Oct. 30, 1951 S. G. BURT WELLS 2,572,983

IMPELLER ASSEMBLY FOR DISHWASHING MACHINES

Filed Jan. 13, 1945 2 SHEETS—SHEET 1

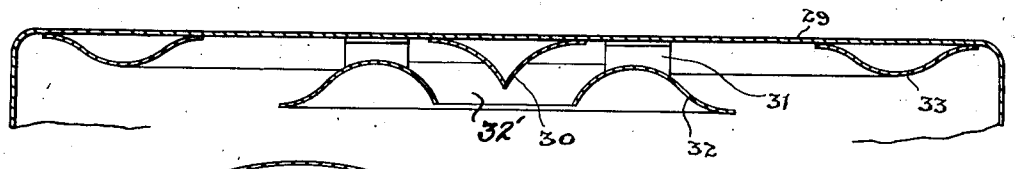


Fig. 2.

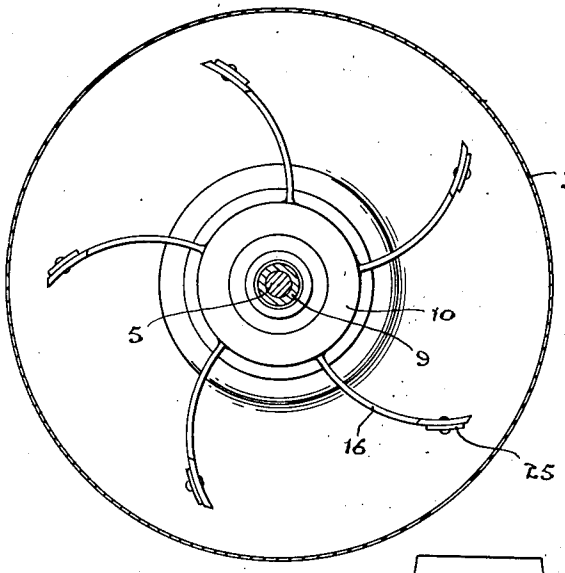


Fig. 3.

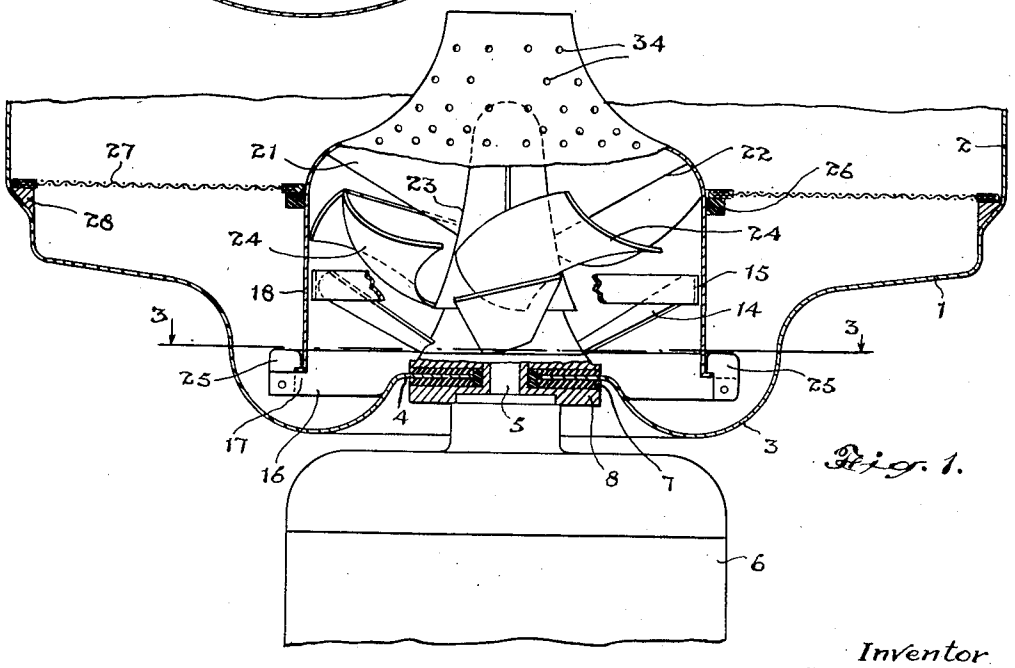


Fig. 1.

Inventor
S.G.Burt-Wells.
by H.J. Dennison
Atty.

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IMPELLER ASSEMBLY FOR DISHWASHING MACHINES

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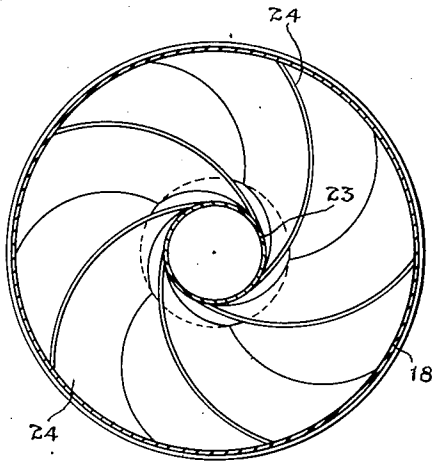


Fig. 6.

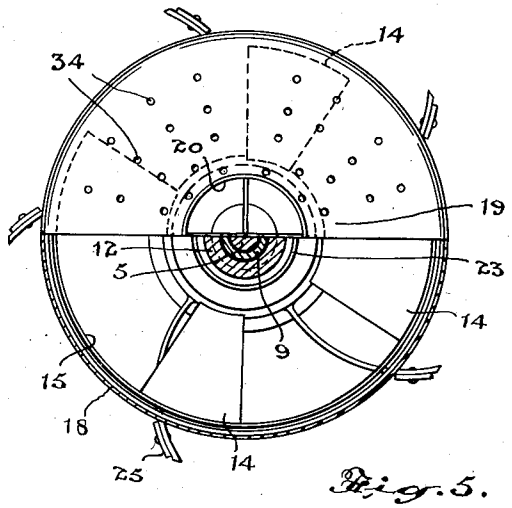


Fig. 5.

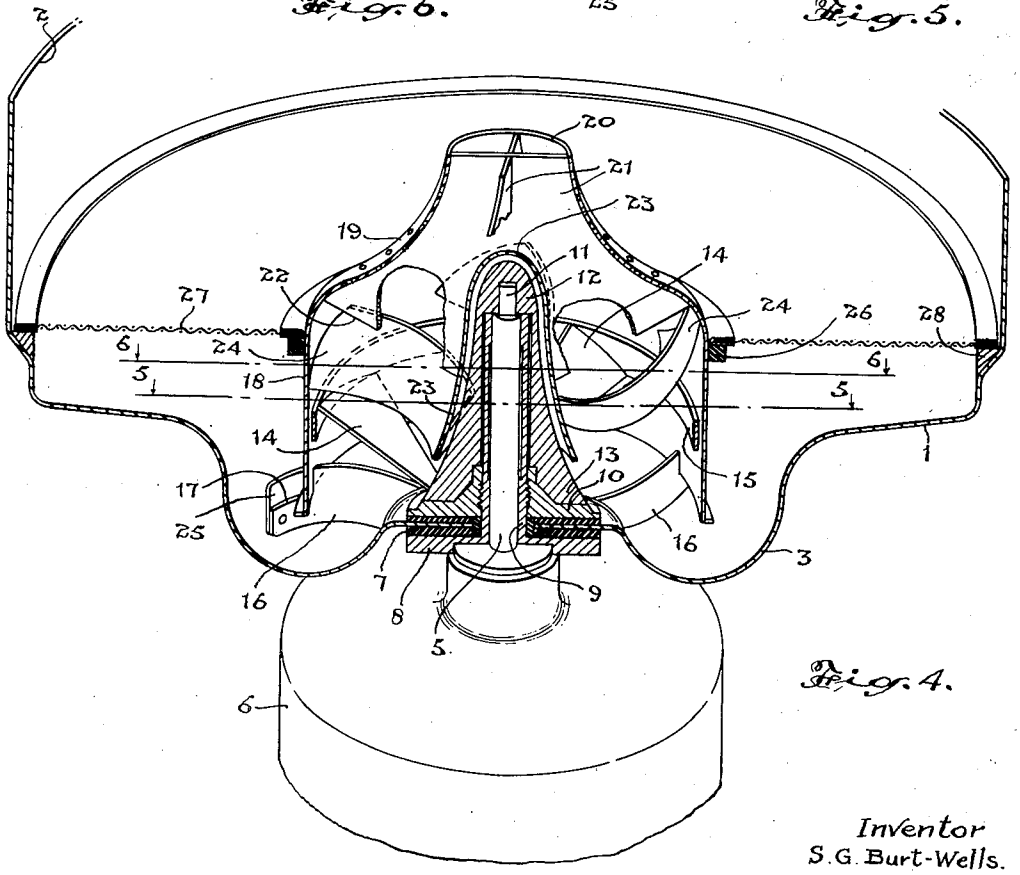


Fig. 4.

Inventor
S.G. Burt-Wells.
by J.J. Dennison
Atty.

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UNITED STATES PATENT OFFICE

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IMPELLER ASSEMBLY FOR DISHWASHING MACHINES

Sidney G. Burt-Wells, Toronto, Ontario, Canada, assignor to Triumph Dishwashers Limited, Toronto, Ontario, Canada

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1

This invention relates to improvements in the means for circulating and dispersing the washing and rinsing water in a machine particularly adapted for the washing of dishes and the objects of the invention are to obtain the maximum of efficiency in the dispersal of the water in the washing compartment so that the water will be distributed uniformly over the dishes in volume sufficiently great to effectively remove all foreign substance from the surface of the dishes, drenching them thoroughly from top and bottom.

A further and important object is to effect material economy in the amount of hot water required to thoroughly cleanse a batch of dishes and also to effect a saving of soap or other cleaner used.

The principal feature of the invention consists in re-circulating a volume of cleansing fluid by forcing it upwardly by the action of an impeller between spaced fixed blades which separate the flow from the impeller and direct it through a centrally arranged convergent nozzle to form a forced column of water, said column being directed to impinge upon a dividing and spreading member arranged above the dishes to be cleaned, said spreading member directing the water laterally and downwardly over the dishes.

A further feature of importance consists in forming the convergent nozzle with perforations adapted to direct a multiplicity of water jets laterally outward and upward to impinge upon the under surfaces of the dishes.

In the accompanying drawings Figure 1 is a part elevational and part vertical mid-section of the lower section of a dish-washing casing and the means for forcing the water upwardly and directing same toward the dish-holding chamber.

Figure 2 is a vertical mid-section of the top of the washing chamber placed centrally and vertically above the water directing means of Figure 1.

Figure 3 is a plan section taken through the line 3—3 of Figure 1.

Figure 4 is a part vertical mid-sectional perspective view of the structure illustrated in Figure 1.

Figure 5 is a half plan view and half horizontal section on the line 5—5 of the structure illustrated in Figure 4.

Figure 6 is a horizontal section through the device shown in Figure 4 taken on the line 6—6 of Figure 4.

In the construction of dish washing machines it has been customary to arrange the dishes in a rack enclosed within a chamber and the cleansing water is directed over the dishes from a plurality of nozzles. This type of dish washing machine is found to be very wasteful of hot water and cleansing substances, such as soap, and the present invention has been devised to overcome these objections.

2

In the structure of the device herein shown the compartment of the machine in which the dishes are placed for cleansing is provided with an integral bottom 1 which slopes inwardly from the side wall 2 to an annular trough-shaped portion 3 which terminates in a flange 4. The flange 4 encircles the vertical shaft 5 of an electric motor 6 and is secured between suitable water-tight gaskets 7 mounted on a flange member 8, which in turn is mounted on the casing of the motor 6.

The flange member 8 is provided with a central tubular portion 9 which loosely encircles the shaft 5 of the motor and is threaded externally.

A flange washer 10 is inserted on the member 9 to clamp the gaskets and the flange 4 securely against the flange 8. This member 10 is provided with a bevelled central hub extension. The member 9 extends well above the top of the bevelled portion of the member 10 and forms a bushing surrounding the motor shaft. The motor shaft is formed with a squared end 11 on which the substantially conical sleeve 12 is mounted, the lower end of said sleeve fitting closely to the tapered upper end of the member 10.

Rigidly secured to the flaring lower end 13 of the sleeve 12 and extending radially therefrom are a plurality of impeller blades 14 which are preferably sloped upwardly and outwardly in an oblique arrangement, and the outer ends of these impellers are preferably connected by a light ring 15.

A plurality of curved vertical vanes 16 rigidly connected with the portion of the bottom 1 adjacent to the flange 4 extend into the trough portion 3 and are formed with notched outer ends 17.

A cylindrical member 18 formed with a flanged bottom edge is supported on the notched ends 17 of the vanes 16 and is formed with an inwardly curving substantially conical upper portion 19 terminating in a circular orifice 20 arranged in axial alignment with the motor shaft and directly thereabove.

A plurality of radial vanes or partitions 21 divide the conical upper end 19 of the member 18 and these vanes, intersecting at right angles in the orifice 20 at the upper end, have their outer edges curved downwardly and the bottom edges

22 slope downwardly and inwardly toward the centre, as clearly illustrated in Figure 1.

A substantially conical hood-shaped member 23, corresponding in shape to the exterior of the sleeve member 12 mounted on the upper end of the motor shaft, extends downwardly over the said sleeve 12, being spaced therefrom so that the member 12 mounted on the shaft may rotate freely therein.

Rigidly secured to the lower portion of the hood 23 are curved cupped vanes 24 which extend diagonally upwardly and outwardly substantially parallel with the diagonal set or inclination of the impeller vanes 14 and are secured to the inner wall of the cylindrical member 18.

These cupped vanes 24 are so arranged at their lower edges that they are in close proximity to the impeller vanes as the impeller rotates, and the water engaged by the impeller vanes and rotated and thrust upwardly thereby, is directed in an upward direction by the cupped curved surfaces of these vanes.

The arrangement of stationary vanes 16 in the sump formed in the trough portion 3 of the bottom prevents the water being swirled by the operation of the impeller, and the water is picked up by the angularly inclined and upwardly tilted impeller blades and forced in an upward direction, which upward direction is enhanced by the interception of the curved cupped vanes 24.

The distinct upward thrust thus imparted to the water by the conjoint action of the impeller blades and the curved vanes 24 is continued by the upwardly inclined fixed radial vanes in the converging throat of the substantially conical curved inner wall of the portion 19.

The ultimate result of this unique arrangement of direction vanes and impeller is that a column of water is projected upwardly from the open mouth 20 of the casing surrounding the impeller. This casing is preferably detachably secured in the notched end 17 of the vanes 16 by pivotal latch members 25.

A flange ring 26 mounted on the outer wall of the cylindrical member 18 supports the inner edge of an annular screen 27 which is supported at its outer edge on a flange 28 arranged in the bottom 1. This screen intercepts articles of food and other foreign matter and permits the water which is discharged over the dishes to drain through into the sump. The water is picked up from the sump by the rapidly rotating impeller directly driven by the motor and forced upwardly in the manner described and the jets or column of water projected through the opening 20 extends directly upward through the centre of the dish washer casing, and at the top of the casing this column of water is divided by a special construction of baffle devices as illustrated in Figure 2.

The top wall 29 of the dish washer casing is provided in the centre with a conical member 30 axially arranged above the discharge nozzle 20, and spaced from the top 29 supported by lugs 31 is a ring 32 which is arranged co-axial with the cone 30 and has a central opening 32'. This ring is formed with an upward and outwardly curved surface extending in an ogee curve outwardly and downwardly so that when the centre of the column of water projected from the nozzle portion 20 strikes the cone 30, it is split and turned outward. A portion of the column strikes the ogee curved ring 32 and it is turned outwardly and downwardly. The water split by the cone 30 partly passes between the ring 32 and the

top 29 and a further diverting downwardly ogee curved ring 33 is secured to the top adjacent to its outer perimeter.

The column of water striking this baffle arrangement in the top of the casing is spread outwardly completely around the circle and directed downwardly to cascade over the dishes uniformly from the centre outwardly and produces an excellent rinsing and washing effect.

A water distribution mechanism such as described continues the circulation of the body of washing water, the impeller picking it up from the sump and continuously projecting it upwardly for the desired period to ensure the thorough cleansing of the dishes.

Coincident with the projection of a pencil column of water the flow of cleansing water upwardly through the convergent nozzle is directed outwardly therefrom in a plurality of fine jets through perforations 34 in the curved convergent portion 19 of the casing 8. These jets are projected angularly upwardly and outwardly to strike the bottom or under portion of the dishes arranged in a suitable rack above the water-distributing member.

A washing machine provided with a water-distributing mechanism such as described is found to be very efficient in its operation and it utilizes the water continuously until the washing operation is concluded without the addition of further water, thus conserving both water heating and soap.

It will be particularly noted on reference to Figures 5 and 6 of the drawings that there are four vanes on the rotating impeller and five of the inclined curved stationary vanes 24 arranged therabove. It is important that the number of vanes in the rotor shall be different from the number of the stationary vanes so that no more than one of the vanes of the rotor will align with the stationary vanes at any point in the rotation of the rotor and there will not be the shock of impact of water impelled by the rotor at more than one point in the circumference at the same time, thus a smoother flowing stream is produced.

What I claim as my invention is:

1. In a dish washing machine, the combination with a compartment to contain dishes to be washed and a motor-driven shaft extending through the bottom of said compartment, of a sleeve surrounding said shaft and connected thereto to rotate therewith, a plurality of radially extending curved impeller blades secured to said sleeve in horizontal alignment and peripherally spaced relation, a plurality of radially extending rigidly fixed vanes arranged immediately beneath said impeller blades, a sump-like formation forming the bottom of said compartment surrounding said vanes and leading to beneath said vanes, a hood concentric with and enclosing said sleeve and impeller blades and supported on said fixed vanes beneath said impeller blades and readily removable from sleeve and impeller blade enclosing position, said hood and vanes defining a plurality of openings leading within said hood from said sump-like formation to said impeller blades while preventing swirling of water beneath said impeller blades, said hood having a convergent upper end forming a discharge nozzle opening at the top through a central discharge orifice, and a plurality of inclined inwardly extending vanes rigidly secured to the interior of said hood above said impeller blades and extending upwardly to adjacent said discharge orifice and having their inward edges equally spaced

from the axis of said discharge orifice and at a distance therefrom sufficient to receive said sleeve between said edges, said latter vanes forming guides to facilitate assembly of said hood on said first-mentioned vanes in sleeve and impeller blade enclosing relation with said discharge orifice located in axial alignment with said shaft, said impeller blades being curved to sweep water delivered from said sump-like formation between said first-mentioned vanes upwardly and outwardly within said hood, and said second-mentioned vanes being shaped to progressively convert upward swirl imparted to the water by said blades into upward straight line motion as the upward moving water is converged towards said nozzle to provide a solid upwardly directed high velocity stream issuing from said nozzle.

2. In a dish washing machine, the combination with a compartment to contain dishes to be washed and a motor-driven shaft extending through the bottom of said compartment, of a tubular member loosely encircling said shaft and extending through the bottom of said compartment, a sleeve engaging over the upper portion of said tubular member and having a convergent upper end above said tubular member connected to said shaft to rotate therewith while bearing on said tubular member throughout a substantial portion of its length, a plurality of radially extending curved impeller blades secured to said sleeve adjacent the lower end thereof in horizontally aligned and peripherally spaced relation, a plurality of radially extending rigidly fixed vanes arranged immediately beneath said impeller blades, a hood concentric with and enclosing said sleeve and impeller blades and removably supported on said fixed vanes, said hood and vanes defining a plurality of openings leading within said hood from beneath said blades while preventing swirling of water therebeneath, said hood having a convergent upper end forming a discharge nozzle opening at the top through a central discharge orifice and forming with the convergent upper end of said enclosed sleeve an annular smoothly convergent flow passage, and a plurality of inclined inwardly extending vanes

rigidly secured within said hood above said impeller blades and extending upwardly to adjacent said discharge orifice and having their inward edges equally spaced from the axis of said discharge orifice and converging to define therebetween the contour of the convergent upper end of said sleeve to receive said convergent upper sleeve and said second-mentioned vanes forming guides to facilitate assembly of said hood on said first-mentioned vanes in sleeve and impeller blade enclosing relation with said discharge nozzle in axial alignment with said shaft, said impeller blades being curved to sweep water delivered between said first-mentioned vanes upwardly and outwardly within said hood and said second-mentioned vanes being shaped vertically to progressively convert upward swirl imparted to the water by said blades into upward straight line motion as upwardly moving water is converged without appreciable flow restriction by said convergent flow passage toward said nozzle.

SIDNEY G. BURT-WELLS.

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