United States Patent

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[54] **PRESSURIZED MIXING DISPENSER**
13 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** **222/94,** 222/136, 137/625.41
[51] **Int. Cl.** **B65d 35/28,** B65d 83/14
[50] **Field of Search** 222/95, 135, 136, 145, 402.1, 515, 519, 520, 94; 137/625.4, 625.41

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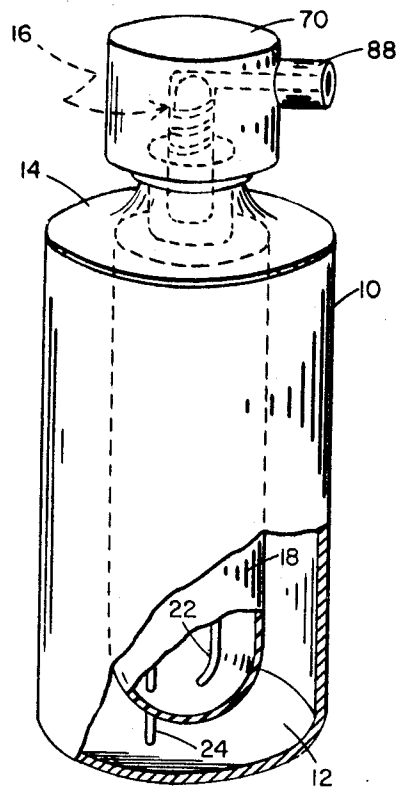
ABSTRACT: A pressurized mixing and dispensing device has an inner container disposed within an outer container. The dip tubes are in the inner container, one tube passing through inner container bottom to a point near the bottom of the outer container and the other going to a point near the bottom of the inner container. Both tubes are connected to outlets in the inner container, which communicate through a valve housing seated in inner container with a valve core disposed in the bore of the valve housing. The valve core has grooves in its surface in which are formed flow restricting protuberances. The core grooves are connected to the container outlets when axial force is applied to the valve core. That axial force causes the core to move axially and rotatably because of a camming pin which extends from the valve core through a camming aperture in the housing against the resistance of a spring connected between the core and the housing. A seal surrounds the valve core just below the grooves.



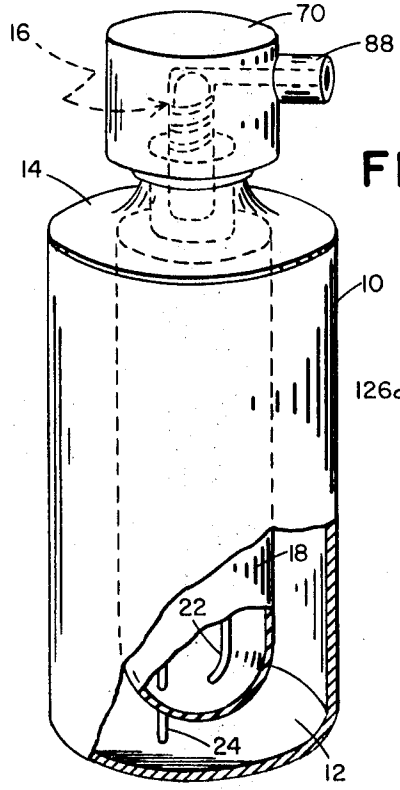


FIG 1

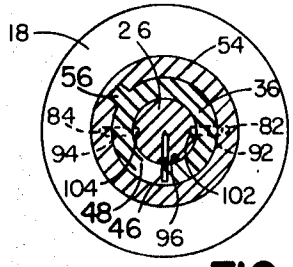


FIG 4

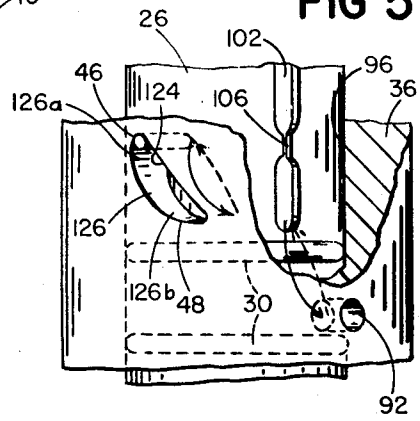


FIG 5

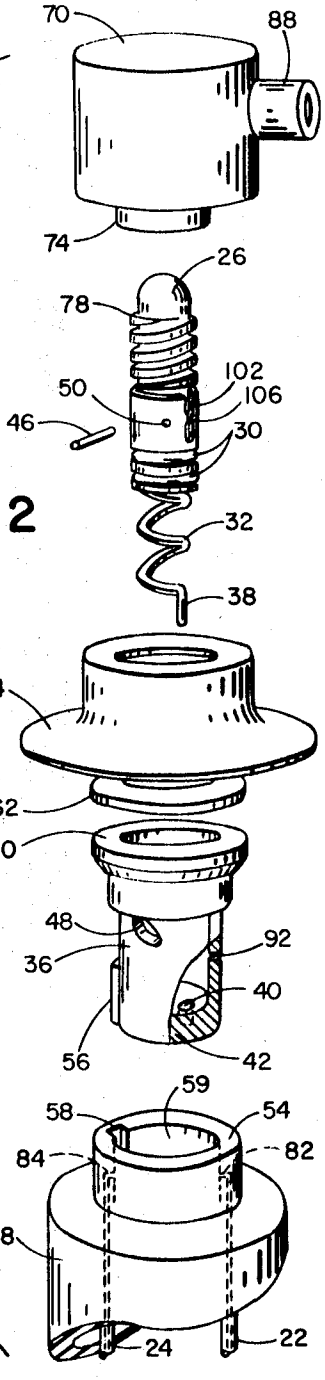


FIG 2

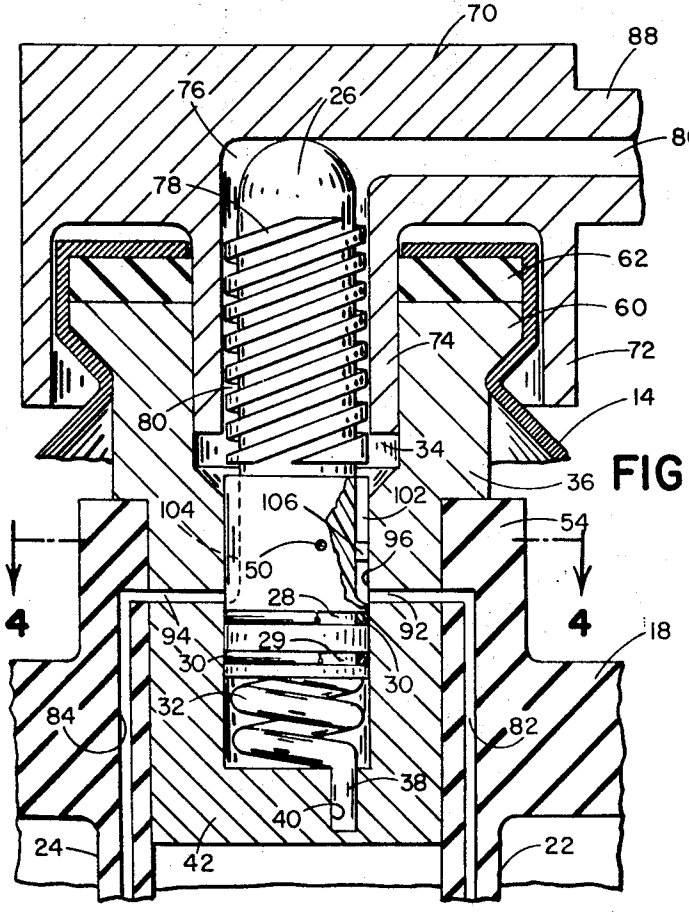


FIG 3

PRESSURIZED MIXING DISPENSER

SUMMARY OF INVENTION

The invention relates to dispensing devices and more particularly to dispensing devices for controlling the coordinated mixing and dispensing of materials under pressure from a plurality of containers to provide a combined product.

Frequently it is desired to dispense a product that results from the mixing, at the time of dispensing, of two or more different ingredients that are stored separately from each other so that those ingredients will maintain their effective properties for an indefinite period of time during storage. A variety of products may be usefully so dispensed, an example being a two-part self-heating shaving soap composition, one part containing a reducing agent and the other containing an oxidizing agent reactive with the reducing agent to liberate heat. Such dispensers and their valve structures should be designed for production in large quantities and in a manner that minimizes cost. Especially where the mixture is applied to the skin the valve assembly should provide precise proportional flow of the two or more ingredients to be mixed to assure a mixture of the kind desired which is useful and not harmful. Such valve assemblies are typically subjected to frequent use and it is necessary that they should be constructed so that they are safe and reliable in continued operation.

Accordingly, it is an object of this invention to provide a novel and improved dispensing device of simple manufacture in which two ingredients may be kept separate until immediately prior to use and which releases the ingredients in a controlled action for mixing and discharge.

Another object of the invention is to provide a safe, reliable valve assembly which will provide accurate proportions of the two or more ingredients to be mixed.

The invention features a device for dispensing a mixture of materials under pressure in more than one container, each container having an outlet, including a valve housing, a valve core having a common discharge passageway, the valve core being disposed in the housing so that it is axially and rotatably movable, and means responsive to axial force applied to the valve core to impart axial and rotary motion to the valve core connecting the common discharge passageway and container outlets.

The invention also features, in the device, an inner container mounted in an outer container, and two tubes within the inner container defining tube passages, the tube passages communicating at one end with outlets in the inner container and at the other end, one of the tubes terminating near the bottom of the inner container, the other tube passing through the bottom of the inner container, the outside of the tube being sealed to the inner container bottom, and terminating near the bottom of the outer container.

In preferred embodiments a spring element is included, connected at one end to the valve core and at the other end to the valve housing, so that the spring element resists both the axial and rotational movement of the valve core. Also, the valve housing includes a camming aperture whose upper surface is a substantially straight diagonal surface and whose lower surface includes a substantially axial upper portion; and the valve core has a camming element that extends through the aperture.

In the preferred embodiments also the valve core has grooves in its outer surface that cooperate with a surface of the valve housing to form passages connected to the common passageway, the grooves being connectable to the container outlets when the valve core is actuated. At least one of the grooves has an externally molded metering restriction in it. Also one or more sealing members are mounted on the valve core and cooperate with a valve housing surface to provide seals between the grooves and housing passages.

Other objects, features and advantages of the invention will be seen as the following description of a preferred embodiment progresses, in conjunction with the drawings, in which:

FIG. 1 is a perspective view, with parts broken away, of an aerosol dispenser embodying the invention;

FIG. 2 is an exploded view of the upper portion of the dispenser, showing its components;

FIG. 3 is a sectional view of the upper portion of the dispenser showing the valve assembly in actuated (dispensing) position;

FIG. 4 is a sectional view taken along the line 4—4 of FIG. 3; and

FIG. 5 is an enlarged view of portions of the valve core and the valve housing, showing particularly the coaction of the cam slot and cam pin.

The aerosol device shown in FIG. 1 includes a rigid cylindrical wall 10 having a domed bottom wall 12 and a top wall portion 14 secured to the cylindrical wall body. These outside walls of the device are made of material such as aluminum or tin plate to provide a rigid container capable of storing a material to be dispensed together with a suitable propellant under pressure.

Secured to the metal container top 14 is a valve assembly generally designated 16 that carries an inner container 18 of generally cylindrical shape which it supports in predetermined spaced relation within the cylindrical outer container. Inner container 18 is of flexible thin-walled construction made of a material such as low-density polyethylene which is impervious to the materials stored in the two containers though not necessarily entirely impervious to the propellant. The flexibility of the inner container tends to equalize the pressures between the inner and outer containers. The dip tubes 22, 24 in the inner container may be blow molded, tube 22 ending near the bottom of the inner container and tube 24 passing through a seal in the inner container bottom and having its lower end disposed near the bottom of the outer container.

Further details of the valve assembly structure are shown in FIGS. 2 and 3. A fiber-filled molded valve core 26 of acetyl thermoplastic has two circumferential grooves 28, 29 which receive rubber inner gaskets 30. The core (together with an integral helical spring 32) is placed in a bore 34 of housing 36, and end 38 of spring 32 being inserted in hole 40 in housing base 42. Stainless steel pin 46 is inserted through cam slot 48 in housing 36 into a hole 50 in valve core 26. Inner container 18, as shown, has a cylindrical top portion 54 which receives the lower end of valve housing 36. A key ridge 56 on the outer surface of the valve housing mates with a slot 58 in the inner container top portion 54 to ensure proper alignment of dip tubes 22 and 24 with the valve assembly. The inside surface 59 of the inner container top portion 54 overlies cam slot 48 and secures pin 46 in proper position.

Formed at the upper part of valve housing 36 is an outwardly extending flange 60 on which is seated a rubber outer gasket 62. Metal container top 14 is mounted over gasket 62 and housing flange 60 and then crimped below the flange to secure the components together. The remainder of the outer container is then secured to the top 14. An actuator cap 70 is then inserted into the housing 36 over the top of core 26. The cap includes a skirt 72 which surrounds the top of the assembly, namely the topmost portion of metal container top 14, the upper gasket 62 and the top of valve housing 36. The upper portion of housing bore 34, gasket 62 and the container top 14 form an annular space around valve core 26 into which an inner cylindrical wall 74 of cap 70 is received. An inner cap bore 76 defined by the inner cylindrical wall cooperates with a helical ridge or thread 78 on the outer surface of valve core 26 to form a helical flow passage 80 leading to the top of cap bore 76 which communicates with a discharge passage 86 that terminates at the cap nozzle 88. The end of bore 76 rests on the top of valve core 26 so that the valve core 26 is moved in the vertical direction when the cap 70 is depressed.

Details of the flow paths from the two containers through the valve assembly to discharge passage 86 may be seen with reference to FIGS. 3 and 4. Dip tubes (from inner container 18) and 24 (from outer container 10) are connected to the vertical portions of passages 82 and 84, respectively, in the top 54 of the inner container. These passages become horizontal, and terminate at the inside surface of the container top, in alignment with horizontal transition passages 92, 94 in valve

housing **36** which extend from the outer surface of the housing adjacent the inner container top to housing bore **34** in which valve core **26** is disposed. Two vertical grooves **102** and **104** on the surface of the valve core **26** cooperate with the valve housing surface **96** overlying the grooves to form further passage extensions. The valve core grooves are restricted by molded projections **106**. The passage dimensions afforded by the projections may differ in size for the two grooves depending on the proportions of ingredients to be mixed. Grooves **102** and **104** communicate with common helical passage **80** formed by helical ridge **78** on the surface of valve core **26** and the inner wall **74** of cap **70**.

As shown in FIG. **3**, seal rings **30**, set in grooves **28**, **29** in the surface of valve core **26** are just below housing passages **92** and **94** in sealing contact with the valve housing when the valve is in actuated position. In released position of the valve, groove **28** is above passages **92**, **94** and groove **29** is below those passages.

Camming aperture **48** in valve housing **36** has a configuration shown in FIG. **5**. Its upper surface **124** is a substantially straight diagonal surface and its lower surface **126** has a substantially vertical upper portion **126*a*** and a curved lower portion **126*b*** which terminates in a substantially horizontal surface.

One ingredient or reactant is stored in the outer container together with the propellant. A second ingredient or reactant is stored in the inner container in isolation from the first ingredient. The pressure applied by the propellant in the outer container is applied through the flexible wall of the inner container to the ingredient stored therein.

Before operation, the moving parts of the dispenser are in the positions shown in FIG. **5**. Pin **46** is urged to the upper junction of surfaces **124** and **126** of cam slot **48**, by the action of valve spring **32**. The cooperation of pin **46** and slot **48** retains the valve core **26** in the valve housing **36** against the force of the spring **32**. The valve core vertical grooves **102** and **104** are out of alignment, both axially and circumferentially, with housing passages **92** and **94** as illustrated by the relation of groove **102** and passage **92** as shown in FIG. **5**. Groove **28** is above housing passages **92** and **94** and groove **29** is below those passages so that the contents of the inner and outer containers that are present in their respective dip tube passages **82** and **84** and the corresponding aligned housing passages **92** and **94** are blocked from further movement by the surface of valve core **26** overlying the inner ends of the housing passages and, especially, by seals **30** in engagement with the inner surface **96** of housing **36**.

The dispenser is operated by pressing cap **70** down in the vertical direction. When this is done pin **46** slides along the lower surface **126** of cam slot **48** as shown by the solid arrow in FIG. **5**, giving valve core **26** both vertical and rotational motion. This movement of the valve core meets both compressive and tortional resistance by spring **32**. The upper portion **126*a*** of the lower cam slot surface is substantially vertical so that initial valve movement, overcoming static friction, is axially in response to the vertical force transmitted to the valve core from the cap. The lower portion **126*b*** of cam slot surface **126** is curved and the valve core **26** is rotated to the fully open position with grooves **102**, **104** aligned with passages **92**, **94**. Groove **28** has been moved to a position below housing passages **92** and **94**. FIGS. **3** and **4** show the device in this position of alignment.

The initial vertical movement of the core **26** at the beginning of the dispensing operation encourages followthrough to the fully open position, avoiding partial communication (throttling) between the passages **92**, **94** and the grooves **102**, **104**. When the grooves and passages are only partially aligned, restrictions are formed which may cause an undesirable change in the proportion of ingredients in the dispensed mixture.

In the fully open position of the dispenser, the contents of the two containers move, under pressure from the propellant, through dip tube passages **82** and **84**, housing passages **92** and **94**, valve core grooves **102** and **104**, (in flow ratio imposed by projections **106**) and into helical passage **80** where the ingredients mix and the resulting product is dispensed at the nozzle orifice **86**.

Throttling susceptibility is also minimized by having restrictions **106**, which determine the proportions of the ingredients, in grooves **102** and **104**, downstream from the actual valve area. Upstream of the actual valve area and the restrictions, the flow passages are in effect oversized and even if the valve is only partially opened, a sufficient flow of ingredients to the restrictions would still result so that projections **106** determine the ratio of ingredients in the dispensed product.

After the desired amount of the mixture has passed out the nozzle orifice, release of the cap allows the restoring force of the spring to push the valve core **26** up, the cam slot **48** causing the pin to rotate the core to its rest position as shown in FIG. **5**, and the flow of ingredients from the housing passages **92** and **94** is terminated.

The pin returns to its original position by sliding along the upper, substantially straight, surface **124** of cam slot **48** (see the dotted arrow in FIG. **5**). This straight surface **124** provides rapid closing of the passage under a combination of vertical and rotational forces on the core **26** created by the spring **32** and cooperation of pin **46** and surface **124**.

While a preferred embodiment of the invention has been shown and described, further modifications will be obvious to those skilled in the art and therefore it is not intended that the invention be limited to the disclosed embodiment or to details thereof and departures may be made therefrom within the spirit and scope of the invention as defined in the claims.

What is claimed is:

1. A device for dispensing a mixture of materials under pressure in more than one container, each said container adapted to hold one of the materials and having an outlet, including

a valve housing element,

a valve core element,

a common discharge passageway,

said valve core element being disposed in said housing element so that said core element is axially and rotatably movable, said valve core element having grooves in its outer surface cooperating with a surface of said housing element to form passages connected to said common passageway, said grooves being connectable to said container outlets when said valve core element is axially and rotatably moved, at least one of said grooves having protuberance in one wall thereof to define a restriction in said groove, a sealing member mounted on said valve core element and cooperating with a surface of said housing so that when said valve core grooves are out of alignment with said container outlets, said sealing member is between said grooves and said container outlets, a spring element, said spring element being connected at one end to said valve core element and at the other end to said valve housing element, so that said spring element can resist both axial and rotational movement of said valve core element, and

means responsive to axial force applied to said core element to impart axial and rotary motion to said core element and connect said common discharge passageway and said container outlets.

2. A device for dispensing a mixture of materials under pressure in more than one container, each said container adapted to hold one of the materials and having an outlet, including

a valve housing element,

a valve core element,

a common discharge passageway,

said valve core element being disposed in said housing element so that said core element is axially and rotatably movable, said valve core element having grooves in its outer surface cooperating with a surface of said housing element to form passages connected to said common passageway, said grooves being connectable to said container outlets when said valve core element is axially and

rotatably moved, a sealing member mounted on said valve core element and cooperating with a surface of said housing so that when said valve core grooves are out of alignment with said container outlets, said sealing member is between said grooves and said container outlets, and

means responsive to axial force applied to said core element to impart axial and rotary motion to said core element and connect said common discharge passageway and said container outlets.

3. The device claimed in claim 2, wherein at least one of said grooves has protuberance in one wall thereof to define a restriction in said groove.

4. A device for dispensing a mixture of materials under pressure from an inner container mounted within an outer container, each said container adapted to hold one of the materials and having an outlet, including

a valve housing element,

a valve core element,

a common discharge passageway,

said valve core element being disposed in said housing element so that said core element is axially and rotatably movable,

means responsive to axial force applied to said core element to impart axial and rotary motion to said core element and connect said common discharge passageway and said container outlets and two tubes within said inner container defining tube passages,

said tube passages defining at one end of the tubes said container outlets,

the other end of one of said tubes being disposed near the bottom of said inner container, and the other of said tubes passing through a seal in the wall of said inner container, with the other end of said other tube being disposed near the bottom of said outer container.

5. The device as claimed in claim 4, wherein said inner container has a flexible wall and said tubes and said inner container are made of the same material.

6. A device for dispensing a mixture of materials under pressure in more than one container, each said container adapted to hold one of the materials and having an outlet, including

a valve housing element,

a valve core element,

a common discharge passageway,

said valve core element being disposed in said housing element so that said core element is axially and rotatably movable,

means responsive to axial force applied to said core element to impart axial and rotary motion to said core element and connect said common discharge passageway and said container outlets, said responsive means including a camming aperture defined by one of said valve elements, said camming aperture having a substantially straight diagonal upper surface and a lower surface that includes a substantially axial upper portion, and a camming element secured to the other of said valve elements and projecting into said aperture.

7. The device claimed in claim 6, wherein said valve core element has grooves in its outer surface cooperating with a surface of said housing element to form passages connected to said common passageway, said grooves being connectable to said container outlets when said valve core element is axially and rotatably moved.

8. The device claimed in claim 7, wherein at least one of said grooves has a protuberance in one wall thereof to define a restriction in said groove.

9. The device claimed in claim 8, including a sealing member mounted on said valve core element and cooperating with a surface of said housing so that when said valve core grooves are out of alignment with said container outlets, said sealing member is between said grooves and said container outlets.

10. A device for dispensing a mixture of materials under pressure in two containers, comprising an outer container, an inner container mounted within said outer container, said inner container having two outlet orifices,

a valve assembly having two inlet passageways connected to said outlet orifices, a discharge passageway, and a valve structure for controlling the flow between said inlet passageways and said discharge passageway,

said valve structure including

a valve housing element defining a bore in communication with said inlet passageways,

a valve core element disposed in the bore of said housing element, said core element defining said discharge passageway,

said valve core element being disposed in said housing element so that it is axially movable, and

means for biasing said core element to a closed position, said core element being responsive to axial force applied to said valve core element to move said core element to a second position to connect said discharge passageway to said outlet orifices,

two tubes disposed in said inner container,

each said tube defining a passage communicating at one end with a corresponding one of said inner container outlet orifices, the other end of one of said tubes being disposed near the bottom of said inner container and the other of said tubes passing through a seal in a wall of said inner container, with the other end of said other tube being disposed near the bottom of said outer container.

11. The device as claimed in claim 10, wherein said inner container has a flexible wall and said tubes and said inner container are made of the same material.

12. The device as claimed in claim 11, wherein said valve housing element further defines a camming aperture, said aperture including a substantially straight upper surface, a lower surface having a substantially axial upper portion, and passages connecting said outlet orifices to said bore,

said valve core element includes a portion of a common discharge passageway connected to grooves in its outer surface, at least one of said grooves having an externally molded protuberance in one wall thereof to define a restriction in said groove, and further including a camming element secured to said core element,

said core element being disposed in said bore of the valve housing element with said camming element extending into said camming aperture so that said valve core element is axially and rotatably movable in said housing element in response to axial force applied to said valve core element to connect said core grooves to said housing passages, the wall of said housing bore overlying said camming aperture to keep said camming element in said aperture,

said biasing means includes a spring element connected at one end to said valve core element and at the other to said valve housing element to resist the axial and rotational movement of said valve core element, and a sealing member mounted on said valve core element and cooperating with said housing bore so that when said valve core grooves are out of axial alignment with said housing passages, said sealing member is between said grooves and said housing passages.

13. In a pressurized dispensing package for dispensing a mixture of two materials to be maintained apart until they are to be dispensed,

a first container and a second container sealingly secured within said first container,

a valve assembly secured to said containers and having a valve housing defining a bore and two passages in said housing, each said housing passage providing fluid communication between a respective one of said containers and said bore, each said housing passage having a port in the wall of said bore,

a valve core disposed in said valve housing for limited sliding movement in said housing bore, a portion of said core projecting outwardly of said package, said core defining a discharge passage opening at one end outwardly of said package for discharging a mixture of the materials stored in said first and second containers to the atmosphere, and opening at its other end internally of said valve assembly, and said core having two grooves in its outer surface cooperating with a surface of said housing bore to form passages connected to said other end of said discharge passage, at least one of said grooves having structure defining a restriction therein,

seal means making fluidtight, slidable bearing between the sidewall of said bore and said core for sealing said other

end of said discharge passage from communication with the ports of said housing passages in said bore when said valve assembly is in a closed position,

and means biasing said core axially outwardly of said chamber to interpose said sealing means between said passage ports and said grooves in said core,

said core being movable against said biasing means to shift the relative position of said seal means to establish simultaneous communication through both of said passage ports with said grooves to dispense a mixture of the two separately confined materials through said one end of said discharge passage.