 and the inner surface of the upper portion of the plate 24 by approximately $\frac{1}{8}$ inch. The tips or extremities of the said blades may clear the bottom of the trough 9 and the bottom edge portion of the plate 24 by a greater distance if desired, and this distance may fall between $\frac{1}{8}$ and $\frac{1}{4}$ inch. It will be appreciated, therefore, that the axes of the respective impeller shafts 13 and 29 need not coincide with the axes of the curved trough 9 and the curved plate 24.

It is to be understood that the forms of this invention herewith shown and described are to be taken as preferred examples of the same, and that various changes in the shape, size, and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

Having thus described the invention, I claim:

1. A dish and silverware washing, rinsing, and drying machine, comprising a housing having a bottom wall providing a fluid collecting trough, fluid impelling means comprising a rotatable shaft journaled in the end walls of said housing and having a plurality of axially spaced impeller blades mounted thereon and arranged to dip into the trough for setting in motion fluid from the trough, and fluid dispersion controlling means operatively associated with the impeller blades, said means comprising an uninterrupted curved surface extending from below the operating fluid level in the trough to a point above said level on the discharge side of all of said impeller blades, thereby preventing radial dispersion of fluid through the area obstructed by said surface, and a plurality of laterally spaced deflector blades projecting above the upper edge of said surface and following the periphery of the zone of operation of said impeller blades, thereby preventing radial dispersion of fluid through the areas obstructed by said deflector blades, the fluid dispersion controlling action of said curved surface and deflector blades being such as to allow the fluid to be dispersed over the portions of the upper edge of the surface lying between said deflector blades into one part of the interior of the housing and from the upper ends of the deflector blades into the remainder of the housing, said deflector blades and impeller blades being so arranged as to partially overlap each other radially of the axis of rotation of the blades so that the fluid dispersed both over the upper edge portions of the curved surface and from the upper ends of the deflector blades will come in part from the impeller blades and in part from the spaces between said impeller blades.

2. A dish and silverware washing, rinsing, and drying machine, comprising a housing having a fluid collecting trough in its bottom portion, fluid impelling means comprising a plurality of axially spaced impeller blades rotatable about a common axis and arranged to dip into the trough for setting in motion fluid from the trough, and fluid dispersion controlling means operatively associated with the impeller blades, said means comprising a surface extending from below the operating fluid level in the housing to a point above said level on the discharge side of all of said im-

5 peller blades, thereby preventing radial dispersion of fluids through the area obstructed by said surface, and a plurality of laterally spaced deflector members projecting above said surface to prevent radial dispersion of fluids through the areas obstructed by said deflector members, the fluid dispersion controlling action of said surface and deflector members being such as to allow the fluid to be dispersed between and from the upper ends of the deflector members into all portions of the interior of the housing, said deflector members and impeller blades being so arranged as to at least partially overlap each other radially of the axis of rotation of the blades so that the fluid dispersed both between and from the upper ends of the deflector blades will come in part from the impeller blades and in part from the spaces between said impeller blades.

3. A dish and silverware washing, rinsing, and drying machine comprising a housing having a fluid collecting trough in its bottom portion, fluid impelling means comprising a plurality of axially spaced impeller blades rotatable about a common axis and arranged to dip into the trough for setting in motion fluid from the trough, and fluid dispersion controlling means operatively associated with the impeller blades, said means comprising a surface which forms a part of the wall of the fluid collecting trough and extends from below the operating fluid level in the housing to a point above said level on the discharge side of all of said impeller blades, thereby preventing radial dispersion of fluid through the area obstructed by said surface, and a plurality of laterally spaced deflector members projecting above said surface to prevent radial dispersion of fluid through the areas obstructed by said deflector members, the dispersion controlling action of said surface and deflector members being such as to allow the fluid to be dispersed between and from the upper ends of the deflector members into all portions of the interior of the housing, said deflector members and impeller blades being so arranged as to at least partially overlap each other radially of the axis of rotation of the blades so that the fluid dispersed both between and from the upper ends of the deflector blades will come in part from the impeller blades and in part from the spaces between said impeller blades.

4. A dish and silverware washing, rinsing, and drying machine, comprising a housing having a bottom wall providing a fluid collecting trough, fluid impelling means comprising a rotatable shaft journaled in the end walls of said housing and having a plurality of axially spaced impeller blades mounted thereon and arranged to dip into the trough for setting in motion fluid from the trough, and fluid dispersion controlling means operatively associated with the impeller blades, said means comprising an uninterrupted curved surface which forms a part of the wall of the fluid collecting trough and extends from below the operating fluid level in the housing to a point above said level on the discharge side of all of said impeller blades, thereby preventing radial dispersion of fluid through the area obstructed by said surface, and a plurality of laterally spaced curved deflector blades detachably secured to the upper end portion of and projecting above said curved surface to follow the periphery of the zone of operation of said impeller blades, thereby preventing radial dispersion of fluid through the areas obstructed by said deflector blades, the fluid dispersion controlling action of said curved surface and deflector blades being such as to allow

the fluid to be dispersed through the spaces left between the deflector blades into one part of the interior of the housing and from the upper ends of the deflector blades into the remainder of the housing, said deflector blades and impeller blades being so arranged as to partially overlap each other radially of the axis of rotation of the blades so that the fluid dispersed both between and from the upper ends of the deflector blades will come in part from the impeller blades and in part from the spaces between said impeller blades.

5. A dish and silverware washing, rinsing, and drying machine, comprising a housing having a fluid collecting trough in its bottom portion, fluid impelling means comprising a plurality of axially spaced impeller blades rotatable about a common axis and arranged to dip into the trough for setting in motion fluid from the trough, and fluid dispersion controlling means operatively associated with the impeller blades, said means comprising a member supported in spaced relation to said trough to allow for the passage of fluid therebeneath, said member presenting a surface to the impeller blades which extends from below the operating fluid level to a point above said level on the discharge side of the impeller blades, thereby preventing radial dispersion of fluid through the area obstructed by said surface, and a plurality of laterally spaced deflector members projecting above said surface to prevent radial dispersion of fluid through the areas obstructed by said deflector members, the fluid dispersion controlling action of said surface and deflector members being such as to allow the fluid to be dispersed between and from the upper ends of the deflector members into all portions of the interior of the housing, said deflector members and impeller blades being so arranged as to at least partially overlap each other radially of the axis of rotation of the blades so that the fluid dispersed both between and from the upper ends of the deflector members will come in part from the impeller blades and in part from the spaces between said impeller blades.

6. A dish and silverware washing, rinsing, and drying machine, comprising a housing having a bottom wall formed of downwardly sloping guide portions to provide a fluid collecting trough, fluid impelling means comprising a plurality of axially spaced impeller blades rotatable about a common axis and arranged to dip into the trough for setting in motion fluid from the trough, and fluid dispersion controlling means operatively associated with the impeller blades, said means comprising a curved plate supported at its lower edge portion in spaced relation to said bottom wall to allow for the passage of fluid therebeneath, said plate having an imperforate main body portion which extends from below the operating fluid level in the trough to a point above said level on the discharge side of the impeller blade, thereby preventing radial dispersion of fluid through the area obstructed by said surface, and a plurality of laterally spaced curved deflector blades projecting from the upper edge of said main body portion and following the periphery of the zone of operation of said impeller blades, thereby preventing radial dispersion of fluids through the areas obstructed by said deflector blades, the fluid dispersion controlling action of said curved plate and deflector blades being such as to allow the fluid to be dispersed over the portions of the upper edge of said plate lying between said deflector blades into one part of the interior of said housing and from the upper ends of the de-

deflector blades into the remainder of the housing, said deflector blades and impeller blades being so arranged as to partially overlap each other radially of the axis of rotation of the blades so that the fluid dispersed both over the upper edge of the curved plate and from the upper ends of the deflector blades will come in part from the impeller blades and in part from the spaces between said impeller blades.

7. A dish and silverware washing, rinsing, and drying machine, comprising a housing having a shallow trough in the bottom wall thereof, a flange of less length than and centrally positioned along the discharge side of said trough, a plurality of laterally spaced deflector blades connected to said flange to project only upwardly

therefrom, and rotatable means including a plurality of axially spaced impeller blades carried by a common shaft and arranged to dip into the trough for setting in motion fluid in said trough, said deflector and impeller blades being so arranged as to at least partially overlap each other radially of said shaft, a portion of said fluid being discharged from said impeller blades at a high velocity and in a subdivided condition throughout a portion of the interior of said housing extending from the flanged side of the trough, another portion of said fluid being delivered from the deflector blades at a high velocity and in a divided condition throughout the remainder of the interior of said housing.

DONALD E. YOCHER.