Aug. 23, 1966 D. A. MEEKER ETAL 3,267,944

SPRAY DEVICE FOR DISHWASHING APPARATUS

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FIG-1

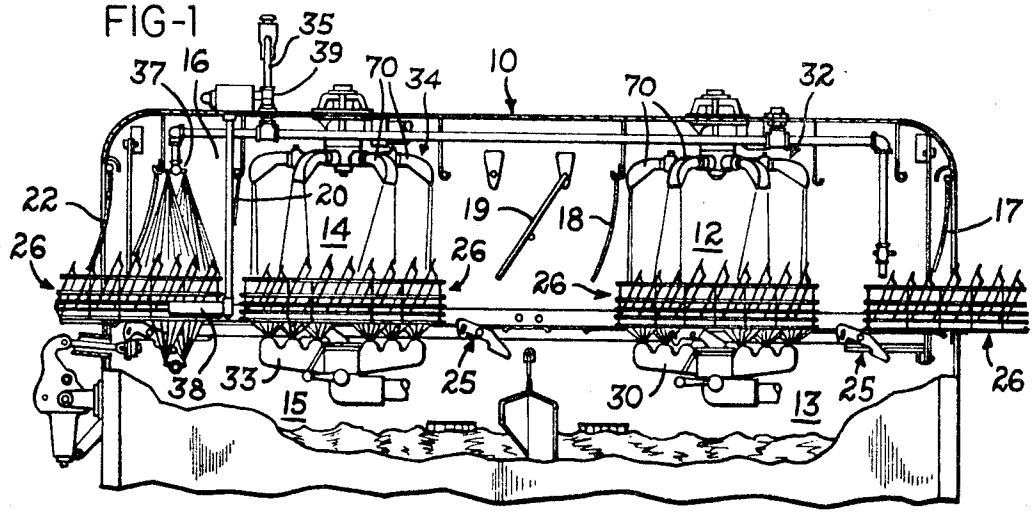

FIG-2

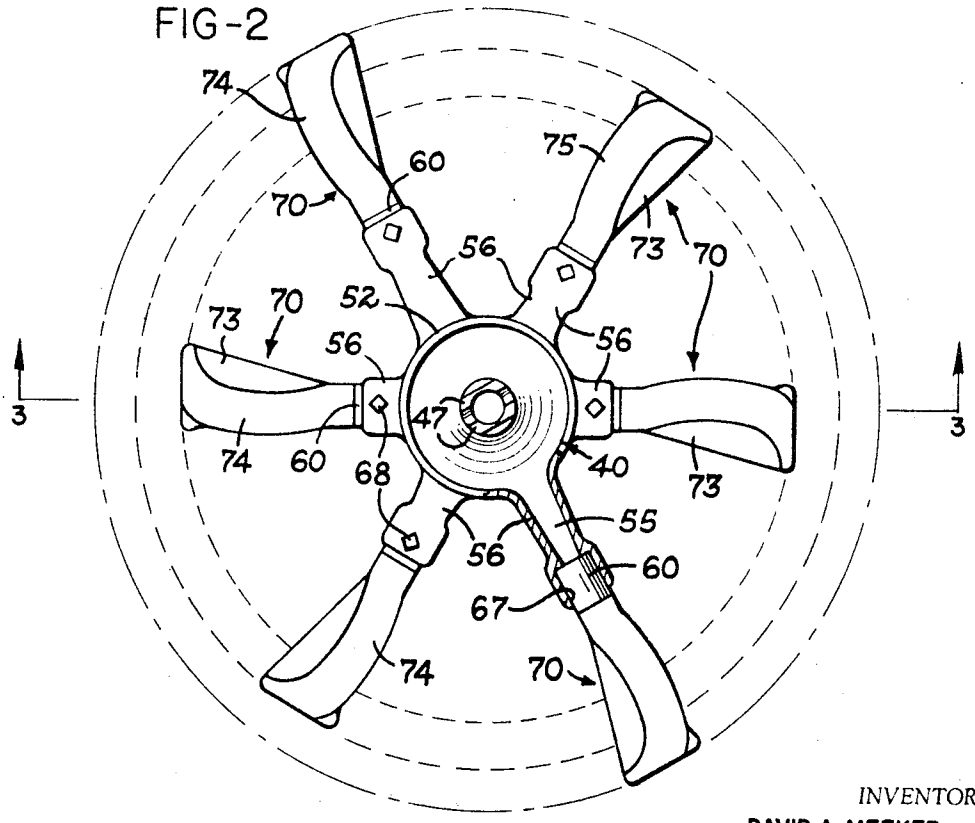

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FIG-3

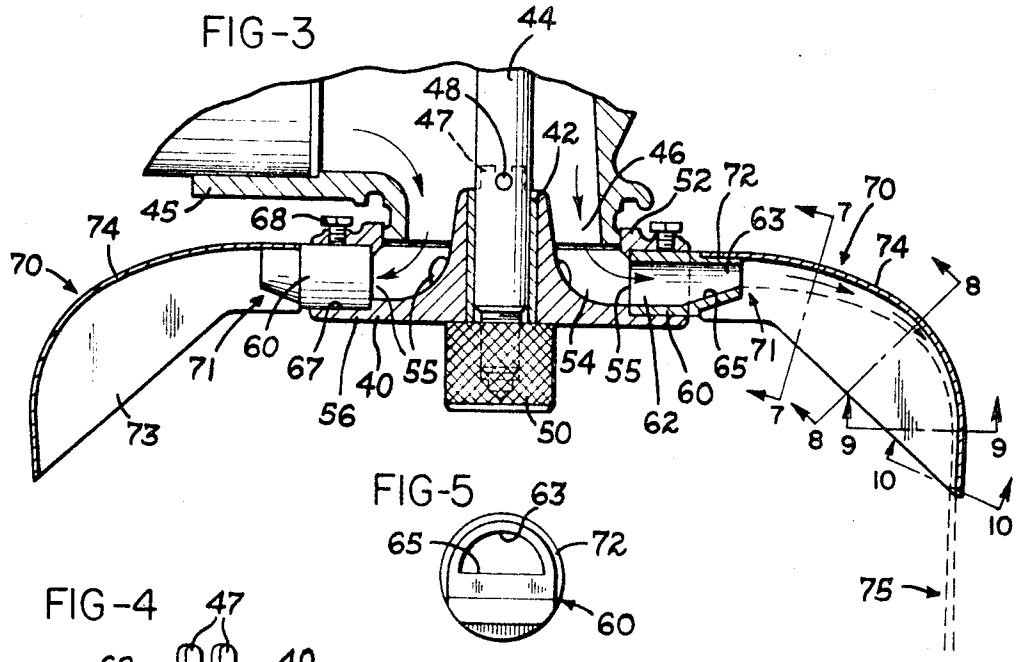


FIG-5

FIG-4

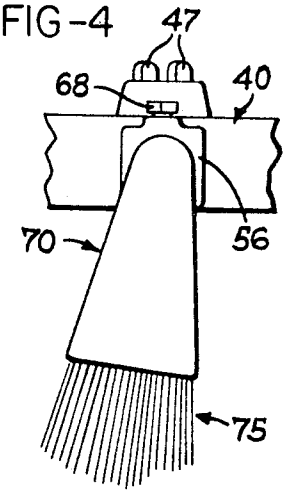


FIG-6

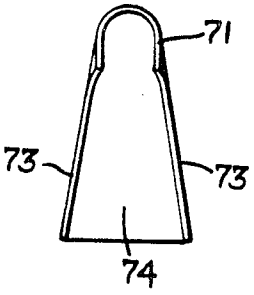


FIG-7

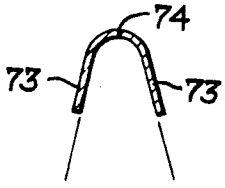


FIG-8

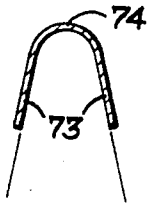


FIG-9

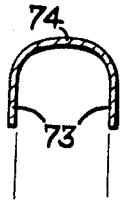
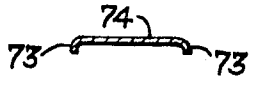


FIG-10



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3,267,944

SPRAY DEVICE FOR DISHWASHING APPARATUS

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Filed Dec. 5, 1963, Ser. No. 328,226
2 Claims. (Cl. 134—179)

This invention relates to an improved type of spray device for dishwashing machines, in particular, to an improved rotary spray device of the reaction type adapted to direct a plurality of streams of cleansing liquid against articles to be cleansed.

Reaction type spray devices of this nature are generally constructed as two or more spray arms extending from a hub which is in turn mounted to rotate about an axis perpendicular, or substantially perpendicular, to the spray arms. These arms in turn have usually included one or more spray openings or nozzles directed downwardly along their length and spaced outward from the hub, as well as a spray nozzle opening at the outer end of the arm which is directed downward and at an angle with respect to the axis of rotation, such that liquid issuing therefrom functions as a cleansing spray and partially as a reaction jet which serves to rotate the device about its mounting.

An important feature of the present invention concerns an improvement in such devices wherein the cleansing liquid is discharged along several different overlapping circular bands concentric with respect to the axis of rotation of the device, such that if looking along the axis of rotation the spray pattern would be observed as several rings or concentric circles of sprayed liquid which expand and overlap to provide a concentrated but relatively evenly spread and uniform liquid spray, which is most effective in cleansing all portions of soiled articles carried throughout the spray. On the other hand, according to the invention the spray is substantially confined to within a predetermined circular pattern and thus relatively little of the cleansing liquid tends to be sprayed outwardly beyond the desired pattern, resulting in a more effective spraying and cleansing action. As a by-product of this improved spray pattern the splashing of liquid to the outside of the chamber of the machine is reduced, and it is possible to attain a more effective splash guard arrangement whereby little of the spray liquid is splashed to the exterior of the machine.

The primary object of this invention, therefore, is to provide an improved rotary spray device for dishwashing machines in which the pattern of the sprayed liquid directed against articles to be cleansed is confined to an area which is essentially a direct projection of the diameter of the spray device along the axis of rotation of the device.

Another object of the invention is to provide such an improved rotary spray device which is of simple and economical construction, and which also has a substantial useful life such that it requires little attention for purposes of maintenance, and which when maintenance is required may easily be removed and disassembled for repair.

Another object of the invention is to provide such a rotary spray device in which the sprayed liquid leaves the device in a plurality of relatively thin and wide sheets, with reference to the axis of rotation, and in which the direction of these sheet-like sprays can be adjusted to any desired angle with respect to the axis of rotation to obtain a desired overlapping spray pattern and also to obtain the desired jet reaction to rotate the device.

Another object of the invention is to provide a novel

spray device for dishwashing machines in which a stream of liquid is confined initially to flow through a fitting of circular diameter and in which the stream is redirected and guided to emerge as a relatively thin and wide sheet-like stream of liquid which is directed in a predetermined relation to the axis of rotation of the spray device.

Other objects and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

In the drawings:

FIG. 1 is a somewhat schematic view, broken away through the major part thereof, showing the overall arrangement of a typical dishwashing machine in which the present invention is incorporated;

FIG. 2 is a plan view, with one segment of the hub broken away and shown in section, of an improved rotary spray device according to the invention;

FIG. 3 is an enlarged cross-sectional view taken on line 3—3 of FIG. 2, and showing in addition a portion of the mounting and supply pipe for the rotary spray device;

FIG. 4 is an end view of one of the flow-directing scoop nozzles, as viewed from the perihpery of the spray device;

FIG. 5 is a detail view, on an enlarged section, showing the outlet portion of one of the flow control fittings in the spray device;

FIG. 6 is a detail view showing the interior of one of the flow direction scoop nozzle members; and

FIGS. 7, 8 and 9 and 10 are true sectional views (at the section line only) taken on the corresponding section lines indicated in FIG. 3, and illustrating the progressive change in cross-sectional dimension and configuration of one of the flow-directing scoop nozzles.

Referring to the drawings, which illustrate a preferred embodiment of the invention, FIG. 1 shows the overall construction of one form of dishwashing machine in which the rotary spray device of the present invention can be incorporated. The machine includes an overall housing **10** which is divided into a first cleaning chamber **12** over a tank **13**, a second cleansing chamber **14** over a tank **15**, and a final rinse chamber **16** which is located over one end of the tank **15**.

The entrance to the first chamber **12** is provided by an opening cover by a flexible curtain **17**, the chambers **12** and **14** are separated by a flexible curtain **18** as well as a splash deflector **19**, the chambers **14** and **16** are separated by a flexible curtain, a portion of which is shown at **20**, and the exit of the machine from the final rinse chamber **16** is normally covered or closed by a curtain **22**. A conveyor structure, indicated generally at **25**, is fitted to convey open mesh racks **26** carrying the articles to be cleansed. This conveyor may be of the type shown in U.S. Patent No. 2,073,521, or other types of conveyors may be used such as forms of continuous or so-called "endless" conveyors.

As is usual in machines of this type there are motor driven pumps (not shown) which withdraw the cleansing liquids from the tanks **13** and **15**, respectively. The pump drawing from tank **13** is connected to supply cleansing liquid under pressure to a lower spray head **30** of conventional design, and to an upper spray head **32** which may be a rotary spray device of the type provided by this invention. In similar fashion, the other pump draws liquid from tank **15** and supplies it under pressure to the conventional lower spray head **33** and to the upper spray head **34** in chamber **14**, and this spray head may also be a rotary spray device of the improved type disclosed herein. The final rinse spray is preferably a hot fresh water spray supplied from a suitable source through pipe **35** to the spray nozzles **37**, and flow to this spray nozzle is controlled by the movable arm **38** sensing presence of

a rack beneath the nozzle 37, and controlling the operation of a valve 39 fitted in the line 35.

With reference to FIGS. 2 and 3, details of the improved rotary spray device provided by the invention include a hub member 40 provided with a central sleeve 42 which is received over a shaft 44. This shaft extends into the end of a liquid supply pipe 45, and through the supply opening 46 therein. The upper end of the shaft 44 is conventionally mounted in a bearing for free rotation, and for this purpose of suitable sealed bearing (not shown) can be provided. The hub member 40 includes a fork configuration 47 adapted to fit with a cross pin 48 in the shaft 44, and the hub member is secured to the shaft with the cross pin received in the fork construction by a nut 50 threaded to the lower end of shaft 44.

The top of the hub member is provided with a cylindrical inlet opening defined by the cylindrical wall or shoulder 52, and this shoulder surrounds the end of the supply pipe outlet 46 as shown in FIG. 3. The liquid under pressure thus enters the central inlet passage or manifold 54 of the hub member, and in turn passes through the several fluid passages 55. These passages may be formed as short arms or tubes 56, preferably arranged in opposed pairs of different lengths as shown in FIG. 2. Thus, the liquid entering the hub member is divided into a plurality of streams flowing through the various passages 55.

At the end of each passage there is a flow control fitting 60 which has an inlet section preferably of circular or essentially circular cross-section, indicated generally at 62. The outlet section 63 of the fitting, at its outlet end, is of approximately semi-circular configuration as seen by comparing FIGS. 3 and 5, and in between there is formed in the bottom of each fitting a ramp or flow direction portion 65 which is flat, or substantially flat, and is inclined upwardly from the inlet section toward the outlet section of the fitting. Each fitting is received in a counter bore 67 in the end of the associated flow passage tube 56, and is held in place by a suitable clamping screw 68. Thus, each fitting can be adjusted to vary the relation of the ramp portion 65 with respect to the axis of rotation of the hub member (defined by shaft 44) merely by turning the fitting to the desired position and tightening the associated clamping screw 68.

Fastened to each fitting, for example by being brazed to the extending part thereof around the outlet section 63, there is a scoop-like flow directing and controlling nozzle. These nozzles are indicated by the general reference numeral 70, and may be of like construction. They are preferably formed from thin and rather lightweight sheet metal, for example stainless steel, although they can be formed by casting or in any other suitable manner. The inlet or flow-receiving portion of these nozzles is indicated, particularly in FIGS. 3 and 6, at 71, and it will be noted that the shape of the nozzle is approximately the same as the shape as the undercut portion 72 on the associated fitting 60. Farther outward along the nozzle the side walls 73 diverge, as shown in FIGS. 7 and 8, while the top wall 74 curves outward and downward as shown in FIG. 3. The progressive change in cross-sectional configuration can be seen by comparing FIGS. 7, 8, 9 and 10 with FIG. 3 of the corresponding section lines thereof. Near the discharge end of the nozzle the side walls 73 are rather slight, and the nozzle is of rather wide and shallow cross-sectional configuration.

The flow of liquid under pressure entering the inlet section of fitting 60 is redirected as the lower part of this flow impinges on the ramp portion 65 and is deflected upward. This causes the flow of discharge into the scoop-like nozzle member 70 and to follow its curved top wall 74 configuration with the stream of liquid following approximately the path shown by dotted lines in FIG. 3. Thus, the flow of liquid is redirected and shaped as it passes through the nozzle 70, such that it is expanded laterally and tends to contract in a direction along the radius of the spray device. Thus, the exiting stream, indicated generally at 75, is a relatively thin sheet-like flow of liquid which is expanding somewhat width-wise of the nozzle, as shown in FIG. 4.

As a result of the velocity of the exiting stream 75 of liquid, this stream may tend to spread slightly outward away from the actual direction of the discharge or exit portion of the scoop nozzle. However, this deviation of the stream is very slight, and the spray pattern is essentially a direct projection of the circular paths followed by the nozzle members, as indicated in FIG. 2. In order to obtain the necessary rotary motion, one or more of the nozzles 70 can be turned at a slight angle with respect to the direction of rotation, as shown in FIG. 4, and in FIG. 2 all of the nozzle members 70 are shown partially turned in this manner, although it will be understood that it is not necessary that all of them should be so directed. The thin exiting stream from the turned nozzles will be spread somewhat in a band which extends along a plane intersecting the circular path of the nozzle member, and thus it is possible also to obtain any desired overlapping of the spray from the individual nozzles, supplementary to the location of the various nozzles at different radii, such that the resultant total spray pattern will be a series of concentric bands of liquid spray which overlap somewhat, but which are maintained essentially within the circular projection of the path of the largest diameter nozzle set.

This arrangement has been found most effective in attaining the desired speed of rotation, and direction of the liquid sprayed from the rotary spray device, and simple adjustments can be made on machines in service in order to obtain the desired result. For example, machines in which a predominance of the articles being washed are large and bulky, for example cafeteria trays, or sectional trays such as those used in some mess halls by the armed services, may best be adjusted to obtain a more effective sluicing action of the stream, to assure cleansing of the interior of the trays, particularly when such trays have soiled compartments. Also, an improved spray pattern is achieved, in general, from the fact that essentially all of the liquid is directed onto the articles to be cleansed, and very little of the liquid is sprayed into the walls of the chamber, although of course some liquid will splash onto the walls after it has struck the articles being cleansed.

While the form of the apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. In a dishwashing machine having a housing defining a cleansing chamber and means for supporting articles to be cleansed in said chamber, an improved rotary spray device comprising a hub member having a plurality of radially extending liquid passages, means supporting the center of said hub member defining an axis of rotation of said hub member extending vertically of said chamber, means forming inlet passages in said hub member spaced inward from the periphery of said hub member and connected to said liquid passages, a nozzle member mounted to extend radially outward from said hub member at the radially outward end of each of said liquid passages, each of said nozzle members including a curved flow directing scoop having an inlet portion fitted to said hub member and of approximately the same cross-sectional dimension as the corresponding liquid passage, a discharge portion on each of said scoops extending transversely to the associated said nozzle member to direct all of the liquid flowing from the associated said nozzle member in a direction generally parallel to said axis of rotation and to confine the flow of discharged liquid essentially to within a cylindrical path which coin-

cides with the circular path of travel of the respective discharge portions about said axis of rotation, and a curved guiding wall extending between said inlet portion and said discharge portion of each said scoop, said guiding wall being curved through approximately 90° to change the direction of liquid passing therethrough, said nozzle member having a flow directing surface extending toward said guiding wall of the associated said scoop to direct substantially the entire flow of liquid therethrough against the wall surface of the associated said scoop to cause the liquid to flow along said curved wall of said scoop and to leave said discharge portion of said scoop in a relatively wide stream.

2. In a dishwashing machine having a housing defining a cleansing chamber and means for supporting articles to be cleansed in said chamber and having a reaction type of rotary spray arm including a stationary supply pipe in said housing terminating in a downwardly directed opening of circular configuration positioned above said supporting means and a rotatable hub member supported for free rotation about said opening, said hub member including a plurality of separate fluid flow passages communicating with said supply opening and extending therefrom laterally outward of said hub member; the improvement comprising flow controlling and directing spray nozzles mounted on said hub member at the radially outward ends of each of said flow passages, each of said nozzles including a flow control fitting secured to said hub member and having an inlet section of essentially circular cross-section and an outlet section of approximately semi-circular cross-section, a ramp portion formed in said fitting between said inlet and outlet portions thereof and extending upwardly from the bottom of said inlet portion toward said outlet portion to direct the liquid flow from the bottom of the inlet portion of the fitting upward into the flow stream of liquid passing through the top of said fitting, and a flow-directing scoop carried on each

of said fittings, each said scoop including an inlet section of internal configuration corresponding at least at the top thereof to the configuration of said outlet portion of said fitting, each said scoop having a further flow turning internal wall surface curved through approximately 90° with respect to said fitting for changing the direction of the flow from said fitting from a generally horizontal direction to a generally vertical direction, and said internal wall surfaces of said scoops being formed to expand laterally with respect to said fitting providing a relatively wide discharge end from which the stream of liquid passing over said internal wall surface is discharged as a stream directed downward in radially spaced relation from said hub member and expanding in a direction generally transverse to the axis of rotation of said hub member, said discharge portions of said scoops being arranged at different radii with respect to the axis of rotation of said hub member such that the fluid exits from the spray device as a plurality of streams at different radii and each of relatively thin dimension radially of the spray device and of substantial width in the circumferential direction about said hub member.

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