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VALVE STRUCTURES FOR LIQUID DISPENSING

Field of the Invention

The present invention relates to the dispensing of liquids and, in particular, to valve structures for the dispensing of viscous liquids.

5 Background

Public bathrooms and washrooms typically include some form of dispenser by which a portion of detergent may be emitted or otherwise ejected into the hand of a user of the washroom. Various arrangements exist. Some arrangements, which are also commonly used in private environments, include pump devices where by a vessel retains
10 a quantity of the detergent and a pump is depressed by the user which then emits a portion of the detergent from a spout associated with the pump. Pump devices are relatively complex and are prone to failure after repeated use, which is typically encountered in public washrooms and the like. A useable life time may be approximately three to six months depending upon the extent of use. Similar devices used in private locations may survive
15 much longer. Pump devices are however attractive in the sense that they are effectively drip free and the positive action by the user is essential for a quantity of detergent to be emitted.

Another form of dispenser is that which is typically mounted upon a wall of a bathroom and which includes a reservoir that supplies the detergent via a valve
20 arrangement essentially under the influence of gravity. Such devices typically include some form of push button which is used to eject a portion of detergent from an outlet arranged at the base of the unit. This form of dispenser is generally considered much simpler than that of the pump dispenser and generally dominates the market for communal use. However, a significant problem associated with these dispensers is that

they tend to drip when not being actuated by a user. This can represent a waste of detergent and a cost to the operator.

Traditional dispensers incorporate valve arrangements which are adapted to prevent the dispenser dripping detergent. One known arrangement incorporates a pair of valves in which an upper ball valve couples to the reservoir of detergent and provides a path for the detergent to an actuating portion which then couples to a lower ball bearing valve that supplies the detergent from the actuating portion to an outlet of the dispenser. The ball bearing valve typically includes a metal ball bearing biased by a stainless steel coil spring and which is used to close an aperture feeding from the actuating portion to the ball bearing valve when the actuating portion is inoperative. Ball bearing valves are expensive to manufacture and assemble. Further, such valve assemblies often become clogged due to undissolved particles or due to a build-up of soap and low viscosity fluids. Such assemblies therefore cannot be used to dispense industrial abrasive hand cleaner.

It is an object of the present invention to substantially overcome, or at least ameliorate one or more deficiencies of existing arrangements.

Summary

In accordance with one aspect of the present invention there is disclosed a valve assembly for the dispensing of a viscous liquid from a reservoir, said valve assembly comprising a ball valve device coupleable to a base of the reservoir into which the viscous liquid may flow; a resiliently flexible and compressible conduit coupling the ball valve to a disc valve and via which the viscous liquid may flow from the ball valve to the disc valve, the disc valve representing an outlet of the valve assembly wherein said ball valve and said disc valve are located on a linear flow path of said liquid, said flow path extending between the reservoir and the outlet.

In a second aspect, the present invention provides a valve assembly for the dispensing of a viscous liquid from a reservoir, said valve assembly comprising:

a ball valve configured to be coupled to the reservoir and into which the viscous liquid can flow;

5 a disc valve representing an outlet of the valve assembly; and

a resiliently flexible conduit coupling the ball valve to the disc valve and via which the viscous liquid can flow from the ball valve to the disc valve and then from the valve assembly when pressure is applied to and removed from the conduit,

wherein said ball valve and said disc valve are located on a linear flow path of
10 said liquid extending between the reservoir and the outlet.

In a third aspect, the present invention provides an apparatus for dispensing a viscous liquid, said apparatus comprising:

a reservoir for the viscous liquid;

a valve assembly according to any one of the first and second aspects coupled to
15 the reservoir via a ball valve, said valve assembly comprising a resiliently flexible conduit; and

an actuator for applying and removing pressure to said conduit to thereby cause dispensing of the liquid from the apparatus.

Brief Description of the Drawings

At least one embodiment of the present invention will now be described with reference to the drawings in which:

Fig. 1 is a longitudinal cross sectional view of a first valve assembly in
5 accordance with the present disclosures;

Fig. 2 is a view similar to Fig. 1 but of the valve assembly in operation;

Fig. 3 is an enlarged cross sectional view of the ball valve of Figs. 1 and 2;

Fig. 4 is an enlarged cross sectional view of the disc valve of Figs. 1 and 2;

Fig. 5 is a plan view of the disc seen in Fig. 4;

10 Fig. 6 is a longitudinal cross sectional view of a dispensing apparatus incorporating the valve of Figs. 1 to 5;

Fig. 7 is a perspective view of a bag-type dispenser incorporating the valve of Figs. 1 to 5;

Fig. 8 is a cross sectional view of a disc valve assembly for a bag dispenser; and

15 Fig. 9 is a view similar to Fig. 6, but of a dispenser formed using the arrangement of Fig. 8.

Detailed Description Including Best Mode

Figs. 1 to 5 show a valve assembly 100 and components thereof which may be used for the dispensing of viscous fluid such as detergents, oil or the like from a container
20 forming a reservoir of such fluid. As best seen in Figs. 1 and 2, the valve assembly 100 is

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formed by a ball valve 110 coupled via a tube or conduit 150 to a disc valve 130. As best seen in Fig. 3, the ball valve 110 is formed by an upper section 112, a lower section 114 and a freely movable ball 116 held captive within a chamber 128 formed between the two sections 112, 114. The upper section 112 includes a circular inlet 118 about which is
5 formed a barbed extension 120 permitting a snap-fit engagement of the ball valve 110 to a rigid container or a substantially rigid portion of a flexible container representing a reservoir of viscous fluid. When suitably engaged, the attached container is held by an interference snap-fit between the barbed extension 120 and a flanged shoulder 129, each formed in the upper section 112.

10 The lower section 114 incorporates a circular outlet 122 formed between flanges 124 extending inwardly from an exterior of the lower section 114. The flanges 124 operate to secure the ball 116 within the chamber 128.

The ball valve 110 is assembled by firstly inserting the ball 116 into the chamber 128 and then closing the chamber 128 by fitting the lower section 114 to the
15 upper section 112 as illustrated. The fitted sections 112 and 114 may be secured using an interference fit, or with a glue, and/or ultrasonic welding. The lower section 114 includes an annular bevelled edge 126 which permits one end of the tube 150 to be engaged over the exterior wall of the ball valve 110 to abut against the flanged shoulder 129, as best seen in Figs. 1 and 2. The tube 150 is preferably formed of resiliently flexible material
20 suitable for conveying the viscous fluid from the ball valve 110 to the disc valve 130 without leakage.

The other end of the tube 150 similarly engages to an exterior annular wall 142 of the disc valve 130, as best seen in Fig. 4. The disc valve 130 includes a lower section 132, an upper closure 134 and a disc 136, positioned therebetween. The lower

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section 132 includes an elongate outlet nozzle 138 extending from a flanged shoulder 140 against which the tube 150 abuts. The lower section further includes the annular wall 142 which defines an interior of the lower section 132 within which a shelf 144 is formed. Upon the shelf 144 the disc 136 rests generally under the influence of gravity when the
5 valve assembly 100 is operatively arranged as shown in Figs. 1 and 2. The upper closure 134 incorporates a central channel 146 and a stepped wall 148 configured to engage the annular wall 142. The stepped wall 148 includes a leading annular bevelled section 149 permitting ease of alignment of the two sections 132, 134 during assembly. As seen in Fig. 5, the disc 136 includes a pair of slots in the shape of a cruciform 137 cut
10 through its surface. In this regard, the disc 136 is preferably formed of flexible rubber such that the cruciform cut 137 permits the opening of the disc 136 in the form of a number of flaps to allow passage of viscous fluid.

Operation of the valve assembly 100 is best seen with reference to Figs. 1 and 2. Fig. 1 shows the valve assembly 100 under a normal static configuration when vertically
15 arranged beneath a reservoir of viscous fluid. As will be appreciated, in this configuration, the ball 116 will, under the influence of gravity, fall to a seated position 156 whereby the outlet 122 of the ball valve 110 is closed or occluded by the ball 116. Thus, any viscous fluid that may enter 152 the ball valve 110 under gravity will be substantially prevented by flowing into the tube 150 and the disc valve 130. Further, as
20 illustrated, the disc 136 is, at this time, in its planar configuration whereby the slot 137 is substantially closed due to the resilient flexibility of the material from which the disc 136 is formed.

When it is desired for the valve assembly 100 to dispense the viscous fluid, as seen in Fig. 2, pressure is applied 162 to the exterior of the tube 150 which deforms the

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tube 150 thereby increasing the pressure within the tube 150. This increase in pressure causes two results. Firstly, the position of the ball 116 becomes raised 158, thus displacing any viscous fluid present in the chamber 128 of the ball valve 110 to flow from the ball valve 110 into the tube 150. Further, the increase in pressure within the tube 150 causes the disc 136 to flex at the slots 137 thereby causing an opening 160 of the disc and thus permitting viscous fluid in the tube 150 to flow through the disc valve to exit 154 the outlet nozzle 138.

When the tube 150 has been fully depressed, the pressure at the inlet 152 and outlet 154 for the flowing liquid will substantially equalize. When the pressure is removed from the tube 150, the resilience of the tube 150 results in the tube 150 returning to its original tubular/cylindrical form. A negative pressure will therefore develop within the tube 150 effectively sucking the ball 116 back to the position 156 to occlude the outlet 122, and also for the disc 136 to flex back to its normal position thereby substantially closing the cruciform slot 137. The flow of the viscous liquid from the valve assembly 100 will then cease. The ball 116 may be hollow or otherwise manufactured from plastics materials which are modestly denser than in the viscous fluid required to be displaced. Further, the sections 112, 114, 134 and 132 of the valves 110 and 130 are preferably manufactured of the same plastics material, many examples of which exist in the art.

Preferably, the tube 150 engages each of the ball valve 110 and the disc valve 130 in an interference fit which may be secured using glue, ultrasonic welding or using a heat shrink sleeve (not illustrated), over each position of engagement.

Fig. 6 shows a liquid dispenser 600 incorporating an outer shell 602 which includes a pair of mounting locations 604 by which the dispenser 600 may be mounted upon a convenient vertical surface, such as a wall of a bathroom or the like. The

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dispenser 600 encloses a container 606 forming a reservoir of viscous fluid. Not illustrated in Fig. 6, but as would be known to the art, is that the container 606 may incorporate a cap or similar closure permitting refilling of the container 606. The dispenser 600 includes the valve assembly 100 which engages beneath the container 606 and extends behind the outer shell 602 to an opening 608. The dispenser 600 incorporates a push button 610 coupled to a push pad 612 via a shaft 614 and a spring 616. With this arrangement, the push button 610 may be manually depressed by a user of the liquid dispenser 600 to engage the tube 150 of the valve assembly 100 to increase the pressure within the tube 150 to cause operation as shown and described in relation to Fig. 2. Other forms of actuation may be used as will be appreciated by those skilled in the art.

The arrangement of Fig. 6 is advantageous in that the valve assembly 100 with the upper ball valve 110 also stops flow back of fluid up into the container 606 through the ball 116 occluding the inlet 118. As such, the valve assembly 100 may be used with both sealed and unsealed (open-top) containers or cartridges, and also for highly viscous liquids and cleaner liquids having abrasives or pumice suspended therein.

Fig. 7 illustrates use of the valve assembly 100 coupled to a flexible bag 700 forming a reservoir of viscous fluid. In this implementation, the flexible bag 700 may be used as a substitute for the effectively rigid container 606 shown in Fig. 6. With the arrangement shown in Fig. 7, the valve assembly 100 may be replaced together with each replacement of the flexible bag 700 in appropriate installations. Mounting of the ball valve 110 in the arrangement of Fig. 7 will be against a substantially rigid portion of the bag 700 formed in a wall thereof.

From the arrangement of Fig. 7, it will be appreciated that the tube 150 of the valve assembly 100, may be depressed or squeezed to cause actuation thereof and

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emission of the viscous liquid. However, squeezing the bag 700, will not cause expulsion of the viscous fluid since such would act to force the ball valve 110 closed.

As a consequence of this, the present inventor considers that when being implemented with the flexible bag 700, the ball valve 110 may be omitted and a simpler arrangement incorporating a modified disc valve 800 as shown in Fig. 8 may be used. As
5 seen in Fig. 8, a bag-arranged disc valve 800 engages with a wall 802 of the bag 700 and incorporates a lower section 804 having a substantially corresponding shape to that of the lower section 132 shown in Fig. 4. The lower section 804 has a flanged shoulder 806.

In the bag-arranged disc valve 800, an upper closure 810 has a slightly different
10 shape to that provided in Fig. 4, in that an outer wall 814 is arranged to extend about the exterior of the lower section 804 towards the flanged shoulder 806 to thereby act to sandwich the bag wall 802 therebetween. To perform this function, an annular channel 816 is formed having an interior bevelled edge 818 thereby configured to align and matingly engage with the extending annular wall of the lower section 804. Once
15 sandwiched between the lower section 804 and the upper closure 810, the bag wall 802 may be secured using adhesive, or ultrasonic welding, to ensure the valve structure 800 is appropriately sealed.

The valve 800 operates on the principle that the disc 136 located therein will be in its closed position (as illustrated in Fig. 8) until such time as the bag 700 is squeezed or
20 the pressure otherwise increased within the bag 700. Upon the pressure being released, a negative pressure will operate to close the disc 136 thereby preventing further flow of the viscous fluid. With the configuration of Fig. 8, such may be used to form a dispenser 900 in which the actuator formed by the components 610, 612, 614 and 616, operates directly upon the bag 700 to emit from the disc valve 800, as seen generally in Fig. 9.

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The arrangements described offer a direct alternative to valve assemblies which traditionally incorporate a ball bearing valve by replacing the ball bearing valve with the disc valve as illustrated. The disc valve is of simple construction and less prone to obstruction and/or failure. Further the assembly of the disc valve is somewhat simpler
5 than that of the ball bearing valve as there is no need to compress the spring traditionally found in ball bearing valves.

Industrial Applicability

The present disclosure is applicable to those situations where relatively small quantities of viscous liquids are required. Such include, for example, washrooms for the
10 dispensing of detergent and massage rooms for the dispensing of oils or creams.

The foregoing describes only a number of embodiments of the present invention and modifications may be made thereto without departing from the spirit and the scope of the present disclosure.

The claims defining the invention are as follows:

1. A valve assembly for the dispensing of a viscous liquid from a reservoir, said valve assembly comprising:

5 a ball valve coupleable to a base of the reservoir and into which the viscous liquid may flow; and

a resiliently flexible conduit coupling the ball valve to a disc valve and via which the viscous liquid may flow from the ball valve to the disc valve, the disc valve representing an outlet of the valve assembly,

10 wherein said ball valve and said disc valve are located on a linear flow path of said liquid, said flow path extending between the reservoir and the outlet.

2. A valve assembly according to claim 1 wherein the disc valve comprises a disc having a cruciform shaped cut formed therein.

15 3. A valve assembly for the dispensing of a viscous liquid from a reservoir, said valve assembly comprising:

a ball valve configured to be coupled to the reservoir and into which the viscous liquid can flow;

20 a disc valve representing an outlet of the valve assembly; and

a resiliently flexible conduit coupling the ball valve to the disc valve and via which the viscous liquid can flow from the ball valve to the disc valve and then from the valve assembly when pressure is applied to and removed from the conduit,

25 wherein said ball valve and said disc valve are located on a linear flow path of said liquid, said flow path extending between the reservoir and the outlet.

4. A valve assembly according to claim 3 wherein the disc valve comprises a resiliently flexible disc having a cruciform shaped cut formed therein and adapted upon

the pressure being applied to flex to form an opening through which the liquid passes from the conduit and through the disc valve, the opening being closed by the pressure being released and the resilience of the disc.

- 5 5. A valve assembly according to claim 4 wherein the ball valve comprises a chamber and a ball freely movable within the chamber and configured to occlude an outlet of the ball valve when no pressure is applied to the conduit and to open the outlet when the pressure is applied.
- 10 6. Apparatus for dispensing a viscous liquid, said apparatus comprising:
 a reservoir for the viscous liquid;
 a valve assembly according to any one of the preceding claims coupled to the reservoir via a ball valve, said valve assembly comprising a resiliently flexible conduit;
 and
15 an actuator for applying and removing pressure to said conduit to thereby cause dispensing of the liquid from the apparatus.
7. Apparatus according to claim 6 wherein the actuator is manually operable to deform the conduit.
- 20 8. Apparatus according to claim 6 or 7 wherein said reservoir comprises a substantially rigid container.
9. Apparatus according to claim 6 or 7 wherein said reservoir comprises a flexible
25 bag.