March 27, 1956 H. F. LYMAN 2,739,781

TIMING CONTROL FOR DISHWASHING MACHINES

Filed June 21, 1952 4 Sheets-Sheet 1

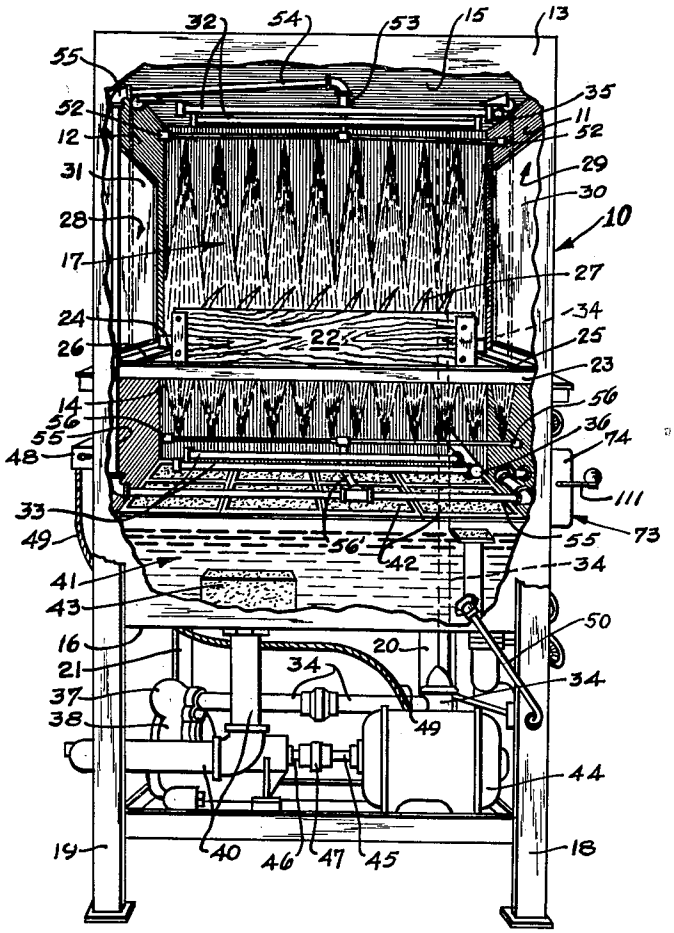


FIG. 1

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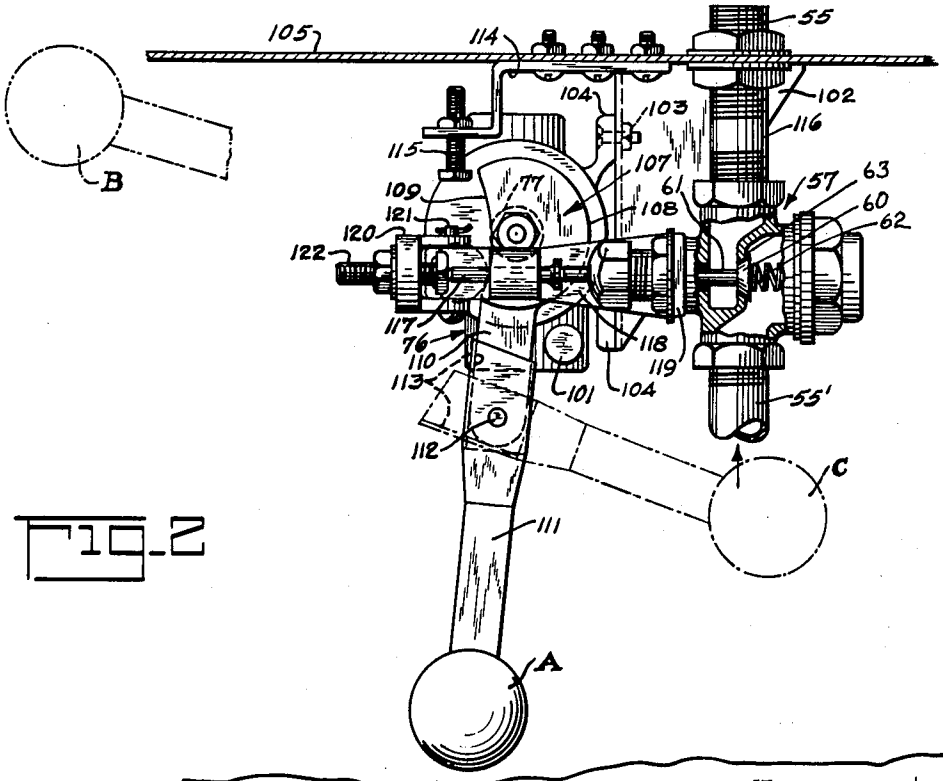


FIG. 2

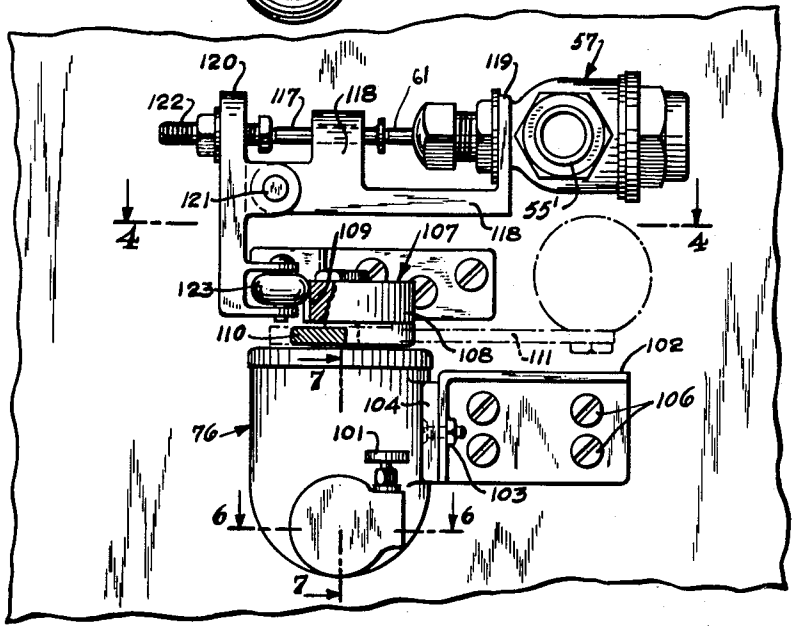


FIG. 3

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TIMING CONTROL FOR DISHWASHING MACHINES

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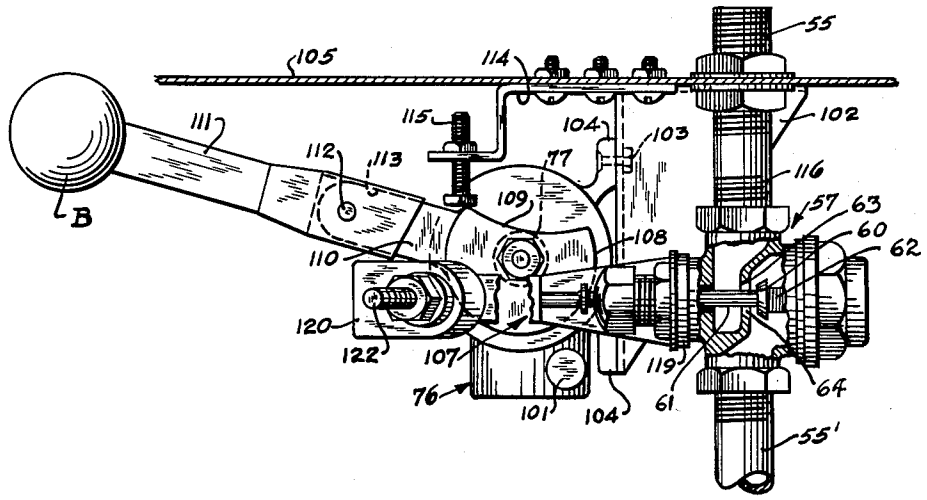


FIG. 4

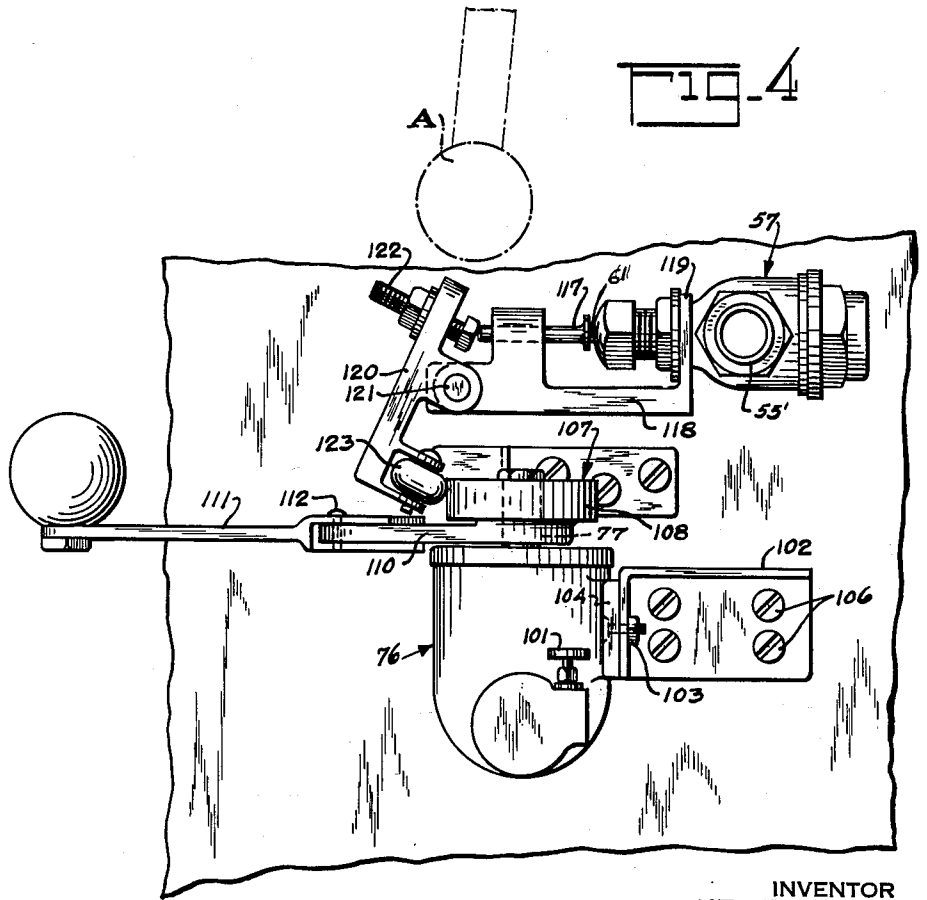


FIG. 5

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TIMING CONTROL FOR DISHWASHING MACHINES

Filed June 21, 1952 4 Sheets-Sheet 4

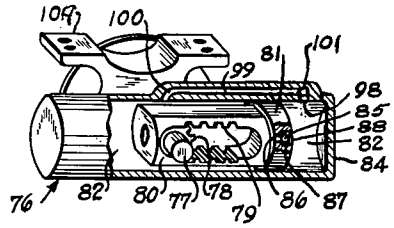


FIG. 6

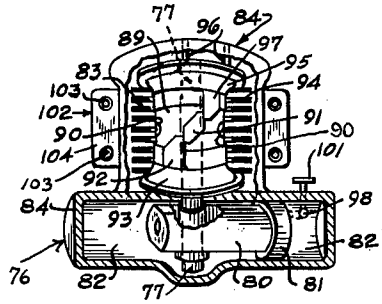


FIG. 7

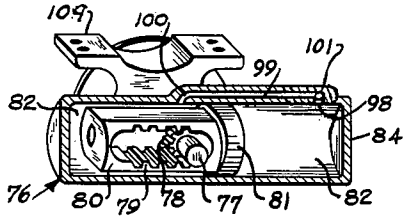


FIG. 8

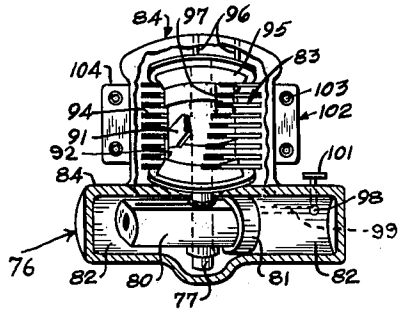


FIG. 9

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2,739,781

TIMING CONTROL FOR DISHWASHING MACHINES

Homer F. Lyman, Nutley, N. J.

Application June 21, 1952, Serial No. 294,767

8 Claims. (Cl. 251—54)

This invention relates to dishwashing machines and more particularly to dishwashing machines of the commercial type, as distinguished from those used in the household, and in which dishes are washed within the machine and thereafter rinsed by flowing rinsing water thereover for a predetermined length of time.

In dishwashing machines of the type to which the present invention relates, a rack of dishes is washed and thereafter rinsed in a washing chamber enclosed within the machine. The dishes are washed by a plurality of sprays of wash-water directed downwardly upon the dishes from a plurality of spray pipes above the rack and directly upwardly from a plurality of spray pipes disposed below the rack. Wash-water is pumped into the spray pipes by a circulating pump which receives the water from a tank compartment below the spray pipes. The pump is driven by an electrical motor. After the washing operation is completed, the dishes are rinsed by rinse-water which is sprayed downwardly onto the dishes from a rinse-water spray pipe and upwardly onto the dishes from other rinse spray pipes disposed below the rack of dishes. The upper and lower rinse spray pipes receive rinse-water from a source of heated water through a valve-controlled conduit.

The present invention provides a timing mechanism by means of which dishes within a dishwashing machine are automatically subjected to a rinsing operation for a predetermined period of time.

The timing apparatus of the present invention comprises hydraulically operated means which automatically controls the operation of the rinsing apparatus of a dishwashing machine so that after the washing of the dishes is completed the dishes are rinsed for a predetermined period of time by rinse-water, the flow of which rinse-water to the rinsing spray pipes ceases after said predetermined period of time.

The dish rinsing mechanism of the present invention comprises a valve which controls the flow of rinse-water to rinse spray pipes above and below the tray of dishes and which are arranged to direct streams of water downwardly and upwardly, respectively, onto the dishes. Hydraulically operated means controls the period of time the dishes are rinsed and comprises a cam actuated by a hydraulic motor. The cam controls the operation of the rinse valve so that upon completion of the washing of the dishes, the rinse valve is opened by the cam to permit rinse-water to flow into the rinsing pipes and rinse the dishes, the rinse valve being maintained in its opened position for a predetermined length of time by said cam as the cam is rotated by the hydraulic motor, at the end of which period of time the valve is returned to its closed position. The hydraulic motor has a shaft upon which the cam is mounted to turn therewith, which shaft is turned in an operating direction by the tension of a spring, the rate of speed at which the shaft moves in said operating direction being governed by movement in one direction of a piston associated with the shaft against a fluid within a fluid-filled chamber. The fluid is permitted to escape from the cylinder in front of the piston at a controlled predetermined rate of flow to a position within the cylinder behind the piston. At the end of movement of the piston in said one direction, the shaft is turned, by a manually-actuated handle, against the tension of said spring, in a non-operating direction which is opposite to the direction in which the shaft is turned during its operating movement. Turning of the shaft in said non-operating direction causes the piston to move in a direction opposite to said one direction and forces the liquid to flow unchecked from its position behind the piston into the space in the cylinder ahead of the piston, thereby filling said space and positioning the piston for movement in said operating direction thereby to again turn the shaft in an operating direction.

The cam on the rinsing timer motor shaft has a surface which engages an actuator for opening and closing the rinse valve, the cam being so constructed that the rinse valve is opened as said cam turns in an operating direction so as to permit rinse-water to flow into the rinse spray pipes and rinse the dishes. The shape of the rinse cam is such as to maintain the valve in an opened position for a predetermined amount of travel of the motor and cam in an operating direction and at the end of said length of travel in the operating direction, permit the valve to close thereby preventing further flow of rinse-water to the rinse spray pipe. The length of time that a tray of dishes is rinsed is controlled by controlling the speed of movement of the rinsing cam in an operating direction by the shaft on which the cam is mounted through controlling the speed of movement of the piston in the hydraulic motor which speed of movement is in turn controlled by controlling the flow of fluid from the space in the cylinder ahead of the piston to the space at the rear of the piston in the cylinder.

The invention will be understood from the following description when considered in connection with the accompanying drawings in which:

Fig. 1 is a side elevational view of dishwashing apparatus embodying the present invention, parts of the casing being broken away, the dishwashing apparatus being illustrated in its dish rinsing cycle;

Fig. 2 is a plan view of the rinse time controller of the present invention shown in its inoperative position at which time the rinse valve is closed;

Fig. 3 is a side elevational view of the time control apparatus illustrated in Fig. 2;

Fig. 4 is a view similar to Fig. 2 except that the time controller is illustrated with the parts thereof in operative or rinsing position with the rinse valve open and at substantially the beginning of the rinsing operation;

Fig. 5 is a side elevational view of the time control apparatus in the position illustrated in Fig. 4;

Fig. 6 is a sectional plan view of the hydraulic motor of the time controller taken on line 6—6 of Fig. 3;

Fig. 7 is a vertical sectional view taken on the line 7—7 of Fig. 3;

Fig. 8 is a view similar to Fig. 6 with the various parts of the motor shown in the position they assume when the timer is at the beginning of the rinsing operation as illustrated in Figs. 4 and 5; and

Fig. 9 is a vertical sectional view of the motor in the position illustrated in Fig. 8.

Like characters of reference refer to like parts throughout the several views.

Referring to Fig. 1 of the drawings, the reference numeral 10 designates the casing of the diswashing and rinsing machine, which casing is substantially rectangular in cross-section. The casing 10 comprises opposite end walls 11 and 12, opposite side walls 13 and 14, a top 15 and a bottom 16 forming therebetween a washing and rinsing chamber 17. The opposite end walls and the opposite

side walls adjacent thereto are secured together preferably by welding and the top and bottom are welded to the sides and ends so that the washing and rinsing chamber 17 is water-tight. Casing 10 is supported on legs 18, 19, 20 and 21 which legs each comprise L-shaped angle bars. Each of the legs is secured to the casing at a corner formed by joining of the opposite sides of the casing and the opposite ends thereof.

A table adapted to support a dish rack 22 is positioned in chamber 17 substantially intermediate the top 15 and bottom 16 of the dishwashing machine. The table comprises spaced L-shaped angle bars 23 and 24 extending between opposite end walls 11 and 12 adjacent to and in spaced relationship with the opposite side walls 13 and 14. Angle bars 23 and 24 are secured at one end thereof to a support 25 projecting along the end wall 11 between the side walls 13 and 14 and at the opposite end thereof to a support 26 extending along the end wall 12 between said side walls. Rack 22, in the embodiment of the invention illustrated, comprises an elongated tray open at the top and at the bottom thereof and having a plurality of supporting means for dishes 27 so arranged as to support the dishes in a plurality of spaced rows extending internally of the tray. The rack 22 may be inserted in chamber 17 either through the opening 28 in the end wall 12 or the opening 29 in the end wall 11. Opening 29 is closed by a door 30 while the opening 28 is closed by a door 31.

Dishes 27 are washed by directing streams of washing liquid under pressure on them from a plurality of wash spray pipes 32 positioned in the chamber 17 above the rack 22 so as to direct streams of water downwardly onto the dishes in said rack and by lower spray pipes 33 disposed below the rack of dishes so as to direct streams of wash-water upwardly and over said dishes in the rack 22. Upper spray pipes 32 receive wash-water from wash-water conduit 34 through a connecting pipe 35 while lower spray pipes 33 receive wash-water through a connecting pipe 36 which communicates with said wash-water conduit 34. Wash-water conduit 34 is in communication with the outlet 37 of the pump 38, the suction (not shown) of which pump communicates through a conduit 40 with a wash-water tank 41 within the casing 10 of the dishwashing and rinsing machine in the lower part thereof below lower spray pipes 33. Intermediate spray pipes 33 and wash-water tank 41 is a straining screen 42 through which wash-water from upper spray piper 32 and lower spray pipes 33, after flowing in contact with the dishes in rack 22, passes into tank 41. A strainer 43 is positioned over the inlet of conduit 40 so that foreign substance from tank 41 will not pass into said conduit and into pump 38.

Pump 38 is actuated by an electrical motor 44, the shaft 45 of which is connected to a pump shaft 46 through a coupling 47. Motor 44 is electrically connected to a manually operated wash switch 48 by an electrical conduit 49. Wash control handle 50 controls the flow of wash-water through conduit 34 to the wash spray pipes.

After washing of the dishes is completed, as will hereinafter be described, the dishes in rack 22 are rinsed by streams of rinse-water directed downwardly thereover from an upper rinse pipe 52 which pipe is revolved from a center connection 53 by force of rinse-water flowing into the upper pipe 52 through a connecting pipe 54 which pipe communicates with a main rinse conduit 55. A lower rinse water spray pipe 56 is disposed below rack 22 and projects streams of rinse-water upwardly over the dishes in rack 22. The lower rinse pipe 56 revolves in a manner similar to upper pipe 52. Lower rinse water pipe 56 communicates with main rinse conduit 55 through a lower connecting pipe 56'.

Flow of rinse-water into main rinse conduit 55 from a rinse inlet pipe 55' is controlled by a rinse-water control valve 57 (Figs. 2 to 5), which control valve is normally retained in a closed position so that rinse-water cannot flow from rinse inlet pipe 55' through valve 57 into main rinse conduit 55. Valve 57 comprises a closure valve 60 having a stem 61 which is actuated by a spring 62 so as to normally be maintained in a seated position (Figs. 2 and 3) in valve seat 63 so as to close valve opening 64. To open valve 57, stem 61 is actuated inwardly of the valve against the compression of spring 62 until closure valve 60 is unseated (Figs. 4 and 5) which permits water to flow from rinse-water inlet pipe 55' through valve opening 64 into main rinse conduit 55, as will hereinafter be fully described.

The length of time that dishes in rack 22 are rinsed through the projection of streams of rinse-water downwardly thereonto through upper rinse pipe 52 and the projection upwardly thereonto of rinse-water from lower rinse-water pipe 56 is controlled by a time controlling apparatus 73 (Fig. 1) having a housing 74 which time controlling apparatus comprises the rinse-time controller which actuates rinse valve 57 into an open position so that rinse-water will flow into upper rinse pipe 52 and lower rinse-water pipe 56 so that the dishes in rack 22 will be rinsed after washing thereof. Valve 57 is permitted to return to its normally closed position by the rinse-time controller after a predetermined period of time within which period the dishes are rinsed.

Rinse-time controller 75 (Figs. 2 to 5) comprises a hydraulic motor 76 (Figs. 6 to 9) having a main rotating shaft 77 to which is secured a pinion 78 that is maintained in geared relation to a rack 79 forming part of the control piston 80 of hydraulic motor 76. Control piston 80 has a piston head 81, the function of which head is to control the movement of shaft 77 in an operative direction, that is, in a counterclockwise direction as illustrated more particularly in Fig. 6. Piston 80 has horizontal reciprocal movement in a horizontally extending cylindrical chamber 82, piston head 81 being in fluid-tight relationship with the inner periphery of said chamber. Chamber 82 is closed at the opposite ends thereof while main rotating shaft 77 extends vertically upwardly through an upright cylindrical chamber 83, both of which chambers are contained within the body 84 of the motor.

Fluid is contained within chamber 82 for movement from a position within said chamber behind head 81 (to left of said head, Figs. 6 and 7) to a location in chamber 82 in front of said piston head (to right of the head, Figs. 8 and 9) and from the location within chamber 82 in front of the piston head to a position behind the head, as will hereinafter be fully set forth. Mounted within the piston head 81, is a ball valve 85 adapted to close a passage 86 in the head 81 during movement of piston 80 and shaft 77 in an operative direction, that is, rotation of the shaft 77 in a counterclockwise direction (Fig. 8) and movement of the piston 80 to the right (Fig. 8). When the piston head 81 and piston 80 are moved in a direction the reverse of that just described, ball valve 85 is forced by fluid passing through passage 86 to move from its closed position in respect to said passage and into an enlarged portion 87 of the passage by force of the fluid entering the passage which positions the ball valve in its open position and permits flow of fluid through passage 86 into that portion of chamber 82 ahead of piston head 81 (Figs. 6 and 7). For maintaining the ball valve 85 against movement out of the piston head 81, a suitable retaining pin 88 is utilized.

Main operating shaft 77, which extends vertically upwardly through upright cylindrical chamber 83, has a collar 89 secured thereto by screws 90 so that said collar is rotatable with the shaft. Collar 89 has dog 91 thereon which is rotatable therewith, which dog engages a lower dog 92 on a rotatable collar 93, which rotatable collar is idly positioned on shaft 77 so that when the shaft 77 is rotated in a clockwise direction (its inoperative movement) dog 91 will cause rotatable collar 93, because of its engagement with lower dog 92, to likewise turn in clockwise direction. This winds a coil spring 94 which

spring is positioned within the upright cylindrical chamber 83 and has its lowermost end secured to lower rotatable collar 93 and its uppermost end secured to an upper non-rotatable collar 95. Upper stationary collar 95 is idly mounted with respect to shaft 77 but is secured against rotatable movement by pins 96 which are anchored in the body 84 of the motor. Dog 97 on the upper collar 95 extends into path of movement of dog 91 on collar 89 so as to limit the rotation of shaft 77 in a counterclockwise or operative direction.

As the shaft 77 rotates in a counterclockwise or operative direction and piston 80 moves to the right (Figs. 8 and 9), fluid in that portion of chamber 82 ahead of piston head 81 flows out of that portion of chamber 82 through an inlet port 98 and into a horizontally extending liquid passage 99 (Figs. 6 and 8) which extends in the body portion 84 of the motor parallel to chamber 82. Passage 99 has an outlet port 100 communicating with chamber 82 to the rear of piston head 81. The speed at which piston 80 moves to the right (Figs. 8 and 9) is governed by the rate of flow at which the fluid from ahead of piston 80 passes outwardly of chamber 82 through inlet port 98 of passage 99, which inlet port is controlled by inlet port control valve 101. Adjustment of the inlet control valve inwardly toward its closed position reduces the size of inlet port 98 and lessens the speed with which the fluid ahead of piston head 80 flows outwardly of chamber 82 and into passage 99 thereby lessening the speed at which piston 80 moves to the right (Figs. 8 and 9) and decreasing the speed at which shaft 77 turns in a counterclockwise or operative direction. Movement of inlet port control valve 101 in the opposite direction toward its open position permits the fluid to flow from chamber 82 into inlet port 98 at a greater speed which permits piston 80 to move faster in a direction to the right of Figs. 8 and 9 thereby rotating shaft 77 at a greater speed in a counterclockwise or operative direction.

Hydraulic motor 76 is mounted on an upright angle plate 102 to which plate the motor is secured by bolts 103 extending through lugs 104 on the body 84 of the motor. The angle plate 102 is secured to the rear wall 105 of housing 74 by bolts 106.

Rinse-time controller motor 76 has a cam 107 so mounted on shaft 77 thereof as to be rotatable with said shaft. Cam 107 is substantially annular having an annular peripheral riser surface 108 and a concave detent surface 109 (Figs. 2 to 4).

An operating arm 110 is fixedly mounted on shaft 77 beneath cam 107 so that said arm may rotate the shaft. An operating handle 111 is pivotally mounted at 112 on arm 110, the arm having a downwardly projecting flange 113 along one side thereof (Figs. 2 and 4) which flange engages the side of arm 110 adjacent thereto when the handle is moved in a clockwise direction from position A to position B (Figs. 2 and 4) thereby to rotate shaft 77 and cam 107 in a clockwise direction. However, since there is no flange along the opposite side of handle 111, it is free to be moved in a counterclockwise direction on pivot 112 from position A to position C (Fig. 2) without turning shaft 77 or cam 107.

A stop 114 is mounted on rear wall 105 of housing 74 and has a screw 115 extending into the path of rotation of cam 107 so as to be engaged by the opposite extremities of concave surface 109 thereby limiting the extent of rotation of the cam in both a clockwise and counterclockwise direction.

Rinse valve 57 is mounted on rear wall 105 of housing 74 by means of a pipe connection 116 secured to said wall. The stem 61 of valve 57 is operated by a plunger 117 mounted for reciprocal movement in a mounting member 118 toward and away from said valve. The mounting member 118 is supported by valve 57 on an upturned flange 119 at one end of the member. Plunger 117 is operated in a direction toward valve 57 by valve operating member 120 which operating member is pivotally mounted in mounting member 118 on pivot 121 intermediate the opposite ends of valve operating member 120. At the uppermost end of valve operating member 120 is an adjustment screw 122 which engages plunger 117 while at the lowermost end thereof a roller 123 is pivotally mounted therein. The roller is disposed to engage outer riser periphery 108 of cam 107 and concave detent 109 of said cam.

In operation of the timing mechanism of the present invention, the various parts thereof in the normal or inoperative position are illustrated in Figs. 2, 3, 6 and 7 of the drawings. Rinse control valve 57 is in its closed position so that rinse-water cannot flow from rinse inlet pipe 55' into main rinse conduit 55 because closure valve 60 is maintained in a seated position in valve seat 63 by action of spring 62. One end of plunger 117 bears against stem 61 while the opposite end of said plunger is in contact with adjusting screw 122 in valve operating member 120. Roller 123 in valve operating member 120 is in the path of movement of rinse valve actuating riser surface 108 on rinse timer control cam 107.

The various parts of the rinse time controller hydraulic motor 76 are in the positions illustrated in Figs. 6 and 7 when the various other parts of the timer are located in the normal or inoperative position illustrated in Figs. 2 and 3 as hereinabove described. It will be noted that piston 80 of the motor is located in its furthermost position to the right, Figs. 6 and 7, the fluid in chamber 82 being to the rear or left of said piston head 81. Spring 94 in vertical chamber is in its unwound position.

When it is desired to wash and rinse a rack 22 of dishes, the rack is positioned within washing and rinsing chamber 17 and supported on angle bars 23 and 24 of the supporting table within the chamber. Openings 28 and 29 in the opposite end walls of the dishwashing and rinsing machine are thereafter closed by closing doors 30 and 31, respectively. The dishes are then washed by setting switch 48 in its "on" position so that electrical current flows from an electrical source to motor 44. Motor 44 is thusly set in operation which drives pump 38 through shaft 45, connection 47 and shaft 46. Wash-water from wash-water tank 41 within the dishwashing and rinsing apparatus is caused to flow through strainer 43 into suction conduit 40 through pump 38 and then is forced under pressure into wash-water conduit 34 whence it passes through connecting pipe 36 into the lower spray pipes 33 through connecting pipe 35 into upper wash spray pipes 32. Sprays of water under pressure are thereby directed upwardly onto dishes in rack 22 from lower spray pipes 33 and downwardly under pressure onto said dishes through upper spray pipes 32. This operation is continued until the dishes are washed at which time switch 48 is turned to its "off" position preventing flow of electrical current to motor 44 which stops operation of the washing apparatus.

After the dishwashing operation is completed, the dishes are rinsed by setting the rinse timer control in operation. The rinse timer is set in operation by the movement of handle 111 from position A, as illustrated in Fig. 2 in a clockwise direction to position B illustrated in dot-and-dash lines to the left of Fig. 2 and in full lines in Fig. 4. Movement of handle 111 from position A to position B rotates cam 107 and shaft 77 of motor 76 in a clockwise direction because flange 113 on handle 111 engages the side of arm 110. At no time during the operation of the timing mechanism of the present invention can the cam 107 be turned in a counterclockwise direction by handle 111 because movement of the handle 111 in a counterclockwise direction from position A to position C, as shown in dot-and-dash lines in Fig. 2 will be on pivot 112 by means of which the handle 111 is pivotally mounted on arm 110.

As handle 111 is moved from position A (Fig. 2) to position B (Fig. 4) the parts of the timer of the present

invention are operated into rinsing position illustrated in Figs. 4 and 5. Cam **107** and shaft **77** turns in a clockwise direction from the position illustrated in Figs. 2 and 3 to the position illustrated in Figs. 4 and 5, surface **108** engaging roller **123** on valve actuator member **120** thereby turning valve actuator **120** in a clockwise direction on pivot **121**. When handle **111** has been moved to position B from position A, cam **107** has reached the full extent of its movement in a clockwise direction because further movement in a clockwise direction is prevented by engagement of cam **107** by screw **115**.

As rinse control cam **107** is turned in a clockwise direction by movement of handle **111** from position A, Fig. 2, to position B, Fig. 3, riser surface **108** on said rinse cam engages roller **123** on valve actuating member **120** causing the valve actuating member to pivot in a clockwise direction on pivot **121**. Adjusting screw **122** on the uppermost end of member **120** is urged against plunger **117** which causes the plunger to move to the right (Fig. 2) pressing valve stem **61** inwardly of the valve against the compression of spring **62** causing closure valve **60** to become unseated from valve seat **63** thereby permitting rinse-water to flow from rinse-water inlet pipe **55'** through the valve and into main rinse conduit **55**. This is the rinse position of the timing apparatus of the present invention which position is shown in Figs. 4 and 5. Rinse-water flows through main rinse pipe **55** into upper rinse spray pipe **52** through connecting pipe **54** which causes the upper rinse spray pipe to rotate on center connection **53** and to spray rinse-water downwardly onto the dishes in rack **22**. Rinse-water also flows into lower rinse pipe **56** through connecting pipe **56'** which causes the lower rinse pipe to rotate and project sprays of rinse-water upwardly onto said dishes in rack **22**.

As cam **107** is turned in a clockwise direction from the position shown in Figs. 2 and 3 to the position shown in Figs. 4 and 5, the various parts of the time control hydraulic motor **76** are moved from the position illustrated in Figs. 6 and 7 to the position shown in Figs. 8 and 9. Turning of the shaft **77** of hydraulic motor **76** in a clockwise direction likewise turns pinions **78** in a clockwise direction, which pinion acts upon rack **79** so as to move piston **80** and piston head **81** thereon in a direction to the left from the position shown in Figs. 6 and 7 toward the position shown in Figs. 8 and 9. Movement of piston **80** to the left forces fluid from the portion of chamber **82** to the left of or behind piston head **81** through passage **86** into the portion of chamber **82** ahead of head **81**, the flow of fluid through said passage **86** causing ball valve **85** to move into the enlarged portion **87** of the passage so that flow of fluid from behind the piston head **81** to the forward part thereof is permitted. Turning of the shaft **77** in a clockwise direction rotates collar **89** in a clockwise direction, the dog **91** on said collar engaging dog **92** on lower rotatable collar **93**. This causes collar **93** to turn in a clockwise direction thereby winding spring **94**, the upper collar **95** being retained against movement by pins **96**. When the cam **107** has reached the full extent of movement in a clockwise direction the various parts of the motor are in the position shown in Figs. 8 and 9.

Thusly, the timer mechanism of the present invention is operated from its normal inoperative position as illustrated in Figs. 2, 3, 6 and 7 to its rinsing position as shown in Figs. 4, 5, 8 and 9.

Upon release of handle **111** by an operator when said handle reaches position B, Fig. 4, cam **107** is turned in a counterclockwise direction by shaft **77** of motor **76** from the position shown in Figs. 4 and 5 to its normally inoperative position as shown in Figs. 2 and 3, roller **123** being maintained in contact with riser surface **108** of cam **107** by action of spring **62** on valve stem **61** and the action of the valve stem on plunger **117** and adjusting screw **122** of valve actuator **120**. As cam **107** is turned in a counterclockwise direction by motor **76**, the rinse valve is maintained in its open position permitting rinse-water to flow into the rinse spray pipes, the valve actuating member being maintained in the position illustrated in Figs. 4 and 5 by riser surface **108** of cam **107**. When, however, the cam reaches such position in its counterclockwise rotation that roller **123** on valve actuating member **120** engages the concave surface of detent **109** of cam **107**, spring **62** of valve **57** urges the valve actuating member in a counterclockwise direction on pivot **121** through action of said spring on valve stem **61** and plunger **117** both of which are moved to the left (Fig. 5) by action of said spring. Closure valve **60** is thereby permitted to seat in valve seat **63** (Fig. 2) preventing further flow of rinse-water through valve **57** to the rinse spray pipes at which time the rinsing operation is completed and the various parts of the apparatus are at the position illustrated in Figs. 2, 3, 6 and 7.

The operation of rinse hydraulic motor **76** in turning shaft **77** and cam **107** in an operative or counterclockwise direction is as follows: unwinding of spring **94** of motor **76** turns lower movable collar **93** in a counterclockwise direction which, through engagement of dog **92** with dog **91** on the intermediate collar **89**, causes shaft **77** to rotate in said counterclockwise direction as the spring unwinds. This moves piston **80** to the right (Figs. 8 and 9) as liquid to the right of piston head **81** escapes from chamber **82** through controlled inlet port **98** thereafter to pass through horizontal passage **99** and into chamber **82** through outlet port **100** behind piston head **81**. Likewise, inlet port control valve **101** regulates the speed of travel of piston **80** to the right (Figs. 8 and 9). This controls the rate at which shaft **77** and cam **107** turn in a counterclockwise direction which determines the time it will take for cam **107** to move from the position shown in Figs. 4 and 5 to its normally inoperative position shown in Figs. 2 and 3 which in turn determines the length of time of the rinsing operation. Therefore, control of the rate of flow of fluid through inlet port **98** by inlet port control valve **101** will control the length of time of the rinsing cycle.

Inasmuch as various modifications may be made in the form of the invention herein disclosed and in the location and relative arrangement of the several parts of the invention without departing from the principles thereof, it will be understood that the invention is not to be limited excepting by the scope of the appended claims.

What is claimed is:

1. Valve apparatus comprising a valve and a valve actuating means for opening and closing said valve, timing means comprising a motor having a rotatable shaft, a fluid containing cylinder, a piston having reciprocal movement in the cylinder, said shaft and said piston being operatively associated so that when said shaft is turned in one direction from a normal position to a predetermined position the piston moves in one direction in the cylinder and when said shaft is turned in the opposite direction from said predetermined position to said normal position the piston moves in the opposite direction in the cylinder against fluid therein, manually operated means for turning the shaft in said one direction from its normal position to its predetermined position, shaft actuating means operatively associated with said shaft to actuate the shaft in said opposite direction only, the motor having a fluid-flow control passage with an inlet in communication with the cylinder at a point ahead of said piston in the direction of its movement in said opposite direction and an outlet in communication with said cylinder behind the piston in the direction of said movement in the opposite direction, fluid flow control means for controlling the flow of fluid from said inlet to the outlet, the motor having another fluid passage in communication with the cylinder ahead

and behind said cylinder in the direction of its movement in said opposite direction, other fluid flow control means associated with said other fluid passage so as to permit free flow of fluid from behind said piston to ahead thereof but preventing flow of said fluid from ahead to behind said piston, an actuator on said shaft operatively associated with said valve actuating means, said actuator being so positioned in relationship to the valve actuating means as to permit the valve to remain in its closed position when said shaft is in its normal position and to open the valve when the shaft is turned in said one direction and maintain the valve in said open position as the shaft turns in the opposite direction and until it reaches said normal position.

2. The valve apparatus comprising the valve and the valve actuating means of claim 1 wherein the fluid flow control means for controlling the flow of fluid from said inlet to said outlet of the fluid-flow control passage comprises an adjustable valve.

3. The valve apparatus comprising the valve and the valve actuating means of claim 2 wherein the actuator on said motor shaft comprises a cam having a riser surface and a detent surface, the cam being so positioned on the motor shaft that the valve actuating means engages the detent surface when the shaft is in its normal position and engages the riser surface when the shaft is turned in said one direction from said normal to said predetermined position thereby to actuate the valve to open position and turned in said opposite direction from said predetermined position to said normal position thereby to actuate the valve to and maintain the valve in its open position while said riser surface and valve actuating means are in engagement.

4. The valve apparatus comprising the valve and the valve actuating means of claim 3 wherein the valve is normally retained in its closed position by a spring, moved toward its open position by the valve actuating means against the tension of the spring, and returned to its closed position by the tension of said spring when said motor shaft reaches its normal position.

5. Valve apparatus comprising a valve and a valve actuating means for opening and closing said valve, timing means comprising a motor having a rotatable shaft, an actuator on said shaft operatively associated with said valve actuating means, means for turning the shaft in one direction from a normal position to a predetermined position, means for turning said shaft in the opposite direction from said predetermined position to its normal position, the actuator on said rotatable shaft comprising a cam having a riser surface and a detent surface, the cam being so positioned on the motor shaft that the valve actuating means engages the detent surface when the shaft is in its normal position and engages the riser surface when the shaft is turned in said one direction from said normal to said predetermined position thereby to actuate the valve to its open position and turned in said opposite direction from said predetermined position to said normal position thereby to actuate the valve to and maintain the valve in its open position while said riser surface and valve actuating means are in engagement, and said timing means also comprising control means for controlling the rate of speed at which the shaft turns in said opposite direction, said actuator being so positioned in relationship to the valve actuating means as to permit the valve to remain in its closed position when said shaft is in its normal position and to open the valve when the shaft is turned in said one direction and maintain the valve in said open position as the shaft turns in the opposite direction and until it reaches said normal position.

6. The valve apparatus comprising the valve and the valve actuating means of claim 5 wherein the motor shaft has operatively associated therewith means for manually turning the shaft in said one direction and wherein the motor comprises means for hydraulically controlling the rate of speed at which the shaft turns in said opposite direction.

7. The valve apparatus comprising the valve and the valve actuating means of claim 5 wherein the valve is normally retained in its closed position by a spring, moved toward its open position by the valve actuating means against the tension of the spring, and returned to its closed position by the tension of said spring when said motor shaft reaches its normal position.

8. Valve apparatus comprising a valve and a valve actuating means for opening and closing said valve, timing means comprising a motor having a rotatable shaft, a fluid containing cylinder, a piston having reciprocal movement in the cylinder, said shaft and said piston being operatively associated so that when said shaft is turned in one direction from a normal position to a predetermined position the piston moves in one direction in the cylinder and when said shaft is turned in the opposite direction from said predetermined position to said normal position the piston moves in the opposite direction in the cylinder against fluid therein, manually operated means for turning the shaft in said one direction from its normal position to its predetermined position, shaft actuating means operatively associated with said shaft to actuate the shaft in said opposite direction only, the motor having a fluid-flow control passage with an inlet in communication with the cylinder at a point ahead of said piston in the direction of its movement in said opposite direction and an outlet in communication with said cylinder behind the piston in the direction of said movement in the opposite direction, fluid flow control means for controlling the flow of fluid from said inlet to the outlet, the motor having another fluid passage in communication with the cylinder ahead and behind said cylinder in the direction of its movement in said opposite direction, other fluid flow control means associated with said other fluid passage so as to permit free flow of fluid from behind said piston to ahead thereof but preventing flow said fluid from ahead to behind said piston, an actuator on said shaft operatively associated with said valve actuating means, said actuator being so positioned in relationship to the valve actuating means as to permit the valve to remain in its closed position when said shaft is in its normal position and to open the valve when the shaft is turned in said one direction and maintain the valve in said open position as the shaft turns in the opposite direction and until it reaches said normal position, said actuator comprising a cam having a riser surface and a detent surface, the cam being so positioned on the motor shaft that the valve actuating means engages the detent surface when the shaft is in its normal position and engages the riser surface when the shaft is turned in said one direction from said normal to said predetermined position thereby to actuate the valve to open position and turned in said opposite direction from said predetermined position to said normal position thereby to actuate the valve to and maintain the valve in its open position while said riser surface and valve actuating means are in engagement.

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