ABSTRACT: A dishwasher detergent dispenser in which the dispenser is held closed by an overcenter spring which, upon being urged past its overcenter position by electrically actuated means such as a bimetal, also provides the force to open the detergent dispenser.
DETERGENT DISPENSER HAVING AN OVERCENTER SPRING DOOR ACTUATOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention pertains to the art of actuating dispensers in washing machines such as dishwashers.

2. Description of the Prior Art

Examples of detergent dispensers for dishwashers of the general character to which this invention is applicable, and which include a solenoid or a bimetal for controlling dispensing are U.S. Pat. Nos. 3,344,957, 3,212,675; and 3,012,696. It is noted that while these patents are representative of typical arrangements, neither they, nor any other prior art of which I am aware, teaches or suggests the concept with which my invention is concerned.

SUMMARY OF THE INVENTION

In the currently preferred form of my invention, a dispenser in the dishwasher tub has a cover attached to a pivotal shaft also carrying lever means to which an overcenter spring is attached to bias the cover toward a closed position when the spring is on one side of the shaft centerline, and an open position when on the other side of the centerline. Actuating means, such as a bimetal energized at the proper time during the washing cycle, urges the lever means from a position in which the cover is closed to a position in which the overcenter spring is shifted sufficiently to a centered position over the shaft that it will then provide the force to move the dispenser cover to a fully open position. Thus the actuating means does not function in any sense as a latch, the overcenter means serving both to hold the dispenser closed, and to provide the force to move it to a fully open position after the actuating means has initiated the dispenser opening operation.

DRAWING DESCRIPTION

FIG. 1 is a elevational view of a dispenser arrangement according to the invention.

FIG. 2 is a partly broken and partly sectioned view of portions of the dispenser arrangement of FIG. 1.

FIG. 3 is a view similar to FIG. 1 but showing the parts in the position corresponding to the dispenser being open to release the detergent.

FIG. 4 is a face view of one example of the detergent dispenser according to the invention with the cover open and corresponding to the mechanism of FIG. 3.

FIG. 5 is a sectional view corresponding to one taken along the line V-V of FIG. 1; and

FIG. 6 is a fragmentary elevational view of an embodiment employing a solenoid actuator.

PREFERRED EMBODIMENTS

The invention will be described in connection with a dishwasher of the type having a swing down door for access to the tub for loading and unloading, and in which the controls are mounted in the door. The detergent receptacle illustrated as one example is of the type in which the receptacle itself is fixed and is provided with a cover movable between an open and closed position. It will be appreciated that the invention is not limited to any particular type of detergent receptacle, nor to its particular location.

Referring to FIGS. 1 and 2, the detergent cup 10 is mounted on the inside face of an inner panel 12 which forms one wall of the dishwashing tub when the door is closed, the interior space of the tub being indicated by numeral 14 located to the right of the drawing in FIG. 2. The cup is provided with a pivotal cover 16 fixed to a shaft 18 for rotation therewith, the shaft being journaled in the cup material adjacent a corner of the cup. The shaft extends through an opening in the inner panel, an opening in the dispenser mechanism mounting bracket 20 axially through a compression spring 22, and has a lever arm 24 attached to its noncircular outer end so that rotation of the lever arm will effect rotation of the shaft, and vice versa. The compression spring insures that the cover 16 is pulled reasonably tightly against the open face of the cup when the cover is closed. An O-ring 26 seals between the shaft and a bushing 28 which may be formed as an integral portion of the cup.

The mounting bracket 20 is fixed to the outwardly facing face of the inner panel 12 and mounts the dispenser actuating mechanism in the space 30 in between the inner panel and the outer finished panel 32 of the dishwasher door. The bracket has one turned-up tab 34 adjacent the lower right corner of the bracket as shown in FIG. 1, and another turned-up tab 36 closer to the pivotal axis of the shaft. The tab 34 secures one end of a tension spring 38 which has its other end secured to the leg 40 of the bellrank-shaped lever 24. When the detergent dispenser cover 16 is closed, the actuating mechanism is in the position illustrated in FIG. 1 in which the axis of the spring 38 lies slightly to the right of the axis of the shaft 18. This is the slightly overcenter position of the spring 38 which results in the spring force being transmitted through the lever and shaft to urge the dispenser cover in a direction holding the cover closed.

The other leg 42 of the lever arm 24 is disposed, as shown in FIG. 1, for engagement by actuating means which triggers the opening of the dispenser cup. In that illustrated embodiment, the currently preferred actuating means in the form of an electrically energized bimetal 44 is shown. The bimetal which has its left end portions secured in an insulating and adjustment block 46 and its right end free to engage and bear against the lever leg 42 when the bimetal is energized and accordingly heated. The bimetal is of the double leg type as shown in FIG. 5. The extreme left ends of the bimetal legs are attached to a source of electrical power so that a circuit can be completed through the bimetal itself. The dissimilar metals of the bimetal are arranged so that upon sufficient heating of the bimetal above ambient temperature the right end of the bimetal will move downwardly to push the leg 42 of the lever in that direction which tends to rotate the lever arm 24 in a counter-clockwise direction as indicated by the arrow in FIG. 1. When the bimetal has pushed the lever arm sufficiently that the axis of the spring 38 has moved past center to the left of the axis of the shaft 18 sufficiently, the tension in spring 38 provides the force which moves the cover 16 to a fully open position as illustrated in FIG. 4. The position of the parts of the actuating mechanism on FIG. 3 corresponds to the dispenser cover being fully open and with the leg 42 being stopped by the tab 36. The cover 16 is returned to a closed position after the dishwasher cycle has been completed by manually rotating the cover 16 to a closed position which in turn moves the lever 24 back to its FIG. 1 position and again cocks the spring 38. The cover is prevented from being moved past its fully closed position and accordingly moving the lever arm 24 back past its FIG. 1 position by the abutment of the offset edges 48 of the cover and cup (FIG. 2).

From the foregoing it will be appreciated that when the overcenter spring 38 (FIG. 1) has its longitudinal axis lying in any range of positions to the right of the axis of shaft 18, the biasing force will urge the lever arm 24 serving as the dispenser condition controlling means in a clockwise direction. Thus, it may be said that when the dispenser condition controlling means occupies any position in the range between a closely approaching-closed position (i.e., spring 38 axis intersecting shaft 18 axis), and a dispenser-closed position, the biasing means urges the controlling means toward the dispenser-closed position. Conversely, when the spring 38 axis is to the left of the axis of shaft 18, the controlling means is beyond that range.

The relation of the bimetal to the lever arm 24 is adjustable by moving the adjusting member 50 which is attached to the insulating and adjusting block 46. Then the screw 52 may be tightened down to hold the bimetal in its adjusted position.
In an alternative arrangement shown in FIG. 6, the bimetal is replaced by other electrically actuated means such as a solenoid 54 disposed so that upon energization thereof it provides the force to move the lever 24 sufficiently that the tension spring 38 will complete the opening of the cover. Another alternative arrangement would utilize a mechanical linkage with the timer to move the lever 24.

Upon reflection it will be appreciated that the overcenter spring furnishes the biasing force both for keeping the cover closed and also for moving the cover to an open position following the initial nudge by the electrically actuated means. Thus any positive latching is avoided and the cover 16 may be readily opened and closed without any sensation by the user of forcing the mechanism. Also, when the electrically actuated means is a bimetal, the timer knob as typically used on most dishwashers may be turned through an entire cycle manually without dumping the detergent when a restarted cycle is desired.

As will be appreciated by those versed in the art, the bimetal is connected in an electrical circuit so that the bimetal is energized at the proper time during the dishwashing cycle to open the cover and release the detergent. Typically, a timer is used for controlling the various parts of the dishwashing cycle and the timer contacts are simply arranged to provide energization of the bimetal at the proper time during the cycle.

I claim as my invention:

1. In a washing machine having a dispenser having opposite open and closed conditions corresponding to respectively opposite positions of dispenser condition controlling means, the improvement comprising:
   biasing means for urging said controlling means to said opposite positions, said biasing means being disposed to urge said controlling means toward a position corresponding to a dispenser closed condition when said controlling means is in a range of positions between a closedly approaching-closed and a dispenser-closed position, and to urge said controlling means toward a position corresponding to a dispenser open condition when said controlling means is in a position beyond said range; and said controlling means is moved between its opposite positions; and actuating means for moving said controlling means beyond said range at a selected time during a washing cycle of said machine;

2. In a machine according to claim 1 wherein: said overcenter spring comprises a tension spring.

3. In a washing machine according to claim 1 wherein: said actuating means comprises electrically actuated means in the form of a bimetallic element disposed relative to said controlling means to move said controlling means beyond said range upon a period of energization of said bimetallic element.

4. According to claim 1 wherein:
   said actuating means comprises electrically actuated means in the form of a solenoid disposed relative to said controlling means to move said controlling means beyond said range upon energization of said solenoid.

5. In a dishwashing machine having a washing tub:
   a washing aid dispenser receptacle in said tub including means movable between a position in which said receptacle is closed and another position in which said receptacle is open;
   rotatable shaft means having said movable means fixed thereto for rotation therewith;
   lever means fixed to said shaft for rotation therewith;
   an overcenter spring connected to said lever means, said spring being disposed relative to said lever means for urging said movable means toward a position corresponding to said receptacle being closed when said movable means is in a range of positions between closely approaching-closed and a closed position, and for urging said movable means to a position corresponding to said receptacle being open when said movable means is in a position beyond said range; and
   actuating means for moving said lever beyond said range at a preselected time during the washing cycle.

6. In a washing machine according to claim 5 wherein:
   said movable means comprises a receptacle cover rotatable with said shaft means and said lever means.

7. In a machine according to claim 6 wherein:
   said actuating means comprises a bimetallic element disposed to engage said lever upon a sufficient period of energization of said element to move said lever means beyond said range.