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DISHWASHING APPARATUS

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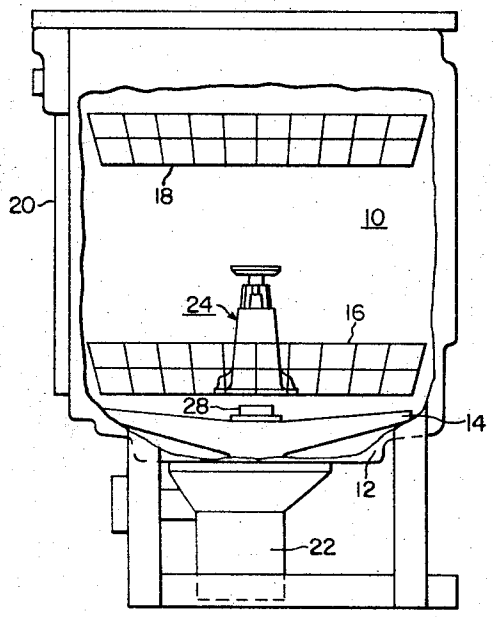
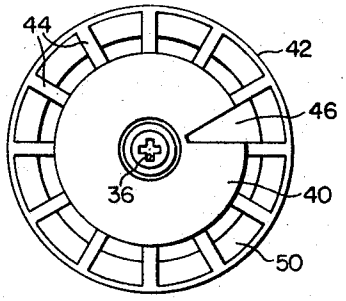


FIG. 1.

FIG. 3.



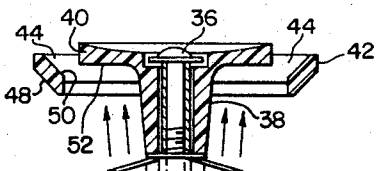
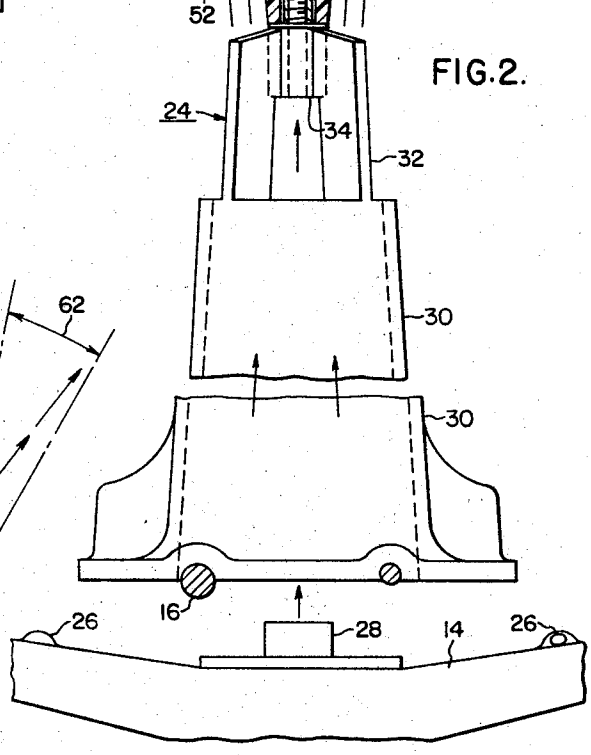


FIG. 2.



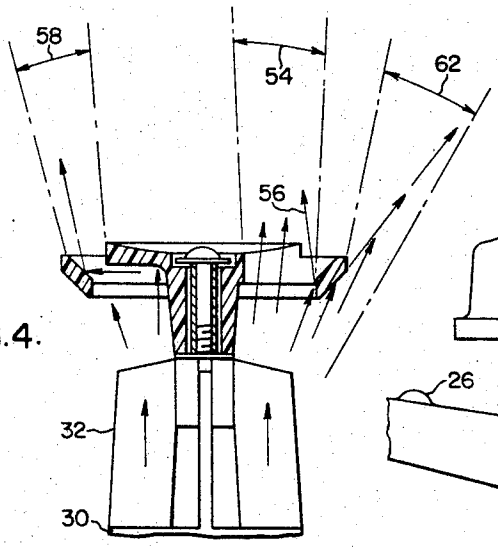


FIG. 4.

WITNESSES

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DISHWASHING APPARATUS

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ABSTRACT OF THE DISCLOSURE

Apparatus for dispersing a stream of water in a pattern over the upper rack of a dishwasher by means of a rotatable wheel having a hub, spokes, and an outer ring, the hub having one open part through which a part of the water passes directly upwardly for producing an inner pattern, the ring having inner and outer inclined surfaces for deflecting additional water into intermediate and outer patterns, respectively.

This invention relates to dishwashing apparatus generally and in particular to water dispersing apparatus for ensuring water coverage of the upper portion of the washing chamber.

Current domestic dishwashers are typically provided with an openwork rack in the lower portion of the washing chamber and another openwork rack in the upper part of the washing chamber for supporting articles to be washed. A primary water distributor, usually in the form of a rotatable arm, is located below the lower rack and fed with washing and rinsing water which is discharged in spray form through a multitude of openings upon the upper surface of the arm. The discharge of the water drives the arm in its rotating path in a reaction manner. Supplementary water distributing means is also provided in many models for distributing water upwardly to the upper rack from an intermediate location. This invention is principally directed to supplementary water dispersing means and has as its objection the provision of a relatively inexpensive but highly effective device for producing desired spray patterns in the upper portion of the dishwasher.

Briefly, in accordance with the invention, a rotatable water dispersing wheel is provided in the central part of the dishwasher at a level above the lower spray arm. It is located to receive a stream of upwardly-directed water issuing from the central part of the lower spray arm. The heart of the invention may be considered to reside in the structural arrangement of the wheel which includes a central hub, an outer ring, and a series of spokes radiating from the hub to the ring. The ring has inclined surface portions on both its inner and outer circumferential faces to disperse a part of the stream into two constant, generally cone-shaped water patterns which overlap in the upper part of the chamber. The hub includes a cut-out segment permitting the passage of part of the stream directly upwardly in the form of a triangular pattern which sweeps around the central area of the upper portion of the dishwasher to fill out the coverage. The spokes serve as impulse surfaces which cause the wheel to rotate as a result of the water stream impulse.

The invention will be described in connection with the accompanying drawing illustrating several preferred embodiments by way of example, and wherein:

FIGURE 1 is a fragmentary, partly-broken side view of dishwasher apparatus embodying the invention;

FIG. 2 is a fragmentary, partly-broken and partly-sectioned elevational view of the dispersal apparatus and underlying rotating arm;

FIG. 3 is a top view of the dispersal wheel; and

FIG. 4 is a fragmentary, sectional, partly-schematic view of the dispersal wheel illustrating the patterns of water to be derived from the wheel in operation, and indicating the paths which the water follows in achieving these patterns.

The dishwasher illustrated has the conventional, generally-rectangular, box shape encompassing the washing chamber **10** which has a sump **12** formed in its bottom wall, a rotatable spray arm **14** immediately above the sump, a lower dish rack **16**, and an upper dish rack **18**. The dishwasher shown is of the front-loading type in which a front door **20** is dropped and both the bottom rack **16** and top rack **18** are adapted to be pulled horizontally forward out of the washing chamber on suitable track means so that the articles to be washed may be loaded in the racks.

A pump and motor assembly **22** are provided below the bottom wall for delivering water under pressure into the interior of the rotatable spray arm **14**. As is conventional, the water issuing under pressure from the top surface of the spray arm **14** through tangentially-directed outlets will cause the spray arm **14** to rotate and the water issuing from this rotating arm is flung upwardly and outwardly through the lower rack **16** and to a lesser extent about the upper portion of the washing chamber **10**.

The dispersal apparatus according to this invention for supplementing the distribution of water about the upper portion of the water washing chamber **10** may conveniently be mounted upon the movable lower rack **16** for movement therewith since the supplementary dispersal assembly is lightweight, relatively small, and does not need to be directly connected to a source of water from the lower spray arm **14**.

As shown in FIG. 2, the rotatable lower spray arm **14** is provided with the reaction and spray outlets **26** on the upper surface of the arm, and is provided with an upwardly-directed, central, jet outlet **28** through which a portion of the water delivered to the spray arm **14** is delivered upwardly in the form of a substantially solid stream. The lower rack **16** is located immediately above the spray arm and supports a hollow, truncated, right cone **30** having its axis aligned vertically with the vertical axis of the jet outlet **28**. The upper end of the cone **30** is provided with a spider-like arrangement **32** for supporting a central core **34** to which the dispersal wheel is secured by means of a screw **36** which passes freely down through a bore in the shank **38** of the wheel. The stream of water is directed up through the hollow cone to the wheel.

Referring now to FIGS. 2 and 3, the wheel includes a central hub **40**, an outer ring **42**, and a series of radiating spokes **44** securing the ring to the hub. As shown in FIG. 3, a portion of the hub between two adjacent spokes **44** is omitted so that an open pie-shaped segment **46** is formed.

Since the structural configuration of the wheel is of importance in obtaining the water distribution patterns desired and available in accordance with the invention, attention will now be directed to the shape and locational relationships of the parts involved. As may be best seen in FIGS. 2 and 4, the outer ring **42** includes an outer circumferential surface portion **48** which is inclined outwardly or diverges in a bottom-to-top direction. The inner periphery of the ring **42** is provided with a circumferential surface portion **50** which is similarly inclined. The lower surface **52** of the hub is essentially flat, except for the inward continuation of the spokes **44** in the presently preferred commercial form of the device, and lies in a horizontal plane intersecting the inner inclined portion **50** of the ring.

The general water distribution patterns obtained from the dispersal wheel described is illustrated in FIG. 4 in

which arrows are used to show the general direction of water passing upwardly to and through the wheel. It is here emphasized that the illustrated patterns are essentially diagrammatic in the sense they are intended to portray the substance of the patterns rather than sharply defining the absolute borders of the patterns. However, three generally perceptible patterns are obtained from the dispersal apparatus of the invention.

The inner portion designated **54** is obtained from water passing through the open segment **46** formed by the pie-shaped slot in the hub and defined at its outer radial limit by the inner face of the ring **42**. This pattern **54** is somewhat triangular in horizontal section and is slightly diverging in elevation. It moves in a path around the vertical axis of the spinner wheel. The pattern is by design progressively heavier toward the radially outer part of the segment opening **46** so that the water delivered is generally proportional to the area to be covered. However, some of the water is deflected back in toward the center by the inner surface of the outer ring **42** as indicated by the arrow **56**. As noted, this inner pattern sweeps the center part of the upper rack **18** as the wheel rotates, and for a conventional size domestic dishwasher approximately twenty-four inches square in plan in its interior, preferably has an outer diameter of about ten inches at the bottom of the upper dish rack.

The intermediate water pattern is indicated by the numeral **58** in FIG. 4, and is derived partly from water which passes directly upwardly through the open annulus between adjacent spokes **44**, and partly from deflected water. The deflected water is that part which first strikes the flat underside hub surface **52** and is directed generally outwardly against the inclined surface **50** of the outer ring **42** so that it is deflected upwardly in the pattern shown. In plan the pattern is ring-shaped, and in elevation generally conical. It is a constant pattern having an inner diameter at the upper rack bottom of about eight inches and overlaps the outer border of the inner pattern **54**. The outer diameter at that level is about eighteen inches.

The third and outer pattern **62** is derived from water passing upwardly outside of the outer ring **42** and in part being deflected by the inclined outer surface **48** of the ring. This outer pattern is also ring-shaped in plan and generally conical in elevation. Its inner peripheral border at the upper rack level overlaps the outer peripheral border of the second pattern **58**. The inner diameter there is about sixteen inches, and the outer diameter is limited by the tub to about twenty-four inches.

It is noted that it is the part of the stream of water which strikes the spokes **44** which causes the wheel to rotate. In the presently preferred commercial embodiment of the invention, the bottom edges of the spokes **44** are simply rounded, and the side surfaces of the spokes need not be provided with any tilt or inclination. However, in the commercial device incorporating the described dispersal device, the water supplied to the jet outlet **28** of the rotating spray arm is swirling to a degree due to the volute of the centrifugal pump used. Accordingly, sufficient oppositely-directed forces are exerted upon spokes at opposite sides of the wheel to cause the wheel to spin at a rate of 15 to 30 r.p.m. in the commercial device. Of course, with a stream wherein such forces are not available, the spokes may be slightly tilted to get the desired wheel rotation. In any case, however, the wheel is designed to operate as an impulse type wheel, as distinguished from a reaction type wheel.

It is not necessary that the stream be confined within the core **30** in its passage to the wheel, but the core does perform a support function and also presents obstructions from being placed in the path of the stream. The wheel may in some instances preferably be supported directly on the lower rack and the core **30** omitted.

As one example of dimensions for a satisfactory wheel for domestic dishwashers, the outer diameter of the ring **42** is about 2⅛ inches, the outer diameter of the hub **40** is about 1$\frac{7}{16}$ inches, and the inner diameter of the outer ring **42** is about 1$\frac{11}{16}$ inches. Both the inner and outer tapered surfaces of the outer ring **42** are tapered at about 45°. The level of the flat undersurface of the hub **40** is about $\frac{1}{16}$ of an inch above the lower edge of the inner tapered surface **50**. The wheel is mounted about 8 to 9 inches above the outlet of the rotating lower spray arm. The outlet **28** of the arm is sized relative to the spray outlets **26** on the upper surface of the spray arm so that approximately one-half to two-thirds of the water is delivered out of the stream outlet while the remainder is delivered as a spray.

The dimensions and relationships expressed give one example of a device which operates satisfactorily, and accordingly are only to be taken as exemplary, and is in no way limiting.

I claim as my invention:

1. Dishwashing apparatus comprising:
an enclosed washing chamber;
an upper and a lower openwork rack in said chamber for supporting articles to be washed;
means for directing a part of the washing water in spray form upwardly against said lower rack;
means for directing another part of the washing water upwardly in stream form to water dispersing means located generally centrally, and below said upper rack;
said water dispersing means including a rotatable wheel against which said stream of water is directed,
said wheel comprising a center hub having a bottom face from which a portion of said stream is deflected radially,
an outer ring having an inner circumferential surface portion inclined outwardly from bottom to top and disposed in the path of said radially deflected water to redirect it upwardly, said ring also including an outer circumferential surface portion inclined outwardly in a bottom to top direction to deflect water generally outwardly,
a series of spokes extending between said hub and said ring, and
said hub includes an open segment permitting a portion of said another part of the washing water to pass directly upwardly therethrough.

2. Liquid dispersing apparatus comprising:
means for directing a stream of liquid upwardly against the under side of a rotatable wheel;
said wheel being supported for rotation about a vertical axis and comprising a hub, an outer ring, and spokes radiating outwardly from said hub to said ring,
said ring includes an outer circumferential surface portion inclined outwardly in an ascending direction to deflect a portion of the rising liquid outwardly,
said ring further includes an inner circumferential surface portion inclined outwardly in an ascending direction to deflect upwardly that liquid directed radially outwardly from the under side of said hub against said inner circumferential surface portion,
said hub includes at least one open segment therein to permit a part of said stream of liquid to pass directly upwardly therethrough.

3. In dishwashing apparatus, water dispersing means for providing selected water distribution patterns in the upper portion of a dishwasher, said water dispersing apparatus comprising:
a wheel supported for rotation about a vertical axis in the central portion of said dishwasher and below the upper portion thereof,
means for directing a stream of water upwardly against the underside of said wheel,
said wheel including a hub, a continuous outer ring, and a series of spokes extending radially outwardly from said hub to said ring,

said ring inner and outer surfaces being inclined outwardly in an ascending direction, and

said hub includes an open segment therein in the path of a part of said stream of water to permit a part of said stream of water to pass directly upwardly therethrough.

4. In a dishwasher according to claim 3:

the under surface of said hub includes substantially flat portions lying in a horizontal plane above the lower edge of said inner inclined surface of said ring so that water deflected outwardly from said under surface of said hub will be deflected upwardly by said inner surface of said ring.

5. In a dishwasher according to claim 4:

said outer ring inclined surfaces are inclined about 45°.

6. In a dishwasher according to claim 3:

said open segment is in the form of an outwardly-open V.

7. Dishwashing apparatus comprising:

a washing chamber enclosing a lower and an upper openwork dish supporting rack;

means for supplying water to said chamber;

means for directing a part of said water upwardly in spray form against said lower rack, and directing another part of said water upwardly in the form of a stream in the central portion of said chamber;

water dispersing means mounted above said stream to receive said stream against its lower side and to direct said stream in dispersed form against said upper rack,

said dispersing means including a rotatably mounted wheel comprising an inner hub, spokes radiating outwardly through an open annulus, and an outer ring,

said hub including at least one pie-shaped slot therein through which a part of said stream passes directly upwardly, and

said outer ring including an inner circumferential surface portion and an outer circumferential surface portion inclined outwardly in a bottom-to-top direction, said outer circumferential surface portion being disposed directly in the path of a part of said stream.

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