March 7, 1961 J. W. JACOBS ET AL 2,973,769

DETERGENT DISPENSER FOR A WASHING MACHINE

Filed Jan. 23, 1958 2 Sheets-Sheet 1

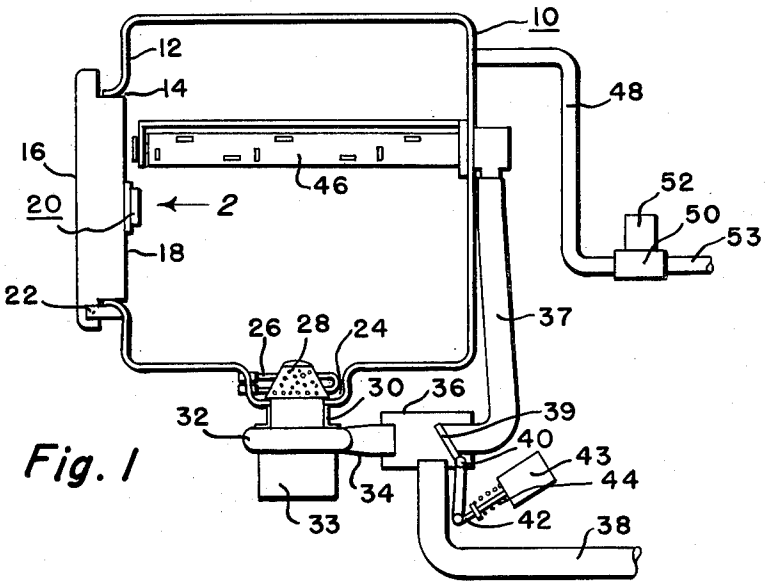


Fig. 1

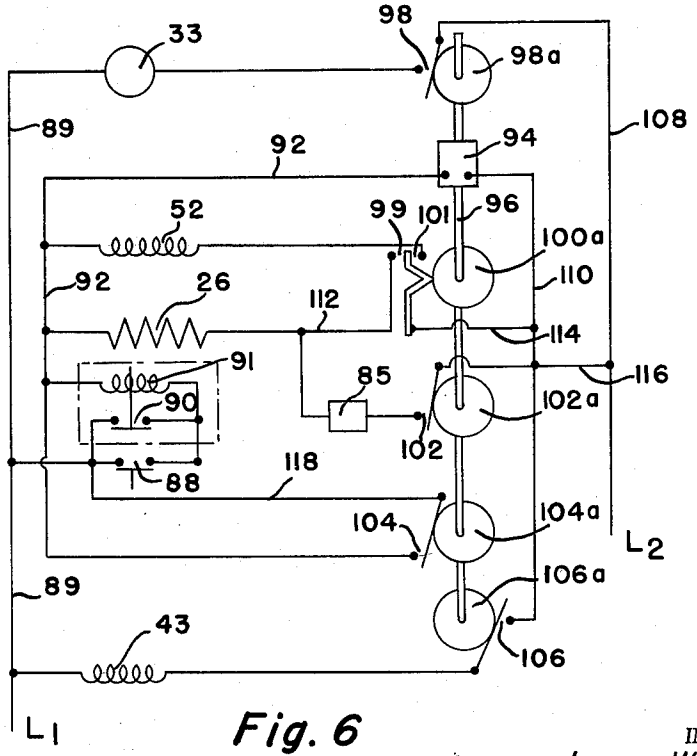


Fig. 6

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DETERGENT DISPENSER FOR A WASHING MACHINE

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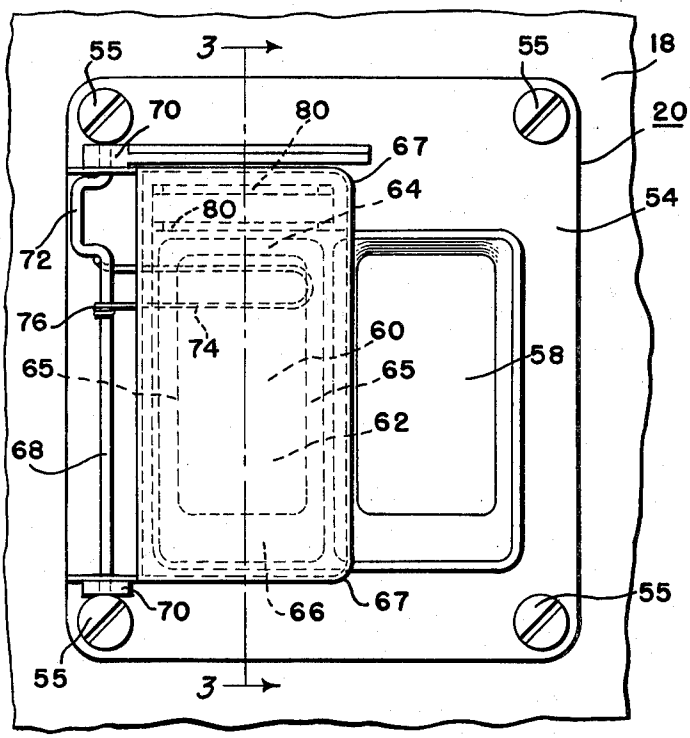


Fig. 2

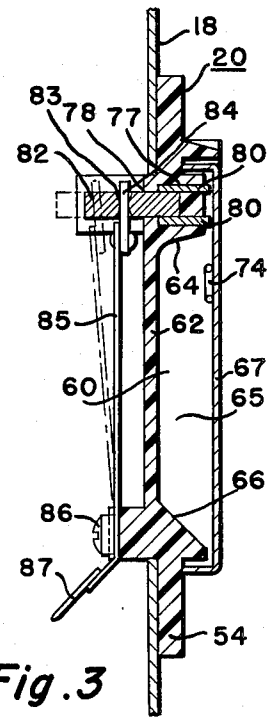


Fig. 3

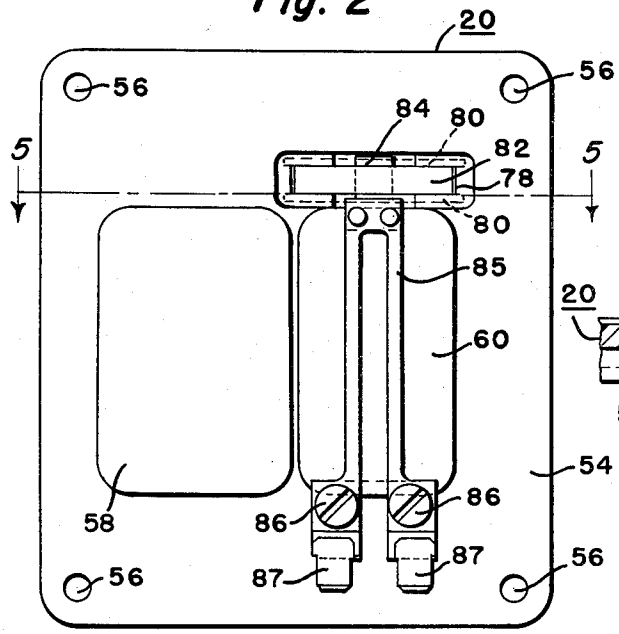


Fig. 4

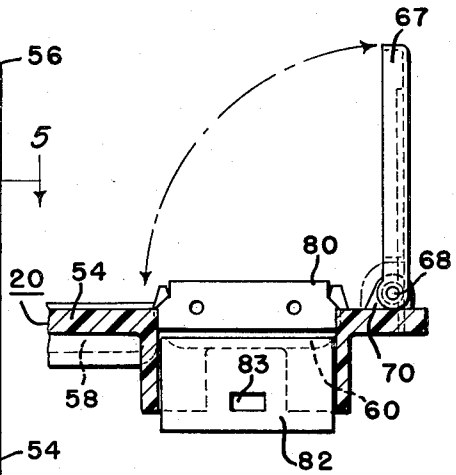


Fig. 5

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DETERGENT DISPENSER FOR A WASHING MACHINE

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6 Claims. (Cl. 134—58)

This invention relates to a domestic appliance, and more particularly to a detergent dispensing apparatus for a washing machine.

It is an object of this invention to provide a detergent dispenser for a washing machine that dispenses detergent into a washing machine and wherein the dispensing is controlled by a timer or sequential controller.

Another object of this invention is to provide a washing machine with a detergent dispenser that dispenses detergent into the tub of the machine and wherein the cycle of operation of the machine is controlled by a timer that also controls the detergent dispenser.

A further object of this invention is to provide a detergent dispenser for a washing machine including a body portion that is formed with a pair of cups that are adapted to receive the detergent to be dispensed, there being a cover member pivoted to the dispenser that is movable from a position overlying one of said cups to a position wherein the cup is uncovered. The cover member is preferably biased to an open position by resilient means and is held in a closed position by a permanent magnet that is movable to release the cover member for opening movement.

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

In the drawings:

Fig. 1 is a diagrammatic side view of a dishwasher made in accordance with this invention.

Fig. 2 is an enlarged front view of a detergent dispenser made in accordance with this invention and looking in the direction of the arrow designated by reference numeral 2 in Fig. 1.

Fig. 3 is a sectional view taken along line 3—3 of Fig. 2.

Fig. 4 is an enlarged rear view of the detergent dispenser of this invention.

Fig. 5 is a sectional view taken along line 5—5 of Fig. 4.

Fig. 6 is a schematic circuit diagram for the dishwasher of this invention.

Referring now to the drawings, and more particularly to Fig. 1, a dishwasher generally designated by reference numeral 10 is shown. The dishwasher has a generally boxed shape tub 12 formed with a front access opening 14. The access opening 14 is covered and uncovered by a door 16 having an inner panel 18 that faces the interior of the tub. A detergent dispenser generally designated by reference numeral 20 is secured to the front panel of the door and is described in greater detail hereinafter. The door 16 is pivoted to the tub as at 22 and moves from a closed vertical position to a substantially horizontally disposed open position. The tub may be enclosed by a cabinet (not shown) of the type shown in the patent to Abresch et al. 2,734,520, issued on February 14, 1956.

The tub 12 has a sump 24 that contains an electric heating element 26 and a strainer 28. The electric heating element and strainer may be of any conventional design, the strainer resting on the lower wall of the sump 24. The sump 24 is in communication through the strainer with the interior of a housing 30 that is attached to the lower end of the tub. The housing 30 supports a conventional centrifugal pump 32 that is driven by an electric motor 33. The inlet of the centrifugal pump is thus connected with the interior of housing 30 and the outlet thereof is connected with a pipe 34.

A valve member including a valve block 36 has its inlet side connected with the pipe 34. The valve member has a pair of outlets, one of which is connected with vertically-extending piping 37 and the other of which is connected with a pipe 38. The pipe 38 is connected with any suitable drain conduit. A valve part 39 is pivoted to valve block 36 by means of a rod 40. The rod 40 is connected with linkage 42 that is operated by a conventional solenoid 43. A spring 44 is interposed between a solenoid 43 and a fixed stop to bias the valve part 39 into the position shown in Fig. 1. When solenoid 43 is energized, the valve part 39 is moved to a position wherein it blocks flow between pipes 34 and 38 and permits flow between pipes 34 and 37. When the solenoid 43 is de-energized, the valve part is in the position shown in Fig. 1 to block flow between pipes 34 and 37 and to permit flow between pipes 34 and 38.

The vertically-extending pipe 37 is connected with a spray tube 46 that is of the type shown in the above-noted Abresch patent and which is supported for rotation within tub 12. The spray tube has a plurality of openings and is rotatably driven by the impingement of water against vanes formed internally of the spray tube in a manner described in the Abresch patent. When the valve 39 is in a position to cover drain pipe 38 and when motor 33 is in operation, the water contained in tub 12 is circulated from sump 24 through the pipe 37 and thence through the spray tube back into the sump 24. This provides for an effective washing action as the spray tube impels the water against the entire interior of the tub 12 during its water-driven rotation.

The rear wall of the tub 12 is formed with an opening that connects with a water inlet pipe 48. This pipe is connected to the outlet side of a conventional solenoid-operated valve 50 having a solenoid operator 52. The inlet side of solenoid valve 50 is connected with a pipe 53 that is adapted to be connected with a suitable supply of hot water. When the solenoid 52 is energized, a valve member is moved to connect pipes 53 and 48, whereas at all other times the valve 50 is held closed to prevent entry of water into the tub 12.

The detergent dispenser 20 is illustrated in greater detail in Figs. 2 through 5. As shown in these figures, the dispenser 20 comprises a body portion 54 that is formed of a suitable plastic material. The body portion of the dispenser is secured to inner panel 18 of door 16 by a plurality of fasteners 55 that pass through openings 56 formed in the body portion of the dispenser. The body portion is shaped to form a pair of open-ended cups 58 and 60 that face the interior of the tub 12. The cup 60 is defined by a rear wall 62, a top wall 64, side walls 65, and a lower wall 66 that slants downwardly as is best illustrated in Fig. 3. The cup 58 is identical in shape with the cup 60 and is therefore not described in detail.

The cup 58 is at all times in communication with the interior of the tub 12 whereas the cup 60 is at times covered by metal door or cover member 67 that is formed of a suitable magnetic metal such as stainless steel. The door or cover member 67 is pivoted to a rod 68 that is supported within bearing members 70 that are in-

tegrally formed with the body portion of the dispenser. The rod 68 has a U-shaped section 72 that lies flat against the body portion of the dispenser to prevent rotation of the rod. A spring 74 has convolutions 76 wrapped around the rod 68 with one end of the convolutions being secured to the rod 68. The opposite end of the spring 74 has a single convolution wrapped around the rod 68. The spring also has a generally U-shaped section as shown in Fig. 2 that bears against the inner face of door 67 when the door is in a position covering the cup 60. The convolutions 76 of spring 74 tend to move the U-shaped section of the spring around the rod 68 to move the door 67 to an open position that is 180° from its position shown in Figs 2 and 3. The spring 74 thus constantly urges the door toward an open position.

The body portion of the dispenser, as is best illustrated in Fig. 3, is formed with a pair of aligned openings 77 and 78. The opening 77 receives a pair of horizontally-disposed metal inserts 80 that are formed of magnetic material. The opening 78 receives a permanent magnet 82 of any well-known construction that slides through opening 78 and between metal inserts 80.

The permanent magnet 82 has a vertically-extending opening 83 that receives a magnet-operating member 84 that is formed of electric insulating material. The member 84 is preferably loose-fitted within the opening 83 and is attached to a magnet operator 85. The magnet operator 85 is U-shaped, as is shown in Fig. 4, and is formed of any suitable bimetal material that is heated by the passage of an electrical current therethrough and which deflects under the influence of and during this heating. The bimetal could be externally heated, if desired, by a separate electric heating unit. The lower end of the bimetal member 85 is attached to the body portion of the detergent dispenser by means of fasteners 86. A pair of terminal lugs 87 are attached to the lower end of the bimetal 85 and provide input terminals that are adapted to be connected to a suitable voltage supply.

When the magnet 82 is in the position shown in Fig. 3, a flux flow is set up from the magnet which passes from one edge of the magnet through a metal insert 80, then through the cover member 67, then back into another of the metal inserts 80 and thence back into the magnet 83. With this flux flow, the door 67 is magnetically held in a closed position against the bias of spring 74. When the bimetal 85 is connected with a suitable source of voltage, a current passes therethrough and the bimetal deflects to the dotted line position shown in Fig. 3. During this deflection, the magnet is moved completely without the metal inserts 80, and the flux path previously described is broken as a portion of the magnetic circuit is now broken. With the magnetic circuit broken, the spring 74 moves the cover member 67 180° to its completely open position, and in this position both cups 58 and 60 are in open communication with the interior of the tub. When the current supply to the bimetal is cut off, the bimetal deflects back to its full-line position shown in Fig. 3, and the cover member 67 may then be manually moved back to its closed position wherein it contacts metal inserts 80. In this position, the cover member is held closed against the force of spring 74 by magnetic attraction.

Referring now more particuluarly to Fig. 6, the circuit components of the dishwasher include a pair of input leads L_1 and L_2 which are adapted to be connected with a suitable voltage supply. The line L_1 is connected to one side of solenoid 43 and to one side of a push-button operated switch 88 by a lead 89. The push-button operated switch 88 is connected in parallel with a relay-operated switch 90 that is pulled to a closed position whenever actuating coil 91 is energized. One side of the actuating coil 91 is connected with a lead 92 that is, in turn, connected to one side of heater 26 and fill solenoid 52. The electric motor 33 that drives pump 32 has one of its sides connected with lead 89, as shown.

The circuit shown in Fig. 6 has a timing mechanism that includes an electrically-operated timer motor 94 having one side thereof that is connected with lead 92. The electric timer motor drives a shaft 96 that carries a plurality of cams 98*a*, 100*a*, 102*a*, 104*a* and 106*a*. These cams operate respectively switches 98, 99, 101, 102, 104 and 106 in a sequence determined by the shape of the cams and by rotation of the timer motor 94. The timer-operated switch 98 is connected between electric motor 33 and a lead 108 that is connected directly to line L_2. The timer motor 94 is connected between a lead 92 and a lead 110. The timer-operated switch 99 is connected between a lead 112 and a lead 114, whereas the timer-operated switch 101 is connected between fill solenoid 52 and lead 114. The timer-operated switch 102 is connected between lead 110 and the bimetal 85 while the timer-operated switch 104 is connected between lead 92 and one side of switches 88 and 90. The timer-operated switch 106 is connected between drain solenoid 43 and lead 110. The leads 110 and 108 are connected together by a lead 116.

The operation of the dishwasher illustrated in the drawings will now be described. The operator of the dishwasher, desiring to effect a dishwashing operation, moves the door 16 to its horizontal open position and places the dishes to be washed within the tub 12 in a suitable rack (not shown). With the door in the horizontal position, the open ends of cups 58 and 60 face upwardly so that they may be easily filled with a detergent. The cover for cup 60 will normally be in an open position since it is opened during a dishwashing cycle. If the cup is not opened, the cover may be grasped and moved to an open position. When the cups have been filled with detergent, the cover 67 is moved to a closed position wherein it contacts metal inserts 80 and is held in this position by magnet 82. The door of the dishwasher may then be closed and the detergent in cup 58 will then fall onto the lower wall of tub 12, the detergent in cup 60 being held in the cup by cover 67.

When the door is closed, the operator of the dishwasher momentarily closes push-button switch 88 to complete a circuit for actuating coil 91. The energization of relay coil 91 pulls switch 90 to a closed position to complete a circuit for timer motor 94 via switch 90, coil 91, line 92, line 110, and line 116. This immediately starts the timer motor to rotate shaft 96. The initial rotation of shaft 96 closes timer-operated switch 104 to short circuit the relay coil 91. The circuit for the timer motor is now through line 89, line 118, line 92, line 110, and line 116. It will be appreciated that the closure of switch 90 completes a holding circuit for actuating coil 91 so that push-button switch 88 need only be momentarily closed to start the dishwasher cycle. It will also be appreciated that once the timer motor is started, the control of its circuit is exclusively through time-operated switch 104.

The initial energization of timer motor 94 also causes switches 98 and 101 to close to permit water to enter the tub through pipe 48 and to start the pump drive motor 33. This initiates what may be termed a "flush" cycle in that water admitted from pipe 48 is immediately pumped to drain by pump 32 due to the fact that the valve 39 is now in a position to close off pipe 37 and to permit flow to drain pipe 38. This initial flush cycle drains the pipe 53 of cold water and also provides an initial flush for dishes located within the tub.

The initial flush cycle continues for a predetermined short period of time. Immediately following this portion of the dishwasher cycle, the switch 98 is opened, the switch 101 remains closed, and the switch 106 is closed. With this mode of energization, the tub 12 is supplied with water from pipe 48, the motor 33 is de-energized, and the valve 39 is in a position to close off flow to drain pipe 38. This portion of the cycle may be termed the "fill" cycle as the dishwasher continues to fill with water as long as switches 101 and 106 are closed. This

"fill" cycle continues for a predetermined period of time.

Immediately following the "fill" cycle is a "first wash" cycle wherein the cams on the timer shaft **96** are rotated to close switches **98** and **106** and are rotated to maintain switch **101** in its open position. In this mode of energization, the water is pumped through strainer **28** through valve block **36**, thence through vertically-extending pipe **37** and thence through spray tube **46** where the water is once more circulated through the path just indicated. This provides for a recirculation of water through the spray tube **46** which violently impels the water against the interior of the tub **12**. This water dissolves or is mixed with the detergent that was in cup **58**, and this cup is washed out by water being expelled by spray tube **46**. This wash cycle continues for a predetermined period of time. Immediately following the wash cycle, the timer-operated cams have moved to a position wherein switch **98** is closed and switches **101** and **106** are opened. In this mode of energization the valve **39** is moved by spring **44** to a position wherein flow is blocked to pipe **37** but wherein flow is permitted to drain pipe **38**. With the motor **33** operating, the water in tub **12** is pumped directly to drain, and this portion of the cycle may be termed a "pump-out" cycle.

The pump-out cycle is followed by a second fill cycle which is identical with the fill cycle described above. This fill cycle is followed by a "rinse" cycle which is identical with the wash cycle described above, but wherein no detergent is dispensed into the water. The rinse cycle is followed by a second pump-out cycle which is identical to the pump-out cycle described above to clear the tub of water.

Immediately following the second pump-out cycle is a third fill cycle that is identical with the fill cycles described above. At the end of the third fill cycle, the switches **98**, **102** and **106** are closed, and the switch **101** is opened. This prevents further filling of the tub **12** and provides for a recirculation of water through spray tube **46** as has been described above. Immediately upon the beginning of this recirculation or wash cycle, the switch **102** was closed to energize the bimetal actuator **85**. This operates to permit the cover **67** to be moved to an open position by spring **74** and thus opens the cup **60** to the interior of tub **12**. When the cup **60** is opened, the detergent therein may fall into the tub **12** and any detergent not so falling is washed out by water from spray tube **46**. It is thus apparent that the detergent in cup **60** will be dispensed into the tub **12** during the second wash cycle.

The second wash cycle may be followed by a plurality of fills, rinses and pump-outs, the cycle of the dishwashing ending with one or more pump-outs and the mechanism of the dishwasher being completely stopped when switch **104** opens. The switch **104** remains closed during the entire dishwasher cycle so that the motor **94** is continuously energized until the dishwashing cycle finishes.

During the dishwashing cycle, the switch **99** is periodically closed to energize heater **26**. At all other times switch **99** remains open. The switch **102** that controls the dispensing of detergent during the second wash cycle is only closed at the beginning of the second wash cycle and the switch **101** is only closed at the beginning of each fill cycle.

It can be seen from the foregoing that the dish-washer described provides for a method of dispensing detergent into the tub of the dishwasher at a predetermined time as controlled by timer motor **94**. Moreover, it is apparent that the door **16** need not be opened to dispense a second quantity of detergent into the dishwasher tub as both detergent cups are loaded prior to intiating the dishwashing cycle.

While the embodiments of the present invention as herein disclosed constitute a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. In combination with a washing machine having a tub, water inlet means for said tub, water impelling means for said tub, a detergent dispenser including a body portion formed with a pair of open-ended cups fixed to one pivotally mounted wall of said tub with the open ends of the cups facing the interior of said tub, a cover member formed at least in part of metal material pivoted to said body portion adjacent one of said cups, said cover member having a closed position wherein it overlies said one cup and having an open position wherein said one cup is uncovered, a spring for biasing said cover member toward an open position, a pair of metal inserts fixed in said body portion that contact said metal material of said cover member when it is in a closed position, a magnet extending exteriorly of said tub and located between said metal inserts and movable relative to said inserts, a bimetal actuator connected between said body portion and the portion of said magnet extending exteriorly of said tube for shifting said magnet, an electrical energizing circuit, a timer, and a switch operated by said timer for connecting said bimetal actuator with said energizing circuit.

2. In combination with a washing machine having a tub, a front access opening in said tub, a door mounted for pivotal movement having a closed vertical position and an open horizontal position, a detergent dispenser including a body portion formed with a pair of open-ended cups fixed to said door with the open ends of the cups facing the interior of the tub when the door is in its closed vertical position, a metal cover member pivoted to said body portion adjacent one of said cups, said cover member having a closed position wherein it overlies said one cup and having an open position wherein said one cup is uncovered, a spring for biasing said cover member toward an open position, a pair of metal inserts fixed in said body portion that contact said cover member when it is in a closed position, a magnet extending exteriorly of said tub and slidably supported between said metal inserts and in contact with said inserts, an electrically heated bimetal actuator having a portion fixed to said body portion and having another portion fixed to the portion of said magnet extending exteriorly of said tub for shifting said magnet, an electrical energizing circuit, a timer, and a switch operated by said timer for connecting said bimetal actuator with said energizing circuit.

3. In combination with a washing machine having a tub, water inlet means for said tub, water impelling means for said tub, a detergent dispenser including a body portion formed with an open-ended cup fixed to one pivotally mounted wall of said tub with the open end of said cup facing the interior of said tub, a cover member formed at least in part of metal material pivoted relative to said body portion adjacent said cup, said cover member having a closed position wherein it overlies said cup and having an open position wherein said cup is uncovered, a spring for biasing said cover member toward an open position, a pair of metal inserts fixed in said body portion that contact said metal material of said cover member when it is in a closed position, a magnet extending exteriorly of said tub and located between said metal inserts and movable relative to said inserts, a bimetal actutaor connected between said body portion and the portion of said magnet extending exteriorly of said tub for shifting said magnet, an electrical energizing circuit, a timer, and a switch operated by said timer for connecting said bimetal actuator with said energizing circuit.

4. In combination with a washing machine having a tub, water inlet means for said tub, water impelling means for said tub, a detergent dispenser including a body portion formed with a pair of open-ended cups fixed to one pivotally mounted wall of said tub with the open ends of said cups facing the interior of said tub, a cover member formed at least in part of metal material pivoted relative to said body portion adjacent one of said cups,

said cover member having a closed position wherein it overlies said one cup and having an open position wherein said one cup is uncovered, a spring for biasing said cover member toward an open position, a metal insert fixed in said body portion that contacts said metal material of said cover member when it is in a closed position, a magnet extending exteriorly of said tub and located in abutting relationship to said metal insert and movable relative to said insert, a bimetal actuator having one end fixed relative to said body portion and another end connected to the portion of said magnet extending exteriorly of said tub for shifting said magnet, an electrical energizing circuit, a timer, and a switch operated by said timer for connecting said bimetal actuator with said energizing circuit.

5. In combination with a washing machine having a tub, a detergent dispenser including a body portion formed with an open-ended cup fixed to one pivotally mounted wall of said tub with the open end of said cup facing the interior of said tub, a cover member formed at least in part of metal material pivoted relative to said body portion adjacent said cup, said cover member having a closed position wherein it overlies said cup and having an open position wherein said cup is uncovered, a spring for biasing said cover member toward an open position, a metal insert fixed in said body portion that contacts said cover member in the vicinity of said metal material when said cover member is in a closed position, a magnet extending exteriorly of said tub and located in abutting relationship to said metal insert and movable relative to said insert, a bimetal actuator connected between said body portion and the portion of said magnet extending exteriorly of said tub for shifting said magnet, an electrical energizing circuit, a timer, and a switch operated by said timer for connecting said bimetal actuator with said energizing circuit.

6. In combination with a washing machine having a tub, a detergent dispenser including a body portion formed with an open-ended cup fixed to one pivotally mounted wall of said tub with the open end of said cup facing the interior of said tub, a cover member formed at least in part of metal material pivoted relative to said body portion adjacent said cup, said cover member having a closed position wherein it overlies said cup and having an open position wherein said cup is uncovered, means for biasing said cover member toward an open position, an insert fixed in said body portion that contacts said cover member in the vicinity of said metal material when said cover member is in a closed position, a magnet extending exteriorly of said tub and located adjacent said metal insert and movable relative to said insert, a bimetal actuator having one end fixed relative to said body portion and another end connected to the portion of said magnet extending exteriorly of said tub for shifting said magnet, an electrical energizing circuit, a timer, and a switch operated by said timer for connecting said bimetal actuator with said energizing circuit.

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