April 26, 1955 H. F. LYMAN 2,706,990

APPARATUS FOR CONTROLLING THE TIME OF WASHING AND RINSING IN DISHWASHING MACHINES

Filed June 21, 1952

5 Sheets-Sheet 1

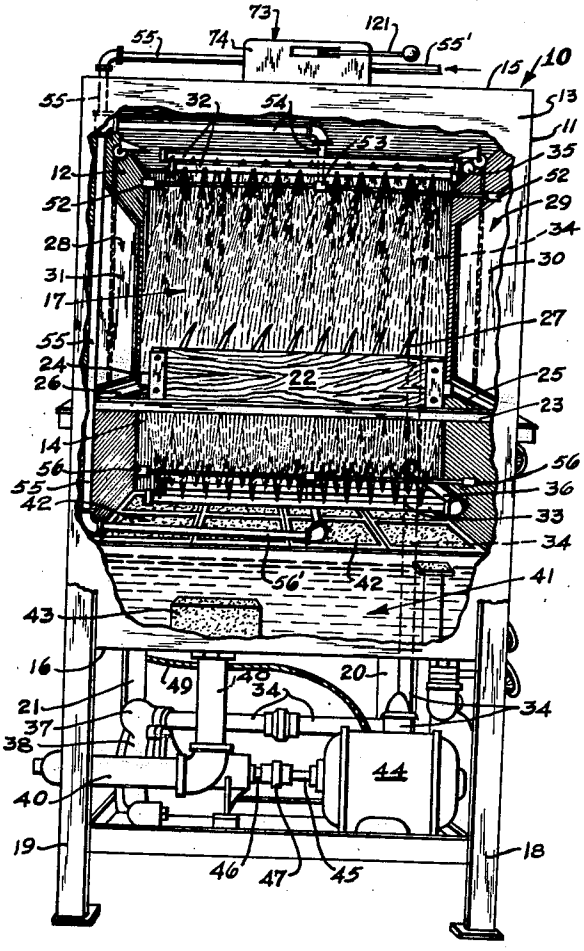



FIG. 1

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5 Sheets-Sheet 2

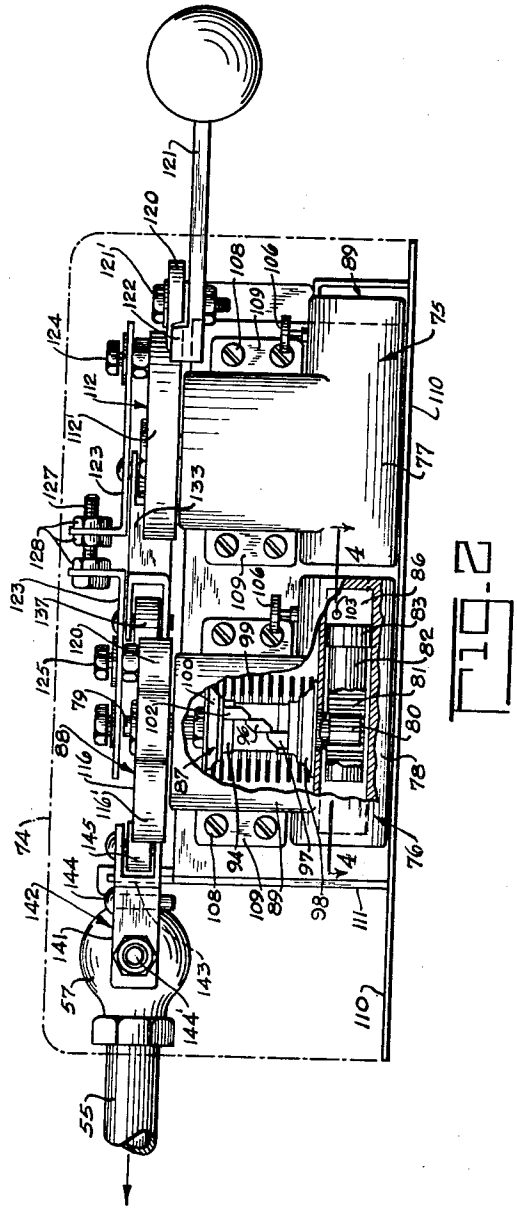


FIG. 2

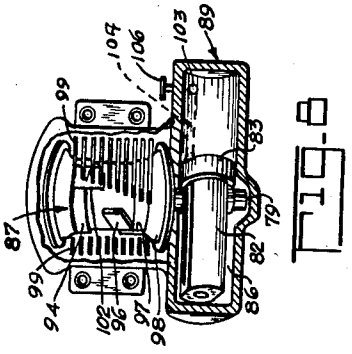


FIG. 8

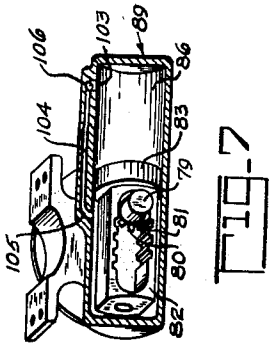


FIG. 7

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5 Sheets-Sheet 3

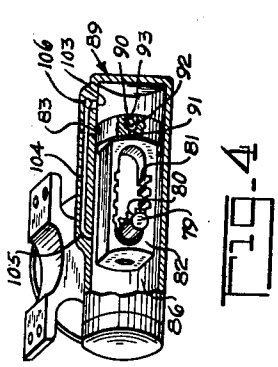


FIG. 4

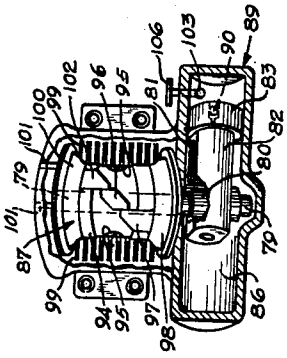


FIG. 5

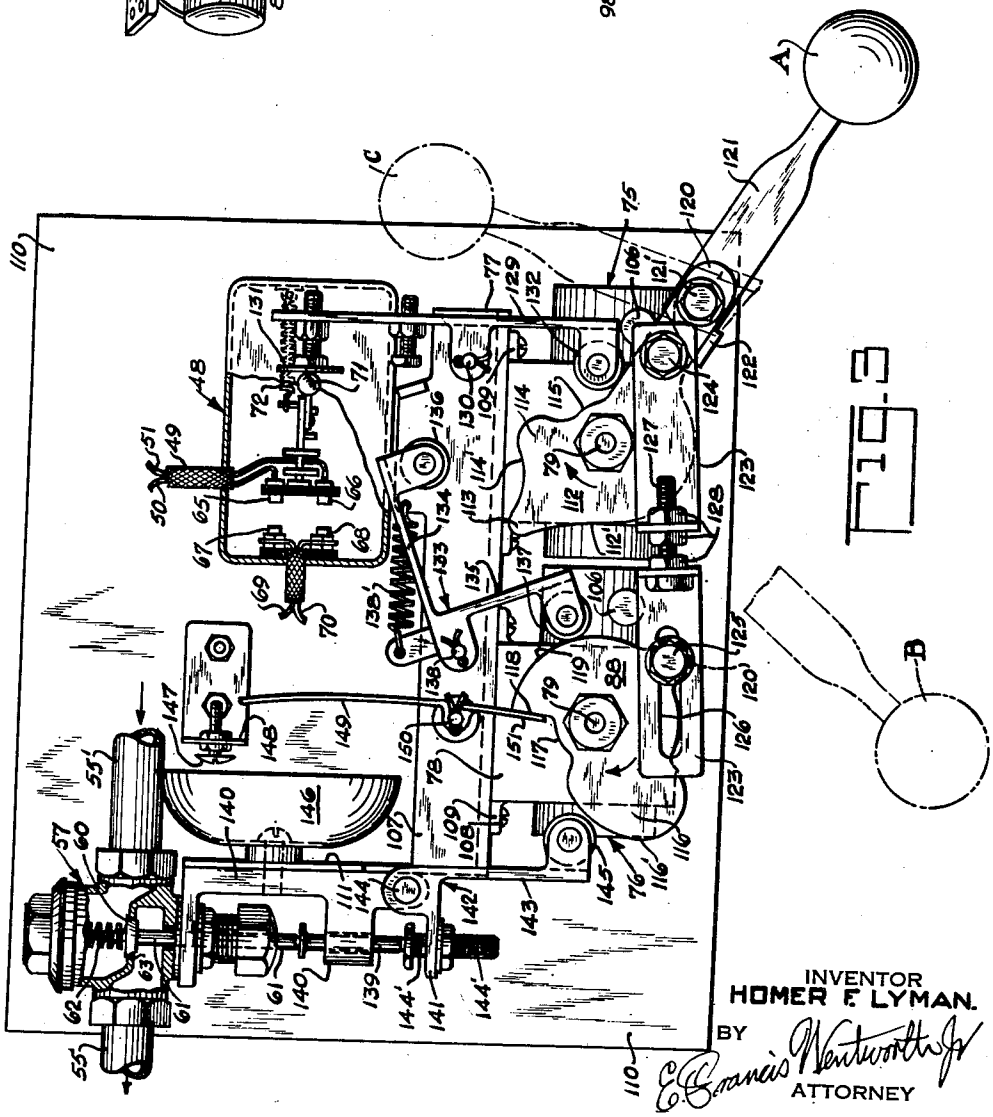


FIG. 3

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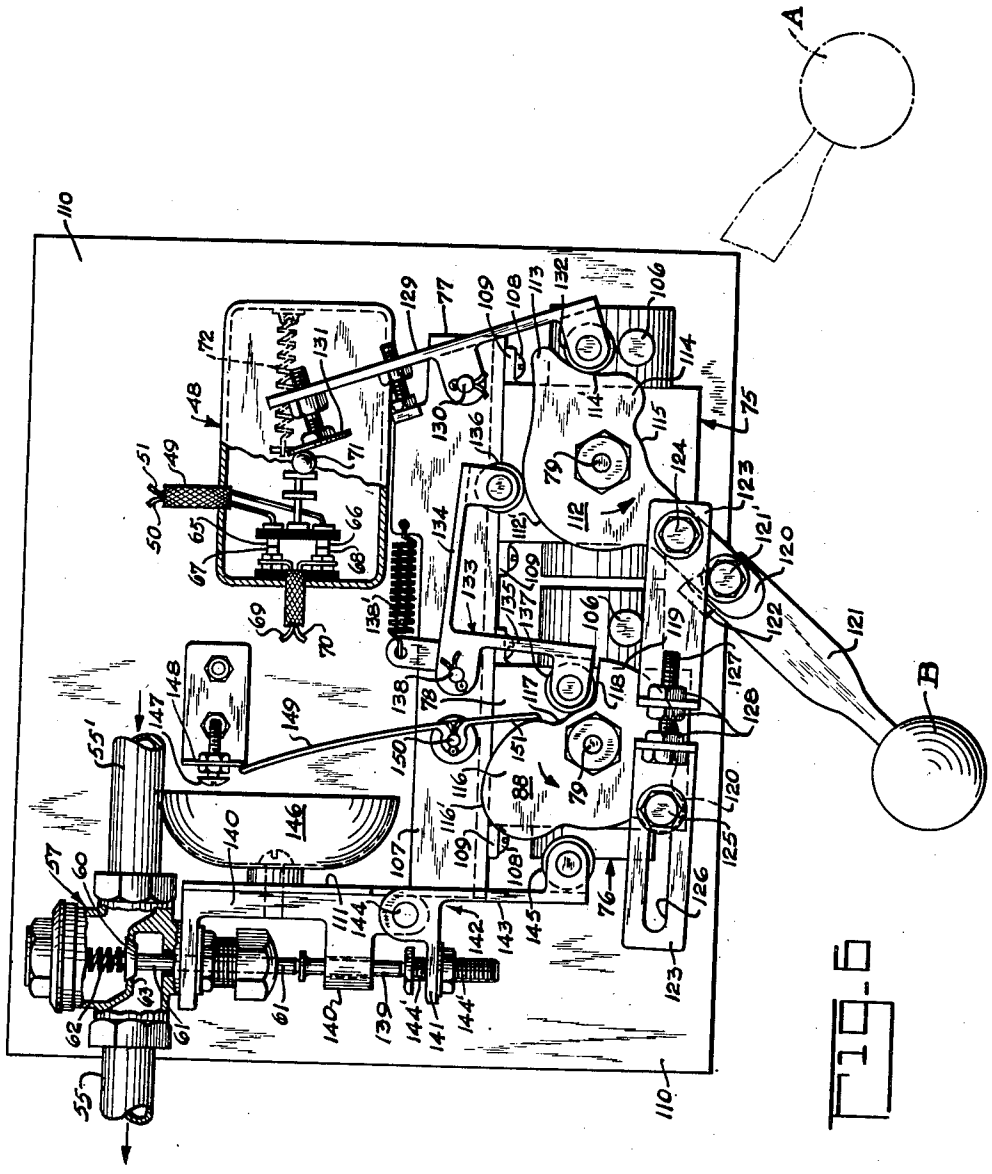



FIG. 6

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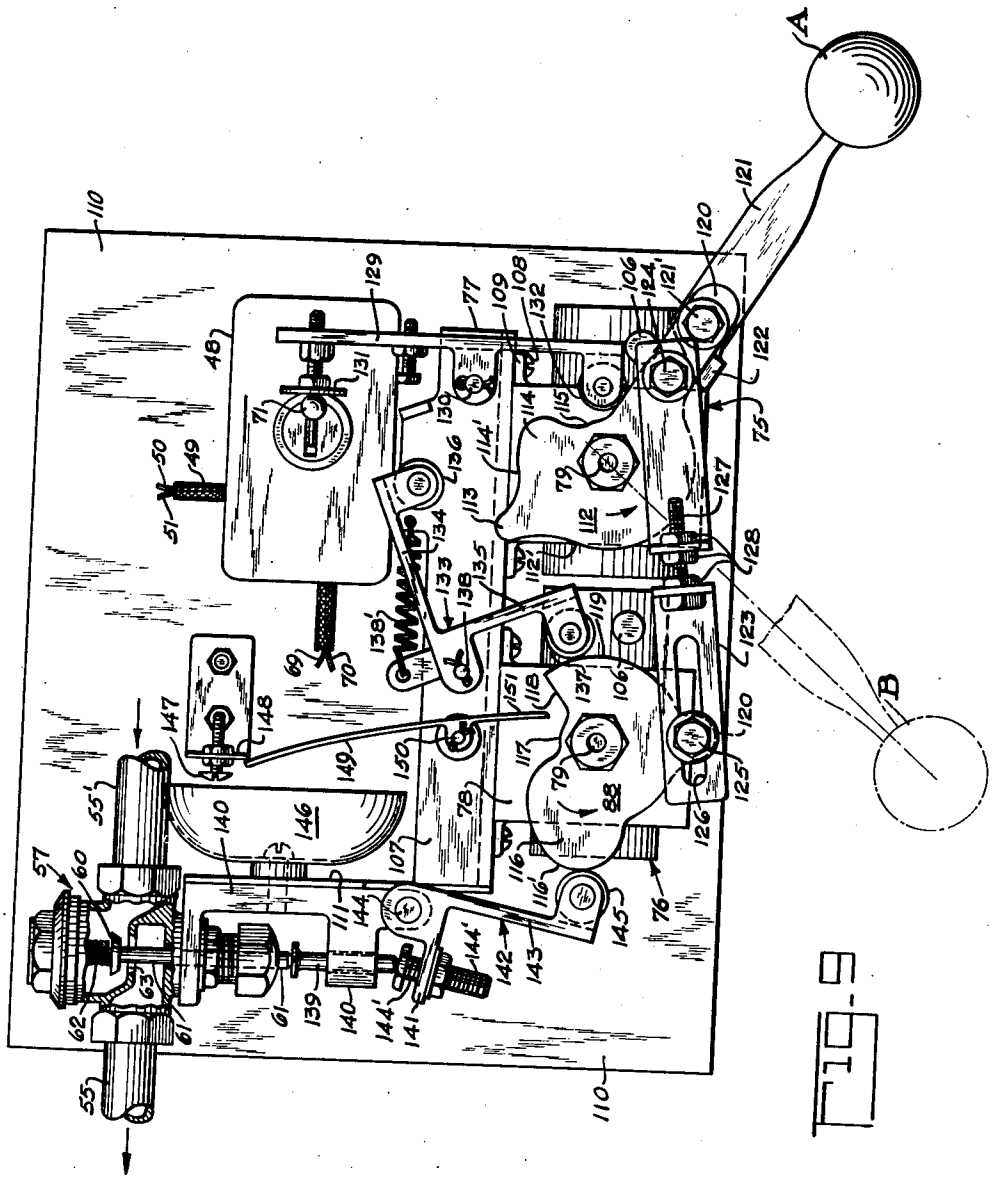



FIG. 5

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United States Patent Office 2,706,990 Patented Apr. 26, 1955



2,706,990

# APPARATUS FOR CONTROLLING THE TIME OF WASHING AND RINSING IN DISHWASHING MACHINES

Homer F. Lyman, Nutley, N. J.

Application June 21, 1952, Serial No. 294,768

12 Claims. (Cl. 134—95)

This invention relates to dishwashing machines and more particularly dishwashing machines of the commercial type, as distinguished from those used in the household, and in which dishes to be washed are positioned within the machine and thereafter washed by passing wash-water thereover for a predetermined length of time and, after the washing is completed, are rinsed by flowing rinsing water thereover for another 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 directed 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 the washing operation for a predetermined period of time and thereafter subjected to the rinsing operation for another predetermined period of time.

The timing apparatus of the present invention comprises hydraulically operated means which automatically controls the operation of the washing mechanism of the dishwashing machine so that dishes are subjected to washing for a predetermined period of time and, after expiration of said predetermined period of time, ceases to operate, together with other hydraulically operated means which automatically becomes operative to control the rinsing operation of the dishwashing machine so that when 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 hydraulically operated means for controlling the period of time for which the dishes are washed has a cam actuated by a hydraulic motor which cam operates an electrical switch controlling an electrical motor for actuating a pump. The pump, when in operation, circulates wash-water from a tank compartment within the lower portion of the dishwashing machine into a plurality of spray pipes above and below a tray of dishes within the washing chamber of said machine. 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. The other hydraulically operated means for controlling the period of time the dishes are rinsed has another cam actuated by a second hydraulic motor. Said other cam automatically controls the operation of the rinse valve so that upon completion of the washing of the dishes within a predetermined time the rinse valve is opened 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, thereafter to return to its closed position. Each of the hydraulic motors has a shaft upon which said cams are respectively mounted to turn therewith, which shafts are 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. Movement 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.

An operating lever is associated with both of the hydraulic motors and has said manually-operated handle thereon which is operative to move the lever in one direction only, the lever being so associated with the motors that movement thereof in said one direction only by the handle simultaneously turns the shafts of the motors in a non-operating direction. The cam on the shaft of said one or washing timer hydraulic motor controlling the washing apparatus acts upon an electrical switch and upon a lock for holding the other or rinsing timer hydraulic motor controlling the rinsing apparatus against movement in its operating direction while the washing timer motor is operating in its operating direction. The other cam on the shaft of the rinsing timer hydraulic motor is acted upon by said lock which releasably maintains the rinsing timer cam and motor against movement while said washing timer cam and shaft are turning in an operating direction and, after release from the locked position, permits said rinsing timer motor to move its cam and shaft in an operating direction, said cam acting upon the rinse valve to operate the same into its open position thereby permitting rinse-water to flow to the rinse spray pipes in the washing machine.

The cams are so constructed and so arranged that movement of the manually-operated lever in one direction by an operator causes the cam associated with the washing timer motor to close a switch thereby permitting electrical current to flow from an electrical source to the electrical motor which in turn actuates the circulating pump causing wash-water to flow into the washing spray pipes. When said switch is in the closed position and, prior to movement of the shafts of the washing timer motor and the rinsing timer motor in an operating direction, the lock moves into engagement with a locking detent in the cam on the rinse timer motor thereby to prevent movement of said cam and shaft of the rinse timer motor in an operating direction. The cam and shaft of the washing timer motor, however, is permitted to turn in an operating direction at a predetermined speed, said cam being so shaped and so associated with the switch that, at a predetermined position of the cam in its movement in said operating direction, the switch is caused to open thereby interrupting the flow of current to the electrical motor causing the motor and the pump to become inoperative. At substantially the same time as the motor and pump become inoperative, a portion of the cam on the washing timer motor engages the lock and releases said lock from the cam on the rinsing timer motor thereby permitting said cam on the rinsing timer motor to turn in an operating direction. The cam on the rinsing timer motor 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. In this manner, the washing mechanism is permitted to wash the dishes for a predetermined length of time after which time the washing mechanism becomes inoperative and the rinsing mechanism becomes operative so that the dishes are rinsed for a predetermined length of time after which the rinsing mechanism becomes inoperative. The length of time that a tray of dishes is washed and the length of time that said washed dishes are rinsed is controlled by controlled by controlling the speed of movement of the washing cam and the rinsing cam in an operating direction by the shafts on which the cams are mounted through controlling the speed of movement of the pistons in the washing timer hydraulic motor and in the rinsing timer 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 pistons to the space at the rear of the pistons 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 the dishwashing apparatus embodying the present invention, parts of the casing being broken away, the dishwashing apparatus being illustrated in its dishwashing cycle;

Fig. 2 is a side elevational view of the washing and rinsing time control apparatus of the present invention with its housing removed and mounted on top of the dishwashing apparatus shown in Fig. 1;

Fig. 3 is a plan view of the time controller shown in Fig. 2 in its inoperative position;

Fig. 4 is a sectional plan view of one of the hydraulic motors of the time controller taken on the line 4—4 of Fig. 2;

Fig. 5 is a vertical sectional view of the motor shown in Fig. 4;

Fig. 6 is a view similar to Fig. 3 but the time control apparatus is shown in washing position and at substantially the beginning of the dishwashing cycle of the dishwashing apparatus;

Fig. 7 is a view similar to Fig. 4 with the various parts of the motors shown in the position they assume when the timer is at the beginning of the washing cycle as illustrated in Fig. 6;

Fig. 8 is a vertical sectional view of the motor in the position illustrated in Fig. 7;

Fig. 9 is a plan view similar to that shown in Fig. 3 except that the time controller is disclosed with the parts thereof in rinsing position and at substantially the beginning of the rinsing cycle of the dishwashing apparatus.

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 dishwashing 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 pipes **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 wash switch **48** (Figs. 3, 6 and 9) by an electrical conduit **49** having leads **50** and **51**.

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 adapted to be rotated by the reaction forces of the fluid under pressure expelled therefrom. Pipe **52** is revolved from a center connection **53** by said reaction 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 pipe **56** is disposed below rack **22** and projects streams of rinse-water upwardly over the dishes in rack **22**, said lower rinse pipe **56** revolving 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, 3, 6 and 9), 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. 3 and 6) 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 tension of spring **62** until closure valve **60** is unseated (Fig. 9) 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.

Wash switch **48** (Figs. 3, 6 and 9) comprises movable contacts **65** and **66** which are connected to leads **50** and **51**, respectively, and also comprises fixed contacts **67** and **68** which are respectively connected to source leads **69** and **70**. Movable contacts **65** and **66** are actuated by a switch lever **71** into and out of engagement with fixed contacts **67** and **68**, the movement of contacts **65** and **66** into engagement with fixed contacts **67** and **68** being against the tension of spring **72**. The tension of said spring **72** acts upon the movable contacts to disengage them from fixed contacts **67** and **68**.

The length of time that dishes in rack **22** are washed by the projection of sprays of wash-water downwardly thereon through upper spray pipes **32** and the projection of wash-water upwardly thereonto through sprays from lower spray pipes **33** and the length of time after said washing operation that the dishes are rinsed through the pro-

jection 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 a wash-time controller which acts upon wash-water switch **48** to open and close said switch so as to operate pump **38** when the switch is closed (Fig. 6) thereby circulating wash water from wash-water tank **41** into upper spray pipes **32** and into lower spray pipes **33** and prevent circulation of wash-water thereinto when said switch is open (Figs. 3 and 9). The time controlling apparatus **73** also comprises a 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** after switch **48** is opened 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.

Time controlling apparatus **73** (Fig. 1) consists of a wash-time controller **75** and a rinse-time controller **76** (Figs. 2, 3, 6 and 9). Wash-time controller **75** comprises a hydraulic motor **77** while rinse-time controller **76** comprises a similar hydraulic motor **78**. As shown, each of the hydraulic motors is identical in construction and is more specifically illustrated in Figs. 4, 5, 7 and 8. Main rotating shaft **79** has secured thereto a pinion **80** that is maintained in geared relation to a rack **81** forming part of the control piston **82** of hydraulic motors **77** and **78**. Control piston **82** has a piston head **83**, the function of which head is to control the movement of shaft **79** in an operative direction, that is, in a counterclockwise direction as illustrated, more particularly, in Figs. 6 and 9. Piston **82** has horizontal reciprocal movement in a horizontally extending cylindrical chamber **86**, piston head **83** being in fluid-tight relationship with the inner periphery of said chamber. Chamber **86** is closed at the opposite ends thereof while main rotating shaft **79** extends vertically upwardly through an upright cylindrical chamber **87**, both of which chambers are contained within the body **89** of the motors.

Fluid is contained within chamber **86** for movement from a position within said chamber behind head **83** (to left of said head, Figs. 4 and 5) to a location in chamber **86** in front of said piston head (to right of head, Figs. 7 and 8) and from the location within chamber **86** in front of the piston head to a position behind the head, as will hereinafter be fully set forth. Mounted within the piston head **83**, is a ball valve **90** adapted to close a passage **91** in the head **83** during movement of piston **82** and shaft **79** in an operative direction, that is, rotation of the shaft **79** in a counterclockwise direction (Fig. 4) and movement of the piston **82** to the right (Fig. 5). When the piston head **83** and piston **82** are moved in a direction the reverse of that just described, ball valve **90** is forced by fluid passing through passage **91** to move from its closed position in respect to said passage and into an enlarged portion **92** 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 **91** into that portion of chamber **86** ahead of piston head **83** (Figs. 7 and 8). For maintaining the ball valve **90** against movement out of the piston head **83**, a suitable retaining pin **93** is utilized.

Main operating shaft **79**, which extends vertically upwardly through upright cylindrical chamber **87**, has a collar **94** secured thereto by screws **95** so that said collar is rotatable with the shaft. Collar **944** has dog **96** thereon which is rotatable therewith, which dog engages a lower dog **97** on a movable collar **98**, which rotatable collar is idly positioned on shaft **79** so that when the shaft **79** is rotated in a clockwise direction (its inoperative movement) dog **96** will cause rotatable collar **98**, because of its engagement with lower dog **97**, to likewise turn in clockwise direction. This winds a coil spring **99** which spring is positioned within the upright cylindrical chamber **87** and has its lowermost end secured to lower rotatable collar **98** and its uppermost end secured to an upper non-rotatable collar **100**. Upper stationary collar **100** is idly mounted with respect to shaft **79** but is secured against rotatable movement by pins **101** which are anchored in the body **89** of the motors. Dog **102** on the upper collar **100** extends into path of movement of dog



**96** on collar **94** so as to limit the rotation of shaft **79** in a counterclockwise or operative direction.

As the shaft **79** rotates in a counterclockwise or operative direction and piston **82** moves to the right (Figs. 7 and 8), fluid in that portion of chamber **86** ahead of piston head **83** flows out of that portion of chamber **86** through an inlet portion **103** and into a horizontally extending liquid passage **104** (Figs. 4 and 7) which extends in the body portion **89** of the motors parallel to chamber **86**. Passage **104** has an outlet port **105** communicating with chamber **86** to the rear of piston head **83**. The speed at which piston **82** moves to the right (Figs. 7 and 8) is governed by the rate of flow at which the fluid from ahead of piston **83** passes outwardly of chamber **86** through inlet port **103** of passage **104**, which inlet port is controlled by inlet port control valve **106**. Adjustment of the inlet control valve inwardly toward its closed position reduces the size of inlet port **103** and lessens the speed with which the fluid ahead of piston head **83** flows outwardly of chamber **86** and into passage **104** thereby lessening the speed at which piston **82** moves to the right (Figs. 7 and 8) and decreasing the speed at which shaft **79** turns in a counterclockwise or operative direction. Movement of inlet port control valve **106** in the opposite direction toward its open position permits the fluid to flow from chamber **86** into inlet port **103** at a greater speed which permits piston **83** to move faster in a direction to the right of Figs. 7 and 8 thereby rotating shaft **79** at a greater speed in a counterclockwise or operative direction.

Hydraulic motors **77** and **78** are mounted on an upright mounting member **107** to which mounting member the motors are secured by screws **108** extending through lugs **109** on the body **89** of the motors. The upright mounting member **107** is secured to a base plate **110** and has at one end thereof an upright plate **111** extending at right angles thereto (Figs. 2, 3, 6 and 9) which upright plate is likewise secured to a base plate **110**.

Wash-time controller hydraulic motor **77** has a cam **112** mounted on motor shaft **79** thereof so as to rotate therewith. Cam **112** has a locking member riser **113** on the outer periphery **112'** thereof, which riser is substantially U-shaped and in spaced relationship with a switch actuating riser **114** also on the outer periphery **112'** of cam **112**. Riser **114** has an outermost surface **114'** extending between riser **113** and detent **115**. Periphery **112'** of cam **112** extends inwardly toward the center of the cam from surface **114'** into detent **115**.

Rinse-time controller motor **78** has a cam **88** so mounted on shaft **79** of said motor as to be rotatable with said shaft. Cam **88** has a rinse valve actuating riser **116** (Figs. 2, 3, 6 and 9) thereon which riser has a curved surface **116'** which extends into a locking member detent **117** at one side of riser **116**. At the opposite side thereof, detent **117** has a wall **118** which extends radially outwardly from the body of the cam from a point adjacent the center thereof to the outer periphery **119** of said cam.

Each of the cams **112** and **115** has an actuating arm **120** projecting outwardly from the periphery of each. An operating handle **121** is pivotally mounted on the arm **120** of cam **112** and has a stop **122** which engages arm **120** of cam **112** so that the hnadle will be operative to rotate the cam in a clockwise direction but inoperative to rotate said cam in a counterclockwise direction. So that rinse timer control cam **88** will be rotated in a clockwise direction simultaneously with the rotation of wash timer cam **112** in said clockwise direction by handle **121**, an operating lever **123** is pivotally mounted with respect to a stud **124** on arm **120** of cam **112** and, at the opposite end of said operating lever is pivotally and slidably mounted with respect to cam **88** on stud **125** on arm **120** of cam **88**. Stud **125** extends through a slot **126** in the operating lever **123**. The heads of studs **124** and **125** retain lever **123** from movement from the studs. As shown, the operating lever **123** is made in two sections, which sections are held in relationship to one another by a bolt **127** and nuts **128**. The bolt **127** and nuts **128** provide an adjustment whereby the operating lever **123** may be lengthened or shortened by the positioning of the nuts on said bolt at various positions.

A switch actuator arm **129** is rotatably mounted intermediate the opposite ends thereof on a pivot **130** which pivot is secured to upright mounting member **107**. At one end of arm **129**, is a plate **131** which plate is adjustable toward and away from arm **129** and

is disposed to engage switch lever 71 of switch 48. On the opposite end of switch actuator arm 129 is rotatably mounted a roller 132 which is engaged by risers 113 and 114 on cam 112 as will hereinafter be described.

Also pivotally mounted on upright mounting member 107 is a locking member 133 which has two arms 134 and 135 at right angles to one another. Arm 134 has a roller 136 rotatably mounted at the end thereof, which roller, when the locking member 133 is in locking position, is acted upon riser 113 of cam 112. Arm 135 has a roller 137 rotatably mounted at the end thereof, which roller is adapted to be releasably maintained in detent 117 of rinse timer cam 115 when said cam is held in locking position as will hereinafter be fully described. The locking member 133 is rotatably mounted adjacent the juncture of arms 134 and 135 on pivot 138.

Rinse valve 57 is mounted on upright plate 111, the stem 61 of which valve is operated by a plunger 139 mounted for reciprocal movement in bracket 140 toward and away from said valve. Plunger 139 is operated in a direction toward valve 57 by arm 141 of valve operating member 142 which operating member has another arm 143 extending at right angles to arm 141 and toward cam 88. Valve operating member 142 is pivotally mounted on bracket 140 on pivot 144. A roller 145 is rotatably mounted on the end of arm 143 and extends into the path of movement of riser 116 on cam 88.

So that an alarm will be given at the end of the washing and rinsing operations, a bell 146 is secured to upright plate 111 which bell is contacted by contacting member 147 disposed on a spring steel upright 148. Upright member 148 is acted upon by one end of a lever 149 pivoted intermediate the opposite ends thereof at 150 on upright mounting member 107. The opposite end of lever 149 designated by reference character 151 is in the path of wall 118 of detent 117 so that said wall will turn lever 149 in a clockwise direction to sound an alarm at the end of the dishwashing and rinsing operations as will hereinafter be described. Opposite end 151 of lever 149 is also in the path of riser 117 so that said riser will turn the lever in a counterclockwise direction into an operating position when cam 88 is turned in a clockwise direction.

Proceeding now to the operation of the timing mechanism of the present invention, the various parts thereof in their normal or inoperative position are illustrated in Figs. 2 to 5 of the drawings. Referring particularly to Fig. 3, it will be noted that movable contacts 65 and 66 of wash switch 48 are out of engagement with fixed contacts 67 and 68 of said switch. Electrical current, therefore, cannot flow from a source through live leads 69 and 70 into leads 50 and 51 of conduit 49 and electrical motor 44 and pump 38 are, therefore, in their inoperative position and wash-water is not circulated into the upper and lower spray pipes 32 and 33, respectively. Switch lever 71 is positioned at its furthermost location to the right (Fig. 3) and spring 72 is not under tension. Switch lever 71 is in the path of movement of plate 131 on switch actuator arm 129 when said actuator arm is moved in a counterclockwise direction on pivot 130 as will presently be described. In the position shown in Fig. 3, wash timer controller cam 112 and switch actuator arm 129 are so disposed in relationship to one another that roller 132 on arm 129 is positioned within detent 115 of cam 112. At this time, 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 139 bears against a stem 61 while the opposite end of said plunger is in contact with adjusting screw 144′ in arm 141 of valve operating member 142. Roller 145 in arm 143 of member 142 is in the path of movement of rinse valve actuating riser 116 on rinse timer control cam 88. Also, roller 137 on arm 135 of locking member 133 is in engagement with outer periphery 119 of rinse timer cam 88, the locking member 133 being held in the position shown in Fig. 3 by the periphery of cam 79 against tension of spring 138′.

The various parts of the wash time controller hydraulic motor 77 and rinse time controller hydraulic motor 78 are in the position illustrated in Figs. 4 and 5 when the various other parts of the timer are located in the normal or inoperative position illustrated in Fig. 3 as hereinabove described. It will be noted that pistons 82 of the motors are located in their furthermost position to the right, Figs. 4 and 5, the fluid in chamber 86 being to the rear or left of said piston head 83. Spring 99 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 then closed by closing doors 30 and 31, respectively. The timer is thereafter set in operation by the movement of handle 121 from position A, as illustrated in Fig. 3 in a clockwise direction to position B illustrated in dot-and-dash lines to the left of Fig. 3 and in full lines (Fig. 6). Movement of handle 121 from position A to position B rotates wash cam 112 and shaft 79 on wash time control motor 77 in a clockwise direction because stop 122 on handle 121 engages outwardly projecting arm 120 on cam 112. At no time during the operation of the timing mechanism of the present invention can the cams 112 and 88 be moved in a clockwise direction by handle 121 because movement of the handle 121 in a counterclockwise direction from a position A to position C, as shown in dot-and-dash lines (Fig. 3) will be on pivot 121′ by means of which the handle 121 is pivotally mounted on outwardly projecting arm 120 of cam 112.

As handle 121 is moved from position A (Fig. 3) to position B, the parts of the timer of the present invention are operated into washing position illustrated in Fig. 6. Cam 112 turns in a clockwise direction and operating lever 123 moves to the left of Fig. 3, the right hand end of slot 126 engaging stud 125 which causes rinse cam 88 also to rotate in a clockwise direction. As wash timer cam 112 turns in a clockwise direction from the position illustrated in Fig. 3 to the position illustrated in Fig. 6, riser 114 engages roller 132 on switch actuator arm 129 thereby moving actuator arm in a counterclockwise direction on pivot 130. Counterclockwise movement of actuator arm 129 on pivot 130 causes plate 131 to move switch lever 71 to the left from the position shown in Fig. 3 toward the position shown in Fig. 6 which in turn moves movable contacts 65 and 66 of the switch toward fixed contacts 67 and 68. When handle 121 has been moved to position B from position A, cam 112 has reached the full extent of its movement in a clockwise direction at which time roller 132 on switch actuator arm 129 has also been moved to the full extent of its movement in a counterclockwise direction after riding out of detent 115 of cam 112 over riser surface 114′ of riser 114 and into the position shown in Fig. 6. At this time switch lever 71 has been moved to the full extent of its movement to the left against the tension of spring 72 and movable contacts 65 and 66 of switch 48 are in engagement with fixed contacts 67 and 68 of said switch as shown in Fig. 6. Electrical current then flows from an electrical source through leads 69 and 70 through fixed contacts 67 and 68, movable contacts 65 and 66, thence through leads 50 and 51 of electrical conduit 49 to motor 44. Motor 44 is then 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 and through connecting pipe 35 into upper wash spray pipes 32. Sprays of water under pressure are thereby directed upwardly onto the dishes in rack 22 from lower spray pipes 33 and downwardly under pressure onto said dishes through upper spray pipes 32.

Rinse control cam 88 also was moved in a clockwise direction by movement of lever 123 to the left (Fig. 3) simultaneously with movement of cam 112 in a clockwise direction. The riser 116 on said rinse cam momentarily engages roller 145 on valve operating member 142 causing valve actuating member 142 to pivot in a clockwise direction on pivot 144 which only momentarily opens rinse control valve 57 but member 142 immediately returns to its normally closed position, as shown in Figs. 3 and 6, after

riser **116** passes roller **145** as the rinse cam turns in said clockwise direction from the position shown in Fig. 3 to the position shown in Fig. 6. Also, as cam **88** turns in a clockwise direction from the position illustrated in Fig. 3 to the position shown in Fig. 6, roller **137** of locking member **133** rides along outer periphery **119** of cam **88** until detent **117** comes opposite roller **137**, said roller at that time dropping into the detent through action of spring **138'**, locking member **133** then turning in a clockwise direction on pivot **138**. Rotation of locking member **133** in said clockwise direction brings roller **136** on arm **134** of the locking member into engagement with cam surface **112'** of cam **112** as shown more particularly in Fig. 6. In this position, locking member **133** prevents counterclockwise movement of rinse cam **88**.

As the rinse cam **88** was turning in a clockwise direction from the position shown in Fig. 3 to the position shown in Fig. 6, a portion of riser **116** engaged the opposite end **151** of lever **149** moving said lever in a counterclockwise direction on pivot **150** so that the opposite end of lever **149** was caused to engage the spring steel upright **148** slowly moving it to the left until the tip end of lever **149** passes the upright said upright thereafter assuming the position shown in Fig. 6.

As cams **112** and **88** are turned in a clockwise direction from the position shown in Fig. 3 to the position shown in Fig. 6, the various parts of the wash time control hydraulic motor **77** and the rinse time control hydraulic motor **78** are moved from the positions illustrated in Figs. 4 and 5 to the positions shown in Figs. 7 and 8. Turning of the shafts **79** of hydraulic motors **77** and **78** in a clockwise direction likewise turns pinions **80** in a clockwise direction, which pinions act upon rack **81** so as to move pistons **82** and piston heads **83** thereon in a direction to the left from the position shown in Figs. 4 and 5 toward the position shown in Figs. 7 and 8. Movement of pistons **82** to the left forces fluid from the portion of chambers **86** to the left of or behind piston heads **83** through passages **91** into the portion of chambers **86** ahead piston heads **83**, the flow of fluid through said passages **91** causing ball valves **90** to move into the enlarged portion **92** of the passage so that flow of fluid from behind the piston heads **83** to the forward part thereof is permitted. Turning of the shafts **79** in a clockwise direction rotates collars **94** in a clockwise direction, the dog **96** on said collars engaging dog **97** on lower rotatable collars **98**. This causes collars **98** to turn in a clockwise direction thereby winding spring **99**, the upper collars **100** being retained against movement by pins **101**. When the cams **112** and **88** have reached the full extent of their movement in a clockwise direction the pinions **80** have reached the end of racks **81** as shown in Figs. 7 and 8 and further clockwise movement of shafts **79** and the cams thereon is prevented.

Thusly, the timer mechanism of the present invention is operated from its normal inoperative position as illustrated in Figs. 3, 4 and 5 to its washing position as shown in Figs. 6, 7 and 8. The various parts of the timing mechanism are illustrated at the beginning of the washing cycle in Figs. 6, 7 and 8.

At the beginning of the washing cycle and throughout said cycle movement of the main rotating shaft **79** of rinse motor **78** is prevented by engagement of roller **137** of the locking member **133** with the wall **118** of locking member detent **117** in cam **88**. Shaft **79** of washing hydraulic motor **77**, however, is free to turn in a counterclockwise direction by the motor, said shaft being turned by the unwinding of spring **99** therein which acts to turn collar **98** in a counterclockwise direction, the dog **97** on said collar engaging the dog **96** on intermediate collar **94** thereby turning collar **94** in a counterclockwise direction thereby rotating shaft **79** in said counterclockwise direction until the dog **96** engages dog **102** on upper collar **100** which prevents further movement of the shaft **79**. The speed at which shaft **79** is rotated in a counterclockwise direction is governed by movement of the piston **82** and piston head **83** against fluid in chamber **86** to the right of the piston head (Figs. 7 and 8). The piston **82** may move to the right (Figs. 7 and 8) only upon the escape of fluid from the right of piston head **83** which escape is through inlet port **103**, the size of the opening of which is controlled by inlet port control valve **106**. As the fluid to the right of piston head **83** (Figs. 7 and 8) escapes through inlet port **103** the fluid flows through horizontally extending liquid passage **104** and outwardly thereof through outlet port **105** into chamber **86** to the left of the



piston head **83** which permits the piston to move from the position shown in Figs. 7 and 8 to its normal position as shown in Figs. 4 and 5 thereby turning shaft **79** of washing motor **77** in a counterclockwise direction.

As the shaft **79** of wash motor **77** turns in a counterclockwise direction at the above mentioned controlled rate of speed, the cam **112** on said shaft also turns in said direction. Turning of cam **112** in a counterclockwise direction moves riser **114** and riser surface **114'** in said counterclockwise direction, the roller **132** on switch actuator arm **129** being maintained in engagement with surface **114'** by action of spring **72** on switch lever **71**, which switch lever **71** bears against plate **131** so as to urge actuator arm **129** in a clockwise direction on pivot **130** thereby urging roller **132** into engagement with cam **112**. As cam **112** rotates in a counterclockwise direction, from the position illustrated in Fig. 6 to the position shown in Figs. 9 and 3, roller 132 moves over surface **114'** toward and into detent **115**, the actuator arm turning in a clockwise direction as the roller **132** moves into detent **115** while switch lever **71** moves to the right. As switch lever **71** reaches the full extent of its movement to the right, as shown in Fig. 9, and roller **132** passes completely into detent **115**, movable contacts **65** and **66** disengage fixed contacts **67** and **68** interrupting the flow of electrical current to motor **44** thereby preventing further circulation of wash-water from wash-water tank **41** into the upper and lower wash spray pipes **32** and **33**, respectively. At this point, the washing cycle is ended. It will be readily understood that the length of time of the washing cycle is controlled by the rate at which fluid flows through the control inlet port **103** of motor **77** which controls the rate at which shaft **79** and cam **112** turns in a counterclockwise direction thereby controlling the length of time required for roller **132** to pass from the position shown in Fig. 6, in which position electrical current flows from a source through the switch **48** to motor **44** until roller **132** and switch actuator arm **129** reach their normally inoperative position illustrated in Figs. 3 and 9 in which inoperative position the flow of electrical current through the switch to the motor is interrupted.

During the turning of cam **112** from the position shown in Fig. 6 to the position shown in Figs. 9 and 3, the tension of spring **138'** of locking member **133** retains roller **136** in engagement with the outer periphery **112'** of cam **112**. As roller **136** passes along said periphery it is engaged by riser **113** on the cam, which riser causes the roller and arm **134** of locking member **133** to turn in a counterclockwise direction on pivot **138** against the tension of spring **138'**. As locking member **133** turns in said counterclockwise direction, roller **137** is moved away from wall **118** of detent **117** on rinse cam **88** until, at the peak of riser **113**, roller **137** disengages wall **118** of rinse cam **88**, thereby unlocking said cam so that it may be turned in a counterclockwise direction by action of hydraulic motor **78**.

Thusly, the timer mechanism of the present invention is operated from the beginning of its washing cycle, illustrated in Fig. 6, to the beginning of its rinsing cycle.

As the cam **88** moves in a counterclockwise direction, riser **116** of the cam engages roller **145** on valve operating member **142** which is in the path of movement of said riser, the roller rides along the surface **116'** of the riser as the cam turns causing the valve actuator to turn in clockwise direction on pivot **144**. Adjusting screw **144'** on member **142** is moved against plunger **139** by movement of arm **141** which presses valve stem **61** inwardly of the valve against the tension 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 Fig. 9. 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 the rack **22**.

As cam **88** continues to turn in a counterclockwise direction from the position shown in Fig. 9 to its normal inoperative position as shown in Fig. 3, roller **145** is maintained in contact with surface **116'** of riser **116** by action

of spring 62 on valve stem 61 and the action of the valve stem on plunger 139, adjusting screw 144' and arm 141 of valve actuator 142. The surface of riser 116 is so shaped that in the movement of the cam 88 from the position shown in Fig. 9 to that shown in Fig. 3, valve actuator 142 is permitted to turn on pivot 144 in a counterclockwise direction after the peak of riser 116 is past permitting valve stem 61 to gradually move outwardly of the valve and gradually permit closure valve 60 to move towards valve seat 63 until in the position shown in Fig. 3. Closure valve 60 is thereby seated in the valve seat preventing further flow of rinse-water through the valve to the rinse spray pipes at which time the rinsing operation is completed.

The operation of rinse hydraulic motor 78, after the movement of roller 137 of locking member 133 out of detent 117, is similar to the operation wash hydraulic motor 77 when said motor is operating cam 112 in a counterclockwise direction. That is, the unwinding of spring 99 of motor 78 turns lower movable collar 98 in a counterclockwise direction which, through engagement of dog 97 with dog 96 on the intermediate collar 94, causes shaft 79 to rotate in said counterclockwise direction as the spring unwinds. This moves piston 82 to the right (Figs. 7 and 8) as liquid to the right of piston head 83 escapes from chamber 86 through control inlet port 103 thereafter to pass through horizontal passage 104 and into chamber 86 through outlet port 105 behind piston head 83. Likewise, inlet port control valve 106 regulates the flow of fluid into passage 104 from chamber 86 which thereby regulates the speed of travel of piston 82 to the right (Figs. 7 and 8). This in turn controls the rate at which shaft 79 and cam 88 turns in a counterclockwise direction which determines the time which it will take for cam 88 to move from the position shown in Fig. 9 to its normally inoperative position shown in Fig. 3 which in turn determines the length of time of the rinsing cycle. Therefore, control of the rate of flow of fluid through inlet port 103 by inlet port control valve 106 will control the length of time of the rinsing cycle.

Just prior to completion of the rinsing cycle wall 118 of the cam 88 engages the opposite end 151 of lever 149 causing the lever to be pivoted on pivot 150 in a clockwise direction. Movement in said clockwise direction of lever 149 causes the outer end thereof to bend upright 148 which is of spring steel to the right (Fig. 6) such distance that the outer end of the lever will pass the upright 148 permitting said upright to be snapped to the left (Fig. 9) so that contacting member 149 strikes bell 146 giving an alarm or signal that the washing and rinsing operation are completed.

Inasmuch as various modifications may be made in the forms 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. Control apparatus for controlling the time of washing and rinsing dishes in a dishwashing and rinsing machine having an area in which dishes are washed and thereafter rinsed which machine has means for directing washing fluid onto the dishes, other means for directing rinsing fluid onto the dishes, means for delivering washing fluid under pressure to said means for directing washing fluid, washing fluid-flow control means for controlling the operation of said washing fluid delivering means, valve means for controlling the flow of rinsing fluid to said rinse fluid directing means, and valve actuating means for opening and closing said valve, which control apparatus comprises timing means operatively associated with said washing fluid-flow control means and with said valve actuating means, said timing means comprising a washing time control motor and a rinsing time control motor each motor having a rotatable shaft, an actuator on the shaft of the washing time control motor operatively associated with the washing fluid-flow control means, another actuator on the shaft of the rinsing time control motor and operatively associated with said valve actuating means, means for simultaneously turning the shafts of said motors in one direction from a normal position to a predetermined position, means operatively associated with the shaft of each motor so as to turn each shaft from said predetermined position to its normal position, locking means operative on the shaft of the rinsing time control motor when said shaft reaches said predetermined position to maintain said shaft against turning in said opposite direction when the shaft of the washing time control motor is turning in said opposite direction, said locking means being operative out of its locking position by said actuator on the shaft of the washing time control motor, and control means associated with each motor for controlling the rate of speed at which the shaft of a motor turns in said opposite direction, the actuator on the shaft of the washing time control motor being inoperative in respect to the washing fluid-flow control means when the shaft of said motor is in its normal position and operative in respect to said washing fluid-flow control means so as to operate the washing fluid delivering means when said shaft is turned in said one direction and so as to maintain the washing fluid-flow control means and delivering means in said operative position as said shaft turns in the opposite direction and until it reaches said normal position, the actuator also being operative in respect to said locking means to operate the locking means out of locking position as the shaft on said washing time control motor reaches said normal position, said other actuator being in operative relationship to the valve actuating means so as to permit the valve to remain in its closed position when the rinsing time control motor shaft is in its normal position and to open the valve when said shaft is turned in said one direction from its normal position to an intermediate position and close said valve when the shaft is turned from the intermediate position to an abnormal position and permit the valve to remain in its closed position when the rinsing time control motor shaft is in its abnormal position and to open the valve when the shaft is turned in the opposite direction from its abnormal position to an intermediate position and close said valve when the shaft is turned in said opposite direction from the intermediate position to said normal position.

2. The apparatus of claim 1 wherein the motor shafts have operatively associated therewith means for manually turning said shafts simultaneously in said one direction and wherein the motors each comprise means for hydraulically controlling the rate of speed at which the shafts each turn in said opposite direction.

3. The apparatus of claim 2 wherein the means for delivering washing fluid to said means for directing the washing fluid comprises a pump, electric motor for driving said pump and wherein the washing fluid-flow control means comprises an electrical switch for controlling the flow of electrical current from a source to said electrical motor.

4. The apparatus of claim 3 wherein the valve is normally retained in its closed position by resilient means and the timing means is so constructed and arranged as to actuate the valve into an open position against the tension of said resilient means, maintain the valve in said open position for a predetermined period of time to permit flow of fluid to said rinse directing means, and permit said resilient means to move the valve to its closed position at the expiration of said period of time.

5. Control means for dishwashing and rinsing apparatus which apparatus has means for delivering washing fluid under pressure onto dishes to be washed, washing fluid-flow control means for controlling the operation of said washing fluid delivering means, valve means for controlling the flow of rinsing fluid onto said dishes after the dishes have been washed, and valve actuating means for opening and closing said valve, the control means comprising a washing time control motor and a rinsing time control motor each motor having a rotatable shaft, an actuator on the shaft of the washing time control motor operatively associated with the washing fluid-flow control means, another actuator on the shaft of the rinsing time control motor and operatively associated with said valve actuating means, means for simultaneously turning the shafts of said motors in one direction from a normal position to a predetermined position, means operatively associated with the shaft of each motor so as to turn each shaft from said predetermined position to its normal position, locking means operative on the shaft of the rinsing time control motor when said shaft reaches said predetermined position to maintain said shaft against turning in said opposite direction when the shaft of the washing time control motor is turning in said opposite direction, said locking means being operative out of its locking position by said actuator, and control means

associated with each motor for controlling the rate of speed at which the shaft of a motor turns in said opposite direction, the actuator on the shaft of the washing time control motor being inoperative in respect to the washing fluid-flow control means when the shaft of said motor is in its normal position and operative in respect to said washing fluid-flow control means so as to operate the washing fluid delivering means when said shaft is turned in said one direction and so as to maintain the washing fluid-flow control means and delivering means in said operative position as said shaft turns in the opposite direction and until it reaches said normal position, the actuator also being operative in respect to said locking means to operate the locking means out of locking position as the shaft on said washing time control motor reaches said normal position, said other actuator being in operative relationship to the valve actuating means so as to permit the valve to remain in its closed position when the rinsing time control motor shaft is in its normal position and to open the valve when said 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 apparatus of claim 5 wherein the motor shafts have operatively associated therewith means for manually turning said shafts simultaneously in said one direction and wherein the motors each comprise means for hydraulically controlling the rate of speed at which the shafts each turn in said opposite direction.

7. The control means of claim 5 wherein the means for delivering washing fluid to said means for directing the washing fluid comprises a pump, electric motor for driving said pump and wherein the washing fluid-flow control means comprises an electrical switch for controlling the flow of electrical current from a source to said electrical motor.

8. Control means for dishwashing and rinsing apparatus which apparatus has means for delivering washing fluid under pressure onto dishes to be washed, washing fluid-flow control means for controlling the operation of said washing fluid delivering means, valve means for controlling the flow of rinsing fluid onto said dishes after the dishes have been washed, and valve actuating means for opening and closing said valve, the control means comprising a washing time control motor and a rinsing time control motor each comprising 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 operatively associated with the shaft of each motor so as to simultaneously turn the shafts in said one direction from their normal position to their predetermined position, shaft actuating means operatively associated with each motor shaft to actuate its respective shaft in said opposite direction only, each 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, and 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.



9. The control means of claim 8 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.

10. The control means of claim 9 wherein the means for delivering washing fluid to said means for directing the washing fluid comprises a pump, electric motor for driving said pump and wherein the washing fluid-flow control means comprises an electrical switch for controlling the flow of electrical current from a source to said electrical motor.

11. The control means of claim 10 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 rinsing time motor shaft reaches its normal position.

12. The control means of claim 11 wherein the actuator on the shaft of the washing time control motor comprises one cam and the other actuator on the shaft of the rinsing time control motor comprises a second cam, said one cam having arranged on the periphery thereof consecutively in the direction of turning of the washing time control motor shaft in its said one direction a riser surface and a further riser surface, said second cam having arranged on the periphery thereof a riser, the cams being so disposed on the motor shafts in respect to each other that when the shafts are in their normal position the one cam is inoperative in respect to the electrical switch of the washing fluid-flow control means and the second cam is inoperative in respect to the valve actuating means and so that when the shafts are turned in said one direction from a normal position to a predetermined position the riser on the one cam operates the electrical switch so that electrical current flows to the electrical motor and the motor actuates the pump and the locking means engages the other detent in the second cam to maintain the shaft of the rinsing time control motor against movement in its opposite direction, said cams also being so disposed on the motor shafts that when the shaft on said washing time control motor turns in said opposite direction the riser on the one cam maintains said switch in operative position until said shaft reaches said normal position and said further riser on said one cam actuates the locking means into inoperative position in relationship to said second cam permitting said second cam to turn in said opposite direction so that the riser on said second cam acts upon said valve actuating means to maintain the valve in open position until said shaft of the rinsing time control motor returns to its normal position.


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