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J. M. D. DELAPENA

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SPRAY DEVICE FOR DISHWASHING MACHINES

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2 Sheets-Sheet 1

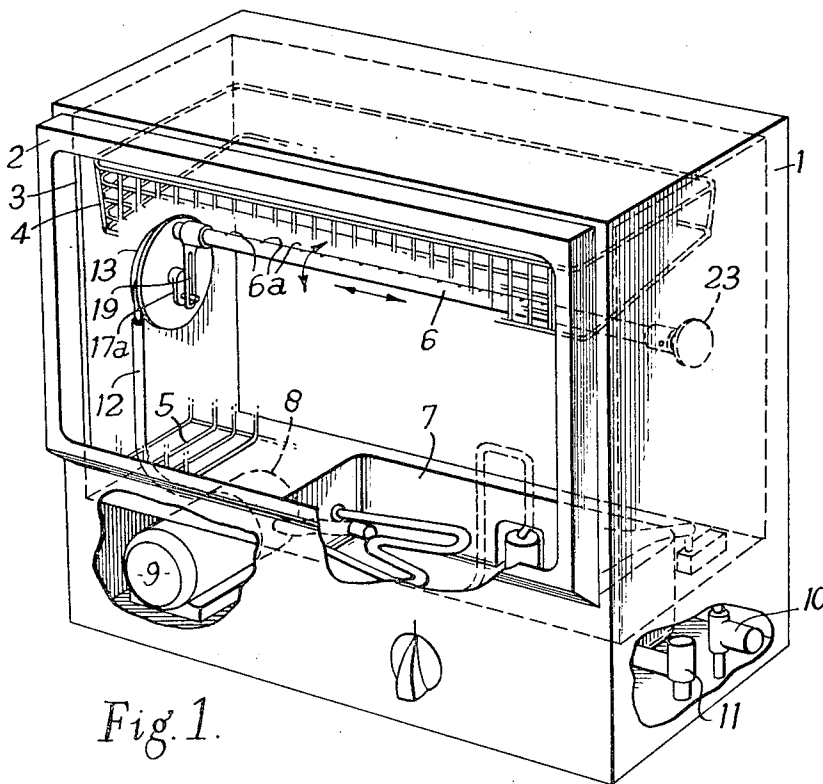


Fig. 1.

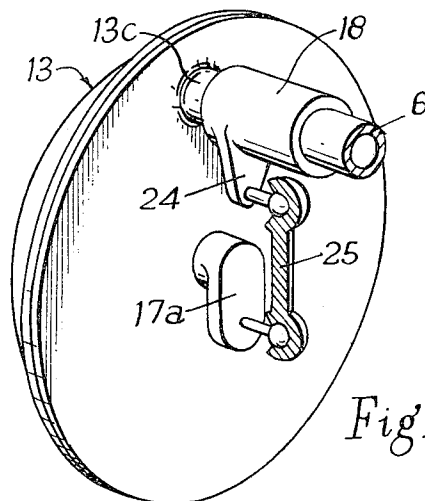


Fig. 3.

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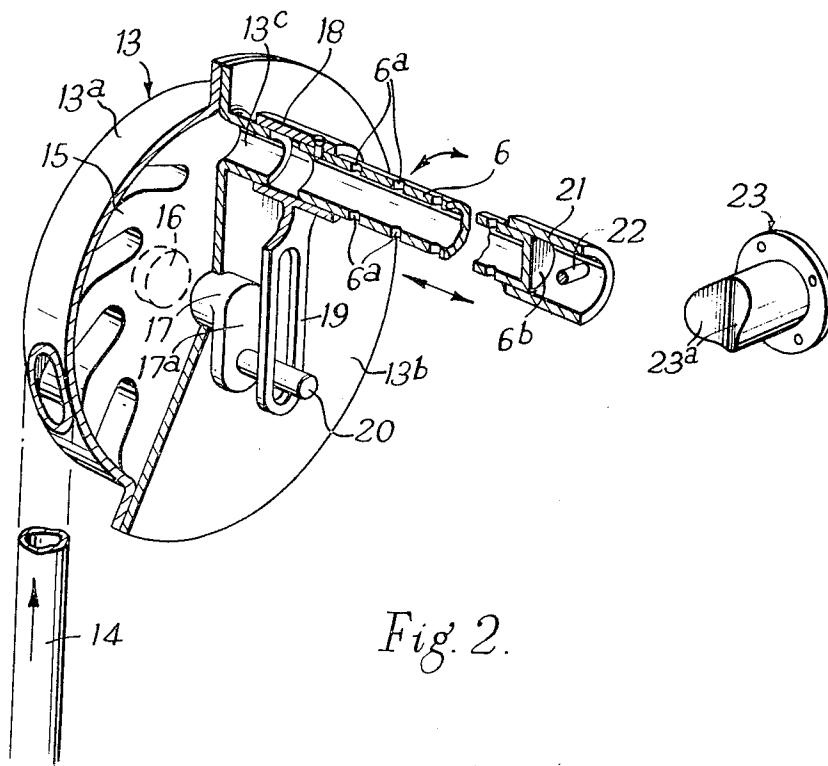
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SPRAY DEVICE FOR DISHWASHING MACHINES
John Michael Devereux Delapena, London, England, as-
signor to Porlester Limited, Leicestershire, England, a
British company

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2 Claims. (Cl. 239-242)

This invention relates to dishwashing machines, that is to say machines for washing dishes, plates and like tableware, cutlery, cooking vessels and utensils and the like.

The invention is concerned with dishwashing machines comprising a casing in which are placed articles to be washed and in which washing fluid is sprayed on to the articles.

In the operation of conventional dishwashing machines, the washing fluid, for example water, being sprayed, takes one direction only and the application of the fluid to the articles within the casing relies to a great extent upon splashing of the fluid from one article to the next or from the inner surfaces of the casing on to the articles. On many occasions one article shields another article from the fluid so that at least part of the latter article does not receive sufficient fluid and is not properly washed. Thus, in conventional dish washing machines there is insufficient distribution of washing fluid and the machines are inefficient in washing articles.

The object of the present invention is to provide a dishwashing machine which is adapted to produce a greater distribution of washing fluid and hence a more efficient cleaning operation.

According to the present invention there is provided a dishwashing machine including a casing, a spray tube formed with perforations along its length and mounted for movement within the casing and arranged to be supplied with washing fluid under pressure and means for driving the spray tube so that it performs regular movements in at least two directions, at least one of these directions of movement being an angular movement about the longitudinal central axis of the spray tube.

Thus, in the operation of the machine in accordance with the present invention the washing fluid issues in jets from the perforations in the spray tube and each jet is subjected, either simultaneously or alternately, to movement in at least two directions, so that each jet is spread over a wide area within the casing.

The washing fluid employed will usually be water and this will be assumed for convenience hereinafter in this specification.

The spray tube and the said means for driving the latter may be so arranged that the spray tube is moved alternately in two directions angularly about its longitudinal central axis, that is to say, is oscillated about the said axis. In this event, the jet of water issuing from each perforation in the spray tube will be moved alternately in two directions about the axis of the spray tube.

Alternatively, the spray tube and the means for driving the latter may be such that the spray tube is continuously rotated in one direction about its longitudinal central axis and is also moved alternately, in two directions, along its longitudinal central axis, that is to say is axially reciprocated. In this event the jet of water issuing from each perforation will be moved in three directions, viz. a constant direction about the axis of the tube and two directions taking place alternately along the axis.

Then again, the spray tube and the means for driving the latter may be such that the spray tube is moved alternately in two directions angularly about its longi-

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tudinal central axis i.e. is oscillated about its axis, and is also moved alternately in two directions, i.e. is reciprocated, along its longitudinal central axis. In this event, the jet of water issuing from each perforation will be subjected to movement in four directions, i.e. if the oscillation and reciprocation are in phase each jet will be moved first in one direction angularly and simultaneously in one direction axially and then in the opposite directions angularly and axially.

The above described alternative arrangements of compound motion of the spray tube in at least two directions will ensure that the water is sprayed over a wide area within the casing and will also vary the angles at which the various jets of water impinge on articles to be washed.

The aforesaid means for driving the spray tube so that it performs the alternative motions described may be of any appropriate form. In any event, where the spray tube is moved both angularly and axially, the axial reciprocation is conveniently derived from the angular movement. Preferably, the said means are constituted by an impeller through which the water flows prior to flowing through the spray tube, the impeller being driven by the water flow and in turn driving the spray tube so that it is moved in one of the alternative ways described above.

Where the spray tube is to be rotated in one direction, and axially reciprocated, the impeller conveniently includes a rotor which is adapted to be rotated in one direction and is connected co-axially with the spray tube whereby the latter is continually rotated in one direction about its longitudinal central axis. In this event, the spray tube is also conveniently mounted for reciprocation along said axis relatively to the impeller and has associated therewith a cam suchwise that the spray tube is axially reciprocated during its rotation.

Where the spray tube is to be both oscillated and axially reciprocated, the impeller conveniently includes a rotor adapted to be rotated in one direction and which is offset, i.e. eccentric, relatively to the spray tube and is connected to the spray tube through a transmission adapted to convert the rotary motion of the rotor into an oscillatory motion of the spray tube about its longitudinal central axis. Here again, the spray tube will be mounted for axial reciprocation along said axis relatively to the impeller and a cam will conveniently be associated with the spray tube suchwise that the latter is axially reciprocated during its rotation.

The aforesaid transmission may be constituted by a crank extending radially from, and rotatable with, the rotor and having a pin extending parallel to the axis of the rotor which engages in a slot formed in an arm extending radially from the spray tube, the pin being of a length to accommodate the axial reciprocation. Alternatively, the transmission may again include a crank rotatable with the rotor and an arm extending radially from the spray tube which are connected by a connecting element articulated there between by means of ball joints accommodating the axial reciprocation.

The spray tube, and hence the rotor of the impeller where provided, may be arranged to be supplied with water under pressure from a source external to the machine. Preferably, however, the machine includes a sump and a pump for pumping water from the sump to the spray tube, and also to the impeller rotor where provided, the arrangement conveniently being such that water issuing from the spray tube on to the articles to be washed is returned to the sump for recirculation by the pump.

The spray tube may be of any appropriate form, but is conveniently of circular cross-section. The perforations therein may be disposed in any convenient disposition. Thus, there may be a single series of regularly

spaced perforations extending along the spray tube in a line parallel to its longitudinal central axis. Alternatively, there may be two or more such lines of perforations appropriately disposed angularly about the longitudinal central axis, the perforations of one set preferably being offset from the perforations of another set. The angular spacing of these lines of perforations would depend upon whether the spray tube were adapted to rotate continuously in one direction or to be oscillated about its axis and in the latter case upon the arc or stroke of oscillation. Thus, the spacing of such lines of perforations or, expressed another way, the angle of arc of the spray circumference which is perforated, is determined by the required coverage of the water jets from the spray tube as a result of the angular movement to which the tube is subject. Alternatively, and particularly where the spray tube is adapted to be rotated continuously in one direction, there may be provided at least one series of regularly spaced perforations extending in a helical line about the longitudinal central axis of the spray tube.

Each perforation formed in the spray tube may be such as to constitute a nozzle for producing a jet of water extending either radially or tangentially relatively to the spray tube. In the latter event the opposite portions of the wall defining each perforation would be offset.

The spray tube may be of any appropriate material, for example, metal or alloy which is rustproof or rendered rustproof. Alternatively the spray tube may be of glass fibre.

The spray tube may be located at any desired disposition within the casing of a dishwashing machine. Usually, the spray tube will extend horizontally within the casing from side to side thereof. The spray tube will, of course, be located in a suitable disposition relatively to a rack or other support for articles to be sprayed by water from the spray tube. Thus, the spray tube may extend immediately above a rack. Alternatively it may extend between racks located above and below the spray tube.

Then again, the spray tube may extend between two racks located at opposite sides thereof and at approximately the same height.

Where a cam is provided for producing the axial reciprocation of the spray tube from the angular movement thereof and the spray tube is driven by an impeller, the cam is conveniently a face cam which is mounted upon the casing and contacts the closed end of the spray tube remote from that end to which the impeller is applied.

The pressure of water entering the spray tube and contacting the closed end will urge the latter into contact with the cam.

In order that the invention may be more clearly understood one specific constructional example thereof will now be described with reference to the accompanying drawings, wherein

FIGURE 1 is a diagrammatic perspective view of the complete machine with parts broken away,

FIGURE 2 is a general part-sectional perspective view of the spray tube and impeller with part of the impeller casing shown broken away, and

FIGURE 3 is a general perspective view corresponding to FIGURE 2 showing an alternative transmission between the impeller and the spray tube.

Like parts are designated by similar reference characters throughout the drawings.

The dishwashing machine of this example comprises, as will be seen from FIGURE 1, a generally rectangular casing or cabinet, indicated generally at 1, adapted to be wall mounted or provided with feet for standing on a floor or table, the cabinet having a door 2, which is partially transparent, forming the front side of the cabinet and which is hinged thereto along its lower edge so as to open as a flap. The door edges and the co-operating

edges of the cabinet are provided with means indicated generally at 3 for sealing the cabinet 1 against egress of water and also with channels for collecting and guiding any unintended leakage water from the vicinity of the door seal back to the machine sump.

Within the cabinet 1 is arranged an upper rack 4 and a lower rack 5 for receiving plates, cups, saucers and the like and other eating and cooking utensils. Between these racks 4 and 5, and immediately below the rack 4, there is provided a horizontally disposed water pipe or spray tube 6 which is formed with a series of perforations 6a and extends the full length from end to end of the cabinet 1.

Below the racks 4 and 5 is a water sump 7, having a capacity of, for example, one gallon and a compartment containing a water pump 8, a motor 9 for driving the latter and the various components forming the control system of the machine which are not shown on the drawings. The control mechanism of the machine forms no part of the present invention and may be of any appropriate form, for example that disclosed in the specification of my co-pending United States Patent Application Serial No. 327,697. Provision is made for connecting an external water supply to an inlet valve 10 and for conveying away waste water expelled through an outlet valve 11. The spray tube 6 is arranged to be supplied with water drawn from the sump by the pump 9 through a pipe 12.

Referring to FIGURES 1 and 2, it will be seen that an impeller, indicated generally at 13, is located at one end of the spray tube and is rigidly secured, in any appropriate manner, to the lefthand side wall of the cabinet as viewed in FIGURE 1. The impeller casing comprises two parts, viz. a cylindrical drum 13a closed at one side and open and formed with a radially extending annular flange at the other side, and a front closure disc 13b secured to the flange, e.g. by means of screws. Depending tangentially from the casing 13 is a water inlet pipe 14 which communicates with the interior of the casing and to which the water pipe 12 is connected.

Located coaxially within the casing is a multibladed impeller 15 provided with trunnions 16, 17, trunnion 16 being mounted in a bearing constituted by a recess formed in the casing part 13a and trunnion 17 extending through an aperture formed centrally within the front plate 13b. A fluid tight seal, not shown, is provided between the trunnion 17 and the aperture in the part 13b. A crank 17a is attached to the trunnion 17 and extends radially therefrom outside the casing 13. The closure disc 13b is formed with a water outlet aperture defined by a forwardly projecting annular flange 13c of substantial depth. Upon this flange 13c is slidable one end portion of a sleeve 18 which is rigid with one end of the spray tube 6 located eccentrically with respect to the impeller. Thus, the spray tube, with the sleeve 18, is capable of axial movement relatively to the impeller casing. The opposite end of the spray tube is supported upon the right hand side of the cabinet 1 by means to be described.

Formed integrally with the sleeve 18 is a radially extending arm 19 which is formed therein with a longitudinally extending slot into which extends a pin 20 provided upon the crank 17a and extending parallel to the axis of the impeller. Thus, rotation of the impeller by the water causes the spray tube 6 to be oscillated about its longitudinal central axis.

The end of the tube 6 remote from the impeller has an end closure wall 6b. Rigidly mounted upon this end of the spray tube is a sleeve 21 provided with a pin 22 extending diametrically therein. The sleeve 21 is mounted upon a combined bearing and cam component, indicated, generally at 23, mounted upon the wall of the cabinet. This component comprises a solid cylindrical block of a diameter to fit within the sleeve 21 and provided at one end thereof with a mounting flange whereby it is secured to the wall of the cabinet. The opposite end of the component constitutes a face cam which is formed by two

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planar end faces 23a intersecting on a line which intersects and is perpendicular to the spray tube axis. The component 23 is shown for convenience of illustration in FIGURE 2 separated from the end of the spray tube and extending at 90° to the axis thereof. In practice, and as shown in FIGURE 1, the component 23 is engaged within the sleeve 21, the pin 22 engaging the two inclined faces of this cam. Pressure of water within the spray tube upon the closed end 6b thereof will ensure that the spray tube and the pin 22 is biased towards the cam. Thus, when the spray tube is oscillated by rotation of the impeller the spray tube will be regularly reciprocated along its longitudinal central axis. Water is continuously emitted in the form of jets from the perforations 6a formed in the spray tube. This produces a very wide distribution of the water issuing from the spray tube and results in a very efficient washing action.

FIGURE 3 shows an alternative arrangement of transmission for converting the rotary motion of the impeller into an oscillatory motion of the spray tube. In this arrangement, the pin 20 and the slotted member 19 are omitted. A short arm 24 is, instead, formed integrally with the sleeve 18 and is connected with the crank 17a by a connecting element 25 articulated thereto by means of ball joints.

The casing and other parts of the impeller described above may be of any appropriate material, i.e. may be cast, fabricated from sheet material or moulded in a suitable plastic material.

I claim:

1. For use in a dishwashing machine, a fluid spray device comprising a spray tube open at one end, closed at the other end and formed with a plurality of series of perforations, each series extending therealong in a line parallel to the tube's longitudinal central axis, support means at opposite ends of said tube for journaling the tube for oscillatory motion about and reciprocation along said axis, an impeller communicating with the open end of said tube and having a rotor rotatable therein eccentrically relatively to said tube, a crank extending radially from and rotatable with said rotor outside said body and carrying a pin, an arm extending radially from said tube and formed with a slot extending radially of the tube into which said pin extends, a cam mounted adjacent the closed end of the tube, at least one part on the closed end of the tube adapted to contact said cam,

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a sump, a conduit extending between said sump and said impeller body, and a pump for supplying washing fluid under pressure from said sump to said body, whereby the rotor is rotated by said fluid flowing into the open end of the tube and through the perforations, the pressure of the fluid upon the closed end of the tube maintaining said part in contact with said cam, and said tube is oscillated by said rotor and is axially reciprocated by said cam during the oscillation.

2. For use in a dishwashing machine, a fluid spray device comprising a spray tube open at one end, closed at the other end and formed with a plurality of series of perforations, each series extending therealong in a line parallel to the tube's longitudinal central axis, support means at opposite ends of said tube for journaling the tube for oscillatory motion about and reciprocation along said axis, an impeller communicating with the open end of said tube and having a rotor rotatable therein eccentrically relatively to said tube, a crank extending radially from and rotatable with said rotor outside the body, a short arm extending radially of said tube, a connecting element connected between the crank and the arm and articulated thereto by means of ball joints, a cam mounted adjacent the closed end of the tube, at least one part on the closed end of the tube adapted to contact said cam, a sump, a conduit extending between said sump and said impeller body, and a pump for supplying washing fluid under pressure from said sump to said impeller body, whereby the rotor is rotated by said washing fluid which flows into the open end of the tube and is distributed through the perforations, the pressure of the fluid upon the closed end of the tube maintaining said tube in contact with said cam, and said tube is oscillated by said rotor and axially reciprocated by said cam during the oscillation.

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CHARLES A. WILLMUTH, *Primary Examiner.*