June 11, 1957 K. O. SISSON 2,795,126

CLOTHES WASHING MACHINE

Filed Oct. 23, 1952 2 Sheets-Sheet 1

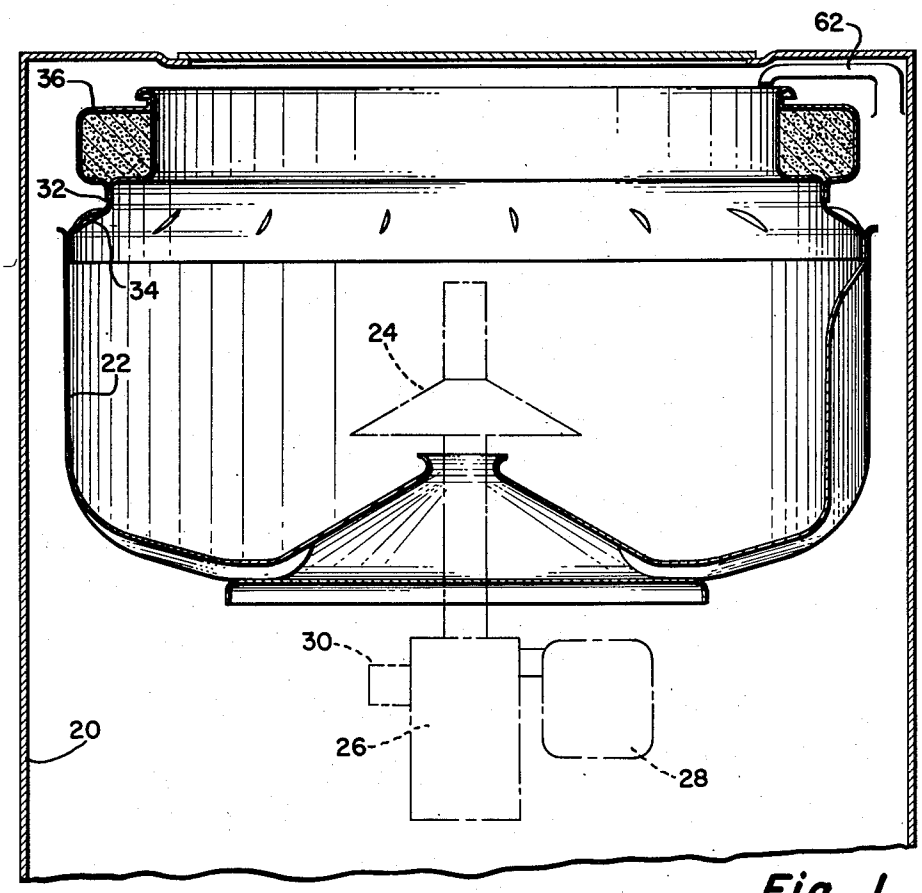


Fig. 1

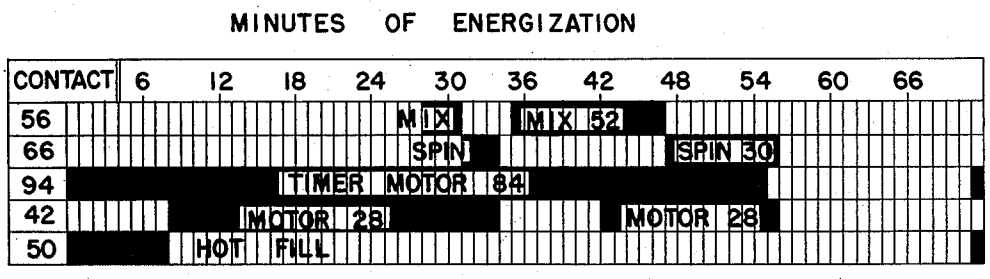


Fig. 2

INVENTOR.
Kenneth O. Sisson
BY
Willits Hardman and Fehr
attorneys

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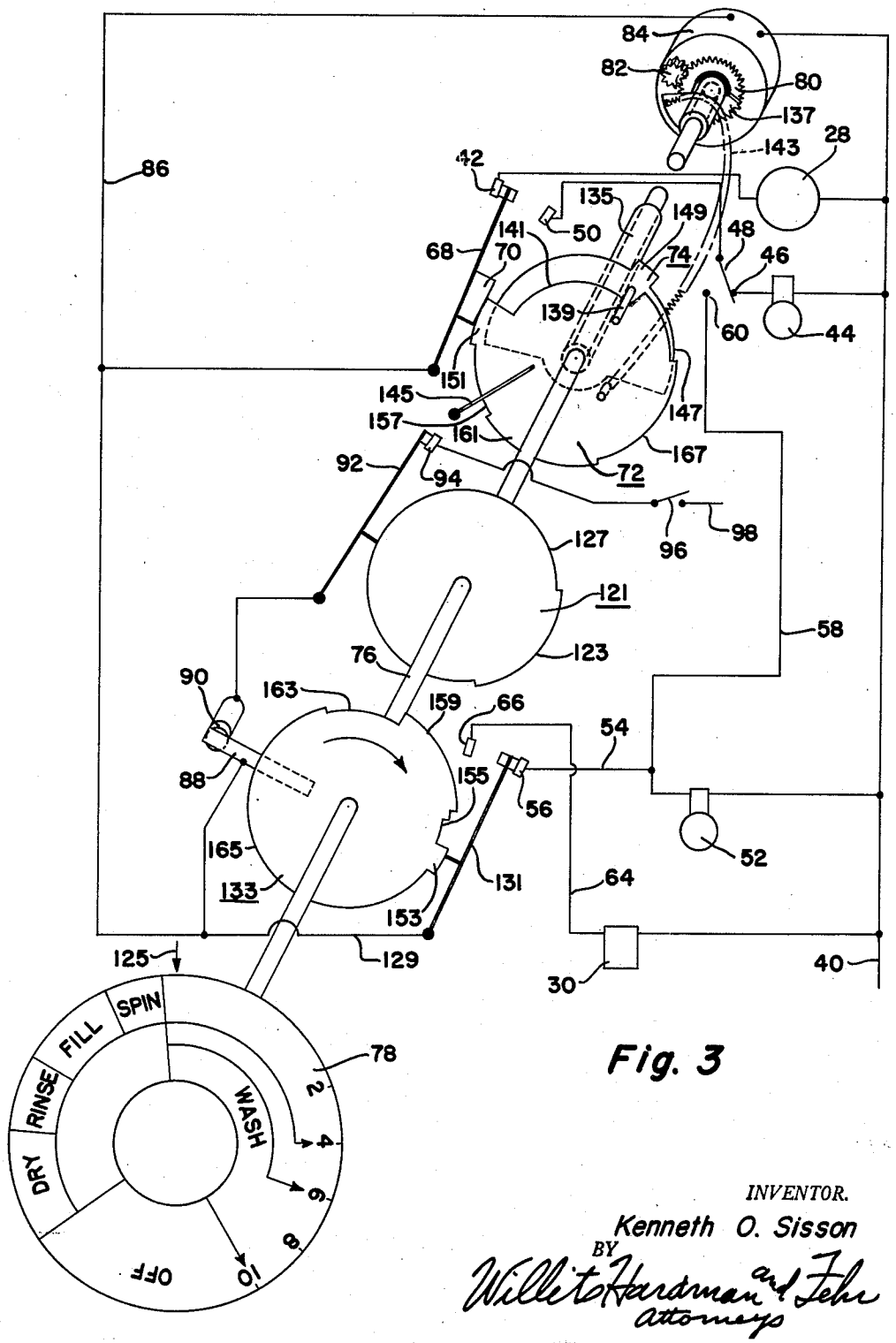


Fig. 3

INVENTOR.
Kenneth O. Sisson
BY
Willett Hardman and Fehr
attorneys

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CLOTHES WASHING MACHINE

Kenneth O. Sisson, Dayton, Ohio, assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

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1 Claim. (Cl. 68—12)

This invention relates to a domestic appliance and more particularly to a control arrangement for providing an overflow of liquid near the end of the agitating period to float away scum.

In clothes washing machines most of the dirt, lint and undissolved soap and detergent collects as a floating soil or scum on the surface of the water. When the water is removed this soil or scum is deposited on the clothes. If this soil or scum can be removed before the water is removed then fewer rinses are required.

It is an object of my invention to provide a control which overfills the tub at the end of the agitation period and the rinse periods to float away the scum on the surface of the liquid in the tub.

It is another object of my invention to provide a control which alternately operates the drive means and provides the initial fill and which provides a mixed water fill during the operation of the driving means.

It is another object of my invention to provide a control providing a preselected wash period which is preceded by a fixed time initial fill and which provides an overflow fill during the wash period.

These objects are attained in the form shown by providing a regulating device in which a camshaft provided with a gear is driven in a predetermined timed relationship by a pinion. A coaxial relatively rotatable shaft is provided with a cam and a sector gear having teeth arranged on the same pitch diameter and having the same width and depth of teeth as the main camshaft gear. This sector gear is so arranged that it may be moved axially into and out of engagement with the drive pinion. When out of engagement with the drive pinion it is held from rotation by a detent so that the camshaft may be rotated while the sector gear and its cam are held by the detent. This arrangement is used to preselect the time of the variable wash period. When the sector gear is moved back into relationship with the pinion the relationship between the two shafts are fixed. This relationship determines the length of the wash or agitation period.

The cam connected to the sector gear determines the time of initial fill period. It is associated alongside a second cam on the main camshaft. Together they operate a double throw switch which in one position is connected to the hot-mix selector switch connecting with either the hot or mixed water fill valves and in its opposite position is connected to the drive motor.

The main camshaft is provided with a second cam operating a double throw switch which in one position serves to remove the water from the tub by spinning and in the opposite position connects to the mixed water valve. This cam is so arranged to open the mixed water valve while the wash cam energizes the motor during the agitation period so that water in the tub will overflow to float away the scum before the spinning period.

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

In the drawings:

Figure 1 is a diagrammatic view of a washing machine to which my invention may be applied;

Figure 2 is a chart showing the operating periods of the various parts of the washing machine shown in Figure 1; and

Figure 3 is a diagrammatic illustration of a timing device which provides the operating periods shown in Figure 2.

Referring now to the drawings and more particularly to Figure 1 there is shown a washing machine 20 provided with a tub 22 containing a vertical reciprocating type of agitator 24. The agitator 24 and the tub 22 are connected to a transmission 26 which in turn is connected to an electric driving motor 28. The transmission 26 is provided with a spin solenoid 30 shown on Figure 3 which when energized causes the motor 28 to be connected to the tub 22 to spin the tub 22 for the purpose of centrifugally throwing the water out of the tub and drying the clothes. When the spin solenoid 30 is deenergized, the motor 28 is connected to the agitator 24 which is reciprocated to agitate the water and the clothes in the tub 22.

The tub 22 is provided with an inturned flange 32 extending inwardly at an angle of about 40° which is provided with a series of openings 34 extending entirely around the tub. When additional water is added to the tub near the end of the agitation period and near the end of the rinse period, the scum on the surface of the liquid will be floated through these openings 34 out of the tub. The inturned flange 32 is provided with a hollow ring-shaped container 36 which may be filled with lead shot or iron powder or other ballast material to serve as a fly-wheel to minimize vibration and oscillation during the spinning period.

The control system is shown in Figure 3 and includes the motor 28 having one terminal connected to the supply conductor 40 and the other terminal connected to a fixed contact 42. There is also provided a hot water solenoid valve 44 having one terminal connected to the supply conductor 40 and the second terminal connected to the one stationary contact 46 of a double throw selector switch 48. This switch 48 has its movable contact connected to the stationary contact 50. There is also provided a mixed water solenoid valve 52 having one terminal connected to the supply conductor 40 and the other terminal connected by the conductor 54 to the stationary contact 56. The conductor 54 is connected by a conductor 58 to the stationary contact 60 of the selector switch 48. The hot water solenoid valve 44 and the mixed water solenoid valve 52 discharge through the filler spout 62 into the tub 22. The spin solenoid 30 has one terminal connected to the supply conductor 40 and the second terminal connected by the conductor 64 to the stationary contact 66.

The switch contacts 42 and 50, connecting respectively to the motor 28 and the solenoid valve 44, are adapted to be contacted by the double throw switch 68 provided with a cam follower 70 operated by cooperating cams 72 and 74. The cam 72 is fixed to a camshaft 76 upon the front end of which is fixed a dial knob 78 provided with legends indicating various length of agitation or wash periods as well as spin, fill, rinse, dry and off periods. The opposite end of the camshaft 76 is connected to a gear 80 driven by a pinion 82 which is rotated at a predetermined speed by the timing motor 84 whenever the timing motor 84 is energized. One terminal of the timing motor 84 is connected to the supply conductor 40 while its second terminal is connected by the conductor 86 to a movable switch contact 88 closed when the dial knob 78 and the camshaft 76 are pushed rearwardly and opened when the dial knob 78 and the

camshaft 76 are pulled forwardly. The movable contact 88 is adapted to engage and be disengaged from the stationary contact 90 which is connected directly to a cam operated switch member 92 cooperating with a stationary contact 94 which in turn is connected through a lid switch or safety switch 96 to the second supply conductor 98. The movable switch contact 92 is provided with a follower operated by the cam 121 fixed to the camshaft 76. This cam 121 is provided with a projection 123 for moving the switch 92 to the open circuit position during the off period of the dial knob 78. The legends on the dial knob 78 cooperate with the pointer 125 which points to the particular operation indicated on the dial which is in effect at the particular time. The cam 121 has a low portion 127 corresponding to the operating periods indicated on the dial knob 78 for closing the switch contact 92 during those periods.

The conductor 86 is also connected by the conductor 129 to the movable contact 131 of the double throw switch which operates between the stationary contacts 56 and 66 which connect respectively to the mixed water solenoid valve 52 and the spin solenoid 30. This double throw switch contact 131 is provided with a cam follower which engages the periphery of the rotatable cam 133 which is fixed to the camshaft 76. In addition, this cam 133 serves to operate the movable contact 88 to open and closed position whenever the camshaft 76 and the dial knob 78 are pulled forwardly or pushed rearwardly.

The cam 74 is fixed to the front end of a sleeve 135 which is rotatably mounted upon the camshaft 76 between the cam 72 and the gear 80. The rear end of the sleeve 135 is provided with a sector gear 137 which when the dial knob 78 and the camshaft 76 are pushed in, is adapted to mesh with the pinion 82 when rotated to the proper angular position. The cam 74 is also provided with a pin 139 which projects into a deep arcuate notch 141 in the cam 72. The length of this notch 141 corresponds approximately with the length of the variable wash or agitation period indicated on the dial knob 78. When the dial knob 78 is pushed in, the pin 139 rotates freely with the camshaft 76. A coil spring 143 connects the sleeve 135 and the cam 72 in such a manner as to resiliently hold the pin 139 against the clockwise end of the notch 141.

When the dial knob 78 and the camshaft 76 are pulled forwardly in the off position and then rotated to the desired length of wash period, the pin 139 will engage a detent 145 which will stop the rotation of the floating cam 74 while the cam 72, the camshaft 76 and the dial knob 78 are rotated. The cam 74 is provided with a low portion 147 which is used to provide the fixed initial fill period. This low portion 147 is terminated by a high projecting portion 149 which constitutes the beginning of the agitation period. When the dial knob 78 is pulled forwardly in the off position and then rotated clockwise, the cam 74 and the pin 139 are pulled forwardly and then rotated until the pin 139 engages the detent 145 approximately when the indication 10, upon the wash period portion of the dial knob 78, is opposite the indicating arrow 125. The engagement of the pin 139 with the detent 145 prevents the movement of the sector gear 137 into engagement with the pinion 82 to permit independent rotation of the cam 72 and the gear 80. Rotation of the dial knob 78 to other wash periods, indicated by the figures 2 to 8 on the dial knob 78, will not change the position of the cam 74 since it will be continued to be held in its same starting position by the engagement of the pin 139 with the detent 145. In this position the cam follower 70 will be resting upon the low portion 147 of the cam 74. In this position, the sector gear 137 will be located adjacent but out of mesh with the pinion 82 and slightly beyond the end of the pinion.

When the dial knob 78 and the camshaft 76 are pushed in, the switch 88 will engage the stationary contact 90 to close the circuit from the supply conductor 98 through the switches 96, 92 and 88 and the conductor 86 to the timing motor 84 which has its second terminal directly connected to the supply conductor 40. This is indicated on the line 94 in Figure 2. The pushing rearward of the dial knob 78 and the camshaft 76 also frees the pin 139 from the detent 145 and moves the first tooth of the sector gear 137 into engagement with the pinion 82 of the now energized timer motor 84. The follower 70 will be in engagement with the low portion 147 which will cause the contact 68 to move into contact with the contact 50 which will connect the conductor 86 through the switch 68 and its contact 50 and through the selector switch 48 with either the hot water solenoid valve 44 or by the conductor 58 with the mix water solenoid valve 52. Each of these valves 44 and 52 has its second terminal connected to the supply conductor 40. This is indicated by the bottom line 50 in Figure 2. This will cause the valve 44 to open permitting the flow of hot water through the filler spout 62 into the tub 22.

The pinion 82 through the sector gear 137 and the sleeve 135 drives the cam 74. At the same time the pinion 82 through the gear 80 and the camshaft 76 drives the cams 72, 121 and 133 at the same speed of rotation as the cam 74. The sector gear 137 continues in driving engagement with the pinion 82 throughout the initial fill period in which the low notch 147 is in engagement with the cam follower 70 and the movable contact 68 is in engagement with the contact 50. The sector gear continues in engagement with the pinion 82 until the high projection 149 engages and lifts up the follower 70 until the follower 70 rides upon the top of the projection 149. This will move the switch 68 out of engagement with the contact 50 (to stop the initial fill by deenergizing the solenoid valve 44 or the valve 52) and into engagement with the stationary contact 42 which will energize the motor 28. The total length of time during which the hot water solenoid valve 44 is energized is always the same and it determines the volume of initial fill of the tub 22. This time is always the same because the sector gear 137 drives the cam 74 the same distance at the start of every wash because the pin 139 and the detent 145 always locates the cam 74 in the same starting position.

The camshaft 76, however, is placed in a location which corresponds to the setting of the dial knob 78 when it is pushed rearwardly. The dial knob 78 may be pushed in when any of the legends 1½ to 10 of the wash period are opposite the indicating arrow 125. This will fix the location of the deep notch 141 of the cam 72 relative to the pin 139 and the cam 74. For a 10 minute wash period the pin 139 will be in the clockwise end of the deep notch 141 as shown in Figure 3. For shorter wash periods the notch 141 will be moved farther clockwise relative to the pin 139. During the wash or agitation period the cam follower 70 rests upon the top of the high projection 149 until the projection 151 at the counterclockwise end of the deep notch 141 engages the pin 139. The cam follower 70 will then ride off the projection 149 onto the projection 151 and the agitation period continues. The energization of the motor 28 is indicated in line 42 of Figure 2.

According to my invention, as shown on the chart in Figure 2, there is indicated a mixed fill period in which the contact 56 is engaged toward the end of the agitation or wash period. Because the cams 72 and 74 are used alternately for energizing the hot water fill valve 44 and the motor 28, the agitation fill cannot be performed by the cams 72 and 74. To provide this additional fill, therefore, a projection 153 is provided on the cam 133 which moves the switch contact member 131 in engagement with the stationary contact 56 to energize and open the mixed water solenoid valve 52 during that portion of the energization of the motor 28 which is indicated on Figure 2. This projection 153 is made sufficiently long that sufficient water flows through the filler spout 62 into the tub that the liquid level therein will be raised

above the level of the series of outlets 34 to cause the liquid to overflow through the outlets 34 from the tub 22. This overflow will carry off the scum on the surface of the water so that this scum will not be deposited on the clothes during the following spinning period.

When the end of the projection 153 is reached, the follower of the movable switch contact 131 will drop into the notch 155 thereby moving the movable contact 131 into engagement with the stationary contact 66 which connects to the spin solenoid 30. This is indicated in line 66 of Figure 2. The energization of the spin solenoid 30 will connect the motor 28 through the transmission 26 with the tub 22 to cause the tube to rotate and to centrifugally throw the water out of the tub and out of the clothes through the openings 34 until substantially all of the water is removed. After this, the follower 70 rides off of the projection 151 onto the shallow notch 157 providing the movement of the switch contact member 68 to a position midway between the contacts 42 and 50 to deenergize the motor 28 as indicated in Figure 2. At the same time the follower of the switch 131 will move up by a step arrangement onto a high projection 159 which will move the movable contact 131 into engagement with the stationary contact 56 which connects to the mixed water solenoid 52. This will open the mixed water solenoid valve 52 and start the flow of mixed water through the filler spout 62 into the tub 22 as indicated in Figure 2.

When sufficient water has flowed into the tub, the projection 161 on the cam 72 engages the follower 70 to move the movable contact 68 into engagement with the stationary contact 42 to reenergize the motor 28 as indicated in Figure 2. Since the spin solenoid 30 is deenergized at this time the motor will be connected through the transmission 26 to the agitator 24 to agitate the clothes and the liquid in the tub 22. The mixed water, according to my invention will continue to flow into the tub 22 as indicated in Figure 2 because of the length of the projection 159 until the water level rises above the level of the series of outlets 34 and overflows the tub 22 to float the remainder of the scum on the surface through the outlets 34.

When this is accomplished, the follower of the switch 131 drops into the notch 163 of the cam 133 to move the switch 131 into engagement with the contact 66 to energize the spin solenoid 30 as indicated in Figure 2. This will reconnect the motor 28 with the tub 22 and cause it to spin. This spinning continues sufficiently long to cause the flow of all of the water out of the tub 22 and out of the clothes therein by centrifugal force so that when the follower of the switch 131 engages the end of the notch 163 the clothes will be substantially dry.

At the end of the notch 163 is provided a long projection 165 on the cam 133 which will hold the movable switch contact 131 in a position mid-way between the contacts 56 and 66. At the same time the follower 70 will ride off of the projection 61 onto the shallow notch 167 of the cam 72 which will hold the switch 68 in its mid position. Also at this time the projection 123 of

the cam 121 will engage the follower of the switch 92 to move it to open position to deenergize the timer. At this time the dial knob 78 will have turned sufficiently far to bring its off position opposite the indicating arrow 125. Thus I have provided a control in which the scum is floated off by over-filling the tub near the end of the wash period and the rinse period.

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

What is claimed is as follows:

A washing machine including a clothes washing container having an overflow outlet, electrically controlled hot and warm water supply means for said clothes washing container, electrically operated means for agitating the liquid in said clothes washing container, electrically operated means for rotating said container to cause any liquid therein to flow by centrifugal action out said overflow outlet, a control means including a driving means and a plurality of rotatable cams driven by said driving means, a first double throw switch means operated by a first rotary cam, a second double throw switch means operated by a second rotary cam, one of the stationary contacts of said first switch means being connected to the agitator means and the other stationary contact being connected to the hot water supply means, one of the stationary contacts of said second switch means being connected to the rotating means and the other stationary contact being connected to the warm water supply means, said first cam having means for operating said first switch means to engage the contact connected to the hot water supply means during one period and having means for operating said switch means to engage the contact connected to the agitating means during separated second and third periods, said second cam having means for operating said second switch means to engage the contact connected to the warm water supply means for a sufficient period of time to cause the liquid to overflow the container during said second and third periods and having means for operating said second switch means to engage the contact connected to the rotating means after its engagement with its warm water contact, and selective means for disconnecting said other stationary contact of said first switch means from said hot water supply means and connecting it to said warm water supply means to provide an optional initial warm water fill.

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