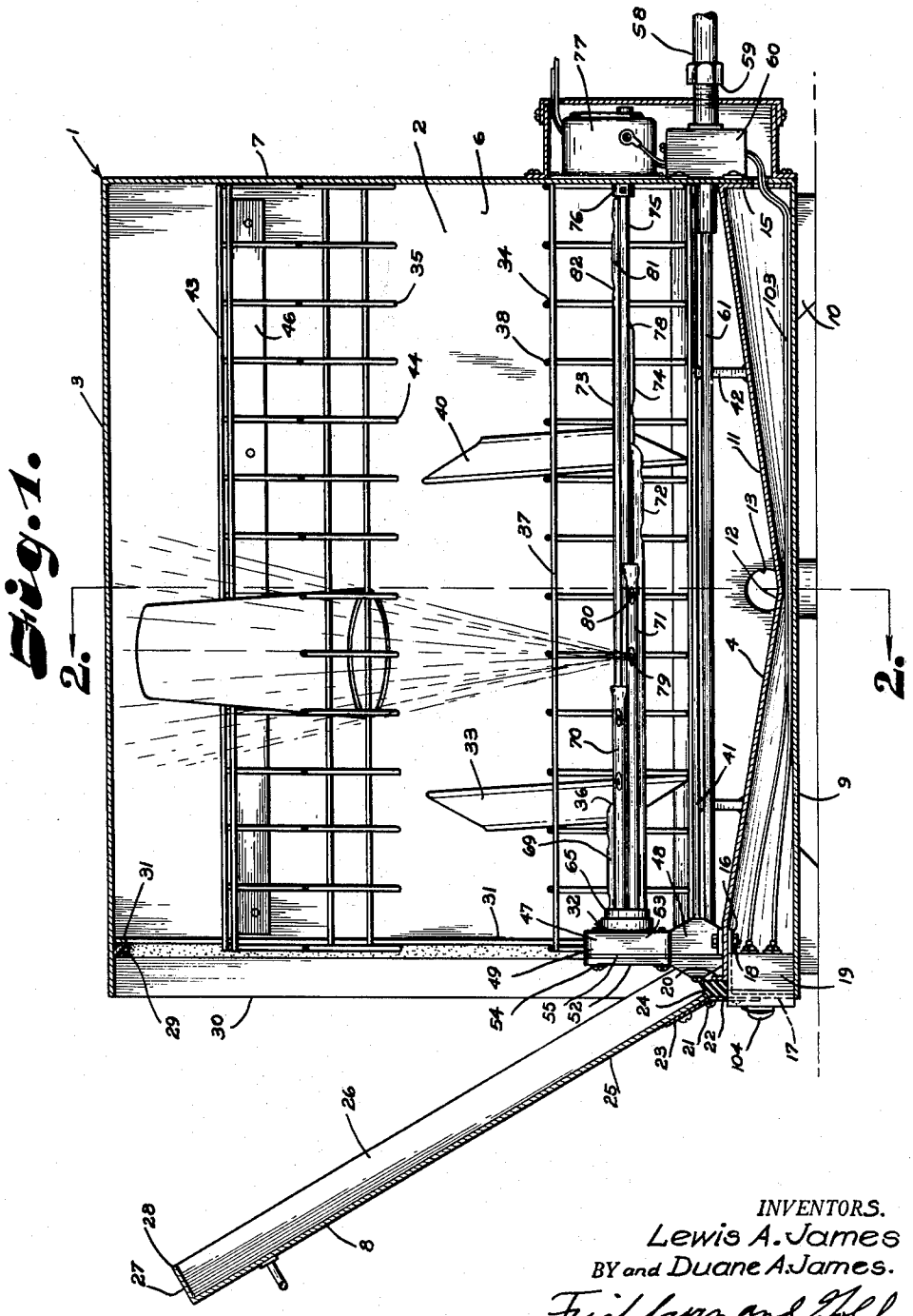
July 18, 1961 L. A. JAMES ET AL 2,992,779

DISHWASHING MACHINE

Filed Jan. 5, 1960 3 Sheets-Sheet 1



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DISHWASHING MACHINE

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Fig. 3.

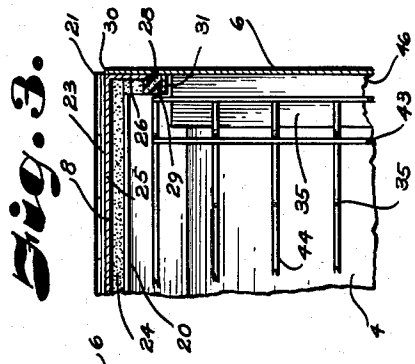
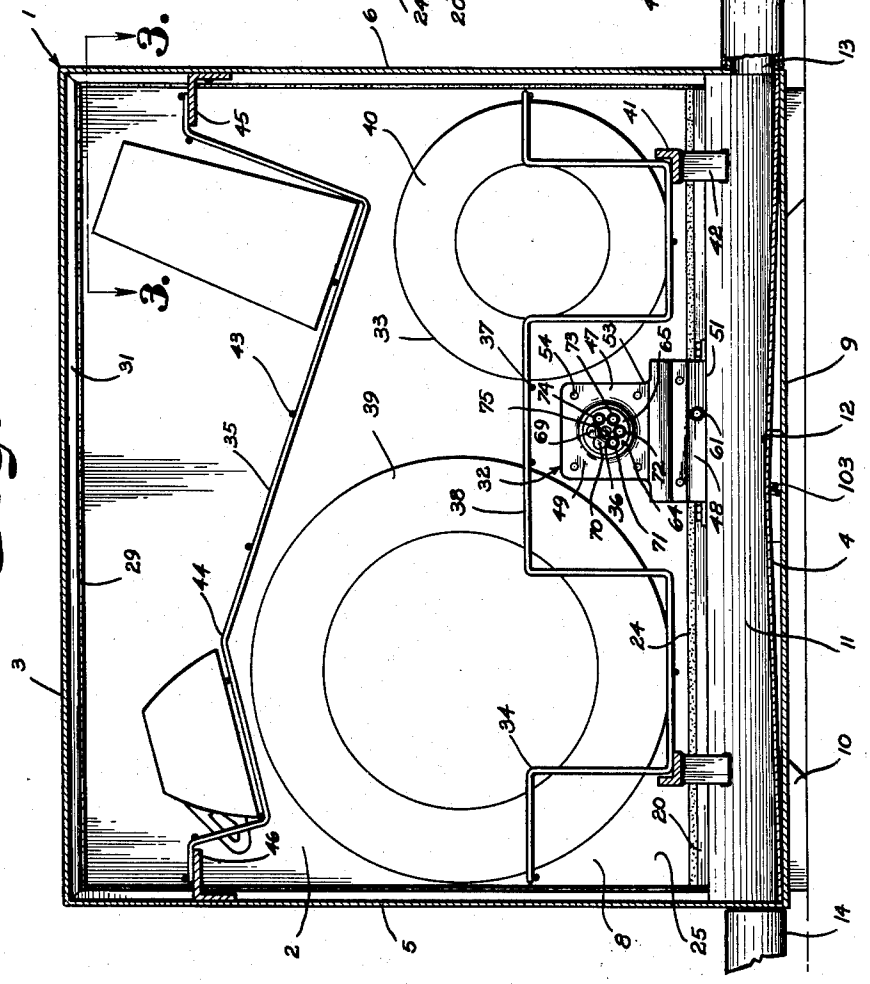


Fig. 2.



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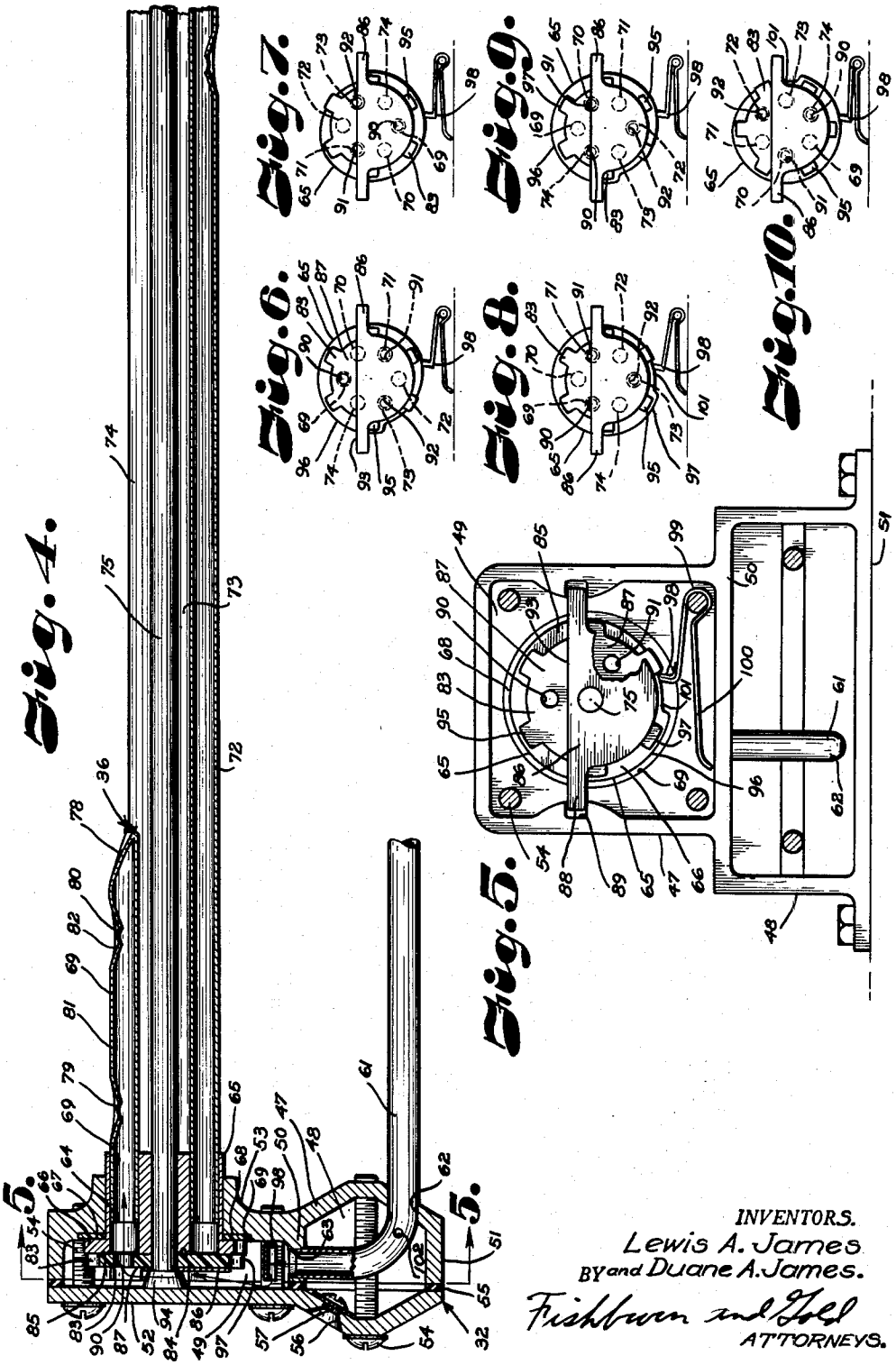


Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

Fig. 10.

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2,992,779

DISHWASHING MACHINE

Lewis A. James and Duane A. James, both of P.O. Box 449, Independence, Kans.; said Duane A. James assignor to Lewis A. James

Filed Jan. 5, 1960, Ser. No. 519
9 Claims. (Cl. 239—226)

This invention relates to dishwashing machines, and more particularly to fluid spraying apparatus for directing streams of fluid onto dishes for washing and rinsing same.

The principal objects of the present invention are to provide a dishwashing machine in which fluid under pressure is forced successively and automatically in several streams to spray the fluid onto dishes racked in different areas in the washing compartment thereof; to provide a dishwashing machine with a plurality of spray jets or outlets spaced along a movable member which is actuated so a stream of fluid from one part of said movable member will pass through an area of the washing compartment, and then another stream of fluid from another point on said movable member will pass through another area of the washing compartment; to provide such an arrangement of sprays on a movable member wherein the sprays are actuated in sequence and collectively said sprays cover all of the dish-containing areas of the washing compartment; to provide such a dishwashing machine in which water from a hot water source is applied to the dishes for both washing and rinsing without recirculation or reapplication; to provide such a dishwasher with cooperative members controlling the communicating connection of the spray members to the fluid source and duration thereof for governing the sequence of actuation of the sprays; to provide such a dishwasher with a detergent container in communication with the water flow to the sprays whereby the detergent is entrained into the water to facilitate the initial cleaning of the dishes; and to provide a dishwashing machine and spray apparatus therefor that requires small power, has simple controls, that is economical to manufacture and that provides an intermittent application of sprays to dishes in various portions of the washing compartment for economy of operation.

Other objects and advantages of this invention will become apparent from the following description taken in connection with the accompanying drawings, wherein are set forth by way of illustration and example certain embodiments of this invention.

FIG. 1 is a longitudinal sectional view through a dishwasher assembly.

FIG. 2 is a transverse sectional view through the dishwashing machine taken on the line 2—2, FIG. 1.

FIG. 3 is a partial horizontal sectional view through the dishwasher taken on the line 3—3, FIG. 2.

FIG. 4 is a longitudinal sectional view through the spray apparatus of the dishwashing machine.

FIG. 5 is a transverse sectional view through the spray apparatus and detergent container taken on the line 5—5, FIG. 4.

FIG. 6 is a diagrammatic view showing the spray control members during spraying operation through certain spray outlets.

FIG. 7 is a further diagrammatic view of the spray control members after movement of the rotor from the position illustrated in FIG. 6.

FIG. 8 is a further diagrammatic view of the spray control members at the start of the advancing of said members to change the group of sprays to be actuated.

FIG. 9 is a further diagrammatic view of the spray control members at the completion of the change of the group of sprays.

FIG. 10 is a further diagrammatic view of the spray control members similar to FIG. 7 with a different group of sprays being activated.

Referring more in detail to the drawings:

1 designates a dishwashing machine having a washing compartment 2 formed by a top wall 3, bottom wall 4, side walls 5 and 6, and end wall 7, and a door or closure 8 adapted to close the other end thereof. The respective walls are arranged and connected to provide a desired shape and size for convenient arrangement of dishes to be washed therein and for suitable location in available space as, for example, in kitchen cabinets and the like.

The machine 1 has a bottom member 9 in the form of a panel which is secured to the lower edges of the side walls 5 and 6 and end walls 7, said panel 9 being carried on supports 10 which cooperate therewith to form a base for the machine. The bottom wall 4 of the washing compartment 2 is arranged above the panel 9 and is illustrated as having inclined portions 11 sloping downwardly from the ends thereof to the mid-portion as at 12 with said mid-portion sloping to the side. The portions of the bottom wall 4 are inclined to the side for flow of fluids through a drain 13 having communication with a suitable drain hose 14 communicating with a suitable disposal such as a sewer or the like. While the bottom wall may be arranged whereby the slope causes all of the drainage to flow to one side, it may slope to both sides, as illustrated in FIG. 2, with a drain 13 and drain hose 14 arranged at both sides for facilitating drainage and escape of water from the washing compartment. The drain 13 is open at all times whereby any fluids collecting on the bottom wall 4 will flow out the drain. The bottom wall 4 adjacent the end wall 7 preferably has a downwardly extending flange 15 engaged with the panel 9 for added rigidity and support, said bottom wall 4 being secured to the end wall 7 and to the side walls 5 and 6 as by welding to form watertight joints. The end of the bottom wall adjacent the door 8 extends over and rests on a flange 16 which extends inwardly from a front end wall 17 which has its lower edge connected to the panel 9 and extends upwardly therefrom, said bottom wall 4 being connected to the flange 16 by suitable fastening devices 18 such as bolts and nuts. A portion of the forward wall 17 is cut away to provide an opening in which a control box 19 is located with the forward portion of the bottom wall 4 extending in overlying relation to said control box and terminating in an upwardly extending flange 20 in rearwardly spaced relation to the wall 17.

A hinge 21 has a leaf portion 22 mounted on the forward wall 17 and extending upwardly therefrom with the other leaf portion 23 secured to the door 8 for swinging movement from open to closed position. A resilient gasket 24 is positioned between the hinge portion 22 and the flange 20 and is adapted to be engaged by the lower edge of a door panel 25 to form a seal. The door panel 25 has rearwardly extending flanges 26 at the sides thereof and a top flange 27 which extends inwardly inside of the forward ends of the side walls 5 and 6 and the top wall 3 respectively with the inner edges 28 of said door flanges engaging a resilient gasket 29 secured on the inside of said side walls 5 and 6 and top wall 3 when the panel 25 is substantially flush with the forward edges 30 of said walls of the compartment. A rib or flange 31 extends inwardly from said side and top wall at the rear of the gasket 29 to aid in retaining it in sealing engagement with the door.

A spray apparatus 32 is mounted in the washing compartment 2 for directing sprays or streams of water

against dishes 33 supported by suitable racks 34 and 35 in the washing compartment. The spray apparatus may be arranged in the washing compartment in various positions depending upon size and space and the arrangement of the dishes permitted thereby. In the illustrated structure, the spray apparatus has a rotor or movable member 36 which extends longitudinally of the washing compartment and slightly offset toward one side wall so as to be between dishes racked in the washing compartment, as illustrated in FIG. 2.

In the illustrated structure, a lower rack 34 is formed of plastic-coated wire or the like with a plurality of longitudinal members 37 and transverse members 38 arranged whereby large plates 39 and the like can be positioned at one side of the spray apparatus and small plates and the like 40 can be positioned at the other side. The rack 34 is preferably slidably supported in ways 41 supported on ribs 42 extending upwardly from the bottom wall 4 whereby said ways position the lower portion of the racks 34 slightly above the door panel 25 when said door is in open position, thereby permitting the racks to be slid outwardly from the washing compartment onto said door. The upper rack 35 is also formed of plastic-coated wire and has a plurality of spaced longitudinal members 43 and transverse members 44 arranged to support cups, glasses and other items to be washed, with side portions of the rack 35 resting on inwardly extending flanges 45 of angle members 46 secured to the side walls 5 and 6 whereby the rack 34 is supported above the plates or other dishes carried in the lower rack. The racks can be of various shapes for convenient and compact supporting of dishes and the like to be washed, the racks supporting the dishes relative to the spray apparatus whereby sprays of fluid are directed onto the dishes to be washed.

The spraying apparatus 32 includes a housing 47 having a lower detergent-containing compartment 48 and an upper flow or manifold compartment 49. In the illustrated structure, the compartments 48 and 49 are separated by a wall 50, and the lower portion of the housing has a surface 51 resting on the upper surface of the forward portion of the bottom wall 4 and is secured thereto and the flange 16 by suitable fastening devices such as the fastening devices 18 whereby the housing 47 is upstanding from said bottom wall and adjacent to but inside of the washing compartment relative to the door 8. For facilitating maintenance and access to the compartments, the housing 47 is made in two sections whereby the forward wall 52 is separate and forms a cover secured to the main body 53 by suitable fastening devices such as screws 54 with suitable gaskets 55 between the sections and around the screws to form a watertight seal for the compartments. The forward wall 52 has an opening 56 normally closed by a flat spring valve 57 in the detergent compartment whereby detergent can be introduced into said compartment 48 as by means of a spout-type can, the spout being inserted through the opening 56 pressing the valve 57 inwardly to open the aperture for filling the compartment with liquid detergent.

A supply pipe 58 connected to a suitable source of hot water as, for example, the usual hot water pipes in a residence, whereby hot water under normal city water pressure is supplied thereto, is connected as at 59 to a valve 60 of the electrical or solenoid type with the output side of the valve connected to a pipe 61 that extends into the washing compartment and into the housing 47 adjacent the lower portion of the detergent compartment 48, said pipe 61 being sealed in the opening 62 in said housing to form a watertight connection, and the pipe extending upwardly in said compartment 48 with its end secured in an opening 63 in the wall 50 whereby the water from the pipe 61 is discharged into the manifold 49. The valve 60 may be of any conventional type which, when energized, will open for flow of hot water from the line 58 through the pipe 61, and when de-energized said valve is closed to cut off flow of water to the machine.

The body 53 of the housing 47 at the rear of the manifold compartment 49 has a bearing opening 64 rotatably mounting a head portion 65 of the rotor or movable member 36, said head portion having an annular outwardly extending flange 66 with a rear surface 67 engaged with a resilient gasket 68 mounted in a recess 69 of the body 53 whereby pressure on the flanged end of the head forcing same towards the gasket 68 effects a seal to prevent leakage of water or washing fluid through the bearing opening 64 around the head 65.

The rotor 36 has a plurality of ducts 69, 70, 71, 72, 73 and 74 extending longitudinally thereof in radially spaced relation to the axis of rotation and equally spaced circumferentially, said ducts being of different lengths and each having an open end at the head communicating with the manifold compartment 49. In the structure illustrated, the rotor includes a shaft 75 having one end fixed in the head 65 and the other end extending through a bearing 76 and connected to an electric motor 77 mounted on the end wall 7 of the machine whereby energization of the electric motor rotates the rotor 36 about the axis of the shaft 75. The ducts 69 to 74 inclusive are each tubular members having flow passages therein with the ends of the tubes remote from the head 65 closed as at 78. The ducts 69 to 74 inclusive each have the same number of spray outlets or jet apertures 79 and 80, said apertures being equally spaced in the respective ducts. Also, the spacing between the group of jet apertures in one duct is an equal distance from the adjacent group in another duct whereby the jet apertures are equally spaced along the length of the rotor 36. The walls 81 of the ducts or tubes adjacent the jet apertures are deformed inwardly in an elongated indentation 82 adjacent said jet apertures 79 and 80 whereby fluid under pressure forced through the jet apertures forms a fan-like spray substantially in a plane extending through the indentation and jet aperture and the axis of the shaft 75 whereby the sprays from all of the jet apertures combined will direct streams of washing fluid into all of the dish-containing areas of the washing compartment 2. In the illustrated structure, there are two jet apertures in each duct, and the delivery of washing fluid to said ducts is alternated or in a sequence whereby the sprays from one duct are moved in a path transversely of the washing compartment, and then the sprays from another duct are moved in their path transversely of the washing compartment whereby each of the sprays from the respective ducts in the completion of a cycle from all of the ducts will have covered all of the dishes in the washing compartment, but the limited number of sprays activated at a time provides lower volume of water requirements and gives higher pressure jet streams and also provides a soaking period for the wetted dishes during the periods in which other sprays are activated.

A valve member or disc 83 is rotatably mounted on the end of the shaft 75 with a face 84 of said disc frictionally engaging the adjacent face 85 of the head 65 and flange 66 thereon. A closure or valve plate 86 is also mounted on the end of the shaft 75 in the compartment 49 in engagement with the outer face 87 of the disc 83, said plate having laterally extending ears 88 engaged in recesses 89 in the wall of the housing 47 to retain the plate 86 against rotation. The valve disc 83 has a plurality of through ports 90, 91 and 92 registrable with the inlet openings of the ducts 69 to 74 inclusive, the number of ducts being a multiple of the number of ports 90 to 92 inclusive. In the illustrated structure, there are six ducts and three ports. The plate 86 has a depending portion closing certain of the ports 90 to 92 inclusive with the shape of the upper edge 93 of said plate having a shape to determine the arc or angle of rotation through which the ports are open for flow of water from the com-

partment 49 to the respective ducts and thereby the angle through which the sprays are activated. The pressure of the washing fluid in the compartment 49 holds the plate 86 against the surface of the valve disc 83. Also holding the plate and disc in position is a lug 94 on the housing portion 52 which engages the end of the shaft 75 and the plate 86 to eliminate endplay.

The valve member 83 has radially extending lugs 95, the number of the lugs corresponding to the number of ducts in the rotor. The annular flange 66 on the head has a peripheral portion with a high portion or lobe 96 extending radially outwardly beyond the outer surface 97 of the lugs 95 whereby a detent 98 having a width to extend across the flange 66 and valve disc 83 is held out of engagement with the respective lugs 95. The detent 98 is preferably on a resilient member which, in the illustrated structure, has a loop portion 99 sleeved on a screw 54 with an end portion 100 engaged with the wall 50 beyond the end of the pipe 61 whereby the flat spring portion extends over said outlet of the pipe 61 and pressure of fluid therefrom striking the flat spring portion 100 tends to increase the biasing action of the detent 98 into engagement with the periphery of the flange 66. The flange 66 forms a cam and has a low portion or dwell 101 of such length that when the detent is in the dwell portion of the cam or flange 66 it will engage one of the lugs 95 and retain same against rotation until the inlet openings of the next group of ducts is moved in registry with the ports in the valve member 83, and after the registry is obtained, the dwell portion of the cam ends and the lobe portion moves the detent out of engagement with the lug whereby the friction between the valve disc 83 and the surface 85 of the flanged head of the rotor causes the valve disc to rotate with said rotor. In the illustrated structure, there is only one dwell in the circumference of the flange 66 and three ports in the valve disc for six ducts in the rotor whereby during rotation of the rotor and valve disc with the port 90 in registry with the duct 69, the sprays in the duct 69 are activated as the port 90 moves upwardly beyond the edge 93 of the plate 86. As the port 90 moves downwardly behind the plate at the other side of its rotation, the port 92 is moving upwardly above the edge whereby washing fluid is delivered through the port 92 to the duct 73 for discharge through the respective apertures therein. As the port 92 moves downwardly behind the plate on the other side, the port 91 is moving upwardly to provide communication to the duct 71 for discharge of sprays from the respective jet apertures therein. As the spraying from the duct 71 is completed by movement of the port 91 behind the plate 86, the dwell of the cam is moving to a position permitting the pawl 98 to enter same and thereby engage the next lug 95 to retain same and the valve disc 83 against rotation during continued rotation of the rotor to move the duct 74 into registry with the port 90 and the duct 70 into registry with the port 91 and the duct 72 into registry with the port 92. The high portion of the flange or cam then moves the detent out of engagement with the respective lug 95 whereby the valve disc 83 rotates with the rotor to effect the periodic sprays through the ducts 70, 72 and 74 in sequence and thereby complete the cycle of sprays from each of the ducts to completely cover the dish-containing area of the washing compartment. The detent 98 then again moves into the dwell of the cam and engages the next lug to effect relative rotation of the rotor and valve disc 83 to move the duct 69 into registry with the duct 91 and the corresponding registry of the other ducts to again start the cycle. In this particular structure, as illustrated, two revolutions of the rotor are required for the complete cycle of sprays from all of the spray jets of the ducts. The number of ducts can be varied but should be a multiple of the number of ports in the valve disc. Also, the shape of the upper edge 93 of the plate 86 may be varied to vary the arc through which the sprays from the respective ducts are activated. In the particular structure illustrated, the arc is through approximately 160 degrees which has been found to be satisfactory for the arrangement of the dishes as illustrated in FIG. 2. The valve disc 83 and detent 98 may be eliminated and the valve plate engage the face 85 of the head 65 to provide a cycle of the sprays with each revolution of the rotor. With such a structure it is preferred that the ducts be less in number as, for example, three instead of the six illustrated.

The detergent from the detergent compartment 48 is entrained into the flow of water in the pipe 61 as the pipe 61 has diametrically opposite small ports 102 in the portion inside of the compartment 48 and preferably adjacent the opening 62 through which the pipe extends therein. The control box 17 has a conventional switch connected in a suitable source of electrical current, together with a conventional timer, whereby when the switch is energized or closed it remains closed for a predetermined period of time, for example five minutes, during which period of time a circuit is completed through electrical conductor 103 to the electrical valve 60 and the motor 77 whereby the valve 60 is maintained open for said predetermined time and the motor 77 will operate to rotate the rotor 36.

In operating a dishwasher constructed and assembled as illustrated and described, the door 8 is opened and the racks 34 and 35 pulled outwardly and loaded with dishes to be washed. After the racks are loaded, they are then moved back into the washing compartment 2. A suitable quantity of detergent is then introduced into the detergent compartment 48, the valve 57 automatically closing after pressure from the outside is removed therefrom. Then the door 8 is closed whereby the edges thereof engage the resilient gaskets 24 and 29 to make a watertight fit. The drain 13 is open at all times. Then the switch handle 104 on the control box 19 is actuated to set the timer and close the electrical circuit to the valve 60 and the motor 77 energizing same whereby the motor starts rotating the rotor 36 and the valve 60 opens the water flow line whereby hot water from the water line 58 flows through the pipe 61, some of the water escaping through the apertures 102 into the detergent compartment 48 with substantially the whole flow of the water passing upwardly into the manifold compartment 49 and through any exposed port 90 to 92 inclusive and into the respective duct registering therewith whereby streams of washing fluid are discharged from the jet apertures 79 and 80 of the respective duct and fanshaped, high pressure sprays directed radially upwardly through the angle of travel of approximately 160 degrees in the illustrated structure. Near the completion of the spray from one duct, the sprays from another duct registering with a port moving upwardly from under the valve plate 86 are activated and make their sweep, the sprays from the respective ducts alternating in sequence to complete the cycle wherein sprays are discharged intermittently from each of the spray orifices. It is preferred that the rotor speed be relatively slow, and since all the motor 77 has to do is turn the rotor very little power is required. Also, since the number of jets actuated at any one time is small, the quantity of water required is relatively small and the effective pressure, as from a city water main, provides adequate force in the spray as, for example, with two jets for each duct and a 30-pound per square inch water pressure, there is 15 pounds of pressure for each jet, which is found to be more than ample for effective dish washing. If the rotor is rotated at a speed whereby the jets from a duct are spraying for a period of two seconds, it will then be ten seconds before those sprays are again activated whereby the wetted dishes soak for ten seconds and then are subjected to a high pressure spray for two seconds. Also, when the machine is started and the valve 60 opened, the first water causes detergent to enter the pipe 61 from the

compartment 48 whereby the detergent is entrained with the water and is applied to the dishes. The apertures 102 are small limiting the flow from the detergent compartment 48 whereby detergent is applied to all of the dishes until the detergent supply is exhausted, for example, approximately two minutes of washing. When the detergent is exhausted from the compartment 48, only hot water is applied through the sprays to the dishes to thoroughly wash same and then thoroughly rinse the dishes. While the water may be recirculated over the dishes by a pump, it is preferred that all of the water sprayed into the washing compartment runs to the bottom wall 4 and drains through the drain 13 and is not recirculated or reapplied to the dishes. Also, there is no dirt or food washed from the dishes and then reapplied thereto as any food particles are carried with the water to the drain. The same force sprays are applied throughout the entire washing and rinsing cycle whereby there is no fine mist created to remain on the dishes, the hot water quickly draining therefrom, and when the rinsing cycle is completed the dishes are sufficiently hot from the hot water that they quickly dry in their clean rinsed condition and are ready for use.

It is believed obvious that we have provided a dishwasher that is very economical to manufacture and efficient in operation in delivering powerful streams of liquid against articles to be washed with no recirculation or returning of used water or food particles to the dishes and with no delivery of mist and the like and thereby facilitating drying of the dishes or articles without liquid spots thereon.

It is to be understood that while we have illustrated and described one form of our invention, it is not to be limited to the specific form or arrangement of parts herein described and shown except insofar as such limitations are included in the claims.

What we claim and desire to secure by Letters Patent is:

1. A fluid spraying apparatus for dishwashing machines comprising, a housing having a chamber therein, means communicating with said chamber for supplying washing fluid under pressure thereto, an elongate rotor having one end rotatably supported in said housing and extending into said chamber with the other end extending from said housing, a plurality of distributor ducts in said rotor and extending longitudinally thereof, said distributor ducts being equally spaced radially and circumferentially in the rotor, means operatively connected to the rotor for rotating same on its longitudinal axis, a spray jet for each duct and having flow communication with said respective duct, said spray jets being equally spaced along the length of said rotor whereby the sprays from the respective ducts move in different paths from the sprays from other ducts, said ducts each having an opening communicating with the chamber, a valve member in the chamber, said valve member having a plurality of through ports registrable with the respective duct openings, and a valve plate held against rotation in the chamber, said valve plate engaging said valve member and closing ports in a portion thereof for delivery of washing fluid from the chamber to the ducts registering with unclosed ports for activation of the respective sprays in a sequence.

2. A fluid spraying apparatus for dishwashing machines comprising, a housing having a chamber therein, means communicating with said chamber for supplying washing fluid under pressure thereto, an elongate rotor having one end supported in said housing for rotative movement and extending into said chamber with the other end extending from said housing, a plurality of distributor ducts in said rotor and extending longitudinally thereof, said distributor ducts being equally spaced radially and circumferentially in the rotor, means operatively connected to the rotor for effecting rotative movement of same on its longitudinal axis, spray jets arranged in groups with one group for each duct and in flow communication with the respective duct, said spray jets being equally spaced along the length of said rotor whereby the sprays from one group move in a path adjacent to the sprays from another duct, said rotor having an end face in said chamber, said ducts each opening from said rotor end face, a valve member axially rotatable relative to said rotor and frictionally engaging said end face of the rotor whereby said valve member normally moves with the rotor, said valve member having a plurality of through ports registrable with the respective duct openings, said ducts being of a number that is a multiple of the number of ports, a valve plate in the chamber, means in the housing holding said valve plate against rotation, said valve plate being engaged with said valve member and closing ports in a portion thereof whereby washing fluid from the chamber flows through ports in the valve member and ducts registering therewith only when said ports are in a portion of their path of movement not covered by the valve plate, and means operative to effect relative rotative movement of the rotor and valve member to advance the said ports into registry with the next duct openings.

3. A fluid spraying apparatus for dishwashing machines comprising, a housing having a chamber therein, means communicating with said chamber for supplying washing fluid under pressure thereto, an elongate rotor having one end rotatably supported in said housing and extending into said chamber with the other end extending from said housing, a plurality of distributor ducts in said rotor and extending longitudinally thereof, said distributor ducts being of different lengths and equally spaced radially and circumferentially in the rotor, means operatively connected to the rotor for rotating same on its longitudinal axis, a spray jet for each duct and having flow communication with said respective duct, said spray jets being equally spaced along the length of said rotor whereby the sprays from the ducts move in different paths spaced one from another, said rotor having an end face in said chamber, said ducts each opening from said rotor end face, a valve member axially rotatable relative to said rotor and frictionally engaging said end face of the rotor whereby said valve member normally rotates with the rotor, said valve member having a plurality of through ports registrable with the respective duct openings, said ducts being of a number that is a multiple of the number of ports, a valve plate in the chamber, means in the housing holding said valve plate against rotation, said valve plate being engaged with said valve member and closing ports in a portion thereof whereby washing fluid from the chamber flows through ports in the valve member only when said ports are in a portion not engaged by the valve plate, and means operative to effect relative rotative movement of the rotor and valve member to advance the said ports into registry with the next duct openings.

4. A spray apparatus for dishwashing machines comprising, a housing having a flow chamber therein, a detergent container having a top and bottom, a hot water flow line extending through the detergent container from adjacent the bottom to the top and connected with the flow chamber for delivery of hot water under pressure thereto, said flow line having ports in the detergent container and communicating therewith adjacent the bottom thereof for entraining detergent into the water delivered to the flow chamber, an elongate rotor having one end rotatably supported in said housing and extending into said flow chamber with the other end extending from said housing, a plurality of distributor ducts in said rotor and extending longitudinally thereof, said distributor ducts being of different lengths and equally spaced radially and circumferentially in the rotor, means operatively connected to the rotor for rotating same on its longitudinal axis, a spray jet for each duct and having flow communication with said respective duct, said spray jets being

equally spaced along the length of said rotor whereby the sprays from the ducts move in different paths spaced one from another, said rotor having an end face in said flow chamber, said ducts each opening from said rotor end face, a valve member axially rotatable relative to said rotor and frictionally engaging said end face of the rotor whereby said valve member normally rotates with the rotor, said valve member having a plurality of through ports registrable with the respective duct openings, said ducts being of a number that is a multiple of the number of ports, a valve plate in the flow chamber, means in the housing holding said valve plate against rotation, said valve plate being engaged with said valve member and closing ports in a portion thereof whereby washing fluid from the flow chamber flows through ports in the valve member only when said ports are in a portion not engaged by the valve plate, and means operative to effect relative rotative movement of the rotor and valve member to advance the said ports into registry with the next duct openings.

5. A fluid spraying apparatus for dishwashing machines comprising, a housing having a chamber therein, means communicating with said chamber for supplying washing fluid under pressure thereto, an elongate rotor having one end rotatably supported in said housing and extending into said chamber with the other end extending from said housing, a plurality of distributor ducts in said rotor and extending longitudinally thereof, said distributor ducts being equally spaced radially and circumferentially in the rotor, means operatively connected to the rotor for rotating same on its longitudinal axis, spray jets arranged in groups with one group for each duct, said groups of spray jets having flow communication with said respective ducts, said spray jets being equally spaced along the length of said rotor, said rotor having an end face in said chamber, said ducts each opening from said rotor end face, a valve member axially rotatable relative to said rotor and frictionally engaging said end face of the rotor whereby said valve member normally rotates with the rotor, said valve member having a plurality of through ports registrable with the respective duct openings, said ducts being of a number that is a multiple of the number of ports, a valve plate in the chamber, means in the housing holding said valve plate against rotation, said valve plate being engaged with said valve member and closing ports in a portion thereof whereby washing fluid from the chamber flows through ports in the valve member only when said ports are in a portion not engaged by the valve plate, and means operative in response to rotation of the rotor for retaining the valve member against rotation during a portion of movement of the rotor to advance the next duct openings into registry with the next respective ports whereby washing fluid passes through said next ports and ducts to the respective spray jets as said next ports move in the area of the valve member not covered by the valve plate to effect actuation of the spray jets in sequence.

6. A fluid spraying apparatus for dishwashing machines comprising, a housing having a flow chamber therein, a detergent containing chamber in the housing, a hot water flow line extending through the detergent chamber and connected to the flow chamber for delivery of hot water under pressure thereto, said flow line having ports in the detergent chamber and communicating therewith for entraining detergent into the water delivered to the flow chamber, an elongate rotor having one end rotatably supported in said housing and extending into said flow chamber with the other end extending from said housing, a plurality of distributor ducts in said rotor and extending longitudinally thereof, said distributor ducts being equally spaced radially and circumferentially in the rotor, means operatively connected to the rotor for rotating same on its longitudinal axis, spray jets arranged in groups having flow communication with said ducts, said spray jets being equally spaced along the length of said rotor with one group communicating with one duct and other groups communicating with other ducts, said rotor having an end face in said flow chamber, said ducts each opening from said rotor end face, a valve member axially rotatable relative to said rotor and frictionally engaging said end face of the rotor whereby said valve member normally rotates with the rotor, said valve membeor having a plurality of through ports registrable with the respective duct openings, means closing said ports as they move through a portion of their rotative path, and means moving said valve member relative to said ducts and cooperating with said port closing means for delivery of water to only certain open ports and ducts registered therewith for effecting sprays equivalent to the sprays from two ducts at any one time.

7. A fluid spraying apparatus for dishwashing machines comprising, a housing having a chamber therein, means communicating with said chamber for supplying washing fluid under pressure thereto, an elongate rotor having one end rotatably supported in said housing and extending into said chamber with the other end extending from said housing, a plurality of distributor ducts in said rotor and extending longitudinally thereof, said distributor ducts being equally spaced radially and circumferentially in the rotor, means operatively connected to the rotor for rotating same on its longitudinal axis, a spray jet for each duct and having flow communication with said respective duct, said spray jets being equally spaced along the length of said rotor whereby the sprays from the ducts move in different paths spaced one from another, said rotor having an end face in said chamber, said ducts each opening from said rotor end face, a valve member axially rotatable relative to said rotor and frictionally engaging said end face of the rotor whereby said valve member normally rotates with the rotor, said valve member having a plurality of through ports registrable with the respective duct openings, said ducts being of a number that is a multiple of the number of ports, a valve plate in the chamber, means holding said valve plate against rotation, said valve plate being engaged with said valve member and closing ports in a portion thereof whereby washing fluid from the chamber flows through ports in the valve member only when said ports are in a portion not engaged by the valve plate, a plurality of lugs on the valve member, there being one lug for each duct and of equal arcuate angle spacing, a detent biased towards said valve member and engageable with the lugs to retain said valve member against rotation, a cam on said rotor having a lobe portion normally engaged with the detent to retain same disengaged from said lug whereby the valve member will rotate with the rotor, said cam having a dwell portion corresponding in length to the arcuate angle of spacing between the adjacent ducts whereby when the detent moves into said dwell portion it will engage the next lug to hold same until the next duct opening advances into registry with the next respective port whereby washing fluid passes through the next ports and ducts to the respective spray jets as said next ports move in the area of the valve member not covered by the valve plate.

8. A spray apparatus for dishwashing machines comprising, a housing having a flow chamber therein, a detergent container having a top and bottom, a hot water flow line extending through the detergent container from adjacent the bottom to the top and connected with the flow chamber for delivery of hot water under pressure thereto, said flow line having ports in the detergent container and communicating therewith adjacent the bottom thereof for entraining detergent into the water delivered to the flow chamber, an elongate rotor having one end rotatably supported in said housing and extending into said flow chamber with the other end extending from said housing, a plurality of distributor ducts in said rotor and extending longitudinally thereof, said distributor ducts being equally spaced radially and circumferentially

in the rotor, means operatively connected to the rotor for rotating same on its longitudinal axis, a spray jet for each duct and having flow communication with said respective duct, said spray jets being equally spaced along the length of said rotor whereby the sprays from the ducts move in different paths spaced one from another, said rotor having an end face in said flow chamber, said ducts each opening from said rotor end face, a valve member axially rotatable relative to said rotor and frictionally engaging said end face of the rotor whereby said valve member normally rotates with the rotor, said valve member having a plurality of through ports registrable with the respective duct openings, said ducts being of a number that is a multiple of the number of ports, a valve plate in the flow chamber, means holding said valve plate against rotation, said valve plate being engaged with said valve member and closing ports in a portion thereof whereby washing fluid from the flow chamber flows through ports in the valve member only when said ports are in a portion not engaged by the valve plate, a plurality of lugs on the valve member, there being one lug for each duct and of equal arcuate angle spacing, a detent biased towards said valve member and engageable with the lugs to retain said valve member against rotation, a cam on said rotor having a lobe portion normally engaged with the detent to retain same disengaged from said lug whereby the valve member will rotate with the rotor, said cam having a dwell portion corresponding in length to the arcuate angle of spacing between the adjacent ducts whereby when the detent moves into said dwell portion it will engage the next lug to hold same until the next duct opening advances into registry with the next respective port whereby washing fluid passes through the next ports and ducts to the respective spray jets as said next ports move in the area of the valve member not covered by the valve plate.

9. A fluid spraying apparatus for dishwashing machines comprising, a housing having a chamber therein, means communicating with said chamber for supplying washing fluid under pressure thereto, an elongate rotor having one end rotatably supported in said housing and extending into said chamber with the other end extending from said housing, a plurality of distributor ducts in said rotor and extending longitudinally thereof, said distributor ducts being of different lengths and equally spaced radially and circumferentially in the rotor, means operatively connected to the rotor for rotating same on its longitudinal axis, spray jets arranged in groups having flow communication with said ducts, said spray jets being equally spaced along the length of said rotor with one group communicating with one duct and other groups communicating with other ducts, said rotor having an end face in said chamber, said ducts each opening from said rotor end face, a valve member axially rotatable relative to said rotor and frictionally engaging said end face of the rotor whereby said valve member normally rotates with the rotor, said valve member having a plurality of through ports registrable with the respective duct openings, said ducts being of a number that is a multiple of the number of ports, a valve plate in the chamber, means in the housing holding said valve plate against rotation, said valve plate being engaged with said valve member and closing ports in a portion thereof whereby washing fluid from the chamber flows through ports in the valve member only when said ports are in a portion not engaged by the valve plate, a plurality of lugs on the valve member, there being one lug for each duct and of equal arcuate angle spacing, a detent biased towards said valve member and engageable with the lugs to retain said valve member against rotation, a cam on said rotor having a lobe portion normally engaged with the detent to retain same disengaged from said lug whereby the valve member will rotate with the rotor, said cam having a dwell portion corresponding in length to the arcuate angle of spacing between the adjacent ducts whereby when the detent moves into said dwell portion it will engage the next lug to hold same until the next duct opening advances into registry with the respective next port whereby washing fluid passes through the next ports and ducts to the respective spray jets as said next ports move in the area of the valve member not covered by the valve plate to effect actuation of the spray jets in sequence.

References Cited in the file of this patent

UNITED STATES PATENTS

1,701,066	Elkington	Feb. 5, 1929
2,228,205	Dwyer	Jan. 7, 1941
2,692,605	Stanitz et al.	Oct. 26, 1954
2,693,390	Spender et al.	Nov. 2, 1954
2,710,617	James et al.	June 14, 1955