

April 20, 1943.

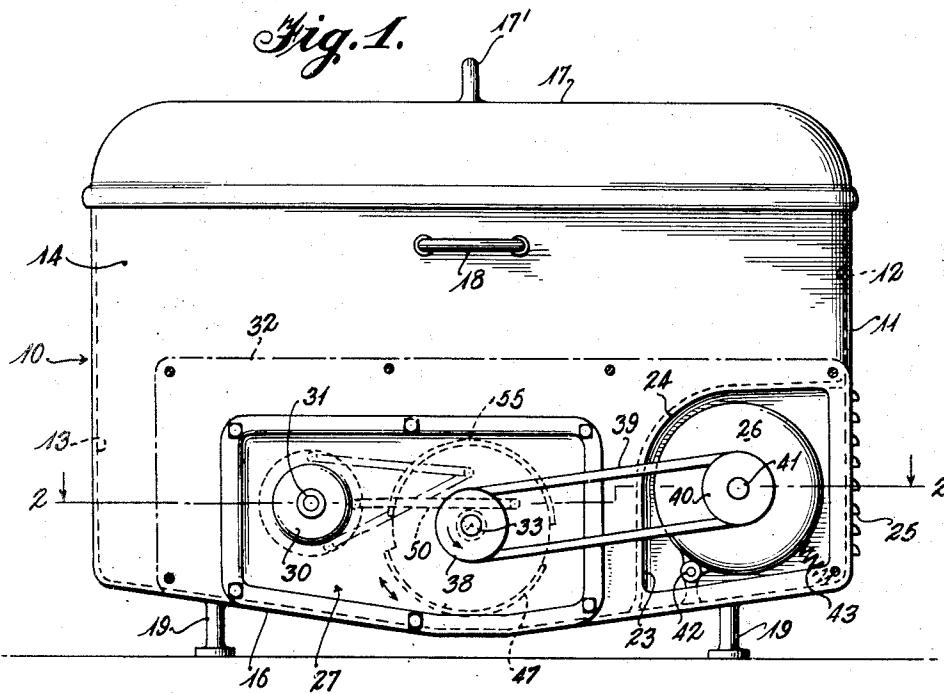
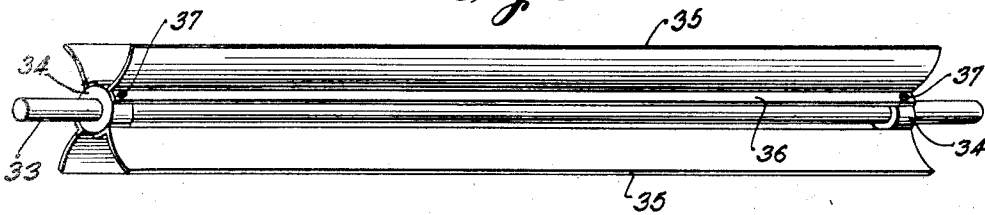
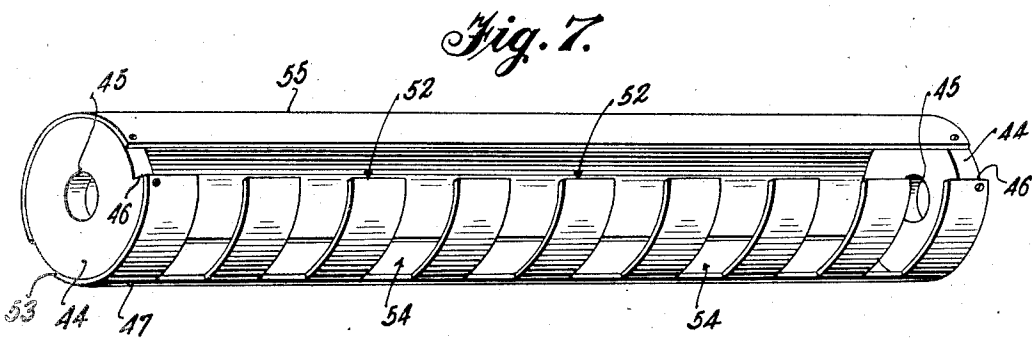
D. E. YOCHER

2,317,014

APPARATUS FOR WASHING AND RINSING DISHES, SILVERWARE, AND THE LIKE

Filed July 11, 1941

3 Sheets-Sheet 1



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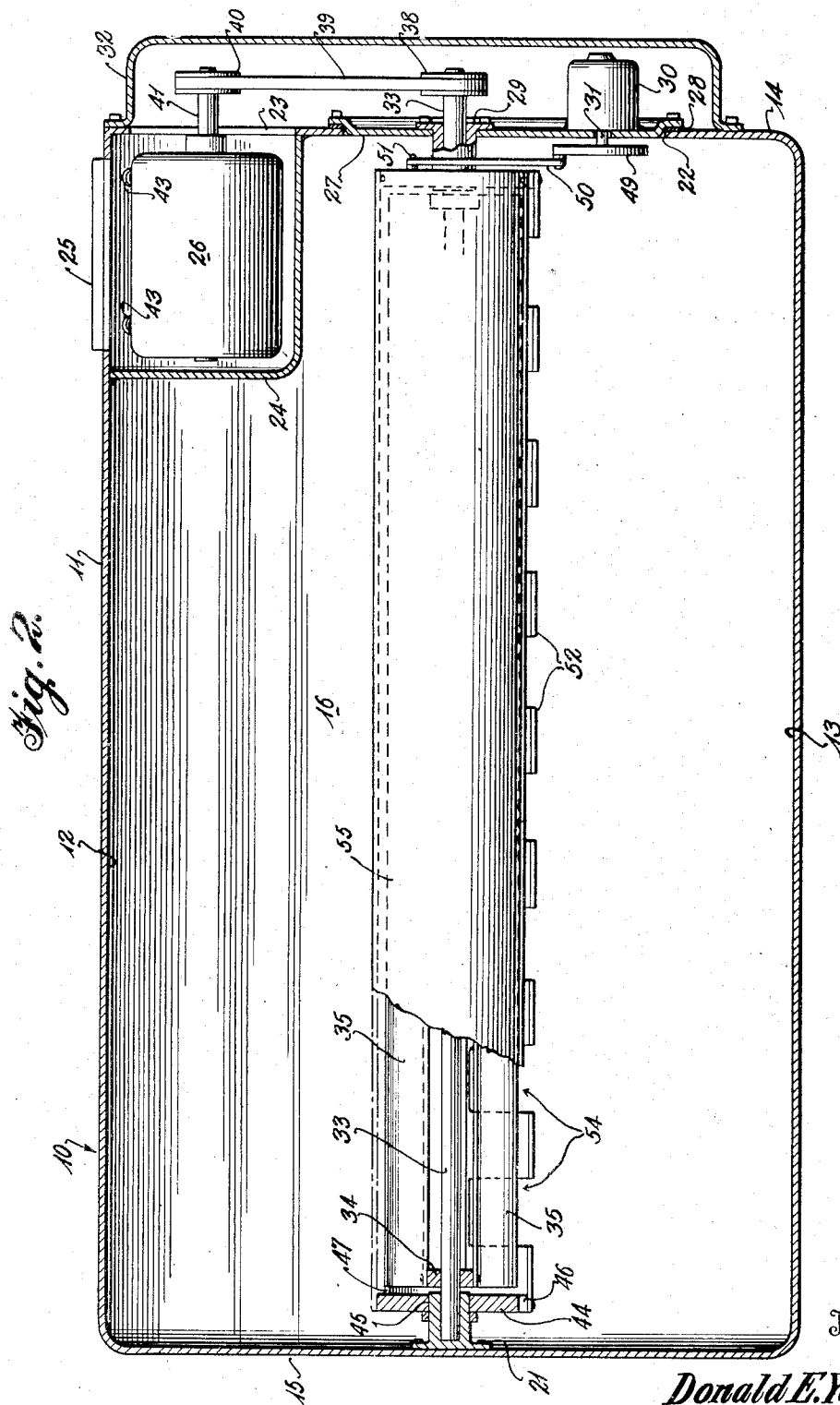
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APPARATUS FOR WASHING AND RINSING DISHES, SILVERWARE, AND THE LIKE

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3 Sheets-Sheet 2



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APPARATUS FOR WASHING AND RINSING DISHES, SILVERWARE, AND THE LIKE

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3 Sheets-Sheet 3

Fig. 3.

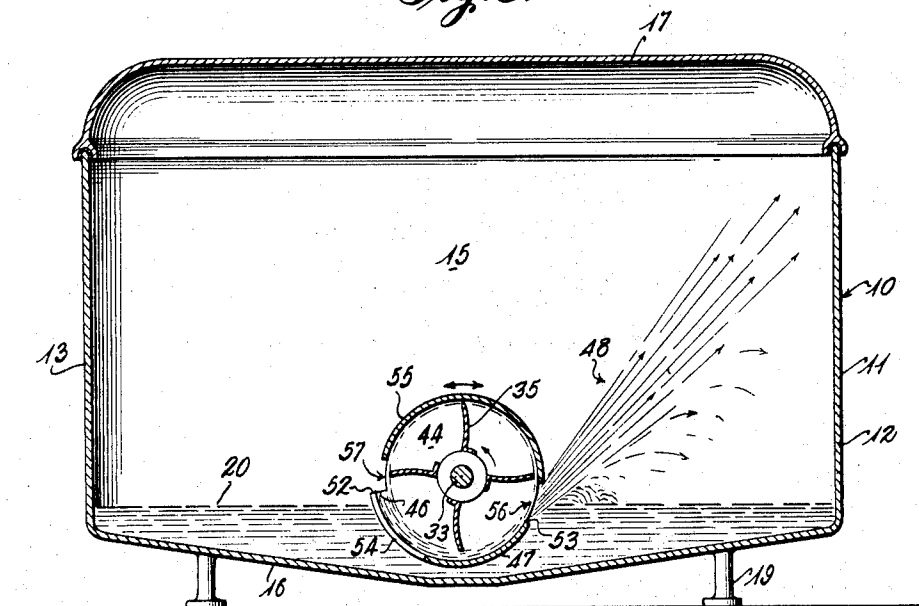


Fig. 4.

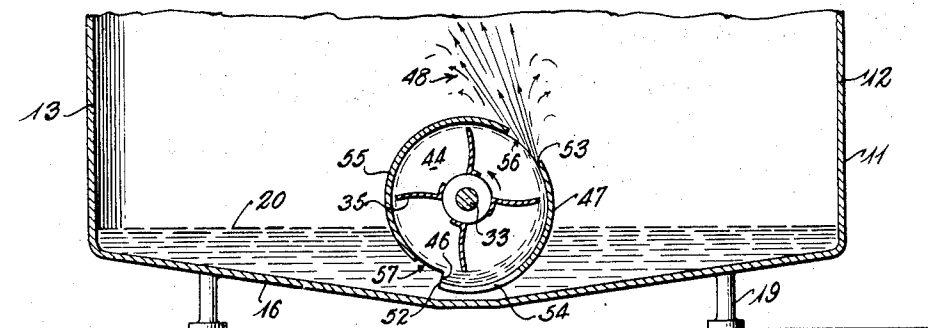
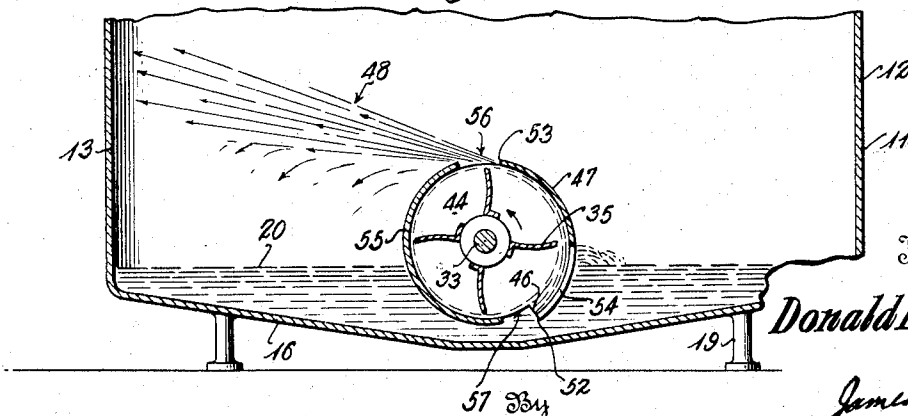


Fig. 5.



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UNITED STATES PATENT OFFICE

2,317,014

APPARATUS FOR WASHING AND RINSING
DISHES, SILVERWARE, AND THE LIKEDonald E. Yochem, Columbus, Ohio, assignor to
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Application July 11, 1941, Serial No. 402,006

10 Claims. (Cl. 299-62)

This invention relates to new and useful improvements in apparatus for washing and rinsing dishes, silverware, and the like.

The primary object of this invention is to provide apparatus for efficiently and scientifically projecting suitable fluids against the surfaces of dishes, silverware, and the like for washing and rinsing the same.

A further important object of the invention is to provide fluid impelling mechanism for washing and rinsing machines with which the dispensed fluid will be delivered in sufficient volume and at a proper high velocity to thoroughly clean and/or rinse the articles being treated, said fluid being dispersed in the form of a band-like stream which extends the full length of the enclosing housing and which is caused to travel the full width thereof to effectively treat all articles enclosed within the housing.

Still another important object of the invention is to provide a fluid impelling mechanism which is of such construction that it may be assembled and disassembled with respect to the housing as a single unit, thereby facilitating making repairs on the unit per se and maintaining the entire apparatus available for use at all times without being withdrawn from service while the apparatus is sent to a shop for repairs.

The fluid impelling mechanism embodying this invention constitutes an improvement over the fluid impelling mechanism disclosed and claimed in my patent numbered 2,137,971, issued November 22, 1938, and over the fluid impelling mechanism disclosed and claimed in my copending application Ser. No. 302,594 which was filed November 2, 1939, now matured into Patent No. 2,257,929, issued October 7, 1941.

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 the dish and silverware washing and rinsing apparatus embodying this invention.

Figure 2 is a horizontal sectional view taken on line 2-2 of Fig. 1.

Figures 3 to 5, inclusive, are detail vertical sectional views illustrating, respectively, three different positions of the fluid directional control portion of the mechanism and the direction of discharge of the fluid when in each position.

Figure 6 is a perspective view of the rotary im-

PELLER MECHANISM EMBODYING THIS INVENTION, AND Figure 7 is a detail perspective view of the fluid directional control mechanism.

In my aforementioned patent numbered 2,137,971, I have disclosed and claimed a fluid impelling mechanism which operates on the principle of simultaneously and continuously subjecting the entire interior of the enclosing housing to the treatment fluid so that all of the dishes, silverware, and the like would be washed and/or rinsed at the same time. To accomplish what was then thought to be the most desirable procedure, a rotatable impeller and fixed deflectors were employed. The rotatable impeller directly delivered the treatment fluid to a certain portion of the interior of the enclosing housing while the fixed deflectors operated to deliver the treatment fluid to the remainder of the enclosing housing.

Later conducted experiments, however, proved that the articles could be more thoroughly and efficiently treated in a shorter length of time and with a smaller quantity of treatment fluid if the fluid was expelled by the impeller mechanism in the form of a concentrated stream or band which was projected into only a fractional portion of the interior of the enclosing housing at any one time and employing movable deflector means which would cause the concentrated discharge to be moved from side to side of the housing so that the various articles arranged within the housing would be repeatedly subjected to this concentrated stream. My aforesaid application Ser. No. 302,594 discloses a form of impeller mechanism which will accomplish this desired result.

As the improvements produced by my aforementioned application structure over my patented structure were due to the delivery of the expelled fluid in a concentrated stream and at a higher velocity, I naturally directed my subsequent efforts toward the development of fluid impelling mechanism which would increase the concentration or volume of the fluid forming the stream and would increase the velocity of the discharge. The impeller mechanism embodying this invention has been found to constitute a marked improvement over the mechanism of my application both as to efficiency of operation and ability to manufacture and maintain in satisfactory operating condition. The improved structural features embodied in this latest mechanism will be developed in detail as follows.

In the drawings, wherein for the purpose of illustration is shown the preferred embodiment of this invention, and first particularly referring to Figs. 1 and 2, the reference character 10 design-

nates in its entirety the housing portion of the apparatus. This housing portion includes a main body part 11 which is formed by the side walls 12 and 13 and the end walls 14 and 15. The bottom wall 16 of the housing is shaped so that its side portions slope downwardly so as to collect and concentrate the greatest amount of fluid in the center of the housing. Figs. 3 to 5, inclusive, illustrate the trough-like shape of the bottom wall of the housing. The open top of the body 11 is closed by the cover 17. A handle 17' is provided for manipulating the cover. Handles 18 are provided at the opposite ends of the main body portion 10 to facilitate moving the apparatus from place to place. Suitable legs 19 support the housing and its mechanism in a desired level position on an appropriate surface, such as a kitchen table, the drainboard of a sink, or the like.

Figs. 3 to 5, inclusive, disclose the level of the fluid 20 when the impelling mechanism is being operated. Naturally, when the impeller is idle, the fluid will be at a normal level which is higher than that disclosed in these figures. Any suitable means may be provided for admitting the washing and rinsing fluids into the housing interior and for measuring or determining the proper amount of fluids to be employed. My aforementioned patent discloses such fluid delivering and measuring means. My patent also discloses an appropriate drain by means of which the used fluid may be withdrawn from the housing. The same or similar fluid draining means may be incorporated in the present housing.

Fig. 2 discloses the end wall 15 of the housing body as having mounted thereon a shaft bearing 21. This bearing may be of any desired construction and is intended to remain fixed to the end wall 15.

The opposite end wall 14 of the housing body is of special construction for it includes a relatively large rectangular opening 22 which is located adjacent the bottom wall 16 of a housing body and is arranged slightly off center. To the right of this rectangular opening 22, the end wall 14 is provided with a second opening 23. Welded to the inner face of the bottom wall 16 and the inner faces of the side wall 12 and end wall 14 is a motor enclosing casing 24. This casing is shaped to form the top, one side, and one end of the motor casing. The side wall 12 of the housing body constitutes the other side wall of the motor casing. The second end wall is left open by the opening 23 formed in the end wall 14 of the housing body. The bottom of the casing 24 is formed by a portion of the bottom wall 16 of the housing. Figs. 1 and 2 disclose louvers 25 which are formed in the portion of the housing body side wall 12 which constitutes the outer side wall of the motor casing 24. These louvers provide ventilation and air circulation for the electric motor 26 which is located in the casing 24.

The larger opening 22 formed in the housing body end wall 14 is adapted to be closed by the readily removable plate 27. A suitable sealing gasket 28 is provided to prevent loss of fluid through the joint formed between this plate 27 and the housing end wall 14. A shaft bearing 29 is mounted on this plate 27 and projects into the interior of the housing body through a suitable opening formed in the plate. This bearing may be of any desired construction and is located on the plate 27 so that it will be in axial alignment with the shaft bearing 21 mounted

on the end wall 15 of the housing body. The plate 27 also acts as a mounting for a casing 30 housing a small electric motor and suitable reduction gearing which is suitably secured to the plate. The slow speed shaft 31 extending from the casing 30 projects into the interior of the housing through a suitable opening formed in the plate. Figs. 1 and 2 disclose a suitably shaped pan or cover 32 which is detachably secured to the end wall 14 of the housing body and functions to enclose the small motor 30, the opening 23 in the end wall of the motor casing 24, and the drive mechanism which extends from the main electric motor 26 to the impeller mechanism, which will be described at a later point.

The fluid impeller mechanisms disclosed in my aforementioned patent and in the above identified application each included a rotatable shaft on which was mounted axially spaced impeller wheels or sets of blades. The use of spaced impeller wheels in the structure of my patent was made necessary, if for no other reason, by the type of fixed deflectors employed in the assembly. This same spaced impeller wheel idea was carried forward into the structure disclosed in my aforementioned application notwithstanding my desire at that time to employ continuous impeller blades which extended the full length of the fluid impelling zone. I was desirous of employing these continuous blades because they theoretically should be able to project a greater volume of liquid as a result of their increased impelling surface. It was discovered, however, that continuous, full-length blades operated to drill a trough in the water residing in the bottom of the housing. This trough apparently was formed as a result of the air which was picked up by the impeller blades in traveling through the upper half of their path of rotation. In expelling this air, the water trough was formed. With an impeller unit that measured 3 inches in diameter and rotated at a speed falling between 3000 R. P. M. and 3500 R. P. M., the surface of the water trough was located in spaced relation to the outer edges of the blades for an appreciable distance extending from the starting or entrance side of the trough. At a speed of approximately 3000 R. P. M., the spacing between the free edges of the blades and the starting or entrance side of the trough was approximately $\frac{1}{4}$ of an inch. This spacing tapered off and disappeared at approximately the bottom dead center with respect to the axis of the impeller shaft. As a result of drilling this fluid trough, the continuous blades did not pick up and expel a greater volume of water than was picked up and expelled by the spaced impeller wheels, or sets of blades, disclosed in my aforementioned application. I finally discovered a way to overcome this trough drilling action and the impeller mechanism about to be described accomplishes that desired result.

The impeller is best shown in detail in Fig. 6. It includes a shaft 33 on which the spaced collars or hubs 34 are rigidly mounted. These hubs or collars 34 have attached thereto the four continuous blades 35 which are slightly curved transversely, or in a radial direction. The blades are provided with base flanges 36 by means of which they are attached to the hubs or collars 34. Screws, or the like, 37 are used to anchor the base flanges of the blades to the hubs or collars. It will be noted that these base flanges 36 are not wide enough to entirely fill the spaces between adjacent blades and for that reason,

the center portion of the blade assembly is left open and the spaces between adjacent blades are all constantly in open communication with each other through the center portion of the assembly. This open construction is important and its function will be explained at a later point.

By inspecting Fig. 2, it will be seen that one end of the shaft 33 is journaled in the shaft bearing 21, while the other end is journaled in and passes through the shaft bearing 29 that is carried by the removable plate 27. This latter shaft end is shown in Fig. 2 as having mounted thereon a pulley 38 which is properly grooved to receive the V-shaped belt 39. This belt in turn is trained over the pulley 40 that is mounted on the armature shaft 41 of the electric motor 26. By means of this type of drive, the motor 26 rotates the impeller at the desired high speed. It has been determined that a speed of approximately 3000 R. P. M. is most desirable for an impeller having a three inch diameter.

By inspecting Fig. 1, it will be seen that the motor 26 is mounted for pivotal movement about a hinge type of mounting 42 which is offset laterally so that the weight of the motor 26 will be applied to the belt 39 to maintain the same taut. The full weight of the motor 26, when it is supported in this off center manner, would provide a too high degree of tautness or tension for the belt 39 and for that reason compression springs 43 are interposed between the bottom wall of the motor casing and the outer side of the motor to support part of the load of the motor. It will be appreciated, of course, that if the weight of the motor 26 is not sufficient to tension the belt 39 to the desired degree, the springs 43 may be of the tension type and will apply an additional force or load on the motor. In other words, such tension springs will add their pulling force to the weight of the motor in applying tension to the belt.

The impeller mechanism of my aforementioned application employed a fluid deflector blade which performed the functions of controlling the direction of discharge of the expelled fluid and causing the discharged stream to traverse or travel back and forth across the interior of the housing as a result of being oscillated about the axis of the impeller shaft. This deflector also functioned to concentrate the discharged fluid by compelling all of the fluid to be expelled in a tangential direction as distinguished from permitting part of the fluid to be expelled substantially in a radial direction.

The improved form of deflector employed in the present impeller mechanism plays a very important part in making possible the use of continuous impeller blades. This curved deflector can best be described in connection with Figs. 3 to 5, inclusive, and 7.

In Fig. 7, there are disclosed spaced end hubs or collars 44 which are centrally apertured at 45 for receiving the impeller shaft bearings 21 and 29. The peripheries of these hubs or collars 44 are rather peculiarly shaped, as is clearly illustrated in Figs. 3 to 5, inclusive. The major portion of the periphery of each hub is concentrically arranged with respect to the axis of the impeller shaft. This concentric peripheral portion extends approximately three-quarters of the distance of the circumference of each hub or collar 44. The periphery of the hub or collar for the remaining one-quarter is generated from a different axis which is offset laterally of the normal axis and a

slightly greater radius is employed. This final quarter of the periphery, therefore, assumes somewhat the shape of a spiral curve with respect to the normal periphery of the hub or collar. This spirally curved quarter section results in placing the points 46 a greater distance from the axis of the impeller shaft than the location of the normal three-quarters of the periphery. This greater spacing of the points 46 is such that it will place these points at approximately the location of the starting or entering side of the fluid channel which is drilled by a solid or continuous bladed impeller of the diameter of the impeller with which these hubs or collars are associated when that impeller is rotated at the same speed as the present impeller. Stated in another way, if a continuous bladed impeller is three inches in diameter and that impeller is rotated at 3000 R. P. M., it will drill a fluid channel which is spaced at its starting or entering side from the outer edges of the impeller blades one-quarter of an inch. With the same impeller rotating at the same speed, the points 46 should be spaced one-quarter of an inch farther away from the axis of the impeller shaft than the spacing of the normal parts of the hub or collar periphery.

Figs. 3 to 5, inclusive, and 7 disclose a curved deflector 47 which is secured to the periphery of the two hubs or collars 44 with one longitudinal edge registering with the points 46. It has been determined that the width of this curved deflector should be at least equal to the diameter of the impeller assembly; that is, for an impeller having a diameter of three inches, the deflector 47 should measure at least three inches in width, or in a diameter circumferentially of the impeller.

Of course, with a curved deflector of this character, the fluid projected by the impeller blades will be discharged over one longitudinal edge of the deflector and the location of this discharge edge with respect to the periphery of the rotatable impeller will determine the direction of discharge of the resultant fluid stream. Figs. 3 to 5, inclusive, disclose the deflector in three different positions. Fig. 3 represents one extreme position while Fig. 5 represents the opposite extreme position of the deflector. Fig. 4 illustrates an intermediate position. The stream of fluid 48 is illustrated in these three figures. It will be seen, therefore, that the full width of the housing will be covered by or will fall within the path of the fluid stream when the deflector is moved through the illustrated range.

It is desired to oscillate the deflector between the two limits represented by Figs. 3 and 5. To bring about this oscillatory movement, Figs. 1 and 2 disclose the slow speed shaft 31 projecting from the casing 30, which encloses a small motor and a suitable reduction gearing, as having a crank or disc 49 mounted thereon. A connecting rod 50 is suitably attached to this crank or disc 49 at one end and is attached at 51 to the adjacent hub or collar 44 that supports the deflector 47. Rotation of the crank or disc 49 will bring about the desired oscillation of the deflector 47 and its supporting hubs or collars 44.

By inspecting Fig. 3, it will be seen that the longitudinal edge 52 of the deflector 47 is above the level of the liquid 20 located within the bottom of the housing body 11. As the fluid is expelled over the opposite longitudinal edge 53 of the deflector, the fluid must naturally pass into the deflector and the operative zone of the impeller blades at a point rearwardly of this discharge head 53. If the deflector 47 were made

solid throughout its width, the fluid would have to enter the deflector by passing over its rear edge 52. Such an admission of fluid is impossible when the deflector is in the position illustrated in Fig. 3. For that reason, the rear or intake portion of the deflector 47 is notched at 54 to provide openings through which the fluid may pass when the edge 52 of the deflector is above the fluid level in the housing.

It has been determined that this wide type of deflector makes possible the use of a continuous bladed impeller without any loss of fluid volume. In other words, the said deflector prevents the continuous bladed impeller from drilling a fluid channel or trough which, as was explained above, reduces the amount of fluid reaching the impellers for being expelled into the interior of the housing. The wide deflector cooperates with the impeller to create a pressure differential between the discharge side or edge 53 of the deflector and its inlet side or edge 52. In other words, a low pressure zone is created at the discharge side 53 and the normal atmospheric pressure which exists at the inlet side 52 compels the fluid to pass into the deflector either over the longitudinal edge 52 of the deflector or through the notches 54 formed in the deflector. It will be appreciated, of course, that if the throw or extent of oscillatory movement of the deflector 47 were reduced so that the inlet edge 52 of the deflector 47 were not moved above the fluid level in the housing, the notches 54 would not be required.

With the structure developed to this point, it was determined that from the position shown in Fig. 3 to approximately the position shown in Fig. 4, the volume of fluid expelled in the stream 48 was considerably greater than the volume of fluid expelled by the mechanism disclosed in my aforementioned application but beyond the position shown in Fig. 4 the volume of fluid dropped off or was reduced. This change in action unquestionably was due to the fact that a fluid trough or channel was being formed in back of the longitudinal edge 52 of the deflector and the formation of this trough prevented the proper amount of fluid from entering the deflector. Additionally, when the inner ends of the notches 54 approached the fluid level and moved above the fluid level, see Fig. 5, considerable fluid was expelled through these notches.

For the purpose of eliminating this fluid trough drilling tendency, and because it was desirable in any event to more completely enclose the impeller so that it would be impossible to injure one's fingers or hand by placing the same in the path of the impellers, a guard 55 was applied to a part of the remainder of the normal peripheries of the hubs or collars 44. This guard was of a proper width to leave a discharge opening 56 at the discharge side of the deflector 47 and an inlet opening 57 at the inlet side of the deflector.

This guard 55 performed its intended function in an ideal manner. The guard completely overcame the tendency to drill a fluid trough or channel after the inlet edge 52 of the deflector became submerged. The guard, also, almost completely stopped the discharge of fluid through the notches 54 as their inner ends approached and passed beyond the fluid level, see Fig. 5. By controlling the width of the outlet or discharge opening 56, formed by the space between the longitudinal edge 53 of the deflector 47 and the opposed, adjacent edge of the guard 55, the thickness of the fluid stream 48 could be

definitely controlled. In this way, the velocity of the discharge was increased. The volume of fluid forming the stream 48 was found to be substantially constant throughout the entire range of travel, or arc of movement, of the deflector 47. The constant volume and velocity of fluid discharge were found to be greater or higher than for any portion of the discharge obtained when the guard 55 was not employed.

The explanation for this substantial increase in volume and velocity appears to be that the enclosing of the impeller blades enables them to create a greater pressure differential between the outlet opening 56 and the inlet opening 57. It will be appreciated that the outlet opening is at all times sealed by the fluid of the stream 48. The inlet opening 57 is sealed while it is submerged in the fluid. It is presumed that the longitudinal edge of the guard 55 which lies opposite the discharge edge 53 of the deflector 47 cuts off a part of the fluid which would ordinarily be centrifugally expelled from the outer edges of the impeller blades. This cut off fluid is not lost because it is not permitted to escape and is returned to the deflector 47 where it joins the newly admitted fluid. The radial offsetting of the rear portion of the deflector assists in retaining this fluid which is carried into the guard portion of the assembly.

Coming now to the previously described open center of the rotatable impeller, it was determined that this open construction for some reason operates to add to the volume and velocity of discharge of the fluid. This beneficial result was discovered purely by accident. The first impeller to be used with the deflector and guard assembly was a one-piece unit which was formed by extruding the impeller through a discharge nozzle which had an opening shaped to provide the impeller hub and the four blades. This one-piece impeller unit had a tendency to whip or vibrate. It was believed that this tendency was due to the weight of the impeller and the fact that the impeller shaft could only be supported at its ends. For the purpose of reducing the weight of the impeller, and thereby eliminating its tendency to whip and vibrate, the fabricated structure disclosed in the several figures was produced. This fabricated structure not only eliminated the tendency to whip and vibrate but it additionally brought about an increase in the volume and velocity of fluid discharge and it lowered the wattage required to drive the electric motor 26.

To definitely establish the fact that the open construction of the center portion of the impeller was responsible for this improved operation, the original, solid impeller was again placed in the deflector and guard assembly but holes were first drilled through the hub to place in communication with each other the spaces between the adjacent blades. This test started out with only a few holes drilled through the hub and arranged to establish communication only between two of the opposed spaces between blades. From this starting point, additional holes were drilled to place the remaining two blade spaces into communication with each other and then the number of holes were increased between each opposed pair of blade spaces. It was found that the volume and velocity of fluid discharge was increased appreciably with each increase in the number of holes employed for interconnecting the blade spaces. Additionally, the wattage required to operate the electric motor 26 dropped

in proportion to the increase in the number of interconnecting holes drilled in the hub.

Another very desirable feature provided by this impeller assembly is that the fluid in the trough-shaped bottom of the housing is very quiet in the vicinity of the impeller. This quietness of the fluid allows food particles, and the like, which have been dislodged from the articles being washed, to settle in the bottom of the housing and remain there until the washing fluid is drained from the housing.

By inspecting Figs. 1 and 2, it will be obvious that by removing the pan or cover 32 and then disconnecting the drive belt 39 from the pulley 38, the plate 27 may be disconnected from the end wall 14 of the housing and the entire impeller mechanism withdrawn from the housing through the opening 22. This withdrawn impeller mechanism then may be sent to a shop for repairs. While service is being performed on the impeller mechanism, the owner of the washing and rinsing apparatus need not be deprived of the use of his machine because the service man readily can substitute another impeller assembly in the apparatus to be used by the owner until the original mechanism is repaired. Obviously, should it be advisable to replace the worn impeller mechanism, an entirely new unit may be substituted.

The mechanism employed for driving the oscillatable deflector 47 and its guard 55 has been described above as consisting of the small motor 30, the crank or disc 49, and the connecting rod 50. It will be apparent that other types of drives may be employed in place of this auxiliary motor. For example, reduction gearing of any desired character may be employed for connecting one impeller shaft end to a shaft which is substituted for the slow speed shaft 31.

The description presented above which recites the manner in which the impeller mechanism was developed makes it apparent that all of the disclosed features of construction are highly desirable for a thoroughly efficient mechanism; however, a reasonably efficient unit will be provided if certain structural features are omitted. For example, the notches 54 may be dispensed with if the apparatus is modified so that the arc of oscillation of the deflector 47 may be reduced to allow the inlet opening 57 to remain submerged in the fluid at all times. For example, the width of the housing may be reduced or the impeller mechanism may be moved to the right of the position illustrated in Figs. 3 to 5, inclusive. If desired, the illustrated housing, or a wider housing, may be provided with two impeller mechanisms arranged in parallelism. In each one of these possible modifications, the arc of oscillation of the deflector 47 may be reduced.

It is obvious from the above description that the guard 55 may be dispensed with and the central portion of the impeller may be left entirely closed. To provide such a closed central portion, the entire impeller may be formed in one piece by an extruding machine or the base flanges 36 may be increased in width so that they will completely fill the present gaps between the longitudinal edges of these flanges and the adjacent side surfaces of adjoining blades.

As certain dimensions are critical if a thoroughly efficient apparatus is desired, one set of dimensions will be given. It will be understood, however, that either larger or smaller machines may be employed if the same relative dimensions or proportions are maintained.

If the impeller measures three inches in diameter, the normal diameter of the end hubs or collars 44, which support the deflector 47 and the guard 55, should be $3\frac{3}{8}$ inches in diameter. This will provide a clearance of $\frac{1}{8}$ of an inch between the longitudinal outer edges of the impeller blades 35 and the discharge edge 53 of the deflector 47. A clearance of $\frac{1}{8}$ of an inch also will be provided between the longitudinal outer edges of the deflector blades and the entire inner surface of the guard 55. The clearance between the outer edges of the deflector blades and the inlet edge 52 of the deflector will be $\frac{3}{8}$ of an inch. The width of the deflector 47, i. e., the distance between the longitudinal edges 52 and 53 will be $3\frac{1}{2}$ inches. The width of the guard 55 will be $4\frac{3}{8}$ inches. The width of the outlet opening 56 should be $\frac{7}{8}$ of an inch. The width of the inlet opening 57 should be $\frac{5}{8}$ of an inch. The width of each impeller blade should be at least $\frac{1}{2}$ the diameter of the impeller, or at least one inch. With the dimensions given above, the most satisfactory speed for the impeller appears to be a peripheral speed of 2500 feet per minute.

It is to be understood that the form of this invention herewith shown and described is to be taken as a preferred example 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. In a dish and silverware washing and rinsing machine, a housing having a bottom portion for collecting fluids, a rotary impeller extending horizontally of the housing adjacent its bottom to receive fluid therefrom and project it into the housing, means for partially enclosing the impeller mounted for angular movement about the axis of and relative to the impeller, said means comprising an elongated transversely curved fluid deflector portion and an elongated transversely curved guard portion opposed to said deflector portion, said deflector and guard portions extending longitudinally of the impeller and being spaced at their adjacent longitudinal edges to provide opposed fluid inlet and outlet openings, and means for angularly moving the deflector and guard assembly about its longitudinal axis so that the fluids projected through said outlet opening by the impeller will be caused to traverse the housing from one side to the other as a result of movement of the deflector portion relative to the periphery of the impeller.

2. In a dish and silverware washing and rinsing machine, a housing having a bottom portion for collecting fluids, a rotary impeller extending horizontally of the housing adjacent its bottom to receive fluid therefrom and project it into the housing, means for partially enclosing the impeller mounted for angular movement about the axis of and relative to the impeller, said means comprising an elongated transversely curved fluid deflector portion and an elongated transversely curved guard portion opposed to said deflector portion, said deflector and guard portions extending longitudinally of the impeller and being spaced at their adjacent longitudinal edges to provide opposed fluid inlet and outlet openings, and means for continuously oscillating the deflector and guard as a unit to cause the fluid projected through the outlet opening by the impeller to traverse back and forth across the housing so as to treat all portions of the interior thereof.

3. A dish and silverware washing and rinsing machine, comprising a housing having a bottom portion for collecting fluids, a shaft bearing attached to one vertical wall of the housing, the opposite vertical wall of the housing having a relatively large opening formed therein, a plate removably attached to the last-mentioned vertical wall to close said opening, said plate having a shaft bearing mounted thereon in axial alignment with the first mentioned shaft bearing, a fluid impeller unit adapted to be inserted and withdrawn with respect to the housing through said wall opening and including an impeller having a shaft journaled in both of said shaft bearings and projecting from the housing through said plate, and means for rotating said impeller drivingly connected to the projecting end of its shaft.

4. In a dish and silverware washing and rinsing machine, a housing having a bottom portion for collecting fluid, a shaft bearing attached to one vertical wall of the housing, the opposite vertical wall of the housing having a relatively large opening formed therein, a plate removably attached to the last-mentioned vertical wall to close said opening, said plate having a shaft bearing mounted thereon in axial alignment with the first mentioned shaft bearing, a fluid impeller unit adapted to be inserted and withdrawn with respect to the housing through said wall opening and including an impeller having a shaft journaled in both of said shaft bearings and projecting from the housing through said plate with means including a fluid deflector partially surrounding the impeller and mounted for angular movement relative to the impeller axis, means for rotating said impeller drivingly connected to the projecting end of its shaft, and means for operating the fluid deflector.

5. In a dish and silverware washing and rinsing machine, a housing having a bottom portion for collecting fluid, a rotary impeller extending horizontally of the housing adjacent its bottom to receive fluid therefrom and project it into the housing, said rotary impeller including a plurality of longitudinally extending blades spaced from each other at their inner edges so that all of the spaces between adjacent blades will be in open communication with each other through the central portion of the impeller, means for partially enclosing the impeller mounted for angular movement about the axis of and relative to the impeller, said means comprising an elongated transversely curved fluid deflector and an elongated transversely curved guard opposed to said deflector, said deflector and guard extending longitudinally of the impeller and being spaced at their adjacent longitudinal edges to provide opposed fluid inlet and outlet openings, and means for angularly moving said deflector and guard about the axis of the impeller so that the fluid projected through the said outlet opening by the impeller will be caused to traverse the housing from one side to the other as a result of movement of the deflector relative to the periphery of the impeller.

6. In a dish and silverware washing and rinsing machine, a housing having a bottom portion for collecting fluid, a rotary impeller extending horizontally of the housing adjacent its bottom to receive fluid therefrom and project it into the housing, means for partially enclosing the impeller mounted for angular movement about the axis of and relative to the impeller, said means comprising an elongated transversely curved fluid deflector and an elongated transversely curved

guard opposed to said deflector, said deflector and guard extending longitudinally of the impeller and being spaced at their adjacent longitudinal edges to provide opposed fluid inlet and outlet openings, the portion of the deflector adjacent said fluid inlet opening being notched to increase the area of the inlet opening, and means for angularly moving said deflector and guard about the axis of the impeller so that the fluid projected through said outlet opening by the impeller will be caused to traverse the housing from one side to the other as a result of movement of the deflector relative to the periphery of the impeller.

7. In a dish and silverware washing and rinsing machine, a housing having a bottom portion for collecting fluids, a rotary impeller extending horizontally of the housing adjacent its bottom to receive fluid therefrom and project it into the housing, said impeller including a plurality of longitudinally extending blades with the spaces between adjacent blades being in open communication with each other through the central portion of the impeller, means for partially enclosing the impeller mounted for angular movement about the axis of and relative to the impeller, said means comprising an elongated transversely curved fluid deflector and an elongated transversely curved guard opposed to said deflector, said deflector and guard extending longitudinally of the impeller and being spaced at their adjacent longitudinal edges to provide opposed fluid inlet and outlet openings, and means for continuously oscillating said deflector and guard as a unit about the axis of the impeller to cause the fluid projected through the outlet opening by the impeller to traverse back and forth across the housing so as to treat all portions of the interior thereof.

8. In a dish and silverware washing and rinsing machine, a housing having a bottom portion for collecting fluid, and fluid impeller mechanism extending horizontally of the housing adjacent its bottom to receive fluid therefrom and project it into the housing, said impeller mechanism including a rotary impeller, an arcuate shaped fluid deflector adjacent the periphery of said impeller, an arcuate shaped guard opposed to said deflector and having each of its longitudinal edges spaced from the adjacent edge of said deflector to provide fluid inlet and outlet openings, said deflector to provide fluid inlet and outlet openings, said deflector and guard being mounted for angular movement as a unit about the axis of said impeller.

9. In a dish and silverware washing and rinsing machine, a housing having a bottom portion for collecting fluids, a rotary impeller extending horizontally of the housing adjacent its bottom to receive fluid therefrom and project it into the housing, means for partially enclosing the impeller movable around the axis of and relative to the impeller, said means comprising an elongated transversely curved deflector extending longitudinally of the impeller, an elongated transversely curved guard extending longitudinally of the impeller in opposed relationship to said deflector, adjacent longitudinal edges of said deflector and guard being spaced to provide opposed fluid inlet and outlet openings, the longitudinal edge of said deflector adjacent the fluid inlet opening being spaced a greater radial distance from the axis of said impeller than is the adjacent longitudinal edge of said guard, means for rotating the impeller, and means for moving the

deflector and guard around the axis of the impeller.

10. In a dish and silverware washing and rinsing machine, a housing having a bottom portion for collecting fluids, a rotary impeller extending horizontally of the housing adjacent its bottom to receive fluid therefrom and project it into the housing, means for rotating said impeller, a generally cylindrical deflector and guard assembly surrounding said impeller except for horizontally elongated substantially diametrically opposed

fluid inlet and outlet openings, the far edge of the fluid inlet opening with reference to the direction of rotation of the impeller being spaced a greater radial distance from the axis of the impeller than is the near edge of said fluid inlet opening, said assembly being mounted for movement around the axis of and relative to the impeller, and means for continuously oscillating said assembly about the axis of the impeller.

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