Jan. 5, 1954 H. K. STOKES ET AL 2,664,904

DISHWASHING MACHINE

Filed June 13, 1950 4 Sheets-Sheet 1

Fig. 1

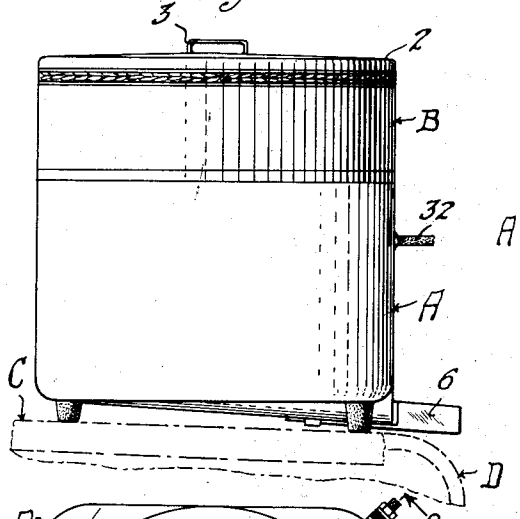


Fig. 2

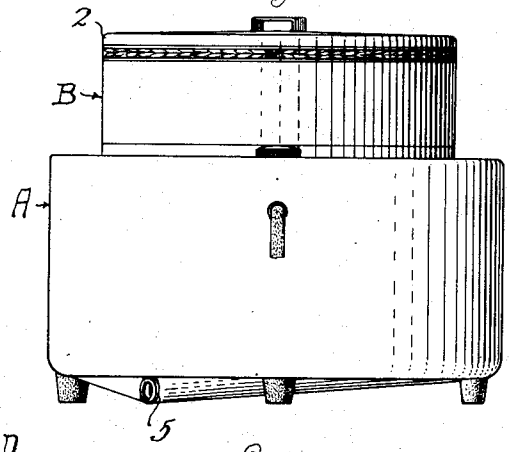


Fig. 3

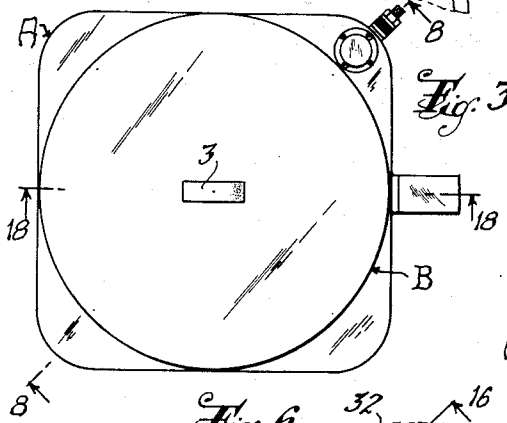


Fig. 5

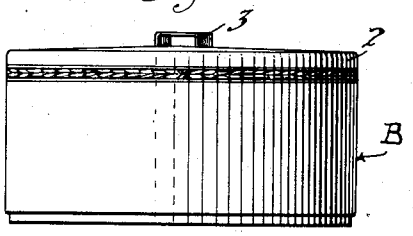


Fig. 4

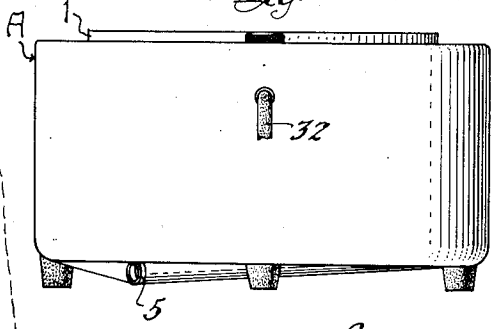


Fig. 6

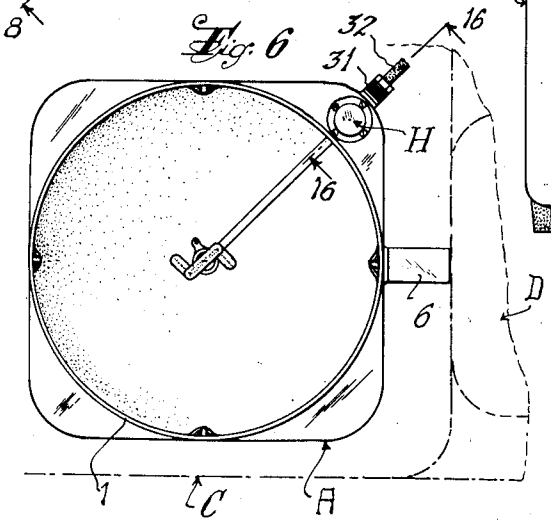
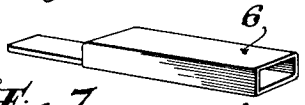


Fig. 7



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DISHWASHING MACHINE

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Fig. 8

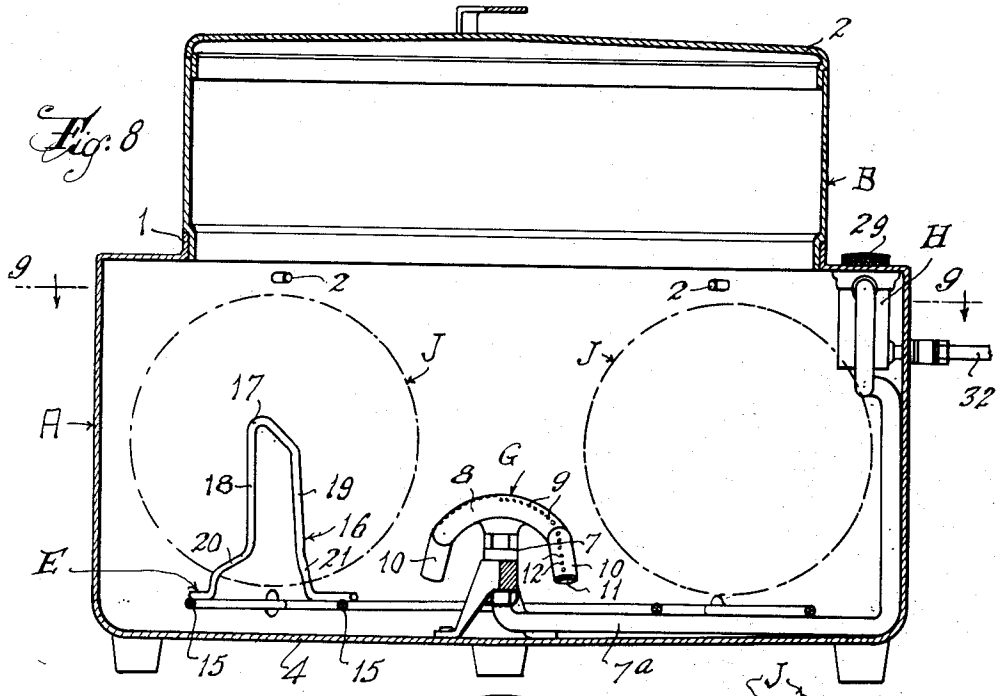

Fig. 10

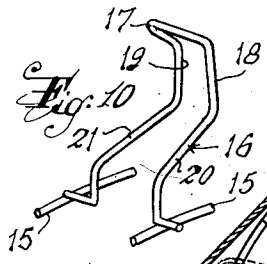

Fig. 11

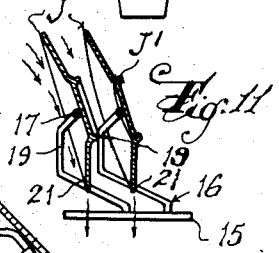

Fig. 9

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DISHWASHING MACHINE

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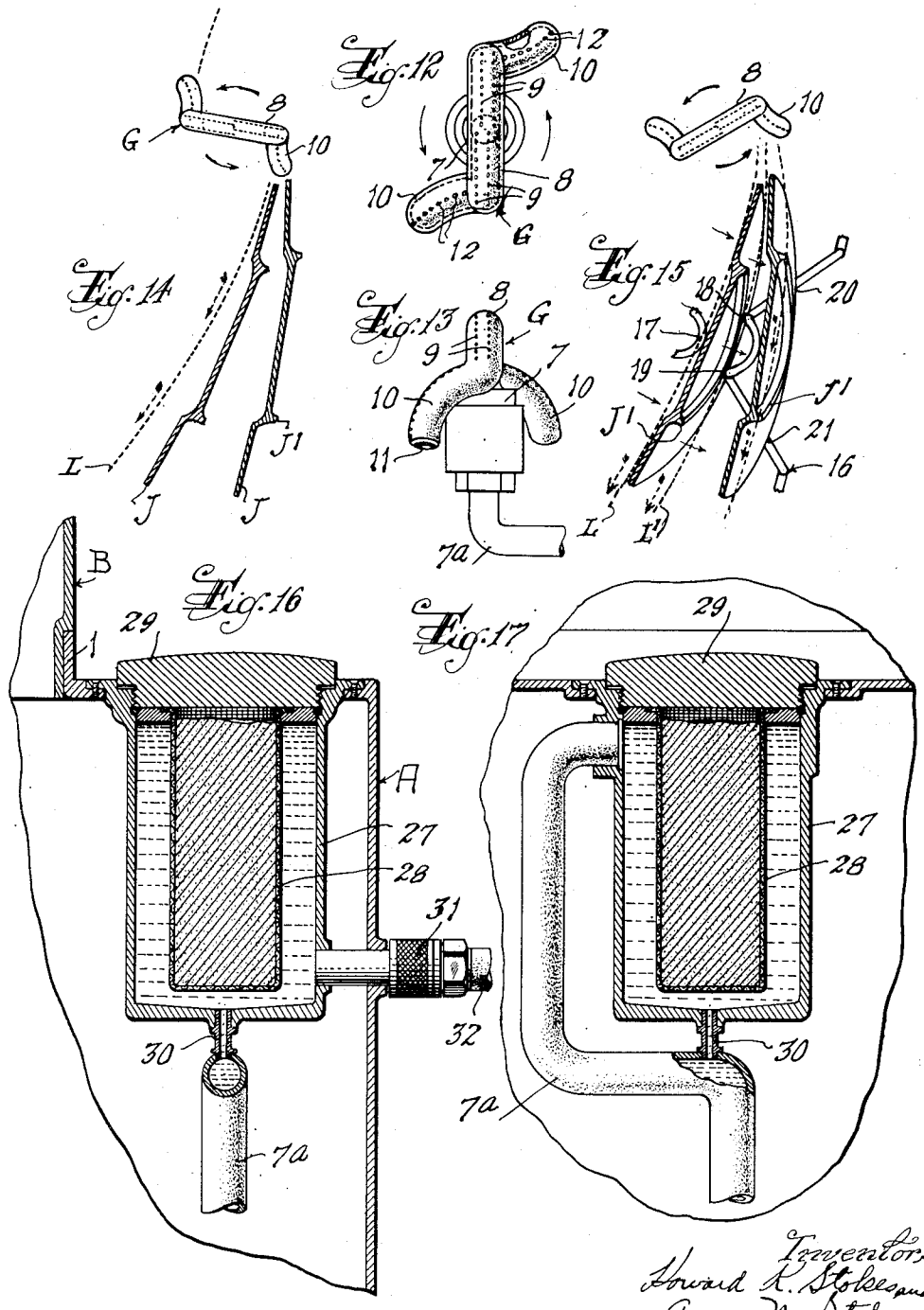

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DISHWASHING MACHINE

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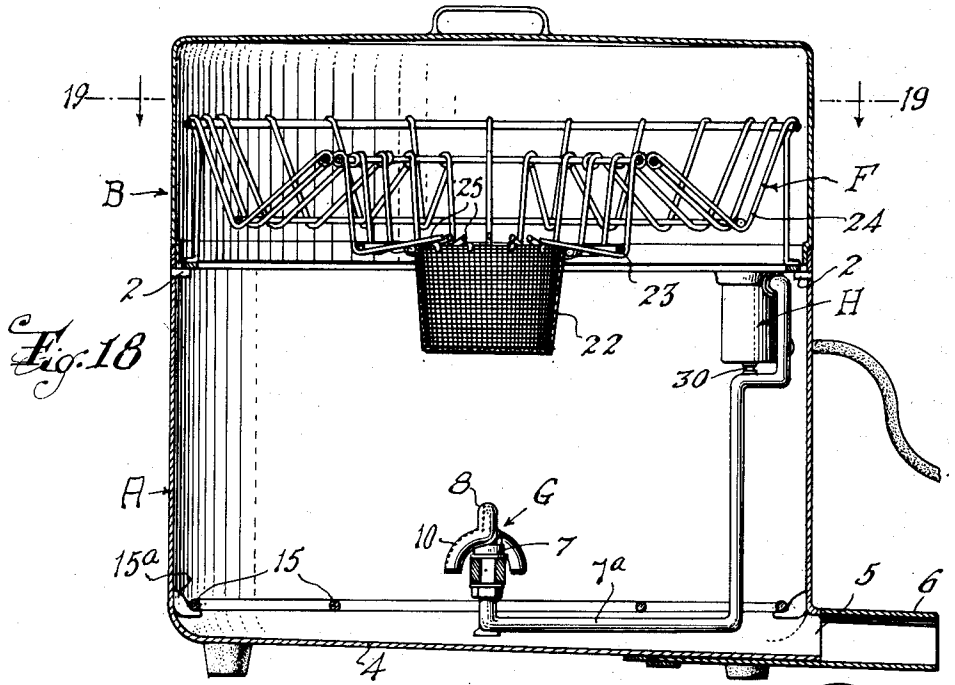

Fig. 18

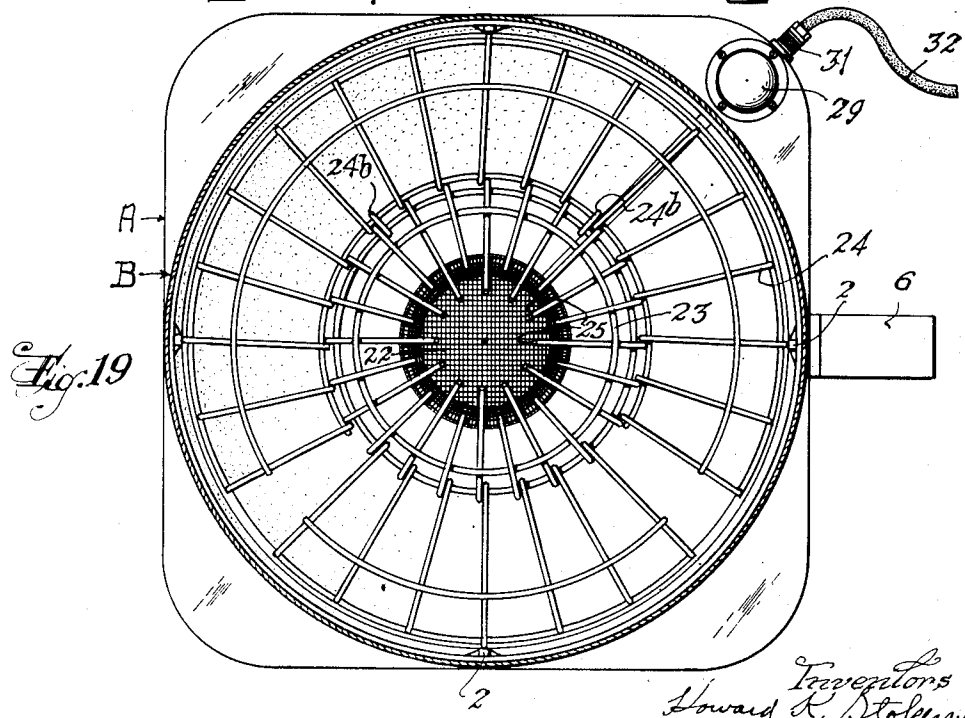

Fig. 19

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UNITED STATES PATENT OFFICE

2,664,904

DISHWASHING MACHINE

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Application June 13, 1950, Serial No. 167,805

5 Claims. (Cl. 134—179)

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This invention relates to a new device for washing dishes, plates, glasses, cups, silver, and the like, by means of a water-powered spraying mechanism operating in an enclosure containing racks designed to hold the various types of objects to be washed, in effective positions. Known dishwashing machines of this general type have not given satisfaction nor met with public approval for one or more of the following reasons: (1) inadequate performance, (2) difficulty of use, (3) insufficient capacity, (4) lack of reliability, (5) high cost of manufacture.

Prime objects of the invention are to provide a diswashing machine which shall overcome all of the above-mentioned difficulties incident to known machines, and thus to provide a machine which shall include a uniquely shaped rotary spray head for water and cooperating racks for holding each article to be washed in such a position as to be subjected to an almost continuous flow of water over every portion thereof as long as the machine is in operation, thereby ensuring maximum results.

Another object is to provide such a machine which shall include novel and improved racks for the objects to be washed whereby said objects can be placed in the machine with utmost speed and ease but in only the optimum positions for best washing results.

Further objects are to provide a dishwashing machine of the character described which shall be simple and inexpensive in construction and embody only one moving part, which shall require only water pressure such as is found in the ordinary household service water systems for operation and which shall make possible automatic soaping, rinsing, drying and shall be self-draining, easily portable and adaptable to the needs and functions of the average kitchen; and to provide such a machine which can be produced under mass production methods for a small fraction of the cost of electrically operated machines that are capable of producing comparable results.

Other objects, advantages and results of the invention will be brought out by the following description in conjunction with the accompanying drawings in which

Figure 1 is a front elevational view of a dishwashing machine constructed in accordance with the invention;

Figure 2 is a side elevational view thereof;

Figure 3 is a top plan view of the machine;

Figure 4 is a side elevational view of the bottom or main section of the machine;

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Figure 5 is a similar view of the top or cover section;

Figure 6 is a top plan view of the section of the machine shown in Figure 4;

Figure 7 is a detached perspective view of the drain tube or leader;

Figure 8 is an enlarged vertical sectional view through the machine approximately on the plane of the line 8—8 of Figure 3 with the major portion of the article holding racks removed for clearness in illustration;

Figure 9 is a horizontal sectional view approximately on the plane of the line 9—9 of Figure 8 showing the plate holding racks in position;

Figure 10 is an enlarged fragmentary perspective view of one of the plate rests;

Figure 11 is a vertical sectional view approximately on the plane of the line 11—11 of Figure 9;

Figure 12 is an enlarged top plan view of the spray head;

Figure 13 is a side elevational view of the spray head;

Figure 14 is a schematic plan view of the spray head and horizontal sectional view of two plates as they are normally arranged in the machine, showing the distribution of the jets of water;

Figure 15 is a similar view showing the spray head in a different position and also including portions of the plate rests;

Figure 16 is an enlarged fragmentary vertical sectional view approximately on the plane of the line 16—16 of Figure 6 illustrating the soaping device;

Figure 17 is a similar view taken on a plane at right angles to that of the plane 16—16;

Figure 18 is a central vertical sectional view showing the upper article holding racks and omitting the plate holding rack, approximately on the plane of the line 18—18 of Figure 3; and

Figure 19 is a horizontal sectional view approximately on the plane of the line 19—19 of Figure 18.

Specifically describing the invention, the machine includes a casing or housing comprising a lower main section A and an upper section B, preferably of a size and shape to conveniently seat on the drain board C of a household kitchen sink D so that water can be supplied to the machine directly from the faucets and can be drained from the machine directly into the sink.

The bottom section is shown as approximately rectangular in plan view and having a circular

opening at its top surrounded by an upstanding flange 1 within which is telescoped the lower edge of the upper or cover section B which is shown as a cylinder with a closed top having a handle 3 to facilitate manipulation. The bottom wall 4 of the lower section is sloped from all sides toward a drain opening 5 and if desired a drain pipe or leader 6 may be separably attached to the casing to carry water from the drain opening into the sink.

Preferably the inner surface of the cover section B and other horizontal surfaces are formed with depending ribs, projections or drip lips to cause the water striking said surfaces to fall directly downwardly instead of flowing laterally along the surfaces toward the side walls of the casing.

In the lower section A is a plate-holding rack E, above which is an open rack F for supporting cups, glasses, silverware and miscellaneous articles. This upper rack F extends up and into the cover section B and is removably mounted on brackets 2 affixed to the inside surface of the lower main section A just below the flange 1. The entire casing and most of the interior parts preferably are constructed of some light material such as aluminum, whereby the machine shall be easily portable.

Mounted on the bottom wall 4 of the lower casing section is a spray head G which constitutes an important feature of the invention. It is mounted on a water-lubricated vertical bearing 7 at the end of a pipe 7a leading from a soap-mixing device H and standing perpendicularly in the center of the bottom of the container. The central portion 8 of the spray head which rests on the bearing, is an arcuately curved pipe extending through about 90°, rotatable about a vertical axis that is the central radial line of said arc, and having on its outer circumference multiple perforations 9 for the projection of water in directional streams. It will be noted that these perforations are not exactly on the outer circumferential line of the pipe but instead, are in two rows at each side of the axis of rotation with one row on each side of said line. (Figure 12.) The purpose of that arrangement is to direct the water upward, not in a vertical plane, but slightly offset to such a plane on each side, so that the articles above will be subjected to spray from many directions as the spray-head revolves. The offset is not however, great enough to prevent penetration to the bottom of the deepest objects, e. g. tall glasses, that are to be washed in the upper rack. It will be noted too that the offset is greater on one side than on the other to compensate for the component of motion imparted to the water by the rotary action and also to provide additional rotary force. In the machine as pictured, the rotary direction is counterclockwise, as indicated by the arrows in Figures 9, 12, 14 and 15.

Affixed to each end of the center pipe 8 is a curved end pipe 10 fitted with a plug 11 at its extremity. The method of affixation is not considered significant; it may be a weld or a joint, or the entire spray head may be stamped out in one piece. Nor is the exact place of the jointure in the end pipes 10 important. It may be at the upper end as shown, or further down toward the center as long as there is no interference between the sprays from the center and end pipes. Of course if the jointure is elsewhere than at the upper end, there will have to be a seal at the top of the end pipe.

These end pipes are also curved through an arc of approximately 90° and have their convex surfaces uppermost and multiple perforations 12 for the directional escape of water, these perforations being in a row exactly in the outer circumferential line so as to expel the water in a fan-shaped plane extending from vertical to horizontal. The horizontal component of motion imparted to this water is nearly perpendicular to the radius of the rotor and the two end pipes extend in opposite directions from the center pipe and are at opposite ends of the center pipe and angularly related to a diameter of the spray head or to the vertical longitudinal median plane of said center pipe as shown in Figure 9, thus working together to provide driving force which spins the spray head. As shown, the longitudinal median planes of the end pipes are approximately perpendicular to the longitudinal median plane of the center pipe.

A vital feature of this invention is the direction imparted to the fan-shaped plane of water emanating from the end pipes. However this direction is relative rather than absolute. It is that direction which will take the water, when the spray head is in rotation, directly between the plates and other relatively flat objects in the generally circular lower rack (see Figures 9, 14 and 15), and thus completely over their faces as it passes through. The direction is of course, constantly changing, but the angle made by the plane of water with the horizontal is constant—the same angle that is made by a plane passed through each of the plates J, with the horizontal. The horizontal direction changes through 360° but is also constant in its relation to each of the plates in succession. But a plane through a plate immediately subject to the washing action, would not coincide with the plane of the end pipe perforations. There must be a sufficient offset away from the face of the plate to compensate for the tangential component of motion imparted to the water by the rotation. In Figs. 8 and 9 that angle is about 10° but would vary with the speed of rotation. However, the effect of rotation (i. e. the amount of the tangential component) can be minimized by reducing the physical size of the end pipes and thus bringing the water outlets nearer to the circumference of the circle described by the extremities of the center pipe.

The lower extremity of each of the end pipes contains the removable plug 11 so as to permit cleaning of the spray head in case the perforations become clogged by impurities in the water or soap.

In Figs. 8 and 18 the place of original entry of the water is shown as in the middle of the center pipe 8 which is the simplest construction, but that is not intended to exclude dual pipe entry for more equable distribution of pressure, such as for example, entry through two supporting pipes from the bearing leading to the junctures between the center and end pipes. Water is supplied by a hose 32 to the soap mixer H from the faucets at the sink or in any other suitable way.

Now referring to the article-supporting racks, the lower rack consists of two concentric rings 15 of a diameter to pass through the top opening in the lower casing section, on which are mounted 24 dish-supporting brackets 16, regularly spaced around the circumference of a circle; said rings being positively held in proper position by engagement of lugs on the casing with notches in the outer ring as indicated at 15a. It will be noted however that the brackets themselves do

not form a circle; those leading into the corners of the container are disposed further than the others from the center of the casing so that they can support plates of larger size without interference with the spray head, as shown in Figure 9.

These brackets are designed to hold all plates, soup dishes, saucers etc. in the same position regardless of size or shape. That position is slightly out of vertical, making the same angle with the horizontal as is made by the plane of the end pipe perforations with the front side down and facing opposite to the direction of spray head rotation—i. e. facing clockwise as viewed from above, as best shown in Figures 9 and 11. Each dish J is held in such a position that a plane K through it (see Figure 9) would pass just outside the end pipe perforation 12 nearest to the radial tip of the center pipe 8 when the center pipe is perpendicular to that plane.

The position of the dish is controlled by five points of contact, 17, 18, 19, 20 and 21 with the bracket 16. The dish leans with its face in contact with point 17 above points 18 and 19 against which press the annular base rib J' of the dish. These contacts keep the angle with the horizontal constant, regardless of the depth of the vessel. Points 20 and 21 determine how far down between the brackets the dish shall be held, depending on the depth of the dish and the curvature of the sides. The controlling portions of each bracket pair are set and shaped on that angle to radial lines which will hold the dish it supports on the angle described in the preceding paragraph.

The upper rack F is removably mounted and consists of a center cylindrical basket 22 of half-inch mesh wire or the like, for silver, surrounded by two circular sub-racks 23 and 24 for glasses, bowls, cups and other deep ware. The silver basket 22, inner cup and glass sub-rack 23 and a segmental portion of the outer sub-rack 24 are hingedly mounted at 24b on the main portion of the sub-rack to swing upwardly unitarily to provide access to the lower rack 15. As is indicated in Figure 18, the upper rack tiers are so spaced that water from the spray-head can reach them all unimpeded, and the concave objects they hold are on spherically radial lines so as to permit the fullest penetration by the water. Items in the upper rack are washed primarily by water from the center pipe, but where the plates are small, the vertical and near vertical streams from the end pipes also provide washing action.

Circumferentially spaced tines or fingers 25 extend into the silver basket 22 from the inner edge of the glass rack 23 to hold the silver pieces upright; and glasses may be placed over the handles or stems of silver articles without detriment to the washing effect on either. The protruding tines 25 also serve both to keep the silver articles divided and to support the glasses.

Figure 16 illustrates the soap-mixing device H in detail and in cross section. The water inlet pipe 31 may be connected to a faucet by a hose 32 and brings the water into the bottom of the mixing chamber 27 which contains a cup-shaped fine meshed strainer 28. The mixing chamber has a removable top 29 which permits the introduction of soap powder into the strainer and clamps the latter in position. The exit from the mixing chamber is the pipe 7a which leads down close to the corner of the casing and across the bottom wall 4 to the spray head. (See also Fig. 8.) This pipe leads out from near the top of the strainer to prevent air pockets. There is also a small tube 30 leading from the bottom of the mixing chamber into the pipe 7a so that there will be automatic drainage without the necessity for detaching the hose from the water supply.

Part of the incoming hot water, under pressure, is forced through the strainer, saturating the soap, which is gradually carried away through the outlet pipe. When the sop has been completely used up, the water comes through clear to provide a rinse. Relative chamber and strainer sizes have been designed to provide for complete use of two tablespoonfuls of soap powder in approximately one minute with water at 140° F. and normal pressure. Two minutes' operation thus provides a complete wash—one minute of sudsing and one minute of rinsing.

The essential points of operation of this machine are doubtless already clear from the preceding description, but there are some aspects that call for further delineation.

The silver is directly above the center of the center pipe 8. Both silver and the other items in the upper rack are washed by the force of the upthrown water; the upper parts of the silver (handles) and the back of the cups and the glasses are washed by the water reflected from the top and sides of the container. In the lower rack the faces of the plates are washed by the upward and outward flow of water from the end pipes. The backs are washed both by splash between plates and by gravity return water from the top and sides.

It will be observed that the articles such as plates and other flat ware in the lower rack are subjected to washing action only when the position of the end pipes is such as to drive water between the articles in the forms of jets in a plane L from the holes 12 as shown in Figures 14 and 15. The wash begins when the plane of water passes the leading edge of the dish ahead as indicated at L' in Figure 15, the momentum incident to rotation of the spray head throwing said plane of water against the plate at the same time the jets are projected along the plate's surface as indicated by the dotted arrows. Some splash action takes place immediately although the bulk of the water goes on through to the outer reaches of the container. As rotation continues the proportion of water striking the face of the plate increases, reaching a maximum just before its plane passes the edge of the plate. Water that passes between the plates goes on to wash platters and serving dishes and other articles that are too bulky for the racks but may be placed in the corners or along the sides of the container.

The entire operation of the mechanism consists of (1) loading the racks, (2) introducing the soap, (3) turning on the hot water, (4) turning it off at the end of approximately two minutes during which both the washing and rinsing operations are performed; and the machine ensures thorough and rapid washing of the articles in all of the racks with a minimum of expenditure of labor and power, the only power utilized being the water pressure.

It will be observed that the articles to be washed are supported in a generally hemispherical dome-like relation to the spray head, which in conjunction with the arcuate form of the center pipe 8 and the pipes 10 ensures a thorough and efficient distribution of the water over the surfaces of said articles, the spray head producing and projecting a hemispherical spray of water into contact with all of said articles.

We claim:

1. A water powered dishwashing machine including a water spraying means, means for connecting said water spraying means to a source of water under pressure, said water spraying means comprising a rotary spray head having an arcuate center pipe rotatable about a vertical axis which is the central radial line of the arc of said center pipe, and curved end pipes carried by and communicating with the center pipe at each end thereof and extending in opposite directions from the center pipe with their convex surfaces uppermost and their longitudinal median planes in angular relation to the vertical longitudinal median plane of the center pipe, said center pipe and said end pipes having rows of perforations for expelling water in precisely predetermined directions, the said rows of perforations being on the outer circumferential line of the end pipes and differentially offset at opposite sides of the outer circumferential line of the center pipe to form fan-shaped sprays, and dish-supporting means for holding dishes in positions to be contacted by said sprays.

2. In a water-powered dishwashing machine as defined in claim 1, said rows of perforations on the end pipes being disposed to produce said fan-shaped sprays in planes inclined to the horizontal, and wherein said dish-supporting means comprises a rack including bracket arms for holding plates edgewise in an annular approximately concentric relation to the spray head and at the same inclination to the horizontal as said fan-shaped sprays of the end pipes with the front sides of the plates facing downwardly and opposite to the direction of rotation of said spray head, said bracket arms being formed to hold said plates with their planes in offset relation to radial lines of the spray head such that a plane through a plate which is subject to washing action passes just outside the end pipe perforations at the instant when the plane of the plate is parallel to the plane of the fan shaped sprays from the end pipes, so as to compensate for the offset from center of the origin of the sprays from the end pipes and for the tangential component of motion imparted to the water by rotation of the spray head, thereby providing for passage of the sprays from the end pipes between the plate edges and along and completely across the face of each plate, the said brackets also being shaped and located to hold said plates with their centers above said end pipes to provide for entry of the sprays between the plates from the lower inside quadrants of the plates.

3. In a water-powered dishwashing machine as defined in claim 2, the addition of a rack above said spray head having a basket for holding silverware at its center and circular-sub-racks for holding concave objects like cups, glasses and bowls upside down and on spherically radial lines from the center of the spray head to insure fullest penetration of said concave objects by the sprays from said center pipe.

4. A water-powered dishwashing machine comprising in combination a water spraying means as defined in claim 1 and a rack for supporting plates or the like to be washed, edgewise in an annular approximately concentric relation to the spray head, said rack including vertically disposed bracket arms spaced apart so that each two adjacent arms will firmly hold a plate in predetermined position between them, each bracket arm comprising two horizontally spaced vertical portions in spaced relation to the corresponding portions of adjacent bracket arms, to be engaged by the base rib of a plate on an adjacent bracket arm, two horizontally spaced bottom portions inclined downwardly from said vertical portions to support a plate edgewise and a top portion inclined upwardly from said vertical portions on the same side thereof as said bottom portions to engage the face of a plate, thus comprising five contact points so arranged as to hold plates or the like, regardless of shape or size, in the same position relative to the spray head, and with their planes inclined to the horizontal and in offset relation to radial lines of said spray head.

5. A water-powered dishwashing machine as defined in claim 4 wherein some of said bracket arms are located at greater distances than the others from the spray head so as to enable them to support larger plates and the like without interference with the spray head, and to provide, in the case of larger plates, a wider space between the plate edges for the entry of the water sprays.

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