April 27, 1965 E. B. BROWN ET AL 3,180,538

AUTOMATIC FLUID DISPENSER

Filed April 24, 1963

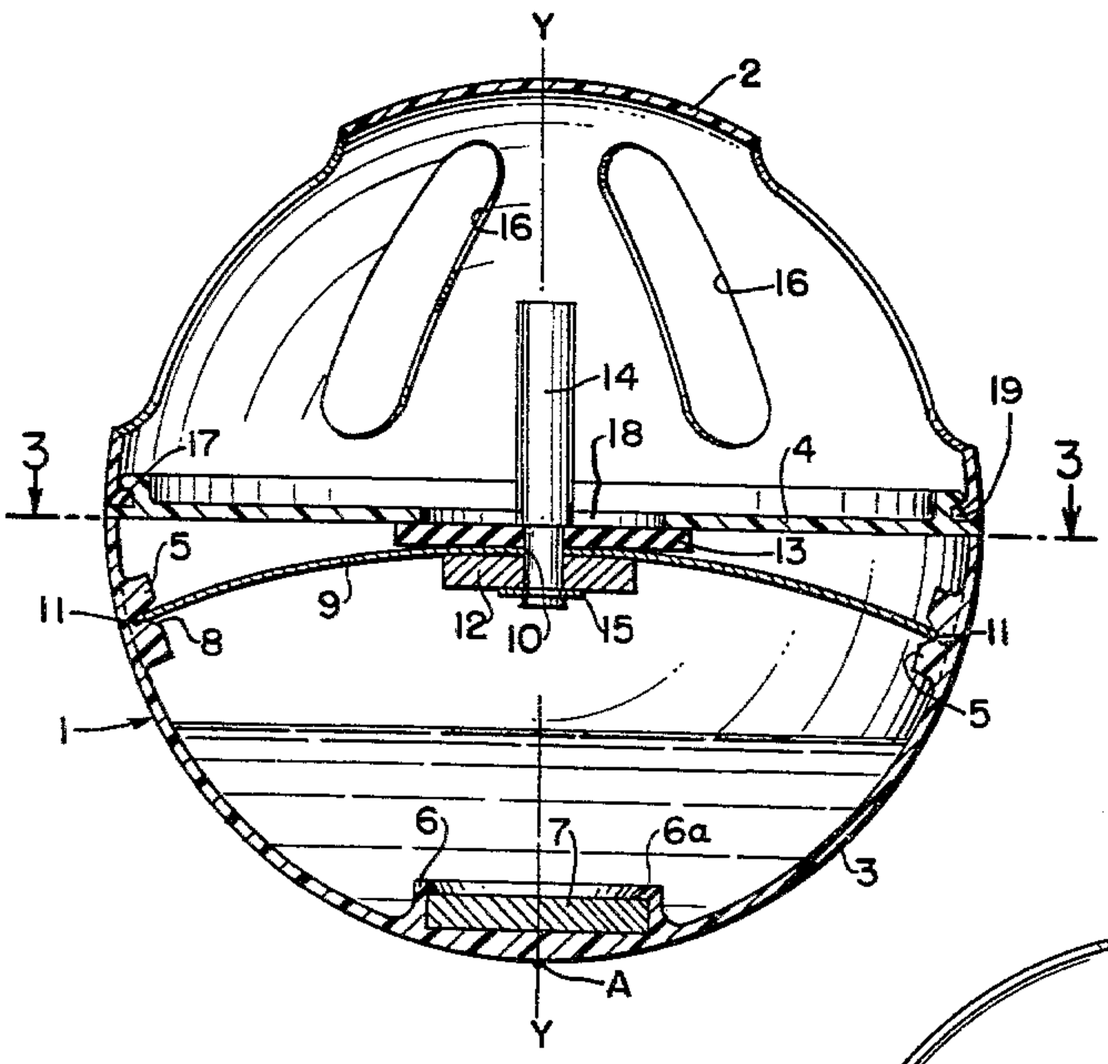

FIG. 1

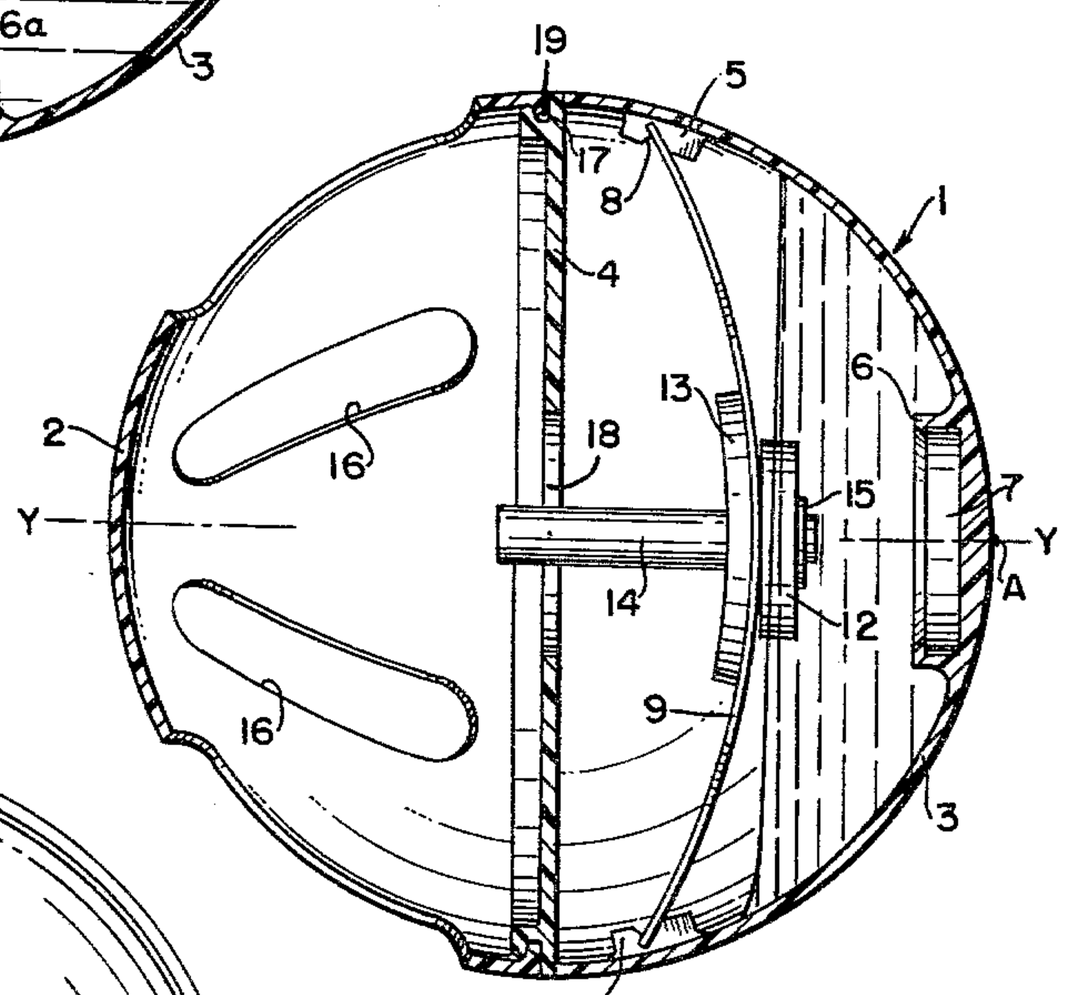

FIG. 2

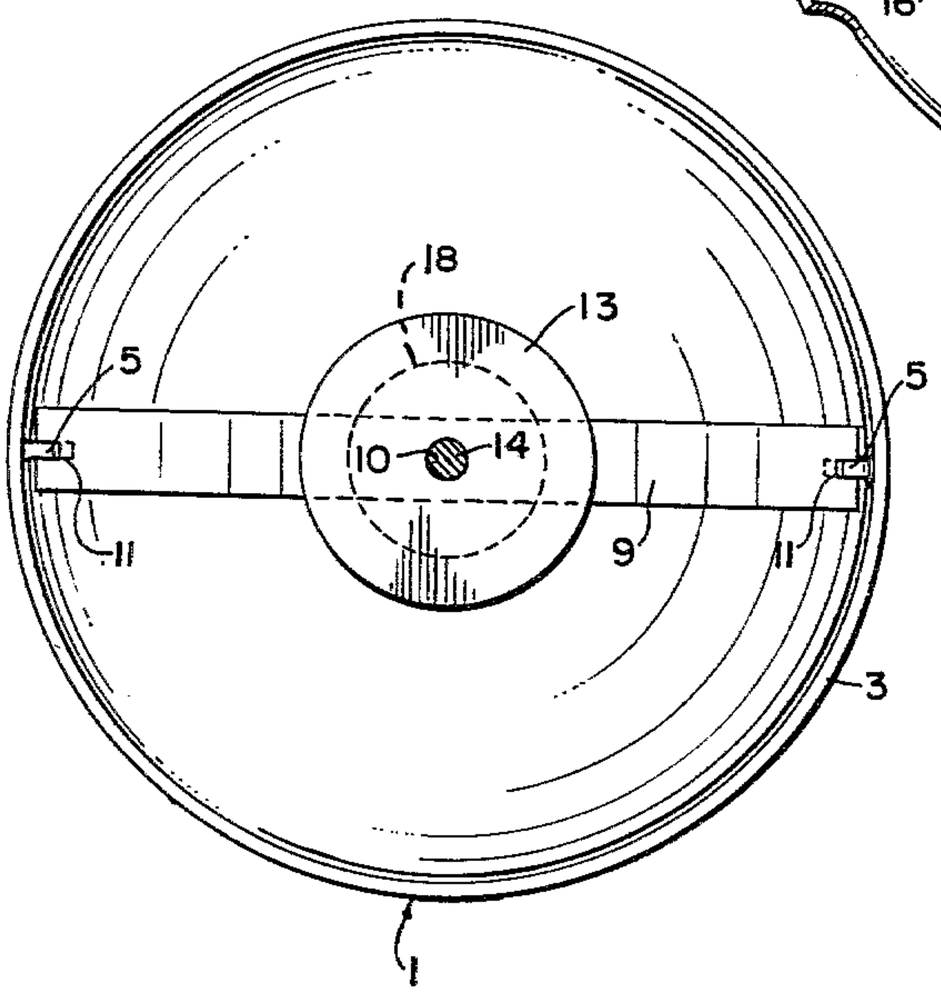

FIG. 3

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3,180,538

Patented Apr. 27, 1965

3,180,538
AUTOMATIC FLUID DISPENSER

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Filed Apr. 24, 1963, Ser. No. 275,414
6 Claims. (Cl. 222—500)

The invention can best be described with reference to the accompanying drawings which illustrate a preferred embodiment.

FIGURE 1 is a vertical cross section of a fluid dispenser constructed in accordance with the invention,

FIGURE 2 is a view similar to FIGURE 1 showing the dispenser in operation and after it has been rotated, repositioned and opened by centrifugal force, and FIGURE 3 is a view taken along section 3—3 of FIGURE 1.

FIGURE 1 shows a fluid dispenser which is composed of a substantially hemispherical container 1 to which is attached in a removable manner a hollow hemispherical shell 2 having a plurality of perforations. The preferred material for the container 1 and shell 2 is an impact resistant plastic such as polyethylene. The fluid container 1 is formed by a hemispherical shell 3 and a flat annular plate 4 fixed thereto. Shell 3 contains a region of increased wall thickness which forms a cylindrical ring 6, or inwardly extending annular flange, open to the interior of shell 3. This cylindrical ring forms a receptacle for a solid disk 7. The internal diameter of ring 6 is slightly reduced at its rim edge 6*a* to provide permanent retention of disk 7 as shown in FIGURE 1. The purpose of disk 7 is to provide a center of gravity location of the dispenser eccentric to its geometric center and is therefore fabricated of a material of relatively large specific gravity. To keep the disk small in size lead can be used.

The interior surface of shell 3 contains two projections 5 diametrically opposed to each other. The projections 5 contain notches 8 in their surfaces as shown in FIGURE 1. The purpose of notches 8 is to retain and position a spring and valve assembly. Spring 9 is of rectangular shape with a central aperture 10 and a notch 11 at each end as shown in FIGURE 3. The thickness of spring 9 is substantially less than its width in order to provide a desired flexibility for bending. The notches 8 and 11 are of similar size such that they will interlock with other. The distance between the bottoms of notches 11, with the spring relaxed, is slightly longer than the distance between notches 8 of opposite projections 5. When installed in shell 3, the spring 9 will therefore assume an up or down deflected position. Spring 9 can be fabricated of a resilient material such as tempered aluminium or spring steel. As shown in FIGURE 1 the spring is deflected upwardly in the valve closed position. It is equally capable of being in equilibrium in the downwardly or valve open position as shown in FIGURE 2. The load required to deflect spring 9 from either of its two equilibrium positions is provided by a control weight 12 fixed thereto. This occurs when the weight is in a centrifugal force field as will be described below. The control weight 12 is cylindrical in shape and provided with a central aperture equal in diameter to aperture 10 in spring 9. Control weight 12 can be fabricated from a material of relatively large specific gravity such as lead.

Adjacent to spring 9, on the opposite side of the weight 12 is a valve 13 which is of cylindrical shape and contains a central aperture equal in diameter to aperture 10 of spring 9. Valve 13 can be fabricated from a flexible material such as rubber. Valve 13, control weight 12, and spring 9 are retained together by a rod 13 which is provided with a reduced diameter equal to aperture 10 thereby creating a shoulder adjacent to valve 13. At its end

adjacent to control weight 12, rod 14 is provided with a circumferential groove which is of appropriate depth and width to accept snap ring 15 which retains the spring assembly as an integral unit. Other retaining means can be used. The length of rod 14 is such that when the spring is in its upward or valve closed position, the end of rod 14 projects through the center of plate 4 into the interior cavity of perforated shell 2.

Annular plate 4 has a central aperture 18 of a diameter somewhat smaller than the outside diameter of valve 13 in order to provide a sealing surface. At the outer edge of plate 4, on its surface exposed to shell 2, is a groove 19 formed around its outer periphery. This groove 19 receives annular flange 17 on shell 2 such as to provide means for retaining shell 2 in a removable manner. Other retaining means can be used. After installation of disk 7 and the spring and valve assembly into shell 3, plate 4 is fixed to shell 3. This may be done by bonding or welding along its outer periphery. Perforated shell 2 is of hollow hemispherical form of substantially similar diameter and wall thickness to shell 3. The surface of shell 2 is perforated with a plurality of holes or slots 16. The purpose of said slots is to permit access of the fluid in container 1 to the fluid in which this dispenser is immersed when valve 13 is open. The purpose of shell 2 is to provide a spherical contour so as to insure proper orientation of container 1 when the dispenser is in either a gravity or centrifugal force field and in contact with another surface.

To illustrate a use of the above described embodiment of the invention, let us consider its application to a conventional top loading agitator type washing machine. The first operation is to remove shell 2 from container assembly 1. This is accomplished by using slots 16 as finger holds and pulling against the snap action of ring 17 from the mating groove 19 of plate 4. This exposes the central aperture 18 of plate 4. If valve 13 is in the closed position it must be opened by pushing rod 14 toward the interior of container 1. This causes spring 9 to deflect to its downward position thereby holding valve 13 in its open position. Container 1 is then held upright as shown in FIGURE 1 and the desired amount of liquid softener or other fluid is introduced thru the central aperture 18 of plate 4 into container 1. It should be noted that the interior volume of container 1 is made larger than the maximum desired amount of fluid to be added. This is to provide positive buoyancy of the dispenser by creating a trapped air space.

After the fluid is added to container 1, valve 13 is manually closed by pulling rod 14 to deflect spring 9 to its upward position. Shell 2 is reassembled to container 1 by snapping flange 17 into the groove 19 of plate 4. The dispenser assembly (container 1 and shell 2) is then put into the washing machine along with the clothes and the washing cycle initiated. As noted above, the interior volume of container 1 is sized, relative to the volume of fluid to be dispensed, such as to provide positive buoyancy to the assembly. Therefore, during the wash cycle, the dispenser will float on the water and follow a random motion. During the wash cycle, the dispenser remains in its original state with valve 13 in the closed position. The normal floating position is as shown in FIGURE 1 due essentially to the effect of the mass of disk 7. In this position, the weight forces of mass 12 acting on spring 9 during agitation of the wash cycle is considerably insufficient to open valve 13. It is possible for the dispenser to float inverted with shell 2 submerged. This is a less stable position than its upright position, however, either position is tolerable to operation of the dispenser. The next cycle generally common to automatic washing machines is the first spin cycle which ejects the dirty wash water. As the tub of the machine increases in rotational speed, the dispenser and clothes move outward from the rotational axis and the water is pumped out. As the rotational speed and

force field increase, the dispenser becomes oriented as shown in FIGURE 2, with point A facing the tub periphery. The axis of symmetry Y—Y is therefore perpendicular to the axis of tub rotation. This particular orientation is achieved since the center of gravity of the dispenser assembly lies within container **1** and near the surface of shell **3** along the Y—Y axis due to the influence of the mass of disk **7**. As a result of this center of gravity location, the orientation described above is the only one which is statically stable during the spin cycle. The bending stiffness of spring **9** and mass of weight **12** are such that under this centrifugal field, the spring will snap over to the valve open position due to the force generated by mass **12**. Weight **12** and disk **7** are now in close proximity which results in the center of gravity of the dispenser moving closer to disk **7** and thus insuring that the orientation will be maintained and no fluid will escape thru the aperture **18** of plate **4** during the spin cycle. As this cycle terminates and the tub slows down to zero rotational speed, the dispenser will drop to the bottom of the tub. It is common for the tub to remain motionless for a period of several seconds while the timing device of the washing machine advances to the next cycle which is the clean water rinse cycle. During this short interval, the dispenser will be resting on the bottom of the tub in the upright position shown in FIGURE 1 due to the eccentric center of gravity location. The condition of the dispenser at this time is that valve **13** is open and all of the softener initially introduced is still in container **1**.

It should be noted that, after the spin cycle, the tub bottom is free of clothes since they adhere to the sides of the tub until the tub becomes filled with water. It is possible that in dropping to the bottom of the tub, at the conclusion of the spin cycle, the dispenser may land in the inverted position. Before rolling over to its upright position, in response to gravity forces, and aided by the spherical contour, a small amount of the softener may be dispensed thru the aperture **18** in plate **4**. Any softener released in this manner will remain at the bottom of the tub until new rinse water enters. As the tub becomes filled with clean water, for the rinse cycle, the dispenser will float in the upright position, again due to the center of gravity location and to its positive buoyancy when containing the prescribed amount (or less) of fluid softener.

After the tub is filled, the agitator is driven in a back and forth agitating motion. The violent action thus produced, creates considerable turbulence and splashing of the rinse water. Water will immediately enter shell **2** thru slots **16** and then enter container **1** thru the aperture **18** in plate **4** since valve **13** is now open. This water will occupy the void portion of container **1** not occupied by softener. In this manner the dispenser will become negatively buoyant and sink oriented with point A downward. At this time the softener in container **1** will be dispensed to the rinse water in either one or both of the following methods:

(*a*) Since the specific gravity of fabric softeners is less than that of water, the softener in container **1** will float out thru the aperture in plate **4** and become mixed with the rinse water to perform its intended function.

(*b*) The agitating motion will cause water to enter and leave container **1** thru the aperture in plate **4** and gradually carry out the softener in diluted form. The concentrated softener does not come into direct contact with the clothes. The significance of this feature lies in the fact that there are softening fluids currently available which contain dyeing agents. Direct contact of this type of softener will produce discoloration of the clothes. This would occur if the softener was dispensed at any time during the spin cycle except when the tub was motionless and the dispenser was not in proximity to the clothes.

The novelty and versatility of the fluid dispenser of the invention is believed clearly evident from the above described embodiment. Its modification to produce another embodiment within the spirit of the apendant claims, will be clear therefrom.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail, construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific features shown, but that the means and construction herein disclosed comprises an illustrative form of several modes of putting the invention into effect and the invention is therefore claimed in any of its form or modifications within the legitimate and valid scope of the appended claims.

Having thus described our invention, we claim:

1. A single-chamber free body dispenser floatable in a supporting fluid comprising, in combination, a closable container having a curved imperforate supporting wall adapted for rocking contact with an underlying surface and a top wall with top aperture means formed therein, a valve member movable from a closed position sealing the top aperture means to an open position, weighted spring means resiliently biasing the valve selectively toward each of its two positions, and ballast-weight means secured centrally to the curved wall biasing the dispenser toward both rocking and floating dynamic stability about a metacentric axis of stable floating symmetry joining the center of gravity and the metacenter of the floating dispenser and passing from the ballast-weight means centrally through the top aperture means, whereby the dispenser normally positions itself with its top aperture means and its ballast-weight means aligned along the direction of weight and inertial reaction forces in both its floating and its rocking modes of support under the influence of both gravitational and centrifugal forces, with the weighted spring means being positioned to shift the valve in a direction toward the ballast-weight means from its closed position to its open position under the influence of a preselected minimum acceleration substantially exceeding the acceleration of gravity.

2. The dispenser defined in claim 1 wherein the top wall is bridged by a curved member with an opening therein, and having a periphery substantially continuous with the curved imperforate wall and providing inverted rolling support for the dispenser.

3. The dispenser defined in claim 2 wherein the curved member is removably secured to the container.

4. The dispenser defined in claim 1 including a valve projection extending from the valve for manual opening and closing of the valve.

5. The dispenser defined in claim 1 in which the weighted spring means includes an arched flexible leaf spring spanning the container and displaceable between two bowed positions respectively near to and remote from the aperture means.

6. A free body dispenser rollable upon a supporting surface and floatable in supporting fluid comprising, in combination, means forming a single-chamber buoyant charge container having top aperture means for both charging and emptying the container, a curved imperforate supporting surface forming a wall of the container remote from the top aperture means, weighted valve means movable from a closed position sealing the top aperture means to an open position, means biasing said valve means in its open position when open and in its closed position when closed, balancing means adjacent to the curved supporting surface tending to orient the container so that it is supported by the supporting surface, whereby acceleration of the dispenser producing inertial reaction force acting in a direction away from the aperture means and toward the supporting surface increasing beyond a predetermined

value moves the weighted valve means to its open position, permitting the supporting fluid to enter the charge chamber through the top aperture means, sinking the dispenser and releasing the contents charged therein through the top aperture means by intermixing dispersion through the fluid.

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