This invention relates to valve mechanisms for pressurized containers, and more particularly to a valve mechanism that can be used when the container is in either an upright or an inverted position and which mechanism is self-cleaning.

During the past few years, the number and type of products that are sold in pressurized cans have increased tremendously. Every container for pressurized products must necessarily have a valve of some type to dispense the product. There have been many prior art proposals for such valves, but each of these prior art proposals has limiting features which dictate the type of product and container with which each such device is useful.

At the present time there are two major problems encountered in dispensing of products from pressurized containers. First, there is the problem of providing a valve mechanism which will dispense the product when the container is in either an upright or an inverted position; and, second, there is the problem of a residue of the product remaining in the valve mechanism and clogging the discharge opening.

There have been some prior proposals for valve mechanisms which will be operative when the can is in either the upright position or an inverted position; and there have been some prior proposals for valve mechanisms which are self-cleaning, i.e., a mechanism which can be positioned so as to blow out a quantity of the propellant gas alone after the mechanism has been used to discharge the product. However, there are no commercially acceptable valve mechanisms for pressurized containers which will permit the containers to operate in either the upright or the inverted position and which are also self-cleaning.

This invention provides a valve mechanism which is operative when the can is in either the upright or in the inverted position and is also a self-cleaning valve mechanism. The new and novel concept of this invention is the provision of a new valve mechanism which controls an outlet nozzle. When the valve is actuated between a shut-off and an open position, it passes a station wherein a tap to the top area of the can is momentarily in register. The tap is again in register as the valve is closed. Thus, after a spraying operation is completed and as the valve is returned from the open to the closed position, the tap is brought into register with the interior of the can. When the tap is in register during closing, the propellant at the can top passes through the tap to flush out the nozzle. When the can is inverted, the valve can be stopped at the tap, and since the contents will have shifted, the tap will supply liquid. By virtue of such positioning, one can cause either the product or the propellant gas alone to be discharged from the pressurized container when the can is in either the upright or the inverted position.

It is readily apparent that for many applications it is highly desirable to use a pressurized container in either the upright or inverted position, and it is equally apparent that for many applications it is highly desirable to clean the valve mechanism immediately after use to remove any residue of product that is left in the mechanism after use which may tend to become sticky, dry, or clog up the mechanism and prevent or hamper future usage. For example, the above characteristics are entirely desirable in a valve mechanism designed to be used with spray-on hair dressings, or paint.

Therefore, one of the principal objects of this invention is to provide a valve mechanism for pressurized containers which will operate when the container is in either an upright or an inverted position.

Another principal object of this invention is to provide such a valve mechanism for pressurized containers which mechanism is self-cleaning.

Other objects and a fuller understanding of this invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is a partially sectioned view of a pressurized container with a valve mechanism in place;

FIGURE 2 is a partially sectioned and enlarged view of the valve mechanism taken along line 2—2 of FIGURE 1, showing the valve in a closed position;

FIGURE 3 is a partially sectioned and enlarged view of the valve mechanism showing the mechanism in one operative position and showing the mechanism in another operative position in phantom;

FIGURE 4 is a top view of the device;

FIGURE 5 is a section taken along line 5—5 of FIGURE 3; and,

FIGURE 6 is an alternate embodiment of the device as it would appear taken along line 6—6 of FIGURE 3.

Referring now to the drawings, and more particularly to FIGURE 1, a valve mechanism 15 is shown in the typical environment of the pressurized container in the form of an aerosol can 10. The can contains a liquid product 11 and a gaseous pressurizing agent or propellant 12. The can is depicted in an upright position with the liquid 11 settled at the bottom of the can away from the valve mechanism 15 and the gaseous propellant 12 surrounding the valve mechanism 15.

Referring now more especially to FIGURES 2 through 5, the valve assembly 15 has a valve body 24 which is suitable to be crimped into a pressurized can. The valve body 24 has a through axial bore 25 and a counterbore 26. The counterbore 26 terminates at a shoulder 27. The valve body 24 also has a transverse bore or duct 30 extending from the axial bore 25 through the body 24 and is positioned within the can 10 above the level of the liquid 11 when the can is in the upright position. A resilient packing ring 29 is fixed to and disposed within the valve body 24. The packing ring 29 has an opening 34 aligned with the transverse bore 30. For convenience, the composite aperture defined by the transverse bore 30 and the opening 34 will be designated by the numeral 40. The ring 29 also has a flange portion 28 which is disposed in the counterbore 26 against the end wall 27.

A valve stem 16 is disposed within the packing ring 29 and has a substantially fluid tight running fit therewith. The valve stem 16 extends out of the valve body 24 and is guided and positioned by a resilient cap 31 which has an opening 32 through which the stem 16 extends. The cap 31 is carried by the valve body 24. A central passage 17 extends axially of the stem 16 from a discharge nozzle opening 18 and terminates at an end wall 20. An inlet port 19 through the side wall of the stem 16 provides communication with the central passage 17.

The stem 16 is movable axially within the packing ring 29 and has three operative positions. In the first operative position, the inlet port 19 is positioned out of register with the composite aperture 40. This is the normal position in which the valve remains when not in use and is the closed position. To retain the valve in this position, a coil spring 38 is provided which surrounds a portion of the valve stem 16 and is positioned in the counterbore 26. The coil spring at one end abuts against the flange portion 28 of the ring 29. The other end of the coil springs abuts against a spring abutment shoulder 22 formed on the valve stem 16. The coil spring urges the valve stem 16...
The valve stem 16 is then permitted to move axially under the urging of the spring 32 to the closed position. A certain amount of cleaning action will occur when the valve stem 16 moves from the fully depressed position to the closed position as the inlet port 19 passes the aperture 40. This may or may not be a sufficient amount of cleaning, and if not, the valve can be manually retained in the cleaning position until sufficiently cleaned.

The following description will now be directed to the operation of the valve mechanism when the can is in an inverted position.

When the valve 16 is in an inverted position, the product flows to the opposite end of the can and surrounds that part of the valve mechanism that is disposed within the can, and the aperture 40 is submerged within the product. At the same time, the propellant also rises to the opposite end of the can and away from the valve mechanism. To cause the product to discharge from the can when the can is in the inverted position, the valve mechanism is moved to the position shown in FIGURE 3. In this position, the inlet port 19 of the valve stem 16 is aligned with the aperture 40. The override shoulder 21 abuts the cap 31 and positions the inlet port 19 in alignment with the aperture 40.

Since, in the inverted position, the product surrounds the valve mechanism and the opening 40 is below the level of the product, when the inlet port 30 is aligned with the opening 40 the propellant forces the product through the opening 40, through the inlet port 19, into the passage 17 and into the atmosphere through the discharge end 18. Thus, in the inverted position, partially depressing the valve stem 16 causes the product to discharge into the atmosphere.

In order to pass this position and put the valve stem into a fully depressed position, as shown in phantom in FIGURE 3, additional pressure is exerted on the stem 16. The shoulder overcomes the resiliency of the cap 31 and thus the stem can be fully depressed. This position can be used to clean the valve when the can is inverted.

This allows the gas propellant to move through the dip tube 37, through the inlet port 35, through the inlet port 19, through the passage 17, and into the atmosphere through the discharge end 18. This method of cleaning is not as effective as the previously described method of cleaning inasmuch as in the described position there may be a substantial amount of product in the dip tube which must first be expelled before the cleaning operation can take place. The preferred way to clean the valve mechanism after use in the inverted position is to return the can to the upright position and allow the cleaning to proceed as described above.

In the alternate embodiment, as depicted in FIGURE 6, there are six transverse bores 30 in the body 24 and six openings 34 in the resilient packing ring 29 aligned with the six transverse bores 30. There are eight inlet ports 19 in the stem 16. This particular construction will allow the mechanism to operate even though the valve stem 16 has a tendency to rotate within the valve body 24. As can be seen from FIGURE 6, no matter what rotational position the valve stem 16 may assume, at least a portion of some of the inlet ports 19 will be aligned with a portion of the apertures 40.

Although the invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

What is claimed is:
1. A liquid dispensing device including a container for containing a liquid and a gaseous pressurizing agent, the combination with said container of a valve mechanism comprising, a valve body extending into said container,
said body having a through axial bore terminating at a first inlet duct in communication with the bottom portion of said container, a second inlet duct in communication with said axial bore and extending through said body transverse to said axial bore, said second inlet duct being in open communication with the top portion of said container, an annular resilient packing ring disposed in said bore, said packing ring having a first opening in communication with said first inlet duct and a second opening in communication with said second inlet duct, a valve stem reciprocally disposed in said packing ring and having a substantially fluid tight running fit therewith, said valve stem having an outlet passage therein, said stem having an inlet port in communication with said outlet passage and said bore, said valve stem having a first position wherein said inlet port is positioned away from said openings of said ring, a second position wherein said inlet port is in communication with said first opening and a third position wherein said inlet port is in communication with said second opening.

2. In the device of claim 1, the provision of resilient means urging the mechanism into said first position.

3. In a liquid dispensing device including a container for a liquid and a gaseous pressurizing agent, the combination with said container of a valve mechanism comprising a generally cylindrical valve body extending into said container, said valve body having a through axial bore terminating at an inlet duct in communication with the bottom portion of said container, said body having a counterclockwise axial bore terminating at a first body shoulder, said valve body having a transverse bore extending from said axial bore through said valve body, said transverse bore being in open communication with the top portion of said container, an annular resilient packing ring disposed in said axial bore, said axial bore being in said opening, said opening aligned with said transverse bore in said body, said bore and said aligned opening together defining an aperture, a valve stem reciprocally disposed in said packing ring, said valve stem having an axial central passage in communication with the atmosphere and terminating at an end wall, said valve stem having an inlet port extending from said passage through said valve stem, said valve stem having a spring abutment shoulder peripherally disposed about said stem and substantially normal to the axis of the central passage, said valve stem having an override shoulder formed thereon, a coil spring disposed in said counterclockwise bore, said spring abutting said first body shoulder and the spring abutting shoulder of the valve stem, said spring urges the stem axially in the axial bore of the valve body to a normal position wherein said inlet port is positioned away from said inlet duct and away from said aperture, said valve stem being selectively movable to a second position wherein said inlet port is aligned with said aperture and wherein said override shoulder abuts a portion of said valve body, and a third position wherein said inlet port is positioned in said inlet duct.

4. In a liquid dispensing device including a container for a liquid and a gaseous pressurizing agent, the combination with said container of a valve mechanism comprising a generally cylindrical valve body extending into said container, said valve body having a through axial bore terminating at an inlet duct in communication with the bottom portion of said container, said body having a counterclockwise axial bore terminating at a first body shoulder, said valve body having a plurality of transverse bores extending from said axial bore through said valve body, the axes of said bores lying in a single plane normal to the axial bore, each of said transverse bores being in open communication with the top portion of said container, an annular resilient packing ring disposed in said axial bore having a plurality of openings, each of said openings aligned with one of said transverse bores in said body, each bore and aligned opening together defining an aperture, a valve stem disposed in said packing ring for reciprocal movement in said valve body, said valve stem having an axial central passage in communication with the atmosphere and terminating at an end wall, said valve stem having a plurality of circumferentially spaced inlet ports each extending from said axial passage through the valve stem, the axes of said ports lying on a plane normal to the axis of the stem and having a spring abutment shoulder peripherally disposed about said stem and substantially normal to the axis of the central passage, said valve stem having an override shoulder formed thereon, a coil spring disposed in said counterclockwise bore, said spring abutting said first body shoulder and the spring abutting shoulder of the valve stem, said spring urging the stem axially in the axial bore of the valve body to a normal position wherein said inlet ports are positioned away from said inlet duct and away from said apertures, said valve stem being selectively movable to a second position wherein said override shoulder abuts said inlet port.

5. In a liquid dispensing device including a container for a liquid and a gaseous pressurizing agent, the combination with said container of a quantity of gas propellant disposed in said container, a valve mechanism extending through the container, said valve mechanism having a valve body, said valve body having a valve stem receiving bore, said body having first inlet means for permitting fluid in the upper portion of the container to enter said stem receiving bore, said body having a second inlet means for permitting fluid in the lower portion of the said container to enter said bore, a valve stem reciprocally disposed in said receiving bore, said stem having a passage in communication with the atmosphere and a passage inlet selectively positionable in communication with the first and second inlet means, whereby, when the liquid is disposed in the lower portion of the container and the gas is disposed in the upper portion of the container the liquid will be expelled by pressure of the gas when the passage is in communication with the second inlet means forcing the liquid through the second inlet means and through the passage, and gas will be expelled when the passage is in communication with the first inlet means through the first inlet means and through the passage; and, whereby, when the liquid is disposed in the upper portion of the container and the gas is disposed in the lower portion of the container by inversion of the can, liquid will be expelled by pressure of the gas through the first inlet means and through the passage when the passage is in communication with the first inlet means, and gas will be expelled through the second inlet means and through the passage when the passage is in communication with the second inlet means.

6. In a liquid dispensing device including a container for a liquid and a gaseous pressurizing agent, the combination with said container of a valve mechanism comprising an elongated, hollow valve body having one end projecting into said container, said valve body having a through axial bore terminating at an inlet duct in communication with a bottom portion of said container, said body having a counterclockwise axial bore terminating at a first body shoulder, said valve body having a plurality spaced transverse bores extending from said axial bore through said valve body, the axes of said bores lying in a single plane normal to the axial bore, each of said transverse bores being in open communication with the top portion of said container, an annular resilient packing ring disposed in said axial bore having a plurality of openings, each of said openings aligned with one of said transverse bores in said body, each bore and aligned opening together defining an aperture, a valve stem disposed in said packing ring for reciprocal movement in said valve body, said valve stem having an axial central passage in communication with the atmosphere and terminating at an end wall, said valve stem having a plurality of circumferentially spaced inlet ports each extending from said axial passage through the valve stem, the axes of said ports lying on a plane normal to the axis of the stem and having a spring abutment shoulder peripherally disposed about said stem and substantially normal to the axis of the central passage, said valve stem having an override shoulder formed thereon, a coil spring disposed in said counterclockwise bore, said spring abutting said first body shoulder and the spring abutting shoulder of the valve stem, said spring urging the stem axially in the axial bore of the valve body to a normal position wherein said inlet ports are positioned away from said inlet duct and away from said apertures, said valve stem being selectively movable to a second position wherein said override shoulder abuts said inlet port.
liquid will be discharged from said container when said passage inlet is in communication with said second opening, and sealing means disposed within said valve body between said first and second openings and between said openings and the normally spaced position of said passage inlet.

7. In a liquid dispensing device including a container for a liquid and a gaseous pressurizing agent, the combination with said container of valve means for selectively dispensing said liquid and said gaseous agent, said valve means comprising an elongated, valve body extending into said container, said valve body having an axial bore, fluid inlet means for permitting fluid to enter said bore from opposite end portions of said container, said fluid inlet means including a bore opening in fluid communication with the bottom portion of said container and an axially spaced port through the side wall of said valve body, said port being in open fluid communication with the top portion of said container, and means disposed in said bore of said valve body for selectively placing the top and bottom portions of said container in communication with the atmosphere, said means including a valve stem having an internal fluid passage, said passage having an inlet communicating with the bore of said valve body and an outlet venting to the atmosphere, said valve stem being normally positioned with said inlet spaced from said bore opening and said port of the valve body and being axially reciprocal to selectively place said inlet in fluid communication with said port and said bore opening for permitting fluid to be discharged to the atmosphere from the top and bottom portions of said container.

8. The device as claimed in claim 7 wherein said means disposed within said valve body bore further includes an angular sealing ring sealably surrounding said valve stem, said sealing ring having a hole through one wall, and said hole being in alignment with said port.

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9. In combination,
   
   A) a pressure vessel having an internal chamber;

   B) the vessel having a valve opening communicating with said chamber and being otherwise imperforate;

   C) a valve housing member in said opening and sealed to said vessel to close said vessel chamber;

   D) said housing member including an internal chamber having first and second spaced inlet openings each extending from the vessel chamber to the housing member chamber;

   E) a valve body member movably carried in the housing member chamber;

   F) the body member including a through passage extending from an inlet port to an outlet port in communication with the atmosphere ambient to the vessel;

   G) said body member having a closed position and first and second open positions with the inlet port in communication with the first and second inlet openings respectively; and,

   H) one of said members including sealing means coactable with the other member to prevent the escape of fluid under pressure therebetween and to selectively seal said inlet portion from:
i) both of said inlet openings when
the body member is in a closed position;

ii) said second inlet opening when the
body member is in the first open
position; and,

iii) said first inlet opening when the
body member is in the second open position.

In the heading to the printed specification, line 6, for
"8 Claims." read -- 9 Claims. --.

Signed and sealed this 25th day of December 1962.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of
Patents