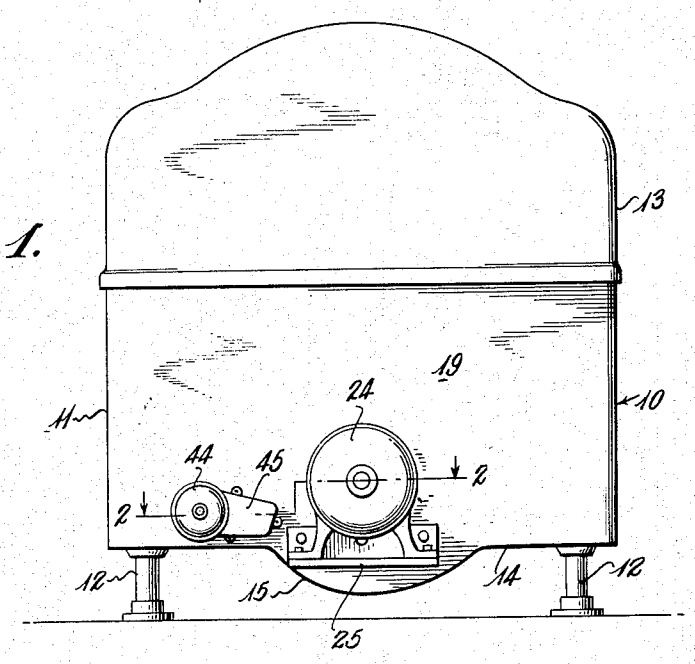
Feb. 24, 1942. D. E. YOCHEM 2,274,024

APPARATUS FOR WASHING DISHES, SILVERWARE, AND THE LIKE

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Fig. 1.



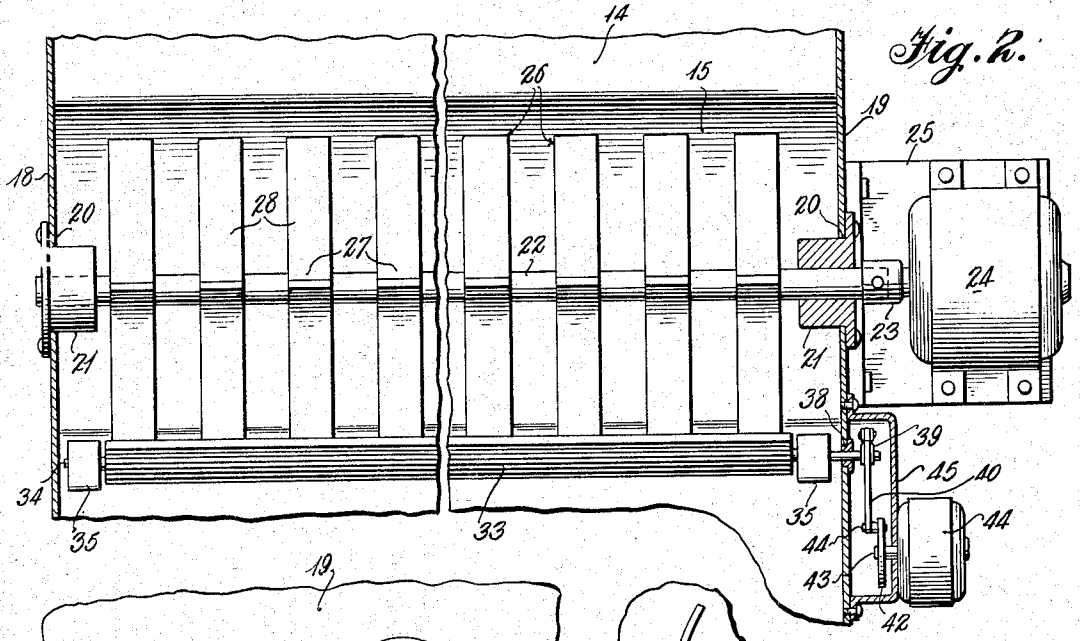


Fig. 2.

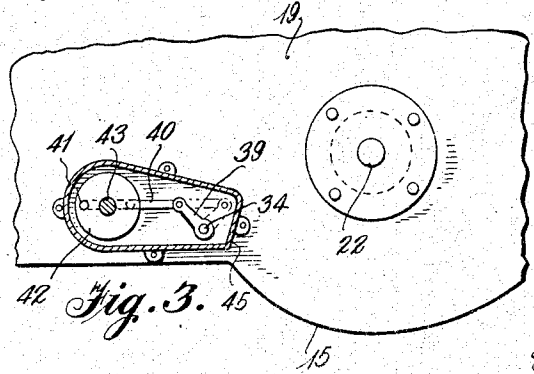


Fig. 3.

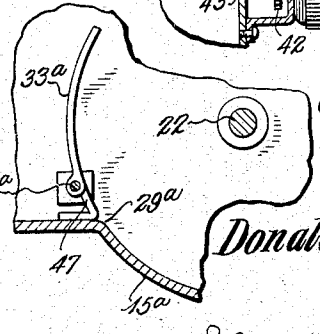


Fig. 7.

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APPARATUS FOR WASHING DISHES, SILVERWARE, AND THE LIKE

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Fig. 4.

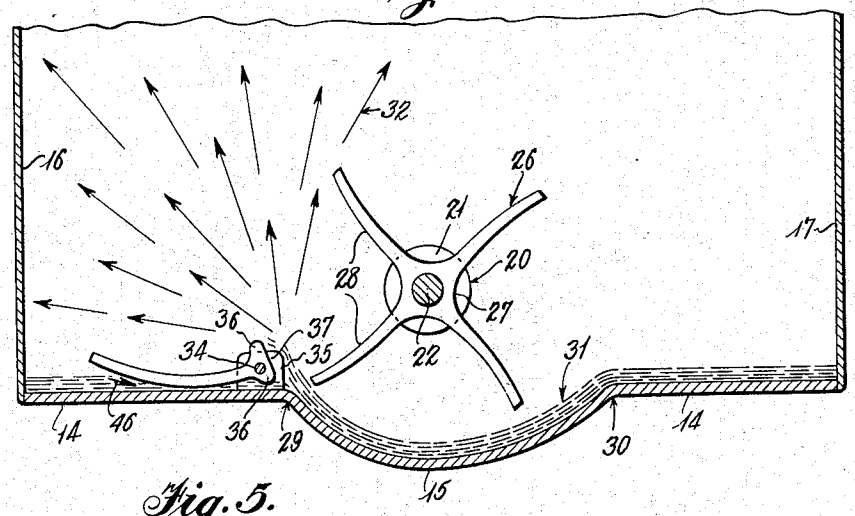


Fig. 5.

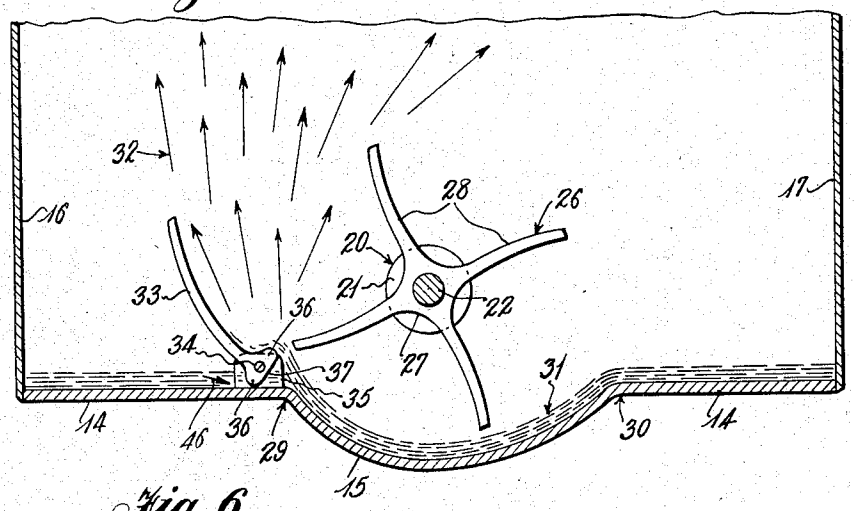
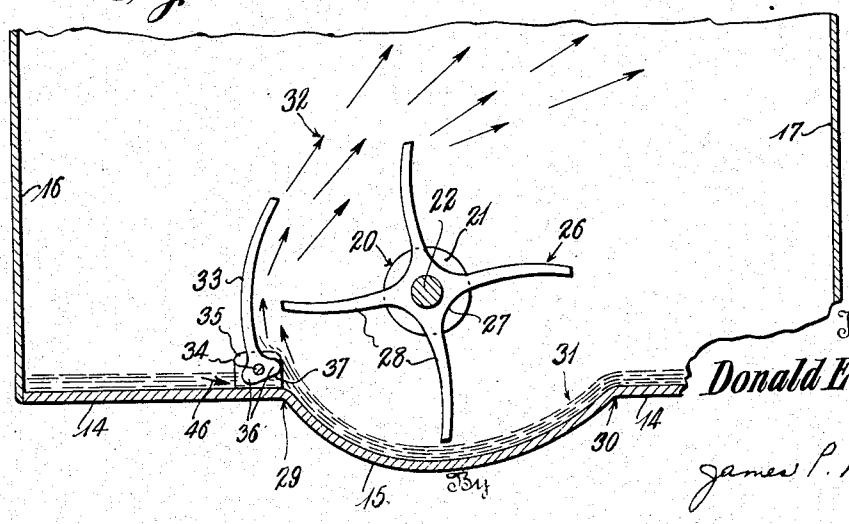


Fig. 6.



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UNITED STATES PATENT OFFICE

2,274,024

APPARATUS FOR WASHING DISHES, SILVERWARE, AND THE LIKE

Donald E. Yochem, Columbus, Ohio, assignor to L. S. D., Inc., Dayton, Ohio, a corporation of Ohio

Application November 2, 1939, Serial No. 302,595

8 Claims. (Cl. 299—63)

This invention relates to new and useful improvements in apparatus for washing, rinsing, and drying dishes, silverware, and the like, and is a modification of the apparatus disclosed and claimed in my Patent No. 2,137,971, issued November 23, 1938, and in my copending application Ser. No. 302,594, filed November 2, 1939, now Patent Number 2,257,929. More specifically, this invention relates to fluid impelling mechanism which is adapted to be employed in place of the impelling mechanism disclosed in my aforesaid patent.

In my aforesaid, copending application, I have described the advantages to be obtained, over the fluid impelling mechanism disclosed and claimed in my issued patent, by expelling the treatment fluid from a shallow trough formed in the bottom wall of the treatment housing by means of a plurality of rapidly rotating impeller wheels carried by a horizontal impeller shaft and continuously deflecting the concentrated, horizontally elongated, vertically fan-shaped stream of treatment fluid into different portions of the interior of the treatment housing so that the dishes, silverware, and the like, will be repeatedly subjected to the action of the treatment fluid in the concentrated stream. The deflecting of the concentrated stream of treatment fluid is accomplished in my aforesaid application by means of a deflector which is oscillated between a position within and a position outside of the shallow trough. The advantages to be obtained from the use of the fluid impelling mechanism of my copending application are the more efficient treatment of the dishes, silverware, and the like, due to the greater concentration of the treatment fluid and the need for employing a smaller amount of hot water during each complete washing, rinsing, and drying operation.

It is the primary object of this invention to provide fluid impelling mechanism for dish washing machines in which the treatment fluids are collected in and dispersed from a trough formed in the bottom wall of the housing by a plurality of rapidly rotating impeller wheels, mounted on a common horizontal shaft, and deflecting the dispersed, concentrated stream of treatment fluid into different portions of the interior of the treatment housing by means of a continuously rocking deflector operatively arranged outside of the discharge side of the fluid collecting trough. This type of fluid impelling mechanism also accomplishes the very desirable results of subjecting the articles being treated to a more concentrated application of the treatment fluid and of requiring a smaller amount of hot water for each complete washing and rinsing operation.

A further important object of the invention is to provide novel deflector means for continuously moving or shifting the concentrated discharge of finely atomized fluid dispersed at a high velocity from a collecting trough by a rapidly rotating impeller.

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 an end elevational view of a dish washing machine embodying this invention,

Figure 2 is a fragmentary, horizontal sectional view taken on line 2—2 of Fig. 1,

Figure 3 is a partly elevational view and partly vertical sectional view which more particularly illustrates the operating mechanism for the stream deflector member,

Figures 4, 5, and 6 are detail, vertical sectional views which illustrate three operative positions of the deflector member which cooperates with the impelling means for changing the radial direction of discharge of the fluid, and

Figure 7 is a fragmentary, vertical sectional view illustrating a modified form of deflector means.

In the drawings, wherein for the purpose of illustration are shown the preferred embodiments of this invention, the reference character 10, in Fig. 1, designates in its entirety the housing portion of the dish washing, rinsing, and drying machine embodying this invention. This housing includes a main body portion 11 which is supported at its four corners by means of the legs 12 and a removable cover 13.

The main body portion 11 of the housing is formed by a bottom wall 14 having a shallow, transversely curved trough 15 formed therein and extending longitudinally thereof, side walls 16 and 17, and end walls 18 and 19.

The end walls are provided with axially aligned bearing apertures 20 which receive the bearing members 21. It is to be understood that these bearing members may be of any conventional form and may be either plain or anti-friction bearings. Journaled in these bearings is an impeller shaft 22 which has one end projecting outwardly of its bearing to be connected by the coupling 23 with the armature shaft of an electric motor 24 which is mounted on a bracket 25

that is suitably bolted, or otherwise secured to the end wall 19 of the main body portion 11 of the housing.

Secured at suitably spaced axial points along the portion of the impeller shaft 22 arranged between the bearings 21 are the impeller wheels 26. These impeller wheels are each formed by a hub portion 27 and a suitable number of longitudinally curved, radially projecting impeller blades 28. It will be noted by inspecting Figs. 4 to 6, inclusive, that the impeller shaft 22 is eccentrically arranged with respect to the curved trough 15 or closer to the discharge side 29 of the trough than it is to the return side 30. The impeller blades 28 are of a proper length, relative to the spacing of the impeller shaft 22 from the inner surface of the trough 15 so that the blades will dip into the trough and pick up the fluid 31 from the trough and expel the same in the form of a stream 32 from the discharge side 29 of the trough. This stream 32 of finely atomized fluid substantially corresponds in width to the length of the trough 14 and is substantially of fan-shape in vertical section.

If the stream 32 were permitted to be expelled into the housing without encountering any obstructing or deflecting surfaces, the vertically fan-shaped stream would always be directed into the lower, left hand corner portion of the housing, as viewed in Figs. 4 to 6, inclusive. The discharge side or edge 29 of the trough 15 would function to determine this direction of discharge. As all of the dishes, or the like, arranged throughout the housing would not be subjected to treatment by the fluid if the stream were always discharged in this way, it becomes necessary to provide deflecting means which can be moved continuously so as to change the direction of discharge of the stream. This deflecting means must be associated with the discharge side 29 of the trough to accomplish this desired result. In Figs. 2 and 4 to 6, inclusive, there has been disclosed one form of deflecting means which is suitable to accomplish the desired results.

This deflector means includes a transversely curved deflector blade 33 which is carried by the rock-shaft 34 mounted in bearings 35 at its opposite ends. The blade 33 is formed with an enlarged inner edge portion 36 through which the rock-shaft 34 passes. Fig. 2 clearly illustrates the length of the deflector blade 33 and its enlarged edge portion 36 as being of less length than the length of the trough 15 to accommodate the bearings 35 beyond the opposite ends of this deflector means. The inner surface of the blade 33 functions as a deflecting surface for the fluid of the stream 32, and the base or outer face 37 also functions as a deflecting surface for the stream. This deflector member, therefore, possesses dual deflecting surfaces.

Fig. 4 illustrates one extreme limit of movement of the deflector means. In this position, the blade portion 33 extends substantially horizontally and lies beneath or beyond the deflecting surface 37 of the enlarged edge 36. This deflecting surface 37 controls the direction of discharge of the stream 32, when the deflecting means is in the position illustrated in Fig. 4. It will be noted that the stream 32 is fan-shaped in vertical section and covers a considerable portion of the interior of the housing which includes all of the side wall 16 of the main body portion, the overlying side wall of the cover 13 and a portion of the top wall of the said cover. The deflecting surface 37, due to its width, eliminates the fluid from the extreme lower left hand corner of the housing interior where it can perform no useful function.

Fig. 5 illustrates the deflector means in its intermediate position. When in this position, the control of the direction of discharge of the stream 32 is obtained primarily by means of the curved deflector blade 33. The deflecting surface 37 has some deflecting action on the stream but, as stated, the blade 33 primarily controls the direction of discharge. In this figure, the stream 32 is illustrated as being of fan-shape in vertical section but as being of reduced thickness. The stream of this figure is directed away from the side wall 16 of the housing and covers an area which corresponds with substantially the entire width of the top wall of the cover and a portion of the side wall of the cover which overlies the side wall 17 of the main body portion of the housing.

Figure 6 illustrates the deflecting means in its upper limit of movement. The deflecting surface 37 has substantially no deflecting influence over the direction of discharge of the stream 32 and the curved blade 33 is entirely relied upon to obtain the desired direction. It is noticed in connection with this figure that the thickness of the stream has been still further reduced. This stream, however, will include the major portion of the right hand side of the housing interior.

From these three figures, it will be appreciated that the treatment fluid may be expelled or directed into all portions of the interior of the housing which may be practically employed for receiving dishes, or the like, to be washed, rinsed, and dried, and that as the stream of fluid is directed toward the right hand side of the housing; i. e., the side farthest removed from the discharge side of the trough 29, the stream 32 increases in concentration or density. This concentrating of the discharge stream has been found to be desirable as the stream is forced out of its natural direction of discharge and would be less effective if it were not increased in density.

Although the deflecting means with its dual deflecting surfaces may be manually moved between its two vertical and horizontal limits, it has been found to be much more practical to continuously operate the deflector means by power operated mechanism. To accomplish this desired result, one end of the rock-shaft 34 projects through a packing 38, mounted in the end wall 19 of the housing, and has connected thereto a lever arm 39, see Figs. 2 and 3. The outer end of this lever arm has pivotally connected thereto a pitman rod 40. The free end of this pitman rod is connected to a crank pin 41 carried by the crank disc 42 which is mounted on the armature shaft 43 of a small, slow speed, electric motor 44. A separate casing or housing 45 is illustrated in these two figures and in Fig. 1 as being employed for enclosing these operating elements for the deflector member.

It has been determined that for the most efficient operating conditions, the electric motor 24 should be of a high speed type which will rotate the impeller shaft 22 at approximately 3500 R. P. M. The rock-shaft 34 of the deflector means should be rocked, or partially rotated in opposite directions, eight or more times per minute. It has been determined that the rate of rocking movement of the shaft 34, and its deflector member, has a direct bearing on the extent to which the stream 32 is concentrated

or reduced in thickness by the upward movement of the deflector blade **33** into the path of the discharge stream. In other words, the concentrating of the stream **32** is reduced or lessened as the speed of rocking movement of the deflector member is increased. Therefore, by varying the rate of movement of the deflector, the concentrating of the stream may be varied.

Figs. 4 to 6, inclusive, disclose the level of the liquid in the bottom portion of the housing when the impeller wheels **26** are in operation. Of course, the fluid will reach a common level in all parts of the bottom portion of the housing when the impeller wheels are not being rotated. Any fluid which comes to rest in the bottom portion of the housing between the return side **30** of the trough **15** and the side wall **17** is permitted to freely run back into the trough. The fluid which drops into the bottom portion of the housing between the discharge side **29** of the trough and the side wall **16** of the housing is permitted to drain back into the trough **15** around the opposite ends of the deflector member and beneath the enlarged edge portion **36** of the deflector blade, as is indicated by the arrows **46** in Figs. 4 to 6, inclusive.

In Fig. 7 there is disclosed a modified form of deflector means. In this form, a fixed deflector blade **47** is permanently associated with the discharge side **29***a* of the trough **15***a*. A rock-shaft **34***a* is mounted adjacent the upper edge of the fixed deflector blade **47**. A transversely curved deflector blade **33***a* is carried by the rock-shaft **34***a*. The impeller shaft **22** is illustrated in this figure, and it is to be understood that this shaft carries the impeller wheels illustrated in the previously described Figs. 2 and 4 to 6, inclusive.

In this modification, the fixed deflector blade **47** functions as a permanent extension of the discharge side **29***a* of the trough. The deflector blade **33***a* is to be rocked from its extreme upper position, illustrated in Fig. 7, to its extreme lower position where it will lie in back of the fixed deflector blade **47**, or into the same relation the deflector blade **33** bears to the deflector surface **37** in Fig. 4.

When in this lowered position, the deflector blade **47** will constitute the sole direction controlling means for the fluid discharged from the trough **15***a*. As the deflector blade **33***a* moves upwardly above the upper edge of the fixed deflector blade **47**, and into the path of the discharged stream of treatment fluid, the blade **33***a* takes over the function of deflecting the stream. The stream is deflected into the different portions of the housing interior by the fixed blade **47** and the movable blade **33***a* in the same manner as is illustrated in Figs. 4 to 6, inclusive.

It has been determined that due to the rapid rate at which the impeller wheels **26** are rotated the fluid is not only picked up by the deflector blades **28** and discharged radially from the tips of these blades but fluid is picked up in the spaces between the adjacent impeller wheels and discharged radially along with the fluid discharged from the tips of the impeller blades. Also, a certain amount of fluid moves, as a result of side slip, laterally off of the advanced faces of the impeller blades into the spaces between the adjacent impeller wheels and is discharged radially along with the fluid leaving the tips of the blades. As a result of this movement of fluid between the adjacent pairs of impeller wheels, the stream **32** has been found to be of uniform density throughout its width, or throughout the length of the discharge side of the trough.

It has been determined that this fluid impelling mechanism operates most effectively and efficiently when three quarts of treatment fluid are employed in a housing which measures 16 inches in width, 21 inches in length, and about 14 inches in height.

Other critical factors or dimensions about the impelling mechanism disclosed and described herein will be referred to as follows.

The impeller wheels should be spaced approximately from ½ of an inch to 1½ inches and the best results are obtained when the impeller wheels are spaced exactly one inch apart. The tips of the impeller blades should clear all portions of the upper surface of the trough **15** by at least $\frac{3}{16}$ of an inch. The impeller blade tips should clear the deflecting surfaces **37** and **47**, of Figs. 4 and 7, respectively, and the upper edges of the deflector blades **33** and **33***a* by approximately ⅛ of an inch, when these blades are arranged in their uppermost positions, as illustrated in Figs. 6 and 7.

The dishes, silverware, glassware, and the like to be washed, rinsed, and dried by the mechanism disclosed and described herein may be supported within the housing **10** by means of the rack structure disclosed in my aforesaid patent or by means of the rack structure disclosed in my copending application Ser. No. 210,937, filed May 31, 1938.

No attempt has been made to disclose in the drawings means for feeding any kind of treatment fluid to the interior of the housing or means for drawing off or draining the fluid from the housing. Reference may be made to my aforementioned patent for suitable means of this nature.

In the normal operation of the machine, the housing **10** should be provided with the articles to be treated and the washing fluid, which is usually hot water and a suitable washing powder or fluid, and after the cover **13** is positioned upon the main body portion, the two motors **24** and **44** may be started. The washing operation requires approximately three minutes. After the dishes have been thoroughly washed, the washing fluid should be withdrawn from the housing and a proper amount of rinsing fluid, such as clear hot water, is then placed in the housing. The impeller wheels and the deflector mechanism are operated during rinsing. After a rinsing period of from one-half minute to one minute, the rinsing fluid is withdrawn. Operation of the impeller and deflector devices is continued for a brief period to dry the dishes by circulating the air within the housing. This air and the articles being treated within the housing have had their temperatures raised by the use of the hot water during the washing and rinsing periods. Due to this rise in temperature, the dishes are very quickly dried. The dishes then may be removed from the housing in a thoroughly dry condition.

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 shallow trough in the bottom wall thereof, an impeller shaft journaled in the housing above said trough and eccentric thereto, a series of axially spaced impeller wheels having radial blades fixed to said shaft, the blades being of proper length to dip into said trough, means for rotating said shaft at a sufficiently high rate of speed to cause the impeller blades to expel fluid in a finely atomized condition from the more adjacent side of the trough, said expelled fluid being in the form of a stream which is substantially equal in width to the length of the trough and is substantially fan-shaped in vertical section, and means arranged in juxtaposition to said adjacent side of the trough and rockably movable for changing the radial direction of discharge of said expelled fluid.

2. A dish and silverware washing, rinsing, and drying machine comprising a housing having a shallow trough in the bottom wall thereof, an impeller shaft journaled in the housing above said trough and eccentric thereto, a series of axially spaced impeller wheels having radial blades fixed to said shaft, the blades being of proper length to dip into said trough, means for rotating said shaft at a sufficiently high rate of speed to cause the impeller blades to expel fluid in a finely atomized condition from the more adjacent side of the trough, said expelled fluid being in the form of a stream which is substantially equal in width to the length of the trough and is substantially fan-shaped in vertical section, means arranged in juxtaposition to said adjacent side of the trough and rockably movable for changing the radial direction of discharge of said expelled fluid, and power means for continuously rocking said rockable means.

3. A dish and silverware washing, rinsing, and drying machine comprising a housing having a shallow trough in the bottom wall thereof, an impeller shaft journaled in the housing above said trough and eccentric thereto, a series of axially spaced impeller wheels having radial blades fixed to said shaft, the blades being of proper length to dip into said trough, means for rotating said shaft at a sufficiently high rate of speed to cause the impeller blades to expel fluid in a finely atomized condition from the more adjacent side of the trough, said expelled fluid being in the form of a stream which is substantially equal in width to the length of the trough and is substantially fan-shaped in vertical section, and a transversely curved deflector blade rockable about an axis arranged in juxtaposition to said adjacent side of the trough and in parallelism with the discharge side of the latter for changing the radial direction of discharge of said expelled fluid.

4. A dish and silverware washing, rinsing, and drying machine comprising a housing having a shallow trough in the bottom wall thereof, an impeller shaft journaled in the housing above said trough and eccentric thereto, a series of axially spaced impeller wheels having radial blades fixed to said shaft, the blades being of proper length to dip into said trough, means for rotating said shaft at a sufficiently high rate of speed to cause the impeller blades to expel fluid in a finely atomized condition from the more adjacent side of the trough, said expelled fluid being in the form of a stream which is substantially equal in width to the length of the trough and is substantially fan-shaped in vertical section, a transversely curved deflector blade rockable about an axis arranged in juxtaposition to said adjacent side of the trough and in parallelism with the discharge side of the latter for changing the radial direction of discharge of said expelled fluid, and power means for continuously rocking said deflector blades.

5. A dish and silverware washing, rinsing, and drying machine comprising a housing, a shallow trough in the bottom thereof, a bladed impeller journaled in the housing above said trough, the blades being of proper length to dip into said trough, means for rotating said impeller at a sufficiently high rate of speed to cause the impeller blades to expel fluid in a finely atomized condition from one side of the trough, said expelled fluid being in the form of a stream which is substantially equal in width to the length of the trough and is substantially fan-shaped in vertical section, a member having dual deflecting surfaces rockable about an axis arranged in parallelism with the axis of the impeller for changing the radial direction of discharge of said stream, and means for rocking said member so that its dual deflecting surfaces will collectively bring about repeated discharge of the expelled fluid into all portions of the housing interior.

6. A dish and silverware washing, rinsing, and drying machine comprising a housing having a shallow trough in the bottom wall thereof, an impeller shaft journaled in the housing above said trough, a series of axially spaced impeller wheels having radial blades fixed to said shaft, the blades being of proper length to dip into said trough, means for rotating said shaft at a sufficiently high rate of speed to cause the impeller blades to expel fluid in a finely atomized condition from one side of the trough, said expelled fluid being in the form of a stream which is substantially equal in width to the length of the trough and is substantially fan-shaped in vertical section, a fixed deflector arranged to act as an extension of the discharge side of the trough for directing the stream into a portion of the housing interior adjacent said discharge side, a movable deflector mounted to rock about an axis arranged adjacent the upper edge of and in parallelism with the upper edge of the fixed deflector, and means for continuously rocking said movable deflector between a position in back of the fixed deflector and a position in alignment with said fixed deflector for directing the stream into the remainder of the housing interior.

7. A dish and silverware washing, rinsing, and drying machine comprising a housing, a shallow trough in the bottom thereof, a bladed impeller journaled in the housing above said trough, the blades being of proper length to dip into said trough, means for rotating said shaft at a sufficiently high rate of speed to cause the impeller blades to expel fluid in a finely atomized condition from one side of the trough, said expelled fluid being in the form of a stream which is substantially equal in width to the length of the trough and is substantially fan-shaped in vertical section, a member having dual deflecting surfaces rockable about an axis arranged outside of the trough and in parallelism with the discharge side of the latter for changing the radial direction of discharge of said stream, said dual deflecting surfaces being provided by a transversely curved blade and an enlarged inner edge portion of said blade, and means for rocking said member so that its dual deflecting sur-

faces will collectively bring about repeated discharge of the expelled fluid into all portions of the housing interior.

8. A machine for washing dishes and the like comprising a housing having a trough in the bottom thereof, an impeller rotatable about an axis disposed above the plane of the lateral edges of said trough for expelling a horizontally elongated vertically fan-shaped stream of fluid from one lateral edge of said trough, a deflector member mounted for rocking movement about an axis disposed below the horizontal plane of said impeller axis closely adjacent and parallel to the discharge edge of said trough, and means for continuously rocking said deflector member for changing the direction of discharge of the expelled fluid in such manner that the fluid will be periodically projected into different portions of the housing.

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