May 3, 1955

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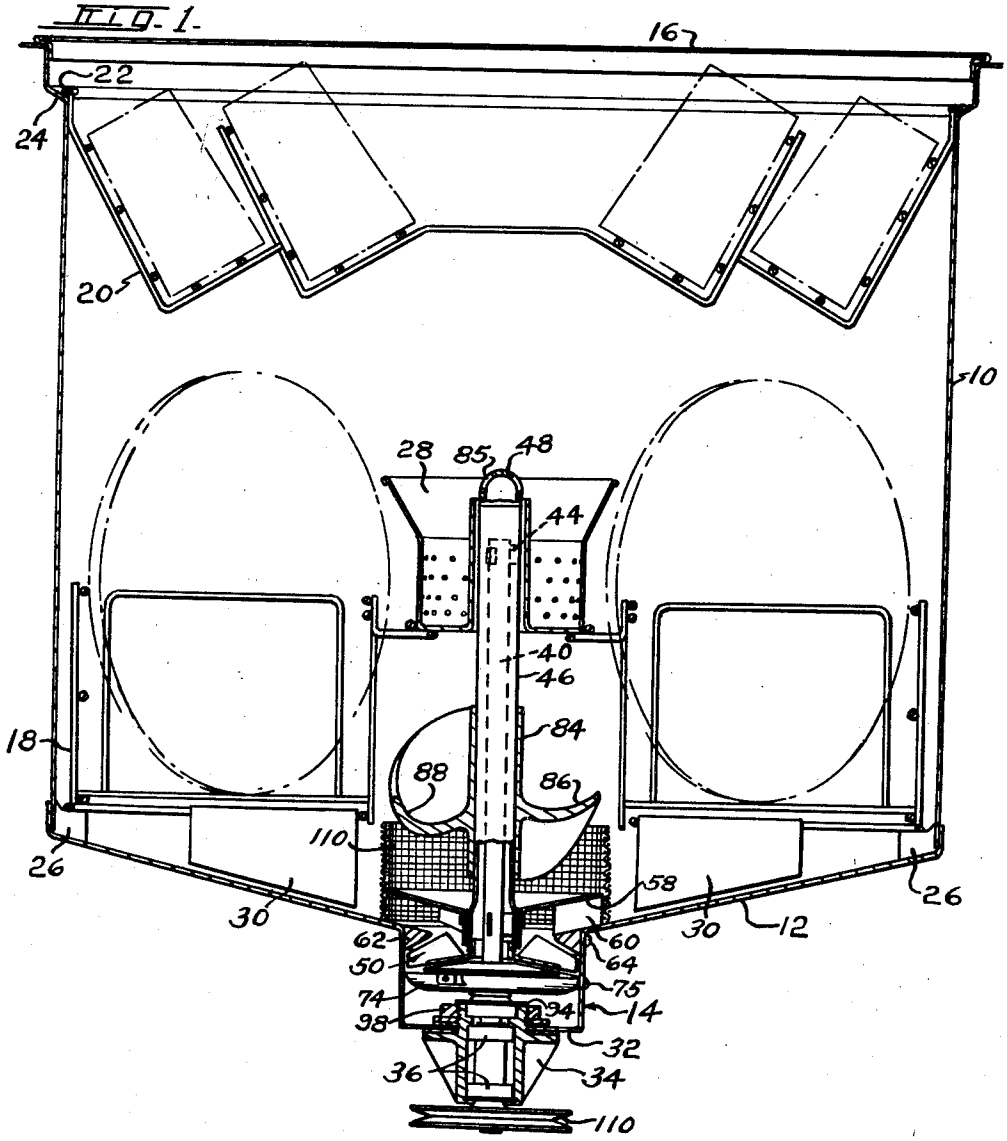
2,707,475

DISHWASHING APPARATUS

Filed April 11, 1951

2 Sheets-Sheet 1

FIG. 1.



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2 Sheets-Sheet 2

FIG. 2.

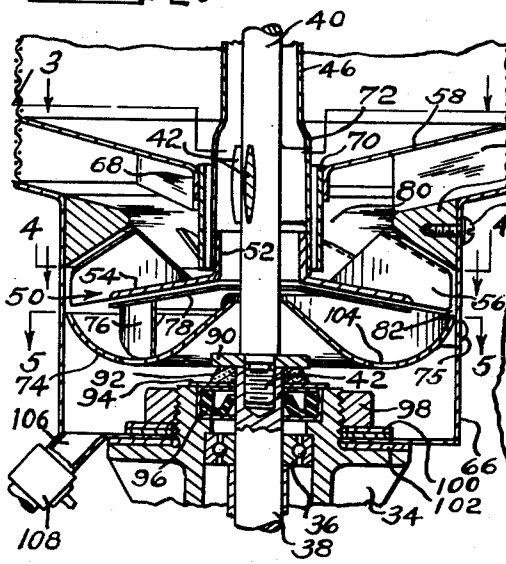


FIG. 3.

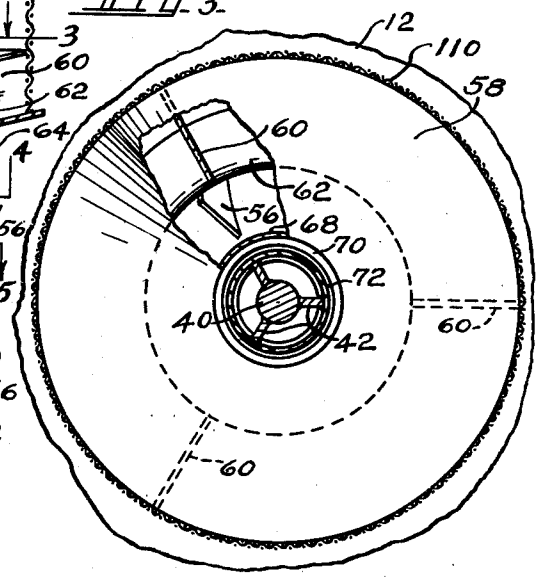


FIG. 4.

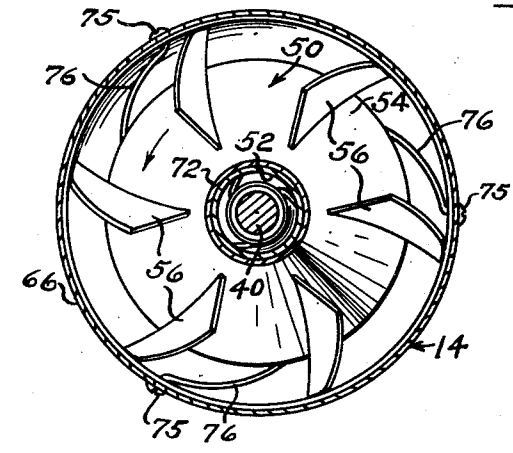
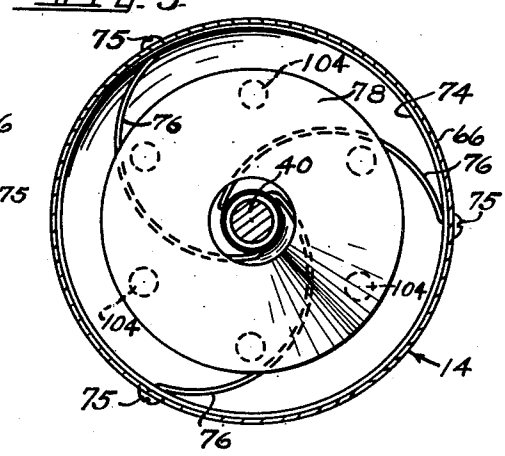


FIG. 5.



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DISHWASHING APPARATUS

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Application April 11, 1951, Serial No. 220,379

14 Claims. (Cl. 134—174)

This invention relates to dishwashing apparatus, and more particularly to an apparatus wherein a quantity of wash fluid is recirculated and impelled or ejected forcibly against dishes to effect a powerful flushing action.

In apparatus of the type described, attempt has been made to wash dishes and vessels supported in a manner to expose their surfaces to flushing action, usually from some central impeller located in the lower regions of the tub. Where such dishes are stacked in multiple layers, difficulty is had in preventing certain dishes from shielding other dishes from direct forceful wash fluid action, and where attempts have been made to create sources of forcefully ejected flush water at different levels to accommodate multiple racks, difficulty has been had in asuring an adequate and equalized distribution at both levels.

The present invention is directed to apparatus adapted to enhance the source of ejected wash fluid and to provide substantial sources of flush water action at levels adapted to effectively cleanse dishes and vessels disposed in different racks positioned one above the other.

The invention further has to do with the provision of a relatively simple impeller pump and jet distributor, preferably involving a single centrally disposed moving part, adapted to recirculate wash fluid at a high rate. Further, the invention has to do with the mounting of such apparatus in association with a central sump, and in provision for balancing the distribution of wash fluid therefrom to suit the needs of the apparatus.

The above and other novel features of the invention will appear more fully hereinafter from the following detailed description when taken in conjunction with the accompanying drawings. It is expressly understood that the drawings are employed for purposes of illustration only and are not designed as a definition of the limits of the invention, reference being had for this purpose to the appended claims.

In the drawings, wherein like reference characters indicate like parts:

Figure 1 is a vertical sectional view of the washing apparatus taken substantially through the center;

Figure 2 is an enlarged fragmentary sectional view of the sump and impeller construction;

Figure 3 is a sectional view taken substantially on the line 3—3 of Figure 2, with parts broken away to show the underlying impeller;

Figure 4 is a sectional view taken substantially on the line 4—4 of Figure 2; and

Figure 5 is a sectional view taken substantially on the line 5—5 of Figure 2.

Referring to Figure 1, there is shown a tub 10 having a substantially conical bottom wall 12, from which depends a sump 14. The tub is provided with a lid 16 and is arranged to receive dish racks 18 and 20, formed of wire in any suitable manner. The upper rack 20 may have an outwardly extending rim 22 adapted to seat upon an annular shoulder 24 formed in the tub side wall immediately beneath the lid, and the lower rack may be

seated upon abutments 26 located adjacent to the juncture of the side wall with the tub bottom wall. The upper rack 20 is preferably arranged to hold glasses, cups and the like, it being desirable to hold such vessels at an angle in the manner shown for reasons which will hereinafter appear. The lower rack 18 may be provided with an elevated central annular silver receiving cup 28 and depending from the lower framework of the rack suitable radial baffles 30 are provided.

The sump 14 has a bottom wall 32, to which is fitted a bearing block 34 containing spaced anti-friction bearings 36 adapted to journal an impeller drive shaft 38. Such shaft extends upwardly through the center of the sump, and is provided with an extension 40 having a screw-threaded coupling as at 42 with the shaft 38. The shaft extension 40 is provided with lower spider elements 42 and upper spider elements 44, from which is supported a tubular conduit 46 affording a passage for wash fluid in the annular space between the shaft extension 40 and the conduit 46. The conduit 46 extends upwardly through the annular silver tray 28 and is capped with a spray nozzle 48.

Dishwashing apparatus of the type herein referred to is adapted to operate upon a somewhat fixed amount of wash fluid containing detergent which may be introduced into the wash tub at the beginning of the wash cycle. For suitable washing action, such wash fluid is delivered to the regions in which the dishes are supported under considerable force and in recirculated quantity whereby susbtantially the entire surface area of the dishes will be subjected to direct impact of the wash fluid thus delivered. In the present apparatus, provision is made for the distribution of wash fluid at two different levels, the lower level being especially adapted for the washing of plates, platters, saucers and the like, such as may be arranged in the lower rack 18, and the higher level being adapted by reason of the spray nozzle 48 for effectively washing glasses, cups, and other vessels as may be arranged in the upper rack 20. The present invention is particularly directed to means for recirculating the wash fluid for distribution at the two different levels described, such distribution being effected in substantial quantity and with substantial force.

In order to lift water to the spray nozzle 48, there is provided a centrifugal impeller located within the sump which, together with passages arranged for the purpose, is adapted to receive wash fluid from the bottom of the tub and to drive such wash fluid up the tubular conduit 46 to the nozzle 48. In Figures 2, 3, 4, and 5, there is shown a centrifugal impeller 50 having a vane-supporting plate 54, and an internal upstanding collar 52 secured to the lower end of the tubular conduit 46. The plate 54 of the impeller is provided with a plurality of vanes 56 adapted to centrifugally throw wash fluid radially outward by rotation of the impeller. Wash fluid is directed from the tub into the central annular region above the impeller by a vane construction comprising a shallow conical disk 58 having radial vanes 60 suitably spacing the disk above the tub bottom, and an annular inwardly extending V-sectioned shoulder 62. The plate 58, vanes 60, and annular shoulder 62 are preferably formed as a unit and are secured in place as by screws 64, extending through the sump side wall 66. The disk 58 has a depending internal collar 68 to which is affixed a sleeve 70 closely surrounding the lower enlarged end 72 of the tubular conduit 46.

The impeller 50 is adapted to discharge into a peripheral annular area therebeneath, and into an annular trough 74 of curved cross-section located immediately beneath the impeller. The trough is secured to the sump wall by screws 75. Such trough is provided with a plurality of spiral vanes 76, which vanes support in spaced rela-

tion an annular top disk 78 located immediately below but in slightly spaced relation from the impeller plate 54. The space between the annular trough and disk affords passages from the annular peripheral area to a central region, from which wash fluid is discharged under pressure upwardly into the conduit 46.

The arrangement thus described is such as to receive wash fluid draining to the bottom of the tub and entering along the vanes 60 to the central annular space 80, whence such wash fluid is centrifugally impelled outwardly by the impeller into the annular space 82. Such wash fluid is then caused to flow inwardly along the stationary spiral vanes 76 and discharge up into the lower end of the tubular conduit 46.

The disk 58 is arranged relatively close to the bottom wall 12 of the tub so as to regulate and confine the wash fluid entering the centrifugal impeller to a portion of the fluid normally lying adjacent the tub bottom, so that the entire arrangement, including the disk 58 is submerged during all normal operation of the washing apparatus, a sufficient quantity of fluid being employed to effect this result.

Wash fluid lying above the disk 58 and which may be referred to as the layer of water adjacent the surface is caused to be diffused by a second impeller 84 drivably mounted upon the exterior of the tubular conduit 46. Such impeller is provided with a pair of opposed spiral scoop-like vanes 86 and 88, the lower edges of which reach below the normal surface level of the wash fluid. Such vanes are adapted to throw wash fluid in substantial quantity and with substantial force radially outward and upward in directions toward the dishes contained in the lower rack 18 and the silver container.

The nozzle 48 is provided with suitable orifices 35 which are adapted to direct heavy streams of wash fluid upwardly into glasses, cups, or other vessels held in the upper rack 20. The glasses or cups are preferably stacked on an angle so as to receive such wash fluid directly upon all portions of the interior of such vessels, and it will be understood by so inclining such utensils, wash water will drain from all surfaces thereof, and particularly the upended bottoms of such vessels.

Located between the shaft 40 and the shaft 38 is a disk 90 clamped between shoulders on the respective shafts, such disk being adapted to bear in sealing relation upon a graphite ring 92 supported on a washer 94. An additional seal 96 is provided between the top bearing 36 and the sealing ring 94 and disk 90. The bearing housing 34 is secured to the bottom wall of the sump by a nut 98 which clamps the bottom wall between washers 100 and 102.

In order to drain the wash fluid from the dishwashing apparatus, the annular trough 74 is provided with a plurality of apertures 104 located at the lowest level in the annular trough. The sump, in turn, is provided with a duct 106 which is provided with a suitable valve 108. When the valve is closed, such apertures are ineffective to interfere with the discharge flow from the centrifugal impeller.

The shaft 38 may be belt driven by a pulley 110 at any desired speed, or may be coupled for direct drive with a suitable motor, it being understood that the impellers 50 and 84 may be designed to accommodate any desired speed of rotation. The construction contemplates that the wash fluid delivered to each of the levels be delivered in sufficient quantities so as to effect a balanced washing action between the dishes and vessels arranged in the upper and lower trays. It will also be appreciated that the vanes 86 and 88 of the impeller 84 may be nonsymmetrical; that is, one adapted to direct wash fluid upwardly and the other upwardly and laterally.

A washing cycle may consist in the introduction of a quantity of rinse water into the tub 10, closing of the valve 108, and rotation of the impellers over a short period of time, after which the rinse water may be flushed from the machine by stopping the motor and opening the drain valve 108. Thereafter, a quantity of wash water and detergent at a temperature of approximately 160° F. is delivered to the tub with the drain valve 108 closed, following which the impellers are rotated for a period of time during which the dishes are thoroughly cleansed. Thereafter, such wash fluid may be drained while the impellers are momentarily stopped and a supply of rinse water thereafter introduced into the tub when the impellers are again rotated for a period. Thereafter, the drain valve is opened, the motor stopped, the lid opened, and the dishes are allowed to dry. If the final rinse water is sufficiently hot to thoroughly heat the dishes, the period required for drying will be relatively short.

There is shown surrounding the disk 58 and vanes 60 an upstanding cylindrical screen 110 which is adapted to prevent recirculation of solids which may, in the process, be washed from the dishes. When the dish washing operation is completed and the trays removed from the tub, such screen can be lifted, rinsed, and the entire machine flushed clean. The mesh of the screen can be of any desired size, and it will also be understood that the selection of the mesh will in part control the relative proportions of the wash fluid handled by the centrifugal impeller and the scoop impeller.

The arrangement thus described is adapted to deliver a heavy spray or stream of wash fluid by reason of the scoop impeller and the nozzles to substantially every part of the tub because of the different levels at which the nozzle and the scoop impeller operate. The plates, platters, and the like which may be positioned in the lower rack, do not in any way shield the vessels contained in the upper rack from direct water action. Such water action in the arrangement shown embodies recirculation in large quantities of the wash fluid and the distribution of such water throughout the tub in substantially every direction with force sufficient to flush wash the dishes and vessels.

The apparatus may be operated cyclically by automatic timer mechanism, particularly if the initial rinse is dispensed with, since once the detergent is administered, the wash cycle comprises merely admission of a quantity of wash water, with the drain valve closed, washing for a period after which the drain valve is opened, reclosing the valve and admission of rinse water in one or more stages, after which the drain valve is opened, the power shut off, and the lid raised to permit evaporation drying of the hot dishes.

Although a single embodiment of the invention has been illustrated and described, it is to be understood that the invention is not limited thereto. As various changes in the construction and arrangement may be made without departing from the spirit of the invention, as will be apparent to those skilled in the art, reference will be had to the appended claims for a definition of the limits of the invention.

What is claimed is:

1. In a dishwashing apparatus, a tub having a bottom wall and a centrally disposed sump therein, said sump having a bottom wall having a vertical shaft bearing therein, a vertical shaft journaled in said bearing and projecting upwardly through said sump, a tubular conduit having an open lower end mounted on said shaft for rotation therewith and extending upwardly into said tub, a pump impeller located within said sump and mounted on the lower end of said conduit, said impeller having an imperforate disk secured to said conduit, and substantially radial blades mounted on the upper surface of said disk, radial vanes cooperating with the tub bottom and radial passages formed in part thereby adapted to deliver wash fluid from said tub into a central annular area above said impeller in the annular region adjacent the inner ends of said blades, vaned discharge conduit means located in said sump beneath said impeller extending from an annular area adjacent the periphery of and beneath said im-

peller to a region radially inward thereof and immediately adjacent the open end of said conduit, and nozzle spray means positioned in the upper end of said conduit.

2. In a dishwashing apparatus, a tub having a bottom wall and a centrally disposed sump therein, said sump having a bottom wall having a vertical shaft bearing therein, a vertical shaft journaled in said bearing and projecting upwardly through said sump, a tubular conduit having an open lower end mounted on said shaft for rotation therewith and extending upwardly into said tub, a radially vaned pump impeller located within said sump and mounted on the lower end of said conduit, radial vanes cooperating with the tub bottom and radial passages formed in part thereby adapted to deliver wash fluid from said tub into a central annular area above said vaned impeller inwardly of its periphery, vaned discharge conduit means located in said sump beneath said impeller extending from an annular area adjacent the periphery of and beneath said impeller to a region radially inward thereof and immediately adjacent the open end of said conduit, nozzle spray means positioned in the upper end of said conduit, and a diffusing impeller mounted on said conduit immediately above said radial passages.

3. In a dishwashing apparatus, a tub having a bottom wall and a centrally disposed sump therein, said sump having a bottom wall having a vertical shaft bearing therein, a vertical shaft journaled in said bearing and projecting upwardly through said sump, a tubular conduit having an open lower end mounted on said shaft for rotation therewith and extending upwardly into said tub, a pump impeller located within said sump and mounted on the lower end of said conduit, radial vanes cooperating with the tub bottom and radial passages formed in part thereby adapted to deliver wash fluid from said tub into a central annular pump inlet area above said impeller, vaned discharge conduit means located in said sump beneath said impeller extending from an annular area adjacent the periphery of and beneath said impeller to a region radially inward thereof and immediately adjacent the open end of said conduit, nozzle spray means positioned in the upper end of said conduit, a diffusing impeller mounted on said conduit immediately above said radial passages, and drive means for said shaft.

4. In a dishwashing apparatus, a tub having a bottom wall and a centrally disposed sump therein, said sump having a bottom wall having a vertical shaft bearing therein, a vertical shaft journaled in said bearing and projecting upwardly through said sump, a tubular conduit having an open lower end mounted on said shaft for rotation therewith and extending upwardly into said tub, a centrifugal pump impeller located within said sump and mounted on the lower end of said conduit, means to deliver wash fluid adjacent the bottom wall of said tub into a central annular area above the center region of said impeller, passage-forming means located in said sump beneath said impeller extending from an annular area adjacent the periphery of and beneath said impeller to a region radially inward thereof and leading to the open end of said conduit, nozzle spray means positioned in the upper end of said conduit, a diffusing impeller mounted on said conduit immediately above said wash fluid delivering means, adapted to act upon surface water in the tub bottom, a lower annular dish rack in said tub adapted to receive wash fluid from said impeller, and an upper annular dish rack in said tub adapted to receive wash fluid from said spray means.

5. In a dishwashing apparatus, an upstanding tub having a bottom wall of shallow substantially conical configuration adapted to drain toward the center, a circular walled sump depending from the central portion of said bottom wall, said sump having a bottom wall, a vertical shaft bearing in said bottom wall concentric with said sump, a vertical shaft journaled in said bearing and projecting into said sump, a vertical tubular conduit mounted on said shaft, having an open lower end positioned within said sump and spaced above the bottom wall of said sump, a centrifugal impeller mounted upon the lower end of said conduit and within said sump and a discharge outlet at the upper end, means for draining wash water adjacent the bottom wall of said tub into the central region of said sump immediately above the central portion of said impeller, and means beneath said impeller adapted to receive fluid radially discharged therefrom at the peripheral edge thereof and for directing and confining the flow of said fluid centrally into the open end of said conduit.

6. In a dishwashing apparatus, an upstanding tub having a bottom wall of shallow substantially conical configuration adapted to drain toward the center, a circular walled sump depending from the central portion of said bottom wall, said sump having a bottom wall, a vertical shaft bearing in said bottom wall concentric with said sump, a vertical shaft journaled in said bearing and projecting into said sump, a vertical tubular conduit mounted on said shaft, having an open lower end positioned within said sump and spaced above the bottom wall of said sump, and a nozzle at the upper end, a centrifugal impeller mounted upon the lower end of said conduit and within said sump, means for draining wash water adjacent the bottom wall of said tub into the central region of said sump immediately above the central portion of said impeller, means beneath said impeller adapted to receive fluid radially discharged therefrom at the peripheral edge thereof and for directing and confining the flow of said fluid centrally into the open end of said conduit, and an impeller mounted on said conduit above said draining means and beneath said nozzle and adapted to act upon the surface layer of water lying in the bottom of said tub.

7. In a dishwashing apparatus, an upstanding tub having a bottom wall of shallow substantially conical configuration adapted to drain toward the center, a circular walled sump depending from the central portion of said bottom wall, said sump having a bottom wall, a vertical shaft bearing in said bottom wall concentric with said sump, a vertical shaft journaled in said bearing and projecting into said sump, a vertical tubular conduit mounted on said shaft, having an open lower end positioned within said sump and spaced above the bottom wall of said sump, and a nozzle at the upper end, a centrifugal impeller mounted upon the lower end of said conduit and within said sump, means for draining wash water adjacent the bottom wall of said tub into the central region of said sump immediately above the central portion of said impeller, means beneath said impeller adapted to receive fluid radially discharged therefrom at the peripheral edge thereof and for directing said fluid centrally into the open end of said conduit, and an impeller mounted on said conduit above said draining means and beneath said nozzle and adapted to act upon the surface layer of water lying in the bottom of said tub, and annular rack means for supporting dishes on two levels, one for receiving wash fluid from said impeller, and the other for receiving wash fluid from said nozzle.

8. In a dishwashing apparatus, an upstanding tub having a bottom wall of shallow substantially conical configuration adapted to drain toward the center, a sump depending from the central portion of said bottom wall, a vertical shaft journaled centrally with respect to said sump, a vertical tubular conduit mounted on said shaft, having an open lower end positioned within said sump and spaced above the bottom wall of said sump and a discharge outlet at its upper end, a centrifugal impeller mounted upon the lower end of said conduit and within said sump, means for draining wash water adjacent the bottom wall of said tub into the central region of said sump immediately above the central portion of said impeller, and means beneath said impeller adapted

to receive fluid discharged radially therefrom at the peripheral edge thereof and for directing and confining the flow of said fluid centrally into the open end of said conduit.

9. In a dishwashing apparatus, an upstanding tub having a bottom wall of shallow substantially conical configuration adapted to drain toward the center, a sump depending from the central portion of said bottom wall, a vertical shaft journaled centrally with respect to said sump, a vertical tubular conduit mounted on said shaft, having an open lower end positioned within said sump and spaced above the bottom wall of said sump and a discharge outlet at its upper end, a centrifugal impeller mounted upon the lower end of said conduit and within said sump, annular radial channel means for draining wash water adjacent the bottom wall of said tub into the central region of said sump immediately above the central portion of said impeller, means beneath said impeller adapted to receive fluid discharged radially therefrom at the peripheral edge thereof and for directing and confining the flow of said fluid centrally into the open end of said conduit, and scoop impeller means mounted on said tubular conduit immediately above said draining means.

10. In a dishwashing apparatus, an upstanding tub having a bottom wall of shallow substantially conical configuration adapted to drain toward the center, a sump depending from the central portion of said bottom wall, a vertical shaft journaled centrally with respect to said sump, a vertical tubular conduit mounted on said shaft, having an open lower end positioned within said sump and a discharge outlet at its upper end, a centrifugal impeller mounted upon the lower end of said conduit and within said sump, means for draining wash water adjacent the bottom wall of said tub into the central region of said sump immediately above the central portion of said impeller, and means beneath said impeller adapted to receive fluid centrifugally discharged therefrom at the peripheral edge thereof and for directing and confining the flow of said fluid centrally into the open end of said conduit.

11. In a dishwashing apparatus, an upstanding tub having a bottom wall of shallow substantially conical configuration adapted to drain toward the center, a sump depending from the central portion of said bottom wall, a vertical shaft journaled centrally with respect to said sump, a vertical tubular conduit mounted on said shaft, having an open lower end positioned within said sump and a liquid distributing means at its upper end, a centrifugal impeller mounted upon the lower end of said conduit and within said sump, annular baffle means for separating the wash water into lower and upper layers and for draining wash water adjacent the bottom wall of said tub in the lower layer into the central region of said sump immediately above the central portion of said impeller, means beneath said impeller adapted to receive fluid centrifugally discharged therefrom at the peripheral edge thereof and for directing and confining the flow of said fluid centrally into the open end of said conduit, and scoop impeller means mounted on said tubular conduit immediately above said draining means and adapted to act upon the upper layer.

12. In a dishwashing apparatus, a tub having a bottom wall and a centrally disposed sump therebelow, a vertical shaft journaled centrally with respect to said sump, a tubular conduit having an open lower end mounted on said shaft for rotation therewith and extending upwardly into said tub, a pump impeller located within said sump and mounted on the lower end of said conduit, radial vanes cooperating with the tub bottom and radial shallow passages formed in part thereby adapted to deliver wash fluid from said tub adjacent the bottom wall thereof into a central annular area above the central region of said impeller, vaned discharge conduit means located in said sump beneath said impeller extending from an annular area adjacent the periphery of and beneath said impeller to a region radially inward thereof and immediately adjacent the open end of said conduit, nozzle spray means positioned in the upper end of said conduit, a diffusing impeller mounted on said conduit immediately above said radial passages and adapted to act upon wash water lying above said shallow passages, and drive means for said shaft.

13. In a dishwashing apparatus, an upstanding tub having a bottom wall of shallow substantially conical configuration adapted to drain toward the center, a sump depending from the central portion of said bottom wall, a vertical shaft journaled centrally with respect to said sump, a vertical tubular conduit mounted on said shaft, having an open lower end positioned within said sump and spaced above the bottom wall of said sump, a centrifugal impeller mounted upon the lower end of said conduit and within said sump, means for draining wash water adjacent the bottom wall of said tub into the central region of said sump immediately above the central portion of said impeller, means beneath said impeller adapted to receive fluid discharged therefrom at the peripheral edge thereof and for directing said fluid centrally into the open end of said conduit, scoop impeller means mounted on said tubular conduit immediately above said draining means, dish racks supported within said tub one above the other, the lower rack being disposed to receive wash fluid from said scoop impeller means, and a nozzle on the upper end of said tubular conduit disposed to supply wash fluid in the region of the upper rack.

14. In a dishwashing apparatus, an upstanding tub having a bottom wall of shallow substantially conical configuration adapted to drain toward the center, a sump depending from the central portion of said bottom wall, a vertical shaft journaled centrally with respect to said sump, a vertical tubular conduit mounted on said shaft, having an open lower end positioned within said sump, a centrifugal impeller mounted upon the lower end of said conduit and within said sump, means for draining wash water adjacent the bottom wall of said tub into the central region of said sump immediately above the central portion of said impeller, means beneath said impeller adapted to receive fluid discharged therefrom at the peripheral edge thereof and for directing said fluid centrally into the open end of said conduit, scoop impeller means mounted on said tubular conduit immediately above said draining means, dish racks supported within said tub one above the other, the lower rack being disposed to receive wash fluid from said scoop impeller means, and a nozzle on the upper end of said tubular conduit disposed to supply wash fluid in the region of the upper rack.

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