Aug. 28, 1962 J. W. JACOBS 3,051,183

SPRAY TUBE FOR A DISHWASHER

Filed March 30, 1959 2 Sheets-Sheet 1

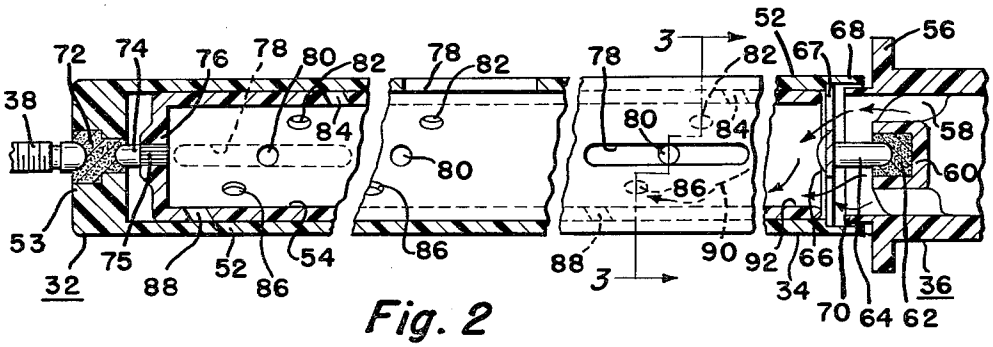


Fig. 2

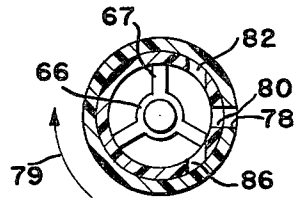


Fig. 3

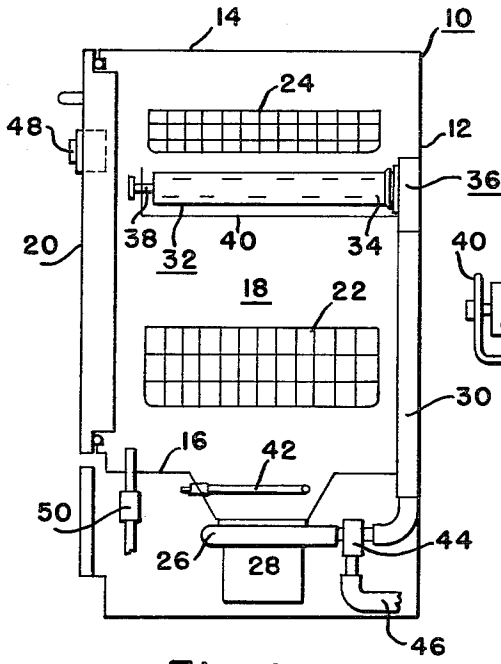


Fig. 1

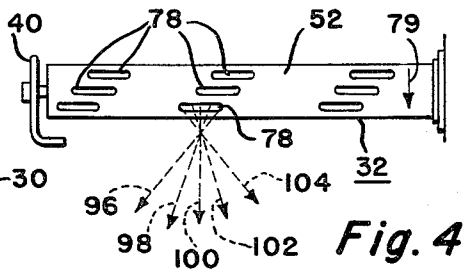


Fig. 4

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SPRAY TUBE FOR A DISHWASHER

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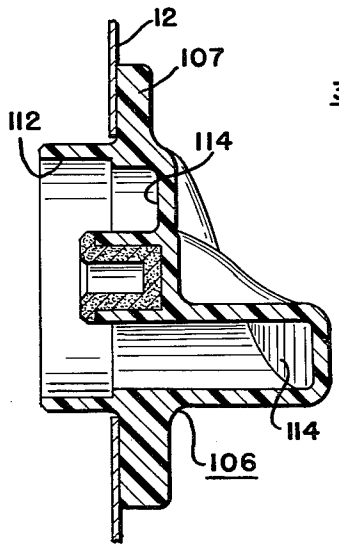


Fig. 8

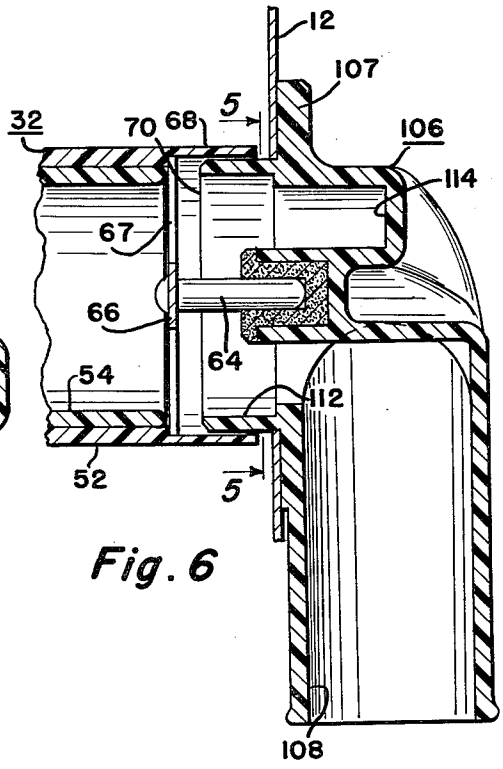


Fig. 6

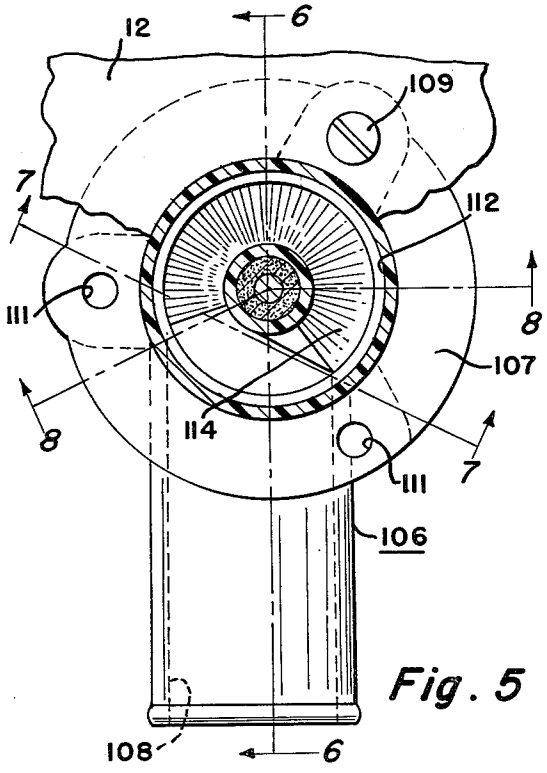


Fig. 5

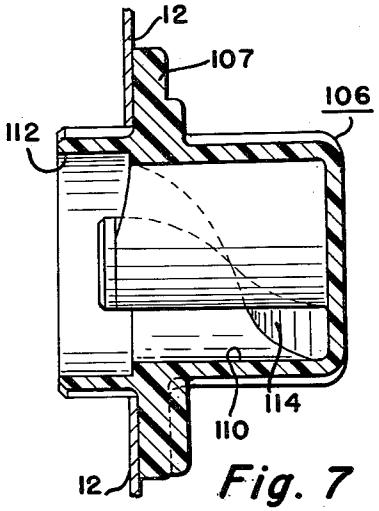


Fig. 7

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SPRAY TUBE FOR A DISHWASHER

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6 Claims. (Cl. 134—174)

This invention relates to a domestic appliance and more particularly to an improved spray tube for a washing appliance.

To improve the cleansing results in dishwashers it is the desire of design engineers in the dishwashing art to secure as complete a spray coverage of the soiled dishware as is possible. In the past the spray pattern from a rotating spray device has been predetermined by the design of the device and the machine in which it is used. Thus if the particular spray pattern designed does not effectively cover the utensils being washed in any given load, the results of the cleansing process for that load will be adversely affected.

Accordingly it is an object of this invention to provide a dishwasher with a spray tube producing a variable or changing spray pattern.

It is another object of this invention to provide a rotatable spray tube with means for changing the spray pattern thereof.

A more particular object of this invention is to provide a perforated spray tube rotated by the frictional drag of water swirling in the tube with means for changing the perforations in the spray tube.

A still more specific object of this invention is to provide a washing appliance with a spray tube having an outer slotted cylindrical section and an inner ported cylindrical section, both of said sections being rotated at different speeds in response to the swirling fluid flowing to the spray tube.

Another object of this invention is a spray tube adapted to rotate in response to fluid moving longitudinally therethrough and having an outer longitudinally slotted cylinder and an inner cylinder having a plurality of differently angularly drilled ports for cooperating with said slots in altering the spray pattern of said spray tube.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

FIGURE 1 is a schematic diagram of a dishwasher suitable for use with this invention;

FIGURE 2 is an enlarged fragmentary cross sectional view of the spray tube of this invention;

FIGURE 3 is a sectional view of the spray tube taken along line 3—3 of FIGURE 2;

FIGURE 4 is a schematic elevational view of the novel spray tube of this invention showing the differently directed jets produced from each slot and relatively smaller than the enlarged view in FIGURE 2;

FIGURE 5 is an elevational view with parts broken away taken along line 5—5 of FIGURE 6 showing a spray head suitable for producing a fluid swirl in the spray tube of this invention;

FIGURE 6 is a sectional view taken along line 6—6 in FIGURE 5 showing the swirl inducing spray head in combination with a portion of the spray tube of this invention;

FIGURE 7 is a sectional view of the spray head taken along line 7—7 in FIGURE 5; and

FIGURE 8 is a sectional view of the spray head taken along line 8—8 in FIGURE 5.

In accordance with this invention and with reference

to FIGURE 1 a dishwasher 10 is designed with a rear wall 12, a top wall 14 and a sump 16 defining a dishwashing chamber 18. The front of the dishwashing chamber 18 is closed by a horizontally pivoted door member 20, which when in a horizontal position is adapted to support a soiled dish support basket 22 removable from the chamber 18 for loading. A second support basket 24 is also adapted to be slidably removable from the dishwashing chamber 18 for facilitating loading thereof. Connected to the sump 16 of the dishwasher 10 is a pump 26 driven by a motor 28. The outlet of the pump 26 is connected by means of a conduit 30 to a spray tube 32 rotatably supported at its rearward end 34 on a spray head or swirl inducing member 36 and at its front end on a pin 38 carried by a spray tube support bracket 40. Within the sump 16 a heater 42 may be located for periodically drying the dishes in chamber 18. Between the outlet of the pump 26 and the conduit 30 a solenoid drain valve 44 is arranged to selectively direct water from the sump 16 to a drain line 46. Although the foregoing is believed to provide adequate structural background for the teachings of this invention, the patent to Abresch et al. 2,806,063, issued October 1, 1957 may be referred to for further details on a dishwasher of the rotatable spray tube type.

In operation the baskets 22 and 24 of dishwasher 10 are loaded, placed within the dishwashing chamber 18 and the door 20 closed. A conventional timer 48 may be set for a given washing cycle at which point water will be introduced to the sump 16 by means of a supply valve 50. At the same time the motor 28 will be energized to cause water to be circulated from the sump 16 through the conduit 30 and the swirl inducing spray head 36 to the spray tube 32. The swirl imparted to the water flowing to the spray tube 32 will cause the spray tube to rotate due to the frictional drag of the water on the inner surface of the tube. In the past a single walled spray tube 32 was used to produce a single spray or water distribution pattern within the dishwashing chamber 18. If none of the many jets of water impinged directly on a badly soiled portion of the dishes being washed, there arose the possibility that the soiled area would not be satisfactorily cleaned. This invention, then, is directed to a spray tube 32 which is designed to produce a constantly changing spray pattern within the washing chamber 18—a plurality of ever changing spray jets which will cover completely all exposed surfaces.

Referring now to FIGURE 2 the construction of the spray tube will be clearly set forth. The spray tube 32 is comprised of an outer driven cylinder or tube 52 and an inner driving cylinder or tube 54. Supported on the rear wall 12 of the dishwasher 10 is a spray head or fluid swirl inducing housing shown generally at 36. The spray head or header 36 is formed with a flange 56 which is utilized in fastening the header 36 to the rear wall 12 of the washing chamber 18 or to the terminal end of the conduit 30. Within the spray head 36 are swirl inducing means such as vanes 58. Thus as water is pumped to the spray head 36 through the conduit 30 a swirl or rotational movement will be imparted to the water prior to its entering the rearward end 34 of the spray tube 32. In the arrangement shown in FIGURE 2 the vanes 58 serve to support a central boss or bearing housing 60 which carries a bearing 62 of graphite or other suitable material for journalling a rear shaft portion 64. The shaft 64 is carried on a spider 66 having several legs 67 which are adapted to support and centrally locate an inlet opening flange 68 on the outer cylinder 52. It should be noted that the radially extending legs 67 of the spider 66 do not offer any substantial resistance to the water flowing into the spray tube 32 as is more clearly seen in FIGURE 3. In order to provide for a more effective or tighter rotary water seal at

the rearward end 34 of the spray tube 32, the spray head 36 is formed with an outwardly extending cylindrical outlet flange 70 which nests within the inlet opening flange 68 of the outer spray tube 52. Of course the cylindrical flanges 68 and 70 are spaced slightly from each other to provide ease of relative rotational movement.

The outer spray tube 52 may be formed of any suitable moldable material such as phenolic and carries at its closed outer end 53 a bearing insert 72 of graphite or the like by which the spray tube 32 is journalled on support pin 38. The bearing insert 72 serves also to journal a pin or shaft 74 fitted securely as by a splined fitting 75 into the closed outer end wall 76 of the inner spray tube 54. A plurality of radially directed fluid ejection slots 78 are formed in the cylindrical wall of the outer spray tube 52. These slots 78 are formed in the outer cylinder 52 in stepped fashion as is more readily seen in FIGURE 4.

The inner spray tube 54 resides within the outer tube 52 in close juxtaposition thereto. However, the tubes must be formed so that they may move relatively to one another with a minimum of frictional drag. The pin 74 in bearing 72 prevents the outer end walls 53 and 76 from contacting each other and also helps to maintain the correct relationship between inner and outer cylinders. Within the cylindrical wall of the spray tube 54 are a series of fluid ejection ports formed in the inner tube 54 at different angles or different axes of ejection. Ports 80 which are drilled at right angles to or radially of the cylindrical wall portion of the tube 54. A second set of ports 82 are formed in the cylindrical wall of the tube 54, but angularly displaced by about 30° from the drill direction of ports 80. A third set of ports 84, a fourth set of ports 86 and a fifth set of ports 88 are formed in the tube 54, all drilled through the wall of the tube from different angular directions. Thus water projecting or ejecting from the inner spray tube 54 through the five different series of ports would project in five different directions. The formation of the ports 80, 82, 84, 86 and 88 are drilled in the tube 54 while progressing gradually lengthwise along the spray tube with the tube rotated slightly prior to each drilling. Of course the ports may be formed simultaneously with the molding of the tube if so desired. In either event the ports are formed in similar stepped fashion along the length of the inner spray tube 54 as are the slots 78 in the outer spray tube 52. This longitudinal or lengthwise displacement of slots 78 and ports 80, 82, 84, 86, 88 provides for aligning different ports within the slots at different times.

The operation of the improved spray tube will now be more clearly set forth with reference to FIGURES 2, 3 and 4. As water is forcefully pumped under pressure through conduit 30 to the spray head 36, a swirl or rotary motion will be imparted to the water so pumped by vanes 58. The motion which the water takes as it proceeds longitudinally of the spray tube 32 is shown by flow arrows 90. This swirling water enters the open rearward end 92 of the inner spray tube 54. This spiralling or swirling action causes the spiralling water to flow along the inner tube 54, thereby rotating the tube 54 by frictional action therewith. Water will pass out of the inner tube 54 through any given group of outlet ports 80 or 82 or 84 or 86 or 88. Different sets of these ports become aligned with the slots 78 of the outer tube 52; and thus from one given instant to another the spray pattern changes in accordance with the ports aligned with the slots 78. The outer tube 52 rotates at a lesser speed than the inner tube 54 due to frictional drag with the inner tube. In other words swirling water rotates the inner tube 54 and the outer tube 52 merely follows along due to the drag between tubes. Certain slippage between tubes accounts for the different speeds. In this fashion the inner and outer tubes 54 and 52 are moving relatively to one another throughout the spray operation. This relative motion places different ones of the ports 80, 82, 84, 86 and 88 in connection with the outer spray tube slots 78 and produces an ever changing pattern such as indicated in

FIGURE 4. FIGURE 4 with arrow 79 indicating rotational direction of the tubes illustrates that for any given slot 78 the projection of water or axis of ejection from the slot will be in the direction 96 when water leaves the inner spray tube through a port 84; in a direction 98 towards the viewer of FIGURE 4 when leaving the tube through a port 82; in a direction 100 when leaving through a port 80; in a direction 102 away from the viewer of FIGURE 4 when leaving through outlet port 86; and in a direction 104 when leaving through outlet port 88. Thus it should be apparent that any exposed surface of a soiled utensil supported in the baskets 22 and 24 within the dishwashing chamber 18 will be completely covered by the variable spray pattern produced by the concentrically arranged double tube system of this invention.

FIGURES 5, 6, 7 and 8 are included to show another means for inducing swirl in the water being pumped to the spray tube 32. In these views a spray head 106 is shown with a flange 107 secured as by a bolt 109 in the spray head opening 111 to the outer side of the dishwasher wall 12 rather than on the inner side as was spray head 36. Water proceeding upwardly in a conduit such as 30 but exterior of chamber 18 will enter the spray head inelt 108 and will be directed to a swirl housing inlet 110. At this point the water will start proceeding toward the outlet 112 on a ramp 114. As the water proceeds from inlet 108 to outlet 112 a swirl is imparted in the water due to the screw-like ramp configuration in the spray housing 106. It should be realized however that this invention is in no way limited by the manner in which swirl or rotational movement is imparted to the water serving as the driving force for the rotatable spray tube 32. Any means by which the inner cylinder 54 is rotated, thereby causing the outer tube 52 to follow by frictional drag therewith will suffice for the purposes of this invention. In its broadest aspect this invention is directed to a device for producing a variable spray through the use of concentrically nested, differently ported, relatively rotating cylinders.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. A dishwasher having a washing chamber comprising, means for supporting dishes or the like in said chamber, a sump at the bottom of said chamber, means connected to said chamber for admitting a fluid medium to said sump, a jet spray tube in said chamber, conduit means connecting said sump and said spray tube, means connected to said conduit means for circulating said fluid medium from said sump to said spray tube, said spray tube including an inner cylindrical member rotatably journalled in said conduit and an outer cylindrical member mounted for relative rotation on said inner member, and swirl imparting means in said conduit means between said circulating means and said jet spray tube for rotating said members relatively, said outer member having a plurality of radially directed slots, said inner member having a plurality of non-radially directed ports sequentially registering with said slots when said first and second members are rotated relatively and said outer member is in close enough relationship to the outer surface of said inner member to operate as a valve for certain of said ports not registering with said slots, thereby to change the jet spray patterns of said cleansing medium in said chamber.

2. A dishwasher having a washing chamber comprising, means for supporting dishes or the like in said chamber, a sump in said chamber, means connected to said chamber for admitting a fluid medium to said sump, a variable jet spray tube in said chamber, means connecting said sump and said spray tube, and means connected to said connecting means for circulating said fluid medium from said sump to said spray tube, said spray tube

having an inner cylinder rotatably journalled on said connecting means and an outer cylinder relatively rotatably mounted on said inner cylinder, said outer cylinder having a slot, said inner cylinder having a plurality of ports selectively registering with said slot when said inner and outer cylinders rotate relatively and said outer cylinder is in close enough relationship to the outer surface of said inner cylinder to operate as a valve for those ports not in registry with said slot, thereby to change the jet spray patterns in said chamber.

3. A dishwasher having a chamber comprising, means for supporting dishes or the like in said chamber, a sump in said chamber, means connected to said chamber for admitting a fluid medium to said sump, a jet spray device in said chamber, means connecting said sump and said spray device, means connected to said connecting means for circulating said fluid medium from said sump to said spray device, said spray device having a first member movably mounted in said chamber and a second member relatively movably mounted with said first member, one of said first and second members having a first fluid medium ejection opening, the other of said members having a plurality of second fluid medium ejection openings sequentially registering with said first opening when said first and second members move relatively and said one of said members is in close enough relationship to the other of said members to operate as a continuously intermittently operating valve for closing one of said second fluid ejection openings while registering another of said second fluid ejection openings with said first fluid ejection opening, at least one of said second fluid ejection openings having a different axis of fluid medium ejection than said first fluid ejection opening.

4. A variable jet spray device for distributing a fluid medium comprising a first cylindrical member having a first radially directed opening, a second cylindrical member in nested relationship to said first member and having second and third non-radially directed openings, and means connected to said jet spray device for driving said first and second members at different speeds for periodically bringing said first opening into registry sequentially with said second and third openings, said first member being in close enough relationship to said second member to operate as a continuously intermittently operating valve for closing the one of said second or third openings which is not in registry with said first opening.

5. A variable jet spray tube for an appliance adapted to be rotated by the motion of water directed through said tube comprising, a first cylinder having a plurality of radially directed slots, a second cylinder concentric with said first cylinder and having a plurality of differently non-radially directed ports, the radially outer surface of said second cylinder substantially coincident with the radially inner surface of said first cylinder to effect a frictional drag between said cylinders and a valving relationship between said radially inner surface and said ports, and means connected to said tube for directing fluid through said second cylinder to rotate said second cylinder at one speed and said first cylinder by said frictional drag at another speed, whereby said ports are repeatedly sequentially in registry with said slots or closed by said radially inner surface of said first cylinder to vary the spray from said tube.

6. A variable jet spray device for distributing a fluid medium comprising, a first member having a first cylindrical surface and a first opening in said first surface, a second member having a second cylindrical surface in substantially coplanar relationship with said first surface and having second and third openings in said second surface, said second and third openings being differently jet spray oriented with respect to said second member, and means connected to said jet spray device for driving said first and second members at different speeds for periodically bringing said first opening into registry sequentially with said second and third openings, said first surface being in close enough relationship to said second surface and sufficiently coextensive with each of said second and third openings to operate as a valve for closing one of said second or third openings when the other of said second or third openings is in registry with said first opening, thereby to vary the spray by continuously and separately opening and closing each of said second and third openings.

References Cited in the file of this patent

UNITED STATES PATENTS

1,524,458	Simmons	Jan. 27, 1925
1,997,450	Burkle	Apr. 9, 1935
2,357,050	McCrum	Aug. 29, 1944
2,815,246	Nyrop	Dec. 3, 1957
2,905,092	Abresch	Sept. 22, 1959