A dispensing unit for receiving a conditioning agent in liquid or powdered form is mounted on the upper end of the dasher assembly with a centrally located lower opening in the dispensing unit positioned in alignment with the discharge port of the pump passageway. The dispensing unit is provided with a resiliently biased valve or closure element that is manually displaced to and latched in a position closing the lower opening.

The unit includes also a detachable apertured cap which is detachable to facilitate insertion of conditioning agent in liquid or powdered form. Thereafter the cap is again attached in place, where it may be held either fractionally or positively. The aperture in the cap is of limited area so that undesired wetting of the agent does not occur during washing or so that the liquid flowing through the unit at a later stage of operation is caused thoroughly to contact the contents of the unit and to cleanse it.

When a cycle of operation of the washing machine is initiated, the dasher assembly is moved orbitally relative to the rotatable tub which is held in a fixed position during this operation. At the completion of the wash cycle, the dasher assembly and the rotatable tub are moved at high speed during which a centrifugally controlled latch in the dispensing unit releases the valve or closure element so that the lower opening of the dispensing unit is opened.

The conditioning agent is not discharged following the opening of the closure element and during the high speed rotation because centrifugal force displaces the agent outwardly away from the centrally disposed lower opening. However, during the deceleration of the rotatable tub and the dasher assembly at the completion of the spin cycle, a liquid conditioning agent flows out through the lower opening into the rotatable tub. This conditioning agent preferably comprises a water softener that is used to prevent the formation of scum on the clothes during the following rinse cycle.

If the conditioning agent is in a powdered form, this agent tends to become caked by the absorption of moisture (although the apertured cap minimizes this, as noted above) and thus does not fall out of the lower opening in the dispensing unit during the deceleration of the rotating tub at the completion of the spin cycle. However, when the rinse cycle is started so that the dasher assembly is moved orbitally and water is supplied to the tub, the pump operates to force the rinse water upwardly through the passageway and into the dispensing unit through the lower opening. This water dissolves the powdered conditioning agent, and the water bearing the dissolved conditioning agent is displaced outwardly through an upper opening in the dispensing unit so as to be discharged into the rotatable tub. Because of the forced supply of water into the dispensing unit at the completion of the spin cycle and at the beginning of the rinse cycle, all of the conditioning agent, whether in liquid or powdered form, is forced out of the dispensing unit. This not only cleans the dispensing unit but also-insures that all of the conditioning agent is made available for use during the cycle of operation of the washing machine. Accordingly, the present invention provides new and improved means for automatically dispensing a conditioning agent, in either powdered or liquid form, into a washing machine at a selected point in the operating cycle thereof.

Many other objects and advantages of the present invention will become apparent from the following detailed description when considered in conjunction with the drawings, wherein:

FIG. 1 is a fragmentary vertical sectional view of an automatically controlled washing machine embodying the present invention;

FIG. 2 is an enlarged vertical sectional view taken along line 2—2 in FIG. 1 assuming that the entire machine is shown therein;
FIG. 3 is a horizontal sectional view taken along line 3—3 in FIG. 2 again assuming that the entire construction is illustrated therein; FIG. 4 is a sectional view similar to FIG. 2 illustrating the dispensing unit in a closed condition; FIG. 5 is a fragmentary vertical sectional view along the lines of FIG. 2 illustrating a modified form of detachable cover cap and mounting of the manually depressible valve or closure element; and FIG. 6 is a fragmentary horizontal sectional view along the line 6—6 of FIG. 5.

Referring now more specifically to FIG. 1 of the drawings, therein is shown a washing machine, indicated generally at 10. This machine preferably is of the type shown and described in detail in the copending application of Henry W. Altlofer, Serial No. 602,812, filed Aug. 8, 1956, now Patent No. 2,909,051 of Oct. 20, 1959, which application is assigned to the same assignee as the present application. As illustrated therein, the dasher assembly 16 includes a housing 18 having a plurality of apertures 30 through which fluid or water from the tub passes into a chamber 32 formed within the tub. The fluid cycle of operation of the machine 10 either by removing the unit 18 from the machine 10 through an opening normally closed by hinged cover 20 or by filling the dispensing unit 18 in its position mounted on the dasher assembly 16. The conditioning agent supplied to the unit 18 preferably comprises a water softener which is useful in preventing the formation of scum during the rinse cycle. When the machine 10 is placed in operation after supplying clothes washing fluid and a suitable amount of detergent to the rotatable tub 14, the dasher assembly 16 is placed in orbital movement within the tub 14 which receives the dispersing fluid on the bars remaining stationary. The fluid is disposed of in operation of the fluid pump assembly 24 which effects flow of washing fluid into a filter element 22. At the completion of the wash cycle; the tub 14 and the dasher assembly 16 are rotated at high speed to release a centrifugal latch assembly 19 (FIG. 25) included in the dispensing unit 18. The release of the latch assembly 19 permits a closure element in the unit 18 to open a lower opening in this unit. Thus, when the tub 14 and the dasher assembly 16 are decelerated at the completion of the spin cycle and if the conditioning agent is in liquid form, this liquid agent, which is located in communication with the outer walls of the dispensing unit 18 during the spin cycle by centrifugal force, is discharged into the rotatable tub 14 through the screen or filter element 22 which is detachably mounted on the upper end of the dasher assembly 16.

If the conditioning agent is in a powdered form, the agent tends to become caked by the absorption of moisture during the spin cycle and is also held in contact with the outer walls of the dispensing unit 18 to prevent its discharge during the spin cycle. At the completion of the spin cycle and at the initiation of the rinse cycle, water is supplied to the tub 14 and the dasher assembly 16 is moved orbitally relative to the tub 14 which is now retained in a stationary position. During this operation of the dasher assembly 16, the pump assembly 24 is placed in operation to force the rinse water upwardly through a passageway 26 to be discharged at the upper end of the dasher assembly 16. The fluid discharged from the upper end of the passageway 26 enters the dispensing unit 18 through the lower opening therein to dissolve the powdered conditioning agent contained therein. The fluid or water containing the dissolved conditioning agent is discharged through an upper opening in the dispensing unit 18 and passes through the filter assembly 22 into the tub 14. The water provided by the operation of the pump assembly 24 cleans the interior of the dispensing unit 18 and insures the complete discharge of the agent to avoid the clogging of the unit 18 and the use of unnecessarily large amounts of the conditioning agent.

Referring now more specifically to the washing machine 10, this machine preferably is of the type shown and described in detail in Patent Nos. 2,709,908, Altlofer, et al., and 2,715,330, Altlofer, Jr. As set forth therein, the tub 14 is held in a stationary position and the dasher assembly 16 is moved in an orbital path during the wash cycle. For centrifugal drying during the spin operation, the tub 14 and the dasher 16 are rotated at high speed. During the following rinse cycle or cycles, the tub 14 is again held in a stationary position and the dasher assembly 16 is moved in an orbital path within the tub 14. The dasher or washing assembly 16 together with the pump means 24 included therein and the filter or strainer assembly 22 mounted thereon preferably are of the type shown and described in detail in the copending application of Henry W. Altlofer, Serial No. 602,812, filed Aug. 8, 1956, now Patent No. 2,909,051 of Oct. 20, 1959, which application is assigned to the same assignee as the present application. As illustrated therein, the dasher assembly 16 includes a housing 28 having a plurality of apertures 30 through which fluid or water from the tub 14 passes into a chamber 32 formed by the housing 28 and the cup 48 and thence into a variable volume pump chamber 34 defined in part by a resilient diaphragm 36, which forms a part of the pump 24, through a plurality of openings 38.

To provide means for shifting the diaphragm 36 and operating the pump 24 during orbital movement of the dasher assembly 16, a crank arm 40 is provided which is eccentrically secured to a rotating drive shaft 42. A first cam 44, which is secured to the crank arm 40, engages a second cam member 46, which is rotatable relative to the crank arm 40. A cup element 48 is secured to an annular depending portion 36b of the diaphragm 36. The operation of the diaphragm 36 is affected by a compression spring 50 interposed between a portion of the assembly 16 and the cup 48 to force the second cam member 46 into engagement with the first cam member 44. Accordingly, when the drive shaft 42 is rotated to turn the crank arm 40 and the cam 46 connected thereto, the cam member 46 is reciprocated relative to the axis of the crank arm 40 to similarly reciprocate the flexible diaphragm 36, thereby changing the volume of the chamber 34. When the volume of the chamber 34 is increased by moving the diaphragm 36 downwardly (FIG. 1), an upper partition 36a which is held in contact with the outer walls of the passageway 38 so that the fluid within the chamber 32 is drawn into the chamber 34. Conversely, when the flexible diaphragm 36 is moved upwardly to reduce the volume of the chamber 34, the flap 36b closes the openings 38 and the entrapped fluid is forced outwardly through the passageway 26 and a tapered nozzle 54 that is mounted on the upper end of the housing 28. This discharged fluid is either deflected by the dispensing unit 18 to impinge on the strainer assembly 22, which is mounted on a resilient gasket 56 carried on the upper end of the housing 28; or passes through the dispensing unit 18 so that the conditioning agent therein is discharged into the tub 14.

Referring now more specifically to the dispensing unit 18, this unit comprises a hollow container or housing defined by a circular side wall 58 which is secured at its lower end to a base plate 60 and at its upper end to a top plate 62. The lower plate 60 is provided with a centrally disposed and outwardly extending bosses or tubular portion 64 terminating in an inwardly directed flange 64a which forms a valve seat and defines a lower passageway 65. The upper plate 62 is provided with a centrally disposed and inwardly extending boss or tubular portion 62a providing an enlarged upper passageway 66 for introducing a liquid or powdered conditioning agent into a chamber or cavity 68 defined by the top and bottom plates 60 and 62 and the side wall 58. The opening 66 is partially closed by a detachable cup 70 hav-
An annular recess 72 in which is disposed a resilient O-ring 74, which serves as a seal frictionally to hold the cap in place when liquid is forced upwardly through the unit. The cap 70 is provided with a centrally disposed and outwardly flared relatively small or restricted opening 76 for discharging the fluid injected into the cavity 68 by the pumping means 24.

To provide means for closing the lower opening 65, a resilient valve or closure element 78 is provided which is secured to one end of a shaft 80. The shaft 80 is slidably mounted within an opening 82 formed in a centrally disposed hub 84 which comprises a part of a spider arrangement formed integral with the side wall 58 of the dispensing unit 18. The spider arrangement, in addition to the centrally disposed hub 84, includes a pair of radially extending arms 86 (FIG. 3) having depending portions 88 which are secured to the lower plate 60.

To provide means for manually shifting the valve element 78 to a closed position in which it engages the tapered portion 64a, the upper end of the shaft 80 is provided with a knob 90 which serves further to restrict the effective size of the latching element 98 is slidably mounted in an opening 102 which extends into the opening 82, and an intermediate portion of the latching element 98 is slidably mounted within an opening 104 in an element 106. The element 106 is secured within an opening in a hollow arm 100 by a set screw 108 (FIGS. 2 and 4). A resilient sealing washer 110 and a stop plate 111 (FIG. 3) are interposed between the element 106 and a shouldered portion of the opening in the hollow arm 100. The inner end of the latching element 98 is biased inwardly toward the opening 82 by a compression spring 112 which is interposed between a pair of lugs 98a formed on the latching element 98 and the stop plate 111. Thus, when the knob 90 is manually depressed to move the valve element 78 into seating engagement with the flange 64a so as to close the lower opening 65, the inner end of the latching element 98 is biased into engagement with the shaft 80 and moves into engagement with a notched portion 114 thereon. This secures the valve or closure element 78 in a position closing the opening 65 as illustrated in FIG. 4 of the drawings.

To provide means for releasing the shaft 80 and the valve or closure element 78 during the spin cycle of the washing machine 10, the inner end of the latching element 98 is biased into engagement with the shaft 80 and moves into engagement with the notched portion 114 thereon. This secures the valve or closure element 78 in a position closing the opening 65 as illustrated in FIG. 4 of the drawings.

The compression spring 92 then moves the shaft 80 upwardly to the position illustrated in FIG. 2 in which the valve or closure element 78 is moved out of engagement with the flange 64a. A strut-locked portion 112, formed integral with the latching element 98 engages the stop plate 111 to limit the upward movement of the latch element 98 during the spin cycle.

To provide means for detachably mounting the dispensing unit 18 on the upper end of the housing 28, a cap element 120 is mounted on the upper end of the housing 28 and is provided with a plurality of upstanding posts 122. An annular ring 124, which is secured to the posts 122 by a plurality of machine screws 126, includes a plurality of inclined slots having enlarged end portions. The lower plate 60 is provided with a plurality of depending and generally hook shaped lugs 128 which are inserted in the cavity 68 of the enlarged portions of the slots formed in the ring 124, and the dispensing unit 18 is then rotated so that the lugs 128 move into interlocking engagement with the ring 124. Thus, the dispensing unit 18 can be detached from the dasher assembly 16 and removed from the washing machine 10 through the opening normally closed by the cover 20.

Referring now more specifically to the operation of the washing machine 10, the cover 20 is opened and clothes and a suitable amount of detergent are disposed within the rotatable tub 14. The cover 70 is then removed from the dispensing unit 18, and the knob 90 is manually depressed so that the resilient valve or closure element 78 moves into seating engagement with the flange 64a to close the lower opening 65, although it should be noted the knob 90 can be depressed prior to removal of the cover. In this position, the notched portion 114 on the shaft 80 is aligned with the latching element 98 so that the compression spring 112 moves the latching element 98 into the notched portion 114 to hold the valve or closure element 78 in engagement with the flanged portion 64a. A suitable amount of a conditioning agent, in either liquid or powdered form, is introduced into the cavity 68 of the dispensing unit 18, and the cover 70 is replaced.

When the automatic cycling control for the washing machine 10 is started to place this machine in operation, the interior of the tub 14 is filled with water and the dasher assembly 16 is driven in an orbital path relative to the rotatable tub 14 which is now held in a stationary position. During the washing operation, the assembly 24 is operated to discharge water through the passageway 26 and the nozzle 54. This water impinges on the convex lower surface of the valve element 78 and is deflected outwardly into the strainer or filter assembly 22 to remove any lint or other particles from the fluid. The cap 70 with its restricted opening 76 minimizes possible undesirable wetting of powder in the dispensing unit. However, the orbital movement of the dasher assembly 16 does not produce sufficient centrifugal force to release the latch assembly 19.

At the completion of the washing operation, the spin cycle is started during which the washing machine 10 is caused to spin the fluid is discharged from the rotatable tub 14 and the rotatable tub 14 and the dasher assembly 16 are rotated at relatively high speeds. This high speed rotation of the tub 14 and the dasher assembly 16 actsuate the centrifugally controlled latch assembly 19 to release the cover or valve for the lower operating unit 18. More specifically, when the speed of rotation becomes great enough, the outwardly directed centrifugal force due to the mass of the weight 116 exceeds the force provided by the compression spring 112 so that the latch element 98 moves outwardly until the stop 98b engages the plate 111. In so moving, the element 98 moves out of the notch 114 so that the compression spring 92 displaces the shaft 80 and resilient valve element 78 upwardly to the position shown.
Instead of relying on frictional holding of cap 70, the latter may be positively but detachably held in place. A construction of this character is shown in FIGS. 5 and 6, in which reference will now be had and in which parts corresponding to the previously described construction are indicated by the reference characters. The main difference is that the cap is held in place by bayonet type holding means comprising a first element 140 with angularly spaced resilient locking projections or tongues 142 engageable with the undersides of inwardly extending projections 144 at the bottom of bossed or tubular portion 62. One of the projections 144 may have a stop 145 dependent therefrom and engageable by a tongue 142 to limit rotary movement of the cap. The projections 144 are separated by slots 146 whereby the tongues can be inserted below the bosses after which, upon rotation of the cap, the tongues 142 resiliently but positively hold the cap in place. Element 140 may be suitably secured to the underside of cap 70 as by screws 148 passing through the hub portion 150 of the element.

Sealing against the escape of fluid around the outer periphery of cap 70 is provided by a sealing ring 152 mounted in a channel 154 at the under side of the outer region of the cap and bearing against wall 62.

In order to minimize possible sticking of the valve element 78 as by corrosion or adhesion caused by the conditioning material, the area of contact between the shaft 80 and hub 84 may be decreased by cutting away parts of the latter whereby to provide angularly spaced spaced guide surfaces 156. This construction also provides a path for passage of liquid along the shaft to cleanse it and its supporting means.

The operation of the modified arrangement is substantially the same as that of the first and description thereof will not be repeated here.

Although the present invention has been described with reference to a particular embodiment thereof, it should be understood that those skilled in the art may make many other modifications and embodiments thereof which will fall within the spirit and scope of the principles of this invention.

What is claimed and desired to be secured by Letters Patent of the United States is:

1. A dispensing unit for a washing apparatus including a rotating element comprising a housing mounted on said element, said housing providing a cavity for receiving a valve element and said housing also including both a lower opening disposed adjacent said element and an axially aligned upper opening spaced from said element, said upper and lower openings being in communication with said cavity; said cavity means carried on said housing and axially movable toward and away from said lower opening to open and close said lower opening; said cavity means connected to said closure means for biasing said closure means toward a position in which said lower opening is open; and a centrifugally operated latch means to detachably secure said closure means in a position closing said lower opening.

2. The dispensing unit set forth in claim 1 in which said latch means includes a latch element movable generally transverse to the direction of movement of said closure means, and means for biasing said latch element toward said closure means.

3. A washing apparatus including a moving washing assembly having an upwardly directed passageway, comprising pump means for discharging fluid through said passageway, a container for receiving a conditioning agent mounted on said assembly and including an opening aligned with said passageway, said container being mounted for rotation by said washing assembly, closure means carried on said container and normally closing said opening, and a centrifugally operated means for opening said closure means to permit said conditioning agent to be discharged from said container.
said closure means includes a closure element movable toward and away from said passageway in alignment therewith to prevent said conditioning agent from entering said passageway.

5. A washing apparatus comprising a dasher assembly including an outlet passageway, pump means for discharging a fluid through said passageway, a container of greater cross sectional area than said passageway for receiving a conditioning agent and having an opening, means mounting said container on said assembly with said opening in alignment with said passageway, and closure means normally closing said opening and operable to open said opening so that fluid discharged from said passageway enters said container.

6. The washing apparatus set forth in claim 5 in which said container includes an aperture spaced from said opening for discharging said conditioning agent and the fluid admitted through said opening.

7. A washing apparatus successively operable through wash, spin and rinse cycles and including a washing assembly rotatably at high speeds during said spin cycle; comprising a container mounted on the washing assembly and adapted to receive a conditioning agent, said container having an opening; a closure element normally closing said opening; means responsive to centrifugal forces developed by rotation of said washing assembly during said spin cycle for displacing said closure element to open said opening; and pump means operated during said rinse cycle for discharging fluid through said opening into said container.

8. A washing apparatus operable through wash, spin and rinse cycles comprising a tub; a dasher assembly disposed within and movable relative to said tub, said dasher assembly including a passageway; a container mounted on said dasher assembly and adapted to receive a conditioning agent, said container having an opening positioned adjacent said passageway; a closure element normally closing said opening; means for rotating said tub and dasher assembly during said spin cycle; means responsive to rotation of said dasher assembly during said spin cycle for displacing said closure element to open said opening; and pump means connected to said passageway and operable during said rinse cycle for forcing fluid through said passageway and said opening into said container.

9. In a washing machine successively operable through wash, spin and rinse cycles, a washing assembly including means defining a passageway, a container for receiving a conditioning agent and including an opening disposed adjacent said passageway, an element normally closing said opening and extending generally transverse to said passageway, filter means mounted adjacent said container, pump means operable during said wash cycle to discharge a fluid through said passageway so that said fluid impinges on said element and is deflected transversely into said filter means, means operable during said spin cycle for displacing said element to open said opening, and means for operating said pump means during said rinse cycle so that fluid discharged from said passageway enters said container through said opening.

10. A dispensing unit for a washing apparatus including a rotatable housing, said housing providing a cavity for receiving a conditioning agent, said housing also providing both a lower opening and an axially aligned and relatively large upper opening spaced from the lower opening, said upper and lower openings being in communication with said cavity, centrifugally operable closure means for the lower opening carried on said housing and axially movable toward and away from said lower opening to open and close it, a detachable cap for the upper opening having an exit providing a restricted outlet for liquid from the cavity.

11. A dispensing unit for a washing apparatus including a rotatable housing, said housing providing a cavity for receiving a conditioning agent, said housing also providing both a lower opening and an axially aligned and relatively large upper opening spaced from the lower opening, said upper and lower openings being in communication with said cavity, centrifugally operable closure means for the lower opening carried on said housing and axially movable toward and away from said lower opening to open and close it, a detachable cap for the upper opening having an exit providing a restricted outlet for liquid from the cavity, and said cap having frictional means detachably holding it on the housing.

12. A dispensing unit for a washing apparatus including a rotatable housing, said housing providing a cavity for receiving a conditioning agent, said housing also providing both a lower opening and an axially aligned and relatively large upper opening spaced from the lower opening, said upper and lower openings being in communication with said cavity, centrifugally operable closure means for the lower opening carried on said housing and axially movable toward and away from said lower opening to open and close it, a cap for the upper opening having an exit providing a restricted outlet for liquid from the cavity, and said cap and housing having cooperating bayonet type holding means detachably securing the cap to the housing.

13. A dispensing unit for a washing apparatus including a rotatable housing, said housing providing a cavity for receiving a conditioning agent, said housing also providing both a lower opening and an axially aligned and relatively large upper opening spaced from the lower opening, said upper and lower openings being in communication with said cavity, centrifugally operable closure means for the lower opening and axially movable toward and away from said lower opening to open and close it, said housing having a plurality of angularly spaced apart supporting means and said closure means including a shaft slideably mounted by said supporting means, and a detachable cap for the upper opening having an exit providing a restricted outlet for liquid from the cavity.

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