

May 28, 1968

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3,385,327

SCREW-DOWN VALVES FOR FILLING BOTTLES WITH LIQUID

Filed May 11, 1965

3 Sheets-Sheet 1

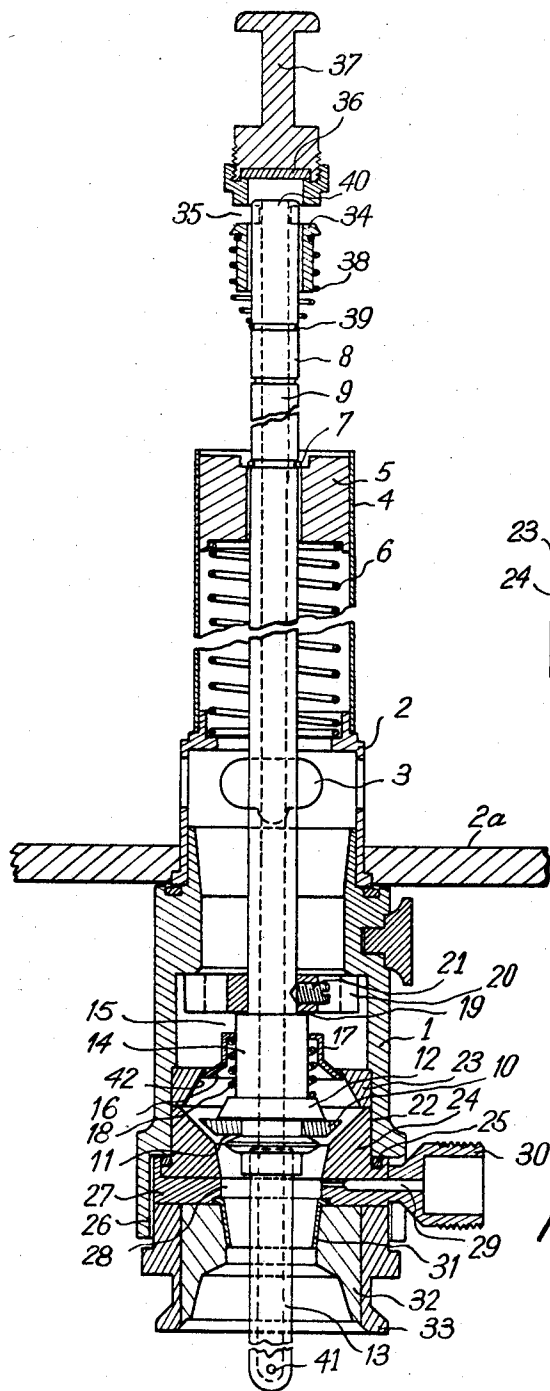


Fig. 1

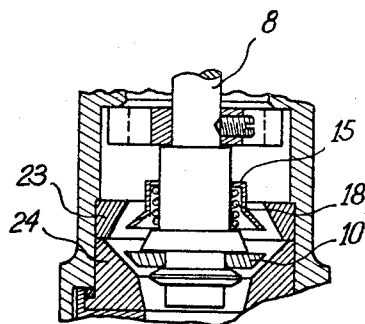


Fig. 2

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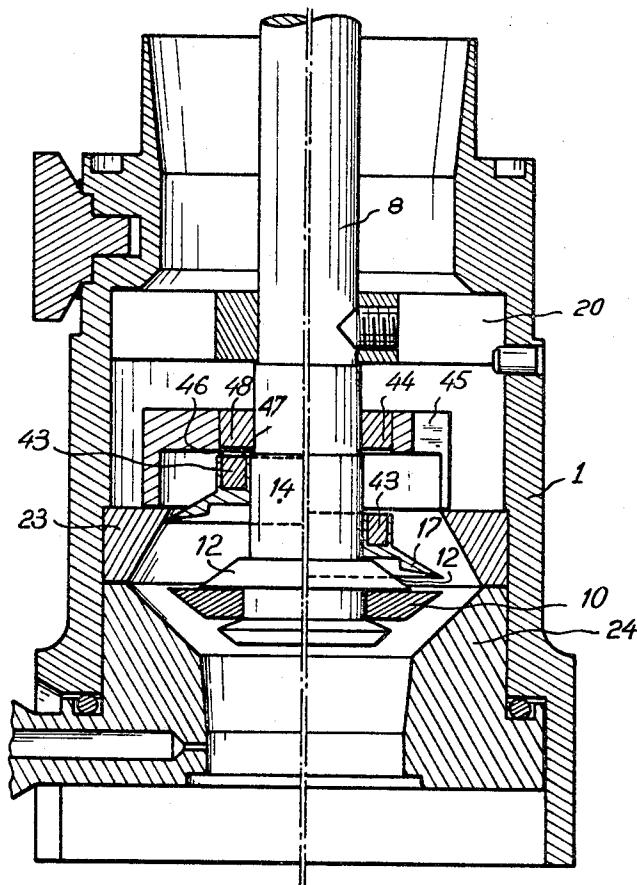


Fig. 3

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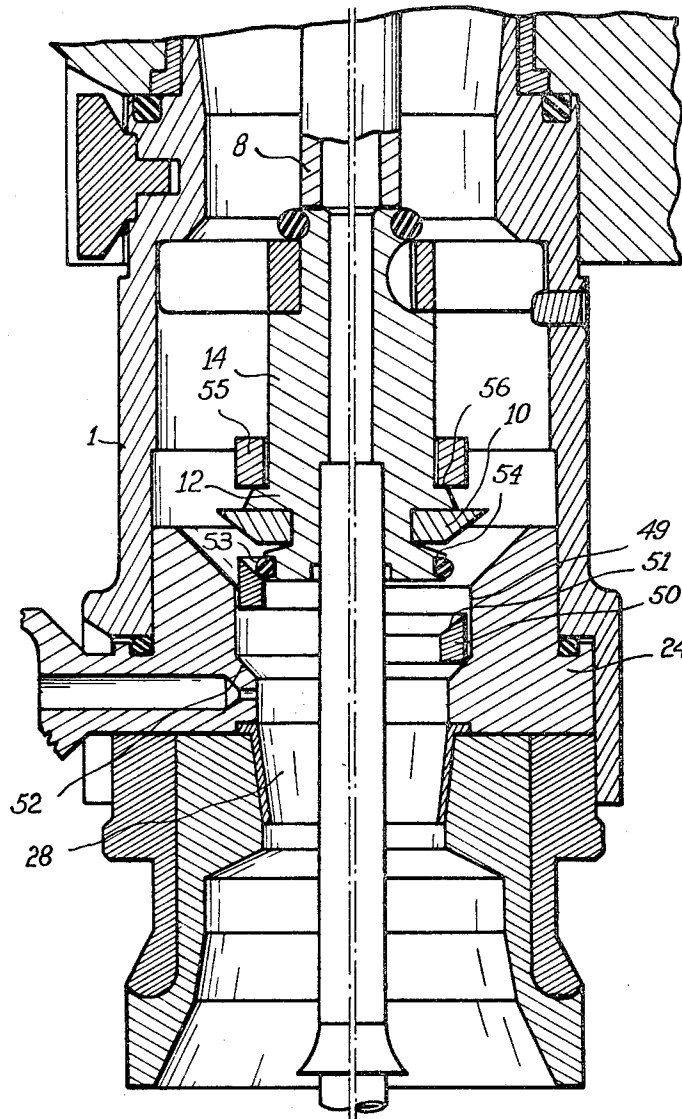


Fig. 4

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SCREW-DOWN VALVES FOR FILLING BOTTLES WITH LIQUID

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2 Claims. (Cl. 141—39)

ABSTRACT OF THE DISCLOSURE

A control valve for filling bottles with liquid under gaseous pressure from a reservoir, having an inlet co-operating with the liquid in the reservoir and an outlet opening into the bottle to be filled. Dual control means located in the flow path of the liquid through the valve, one of which control means is pressed upon its seat by the action of the gaseous pressure contained in the reservoir above said liquid on a piston and being moved to the open position by biasing means when gas above the liquid is allowed to flow through the hollow stem of the control means so as to balance the pressure in the bottle to be filled and the reservoir. The second control means, which is normally biased to the closed position is then opened by the weight of the liquid in the reservoir to allow the bottle to be filled to a predetermined height.

The present invention is drawn to an improved screwed-down valve for filling bottles with drinks and more particularly with gaseous drinks having a high percentage of pulp.

In modern installations for filling bottles with gaseous drinks containing, in particular, carbon dioxide under counterpressure, at present an automatic apparatus is used which enables predetermined quantities of liquid to be delivered into the bottles. These apparatus comprise a mechanism for handling the bottles, in which the empty bottles are raised until the neck engages with the filling device, in order to receive a certain volume of liquid, then they are lowered and directed towards a capping device. The filling device comprises a tank containing a liquid which flows under the effect of a gas under pressure above the free level of the liquid, a screw-down valve located in the tank and comprising a valve for placing the gas chamber of the tank in communication with the empty bottle, and a liquid valve which opens to allow the bottle to be filled with liquid, when the pressure is established between the gas chamber and the inside of the bottle. During the filling period, the gas contained in the bottle is evacuated through a vent tube towards the gas chamber of the tank. As soon as the level of the liquid in the bottle reaches the apertures of the vent tube, the gas which is located in the neck of the bottle can no longer escape, and the flow is stopped. The liquid and gas valves are then closed again by a system of levers acting on the end of the control rod of the valves.

However, when the flow of the liquid is initially stopped and the liquid valve is still open, some of the gas which is trapped in the neck flows through the liquid to the vent tube, thereby causing further slight flow of liquid due to the escaping gas and a constant filling level of the bottle cannot be obtained.

With a view to avoiding this gas flow through the liquid, a metal sheet, a grid or a diaphragm having the effect of delaying the outflow of the liquid, has been used so that the outflow of the liquid may be stopped before filling is completed and which, by the superficial

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or surface tension of the liquid, ensures a complete separation between the gas trapped in the neck of the bottle and the liquid of the tank.

These devices for reducing the outflow may be suitable when filling bottles with water, however, they do not appear to be very satisfactory when they are used for liquids containing solids in suspension, for example pulpy liquids, for which these devices tend to be obstructed and to reduce the gas contents of the liquid by causing a lamination of the liquid.

To the same end, a siphon device has also been used, which allows a free passage for pulpy liquids, but cannot ensure that the flow of the liquid will be prevented after filling has stopped, which results in substantial differences in the heights of the level of the liquids in the bottles.

In the present invention, a valve is used, in which a closure member is subjected to the action of a calibrated spring, in order to be opened under the weight of the column of liquid when the liquid valve is opened and which is closed as soon as the pressure of the gas in the neck of the full bottle is sufficient to push the closure member back onto its seating, in co-operation with the spring, and to stop the flow of the liquid when the liquid valve is still open. This valve ensures that the flow channel is completely closed and it enables levels of constant height to be obtained in the bottle. Moreover, all liquids, even pulpy liquids, may be utilised without the fear of the filling channel being blocked by particles in suspension in the liquid.

During the operation of the valve it will be seen that the closure member of the valve is subjected, at its upper part, not only to the weight of the liquid but also to a residual pressure between the liquid tank and the inside of the bottle, the liquid valve opening under the action of the main spring, before balance is completely re-established between the part of the tank containing the gas under pressure and the inside of the bottle.

In another embodiment, the valve spring may be replaced by two permanent magnets, one of which is secured to the valve and the other of which is mounted on a cross-piece fixed on the valve seating.

The magnetic force mutually attracting the two magnets normally holds the valve-closure member against its seating, so that, when the bottle is being filled, the weight of the column of liquid which acts on the closure member with a force which is greater than the magnetic force, separates the closure member from its seating which is lowered and is applied to the liquid valve head.

The closure member of the valve returns again to rest on its seating as soon as the pressure of the gas in the neck of the full bottle is sufficient to co-operate with the magnetic attraction of the magnets.

This device necessitates no calibration, as does the spring, and does not risk being deteriorated during assembly as occurs in the case of spring control.

On the other hand, a complete opening of the apertures for the passage of the liquid is obtained in the opened position and a maximum attraction of the magnets when the valve is closed. Consequently, when closing is effected, much more regular heights of the level of the liquid are obtained than with a spring.

On the other hand, in order to simplify the device of the valve, another embodiment may be used in which a valve situated in the lower part of the liquid valve has a closure member constituted by a magnetic ring presenting a tapered projection which rests on a seating constituted by a flexible ring mounted on the head of the liquid valve. The closure member is subjected at its lower part to the combined magnetic force of the magnet of which it is constituted and of an annular magnet fixed on the head

of the liquid valve, so that the closure member is applied against its seating when the stop-cock is closed and when it is separated from its seating for filling the bottle, when said closure member is subjected to the weight of the liquid and to the residual pressure existing between the liquid tank and the inside of the bottle after the liquid valve has been opened.

The valve closure member returns again to rest on its seating as soon as the pressure of the gas in the neck of the full bottle is sufficient to co-operate with the magnetic attraction of the magnets.

This device, the assembly of which is simple, ensures a still larger opening of the section of the apertures for the passage of the liquid than in the previous embodiment, by removing the cross-piece supporting the fixed magnet.

According to the present invention, the valve is composed of a seating housed in the body of the stop-cock and of a closure member sliding on the rod of the liquid valve, which is arranged on the upper part of said valve in the direction of flow of the liquid, this closure member being subjected at its lower part, to the action of a flexible return means on its seating and, at its upper part, to the weight of the liquid and to the pressure existing after the liquid valve between the supply tank and the inside of the bottle has been opened, so that the valve is opened under the pressure of the liquid when the two valves are opened, as soon as communication is established between the inside of the bottle and the volume of gas arranged above the liquid and it is closed when this communication is interrupted by the liquid reaching a predetermined level in the bottle.

In order that the invention may be more clearly understood, reference will now be made to the accompanying drawings which show embodiments thereof merely by way of example, and in which:

FIGURE 1 is an elevational view of a screw-down valve with a spring valve,

FIGURE 2 is a detail view showing the valve in an open position,

FIGURE 3 is a detail view of the stop-cock showing the valve having return means constituted by magnets, said valve being shown open on the right hand section and closed on the left hand section of the figure, and

FIGURE 4 is a detail view of the stop-cock showing the valve having return means constituted by magnets, said valve being situated on the lower part of the liquid valve and which again, like FIGURE 3, is shown open on the right hand section and closed on the left hand section of the figure.

Referring now to the drawings, the screw-down valve shown in FIGURE 1 is constituted by a stop-cock 1, on which is mounted a base 2, having apertures 3, through the wall thereof for admitting liquid, surmounted by a tube 4 in which moves a piston 5 subjected to the action of a spring abutting the base 2. The valve is connected to a reservoir, the base of which is indicated as 2a. Furthermore, the piston 5 is secured, by means of a flexible ring 7, to a piston rod 8 having a central longitudinal bore 9 open at its two ends, and having on its lower part a closure member 10 engaged in a groove 11 in a liquid valve head 12 on which is screwed a vent tube 13 which communicates with the bore 9 of the valve rod. Above the valve head 12, the valve rod 8 has a part 14 of larger diameter, on which moves a closure member 15 for the level control valve. This member 15 is preferably metallic but could just as well be made of another substance capable of satisfying the conditions of use and has a hat-shape, comprising a conical or outwardly tapering projection 16 and a cylindrical part 17, leaving an annular space between its internal wall and the part 14 of the valve rod, said space receiving a spring 18, one of whose ends abuts the valve head 12 and, the other of whose end abuts the base of the closure member 15. A stop in the form of a cross-piece 20 is secured in position in the valve rod 8

against the shoulder 19 formed by the part 14 of the rod, by means of a set screw 21.

In a chamber 22 in the lower part of the body 1 are mounted a valve seating 23 which co-operates with the closure-member 15 for the level control valve and a seating 24 which co-operates with the closure member 10 of the liquid valve and includes a sealing joint 25.

In a second chamber 26, at the lower part of the stop-cock 1, a disc 27 having a central aperture 28 for the outlet of liquid, said aperture is located on the valve seating 24, said disc having a lateral channel 29 in communication with a pipe 30 which is an integral part of the disc. A pressure-release member (not shown in the figure) is screwed on the pipe 30.

A tapered socket 31, inserted in the disc 27, is engaged in a centering plug 32 made of flexible material, which is held in place by a centering socket 33, said plug being used to receive the upper neck of a bottle, against which it abuts.

On the upper part of the rod 8 is mounted a gas valve, constituted by a sleeve 34 having lateral apertures 35 and one end of which is closed by a disc 36 held by a push-rod 37 screwed to said sleeve. The sleeve 34, which slides on the upper end of the rod 8, acts in opposition to a spring 38 that abuts a flange of the sleeve 34 and a flexible joint 39 engaged in a groove in the rod 8, in order to ensure that the upper aperture 40 of the piston rod is shut.

The stop-cock is operated in the following manner:

When the neck of an empty bottle arrives beneath the centering plug 32, the gas and liquid valves as well as the valve for controlling the level are closed, i.e., the disc 36 of the gas valve, is applied to the aperture 40 of the valve rod, the closure member 10 of the liquid valve is applied on its seating 24 and the closure member 15 of the level control valve rest on its seating 23.

In order to fill the bottle, the push-rod 37 controlled by a control lever, (not shown in the figure), rises, together with the sleeve 34, under the action of the spring 38 uncovering the aperture 40 and the apertures 35, whilst enabling the gas, situated above the liquid, to fill the bottles through the central hole 9, the vent tube 13 and the apertures 41. This first operation enables a gas pressure to be obtained in the empty bottle which pressure is equal to that of the gas located above the liquid.

As soon as balance between the pressures has been established, the excess pressure which was exerted inside the tank up to the present time on the liquid valve is removed and the closure member 10 rises from its seating 22 under the action of the spring 6 acting on the piston 5 and the piston rod 8. The closure member 15 of the level control valve is then opened under the weight of the liquid and of the pressure existing after the liquid valve between the tank and the inside of the bottle has opened, which pressure has a force which is greater than that of the spring 18, enabling the liquid to flow into the bottle through the apertures 3, the inside of the stop-cock 1, the seatings 23 and 22 the aperture 28 and the tapered socket 31 (FIGURE 2). At the same time, the gas in the bottle passes through the apertures 41 of the vent tube 13 and the central core 9 of the piston rod so as to return into the tank through the gas valve.

When the liquid has reached the apertures 41 of the vent tube 13, the gas in the bottle can no longer escape and it is compressed in the neck of the bottle, so that it pushes back the closure member 15, in cooperation with the spring 18 and applies the closure member device on the valve seating 23 so as to stop the flow of the liquid.

Then, the push rod 37 is lowered by the lever referred to above in order to act on the piston 8 and to ensure that the gas and liquid valves are closed. The pressure of the gas in the neck of the bottle is released by the channel 29 and the pressure-release member on the pipe 30.

When the pressure within the bottle has become equal to the external pressure, the bottle may be removed from the filling device. In the valve shown in FIGURES 1

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and 2, the tapered projection 16 of the closure member 15 has a taper angle which is different from that of the conical projection 42 of the seating, in order that the valve action is obtained in a circular line and not a surface. This arrangement enables a better seal to be achieved and prevents the closure member sticking on its seating when liquids containing sugar are used. On the other hand, the surface 42 may be scraped and cleaned by means of the edge of the member 16 for liquids containing pulp.

In FIGURE 3, another embodiment of the invention is shown comprising the stop-cock 1 having the seating 23 which cooperates with the closure member 17 of the level control valve and the seating 24 which cooperates with the closure member 10 of the liquid valve.

The closure member 17 is slidably mounted on an enlarged part 14 of the valve rod 8 and in the upper part thereof is housed an annular permanent magnet 43 which, when the member 17 is in closed position, as shown on the left hand side of the drawing, cooperates by magnetic attraction with another annular permanent magnet 44 secured to a supporting cross-piece 45 fixed above the seating 23, so as to hold the valve in closed position against the seating 23.

A gap 46 is arranged between the faces 47 and 48 of the opposed and mutually attracted magnets 43, 44.

When the closure member 10 of the liquid valve is opened as shown in the figure, the column of liquid above the valve 17 drives the latter under the force of gravity which is greater than the magnetic attraction between the magnets 43, 44. The valve 17 slides on the part 14 of the valve rod 8 and is applied against the valve head 12, ensuring a complete opening of the apertures for the passage of the liquid as shown on the right hand side of the figure.

As soon as the bottle is full, the member 17 returns to a closed position under the combined action of the pressure of the gas located in the neck and of the magnetic attraction between the magnets 43, 44.

The annular magnets 43, 44 are covered by a coating layer, particularly of cold enamel or are chromium plated so as to protect them against the action of liquids.

FIGURE 4 shows yet another embodiment of the invention incorporating the body of the stop-cock 1 in which the seating 24 is engaged, which cooperates with the closing device 10 of the liquid valve. The seating 23 co-operating with the closure member 17 of the previously described valve is removed. The seating 24 has a cylindrical chamber 49, made in the lower part of the projection of the closure member 10 in which a closure valve 50 is slidably mounted said valve being constituted by an annular permanent magnet having a tapering projection 51. The closure member or valve 50 is retained in a low position by a bevelled shoulder 52. The head of the liquid valve 12 receives in its upper part a flexible toric joint 53 disposed in a groove 54 in said valve head. This flexible joint 53 constitutes the seating of the valve against which the tapered projection 51 of the member 50 is supported when the latter is in the closed position.

On the enlarged part of 14 the valve rod 8 is engaged an annular permanent magnet 55 which rests on a well-formed shoulder 56 on the valve head 12 in the upper part of the liquid closure member 10.

When the liquid closure member 10 is in contact with its seat 24 for the closed position of the stop-cock, the toric joint 53 is supported on the projection 51 of the member 50, the latter being supported by the shoulder 52.

When the closure member 10 of the liquid valve is opened, as is shown on the right hand side of the figure, the weight of the column of liquid being located above the closure member and the residual difference in pressure between the liquid tank and the inside of the bottle, hold the closure member 50 in support against the shoulder 52 by the force which they exert on said closure

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member and which is greater than that of the magnetic attraction between the magnets 50, 55. In this position of the member 50, a complete opening of the apertures for the passage of the liquid is ensured.

As soon as the bottle is full the member 50 returns to closed position under the combined action of the pressure of the gas situated in the neck of the bottle and of the magnetic attraction of the magnet 55 and the magnet 50 constituting the closure member, (left hand side of the figure).

The valve or closure member 50 is applied against the toric joints 53 by its tapered projection 51 and ensures that the aperture for the passage of the liquid 28 is closed, whilst the valve 10 of the liquid valve is still in opened position.

The magnet constituting the closure member 50 and the annular magnet 55 are covered by a coating layer, particularly of cold enamel or plastics material, intended to ensure their projection against the action of liquids.

Of course, the invention is not limited to the described and shown embodiments, but covers on the contrary, all the variants thereof. Moreover, the above described device could possibly be used for filling bottles with gaseous drinks: in this case it will be necessary to provide in the liquid tank a pressurized gas such as compressed air.

I claim:

1. A bottle filling control valve for the automatic bottling of liquids from a reservoir containing liquid under gaseous pressure, comprising: a valve body capable of being fixed to said reservoir, said valve body having an inlet cooperating with the liquid in the reservoir and an outlet capable of being attached to a bottle to be filled; removable seating means carried by said body; a hollow piston rod open at both ends slidably mounted in said body and extending through said seating means, one end of said rod communicating with the gas under pressure in said reservoir while the other end extends through said outlets so as to be in communication with the bottle to be filled; said rod having first and second closure members, cooperating with said seating means, mounted on a lower part thereof, said first closure member being fixed to said rod and said second closure member being slidable thereon; piston means secured to said rod; biasing means acting on one side of said piston in a direction tending to raise said first closure member from the seating means; said piston means being subjected to the gas pressure in said reservoir, said gas pressure being stronger than said piston biasing means so as to normally hold said first closure member in the closed position on its seat; stop means mounted on said rod and co-acting with said valve body to limit the movement of said rod; a gas vent valve mounted on said one end of said rod for controlling the passage of gas from said reservoir through said rod to the other end thereof to equalize the pressure in said reservoir and the bottle to be filled, so as to thereby allow said first closure member to be moved to the opened position by said piston biasing means; said second closure member normally being biased to a closed position on the seating means and capable of being opened by the weight of the liquid in the reservoir after said first closure member has been moved to its open position to thereby allow the bottle to be filled to a predetermined height with liquid from the reservoir said second closure member comprising a flexible toric joint mounted on said rod and an annular permanent magnet slidably mounted within a cylindrical chamber formed with a stop means for said annular magnet at one end thereof; said annular magnet and said toric joint being mounted downstream of said first closure member; said annular magnet being subjected to the magnetic attraction of a second annular permanent magnet mounted upstream of said first closure member so as to bias said annular magnet to its closed position against said toric joint.

2. The valve of claim 1 in which said annular magnet has a tapered interior portion, capable of coacting with

said toric joint to stop the flow of liquid through said valve.

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