

[54] **PLURAL COMPARTMENT
PRESSURIZED DISPENSING PACKAGE**

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[52] U.S. Cl.222/94, 222/136, 222/214, 222/402.21

[51] Int. Cl.B65d 35/22

[58] Field of Search.....222/94, 95, 135, 222/136, 402.21, 402.22, 402.23, 214

[56] **References Cited**

UNITED STATES PATENTS

3,540,623 11/1970 Wittke.....222/94

3,241,722	3/1966	Nissen	222/386.5 X
3,270,925	9/1966	Obst	222/402.21
2,671,578	3/1954	McBean	222/95
3,540,634	11/1970	Mayercok	222/402.21

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[57] **ABSTRACT**

A pressurized dispensing package has a self-supporting flexible walled inner container disposed within and seated on the base of a rigid walled outer container. A valve assembly controls mixing of materials stored in the containers and flow of that mixture to the atmosphere. Dip tubes secured to the valve assembly extend to the bottom of each container. The outer container is charged with propellant through the valve stem of the valve assembly. An actuator cap on the stem is pivoted about a tilt axis to open two valves and discharge a mixture.

2 Claims, 10 Drawing Figures

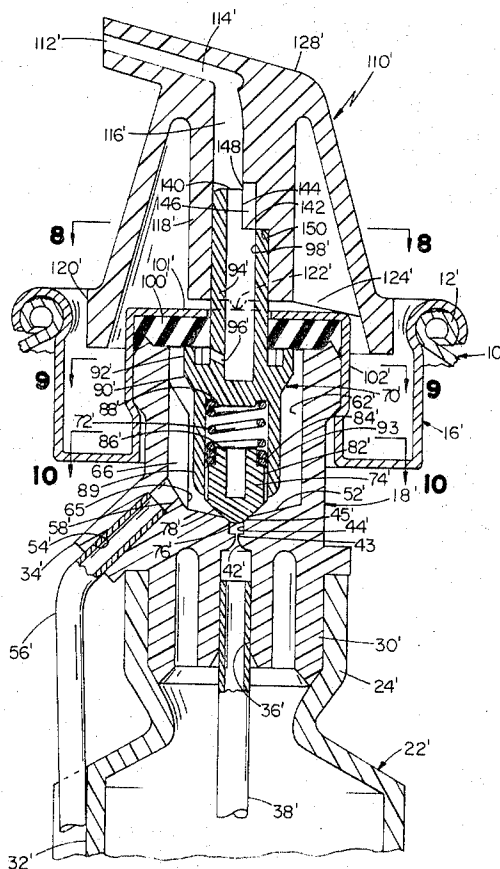


FIG. 1

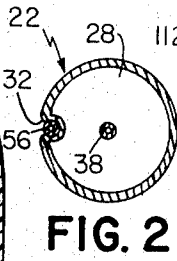
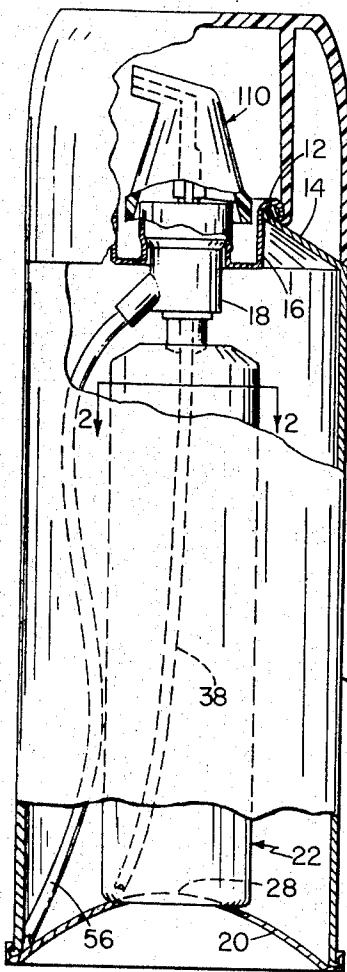


FIG. 2

FIG. 3

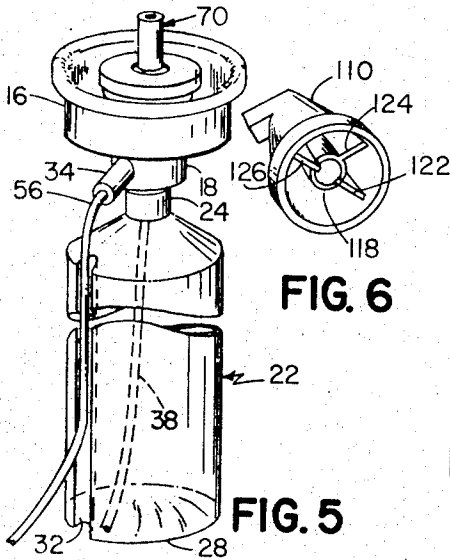
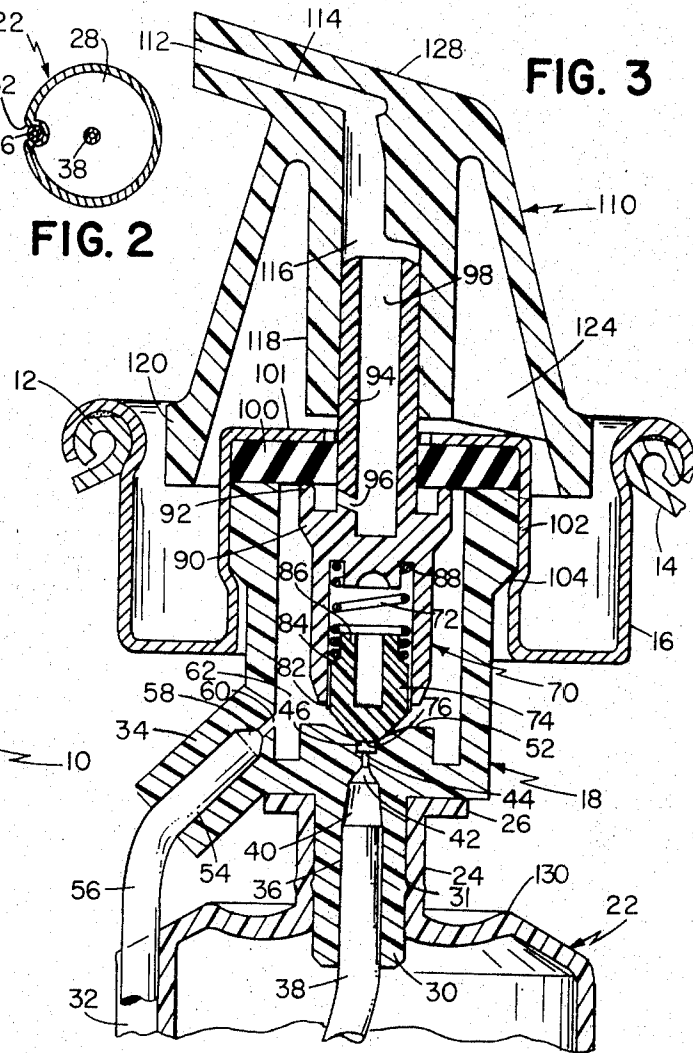


FIG. 6

FIG. 5

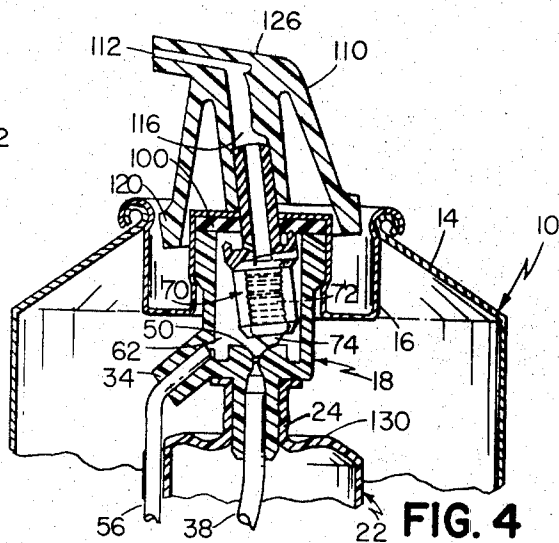
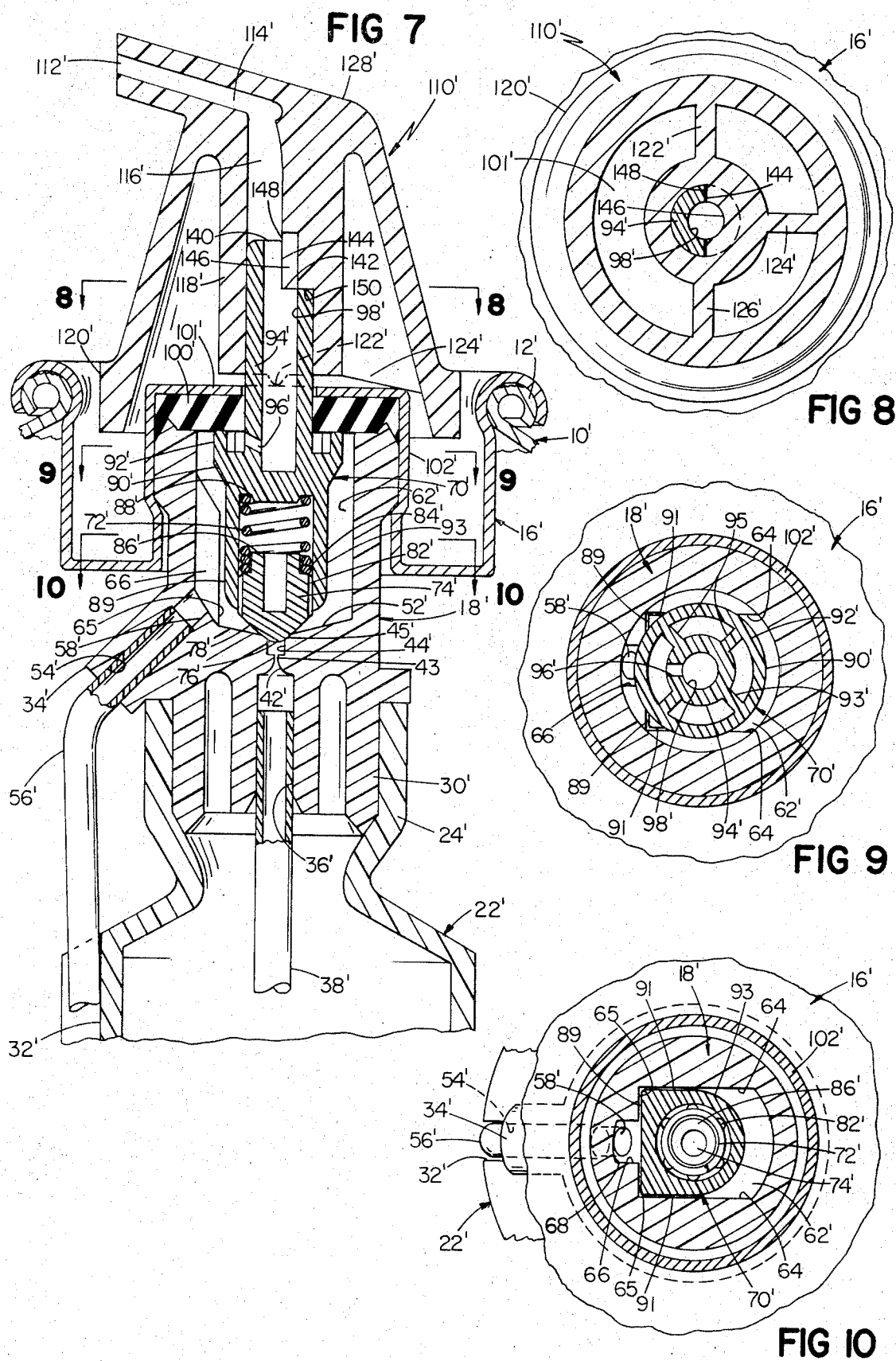


FIG. 4



PLURAL COMPARTMENT PRESSURIZED DISPENSING PACKAGE

This application is a continuation-in-part of my co-pending patent application, now abandoned, Ser. No. 778,689, filed Nov. 25, 1968 entitled "Pressurized Dispensing Package."

SUMMARY OF INVENTION

This invention relates to dispensing packages and more particularly to an improved dispensing package and valve structure for controlling the coordinated mixing and dispensing of materials under pressure from separate compartments to provide a combined product.

Frequently it is desired to dispense a product that results from 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 cosmetic composition applied to the human skin, one part containing a reducing agent and the other part containing an oxidizing agent which is 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. In many instances it is desirable that the dispensing package provide precise proportioning and the desired interaction or mixing of the ingredients prior to discharge. The assembly should be constructed so that it may be easily operated in a safe and reliable manner. Frequently it is desirable that the package be operable in an upright position. Further, the dispensing package should be arranged to permit ready charging of one of the containers with propellant while insuring that in a dispensing mode of operation, ingredients from both containers are mixed together as they are dispensed.

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

Another object of this invention is to provide a novel and improved dispensing package which is arranged to dispense two or more ingredients in an upright position.

Still another object of the invention is to provide novel and improved arrangements for metering the dispensing of ingredients from pressurized dispensing packages.

A specific object of the invention is to provide a novel and improved package for dispensing warm shaving lather.

A further object of the invention is to provide novel and improved arrangements for supporting and interrelating containers for holding ingredients in a pressurized dispensing package.

Still another object of the invention is to provide a novel and improved actuator arrangement for a pressurized dispensing package.

In accordance with a feature of the invention there is provided a dispensing device of the pressurized type which employs a plurality of separate ingredient compartments disposed in predetermined relation to one

another. The dispensing package has a valve assembly, common to the ingredient container, through which a mixture of the ingredients in those containers flows to a discharge nozzle structure. In a preferred embodiment, one container is a rigid outer container to which the valve assembly is secured. The valve assembly includes a connector structure and a second container is a flexible self-supporting container structure which includes a cooperating connector structure that is received in sealing engagement with the connector structure of the valve assembly. The second container is secured against a wall of the outer container so that a flexible wall of the second container is stressed to generate a biasing force which maintains the sealing engagement of the two tubular connector structures. In a particular embodiment, dip tubes extend from the valve assembly to the bottom of each container and the second container has an axially extending groove in its wall to accommodate the dip tube of the outer container.

This dispensing package admits the ingredients from the inner and outer container in proportioned amounts into the valve assembly for mixing as they flow to the discharge nozzle structure. In the dip tube form, this package may be operated in upright position in which the propellant in the upper portion of the outer container forces the ingredient in the outer container upwardly through a metering passage to the valve assembly and the propellant also operates to collapse the flexible second container to force a properly proportioned amount of material through a metering passage to the valve assembly and discharge nozzle. The resilience of the inner container, together with its propellant permeability characteristics, allow return towards its original shape for a subsequent dispensing operation.

In a preferred embodiment the second container is an inner container which is proportioned have a diameter substantially the same as the diameter of the opening in the outer container in which the valve assembly is received and the length of the inner container in unstressed condition as mounted on the valve assembly is slightly greater than the length of the outer container. In assembling the inner and outer containers together the top wall of the inner container is flexed due to engagement of the bottom walls of the two containers and creates a biasing force which maintains the seal connection between the valve assembly and the inner container. This connection is a frictional slip fit between two tubular connectors and results in a fluid seal between the ingredients stored in the two containers so that no mixing of those ingredients occurs through this seal.

In particular embodiments, the dip tube is used as a metering passage as a function of its length and inner diameter, the length being selected to provide the desired flow rate. For example, flow of a shaving cream material is metered through a 0.052 inch diameter orifice and a dip tube of 0.050 inch I.D. and 5½ inches in length at the same rate as through a 0.027 inch diameter orifice without any dip tube. Also a metering system with a 0.052 inch diameter orifice and a dip tube 3½ inches long and of 0.045 inch inner diameter produces a flow rate of about 10 percent greater than is produced when the tube is 1 inch longer.

In a particular embodiment the valve assembly has a tilting mode of operation which opens passage to both containers and an axial mode of operation which opens a passage to only one of the containers. A discharge nozzle structure is formed in an actuator cap which is slidably received on the tubular structure of the valve actuator that defines the outlet orifice of the valve assembly. This actuator cap includes surfaces which limit its axial position on this tubular structure and, together with the shape of the cap which includes an actuator surface that is overcenter with respect to the axis of the valve assembly, permit the valve assembly to respond only in a tilting mode to manually apply pressure to open the valve assembly for the concurrent discharge of the two ingredients stored in the inner and outer containers.

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

FIG. 1 is a side elevational view, with parts broken away, of a dispensing package constructed in accordance with the invention;

FIG. 2 is a sectional view of the inner container taken along the line 2—2 of FIG. 1;

FIG. 3 is an enlarged sectional view of the valve assembly and associated components employed in the dispensing package shown in FIG. 1;

FIG. 4 is a sectional view (to a smaller scale) similar to FIG. 3 showing the valve assembly in an actuated position;

FIG. 5 is a perspective view of the valve assembly, inner container and dip tube components of the dispensing package shown in FIG. 1;

FIG. 6 is a perspective view of the actuator cap employed in the dispensing package shown in FIG. 1;

FIG. 7 is a side elevational view, with parts broken away, of components of another dispensing package in accordance with the invention;

FIG. 8 is a sectional view through the actuator cap and stem of the package of FIG. 7 taken along the line 8—8 of FIG. 7;

FIG. 9 is a sectional view showing details of the valve assembly of the package of FIG. 7 taken along the line 9—9 of FIG. 7; and

FIG. 10 is a sectional view showing further details of the valve assembly of the package of FIG. 7 taken along the line 10—10 of FIG. 7.

DESCRIPTION OF PARTICULAR EMBODIMENTS

The dispensing package shown in FIG. 1 is of the general type shown in Nissen U.S. Pat. No. 3,241,722 and includes an aluminum outer container 10 that has an opening defined by bead 12 in its top wall 14 to which is secured a mounting cup 16 which in turn supports a valve assembly housing 18. The outer container 10 has a bottom wall member 20 on which is seated an inner container 22 in the form of a generally cylindrical, self-supporting, flexible walled bottle of low density polyethylene of 0.985 inch outer diameter and an overall length of 3.740 inch. The container 22 has a wall thickness of 0.015 inch and at its upper end a tubular connector neck of 0.160 inch inner diameter is formed which terminates in a flange 26 of 0.320 inch outer diameter. The bottom wall 28 of container 22 has

a radius of approximately $1\frac{1}{2}$ inch, corresponding to the radius of the bottom wall 20 of outer container 10. Neck 24 of bottle 22 is secured on depending tubular connector stub 30 of valve assembly 18 on which an annular ridge 31 (0.002 inch in height) is formed. Molded in one wall of container 22 is an axially extending groove 32 (as indicated best in FIGS. 2 and 5) that is 0.100 inch deep and 0.100 inch wide.

Formed in stub 30 is a cylindrical passage 36 of 0.085 inch inner diameter and about one-fourth inch long that receives a polyethylene dip tube 38 of 0.090 inch O.D. and 0.050 inch I.D., and $3\frac{1}{2}$ inches long. A tapered transition section 40 connects passage 36 to a curved conical transition section 42 which tapers from a diameter of 0.0625 inch to a diameter of 0.014 inch and two cylindrical sections 44, 46. Formed beyond cylindrical section 46 at the base of housing 36 is a conical valve seat 50, the surface of which is inclined at an angle of 45° . The radial extension of surface 50 is a conical surface 52 disposed at an angle of 6.5° .

The valve assembly housing includes, in addition to stub 30, a second stub 34 which also projects diagonally downwardly from housing at an angle. Stub 34 has a cylindrical entrance passage 54 of similar dimension to passage 36 of stub 30 in which is received polyethylene dip tube 56 of 0.090 inch O.D., 0.050 inch I.D. and $5\frac{1}{2}$ inches long. Passage 54 is connected by conical transition surface 58 to a cylindrical metering passage 60 of 0.027 inch diameter which extends through the wall of housing 18 to the interior chamber 62.

The valve housing 18 is molded of an ethylene copolymer and receives within it a valve core 70 molded of acetal resin (Delrin). Secured to the lower end of the core 70 is a spring 72 to which in turn is secured valve plug 74 molded of a polycarbonate resin (Lexan). Plug 74 has a valve surface that includes a center spherical component 76 and a conical surface 78 that extends, at an angle of 50° radially outwardly from spherical surface 76. Formed on the body of the valve plug 74 are a series of guide ribs 82 which terminate in a spring seat surface 84 above which extends cylindrical projection 86. The upper end of spring 72 is received in seat 88 formed in core 70. Also formed on the body of core 70 is an annular flange 90 which includes an upwardly extending annular rib 92 which forms a valve surface. Extending coaxially above valve surface 92 is a stem section 94 of 0.495 inch in length, of 0.153 inch outer diameter and of 0.080 inch inner diameter. A passage 96 disposed at an angle of $46^\circ 30'$ to the axis of the core and of 0.031 inch diameter extends through the wall of stem 94 and provides communication between the annular channel formed between the stem and valve flange 92 and the stem passage 98.

A gasket 100 (of 60–70 durometer NBR rubber) 0.080 inch thick and having an 0.149 inch hole is interposed between valve flange 92 of the core 70 and the upper horizontal surface 101 of mounting cup 16. Housing 18 has an annular surface 102 at its upper end and a recessed intermediate portion 104 into which the wall of the mounting cup is crimped beneath surface 104 to force surface 102 of the housing 18 into gasket 100 to secure gasket 100 and provide a seal at that point.

Mounted on stem 94 is an actuator cap 110 which defines a discharge orifice 112, an inclined passage 114 and a vertical passage 116. Passage 116 is enlarged at its base to receive stem 94 of valve core 70. A conical skirt 120 surrounds the sleeve 118 that defines passage 116 and extends downwardly to overlie the central portion of the mounting cup 16. As shown in FIG. 6, three webs 122, 124 and 126 extend radially from sleeve 118 and define stop surfaces which seat on surface 101 of mounting cup 16 and limit the downward movement of the actuator cap 110 along the valve stem 94. Webs 122 and 126 have horizontal surfaces and define a tilting surface on mounting cup surface 101. Web 124 is inclined downwardly in the radial outward direction. No web is provided on the discharge nozzle side of sleeve 118 so that manual pressure applied on surface 128 (inclined at an angle of 20°) in a vertical direction is translated into tilting action due to the inclination of surface 128 and to the fact that webs 122, 124 and 126 prevent axially downward motion of the actuator cap.

It will be seen that all the components of the dispensing package may be easily manufactured by high volume production techniques. In assembling the dispensing package, the valve core 70, spring 72 and valve plug 74 are assembled together in the position indicated in FIG. 2. Gasket 100 is seated against surface 101 of mounting cup 16 and the core assembly is inserted through the hole in the gasket 100. Housing 18 is then seated against gasket 100 and the cup is crimped inwardly to secure the assembly together in the position shown in FIG. 2. Dip tubes 38 and 56 are inserted in stubs 30 and 34. The inner container 22 is filled with its ingredient, in this particular embodiment hydrogen peroxide, and neck 24 is slid over stub 30 so that flange 26 abuts the lower surface of housing 18.

The outer container 10 is filled with its ingredient, in this embodiment a soap solution and a reductant, and the inner container and valve assembly-mounting cup is inserted with the dip tube 56 secured in groove 32 so that that assembly and dip tube may pass through the opening defined by bead 12 in the upper wall of the container 10. The mounting cup assembly is crimped to the container bead 12, thus providing a sealed container. In this position the bottom of container 22 is seated on the bottom of container 10 so that top wall 130 is flexed (as indicated in FIGS. 3 and 4) to produce a biasing force which securely maintains the seal between stub 30 and neck 24.

A suitable pressure generating propellant is introduced into the outer container under pressure through the valve assembly. In this mode the core 70 is forced downwardly in an axial direction against the biasing force of spring 72 to open the seal between gasket 100 and valve bead 92 and propellant is introduced through core passage 98 into the outer container 10 without entering the inner container as valve plug 74 maintains orifice 44 closed.

In this container, the pressure of the propellant in the outer container is applied against the flexible wall of the inner container to the ingredient stored therein. As the inner container material is pervious to the propellant, the propellant passes through the wall of the inner container slowly so that after a predetermined interval the inner container resumes its normal cylindrical configuration. To dispense a mixture of the two in-

gredients, actuator surface 128 is depressed, tilting the valve assembly to the position shown in FIG. 4, by pivoting about an axis defined by an edge of the flange 92. This tilting movement of the core 70 withdraws a portion of the valve bead 92 from gasket 100, thereby opening the passage between chamber 62 and the discharge passage 96. This same angular displacement of the core also swings the coupling section which carries the valve plug 74 laterally, and snaps that valve plug over the ridge at the top of conical seat 50 to fully open the orifice 44 to the inner container 22 and release the oxidant for flow into and through the chamber 62 and the discharge passageway with the ingredient from the outer container 10. The chamber 62 and the tortuous passageway formed by sections 96, 98, 116 and nozzle 114 enable the ingredients to be mixed and the chemical reaction to occur before the discharge of the mixture from the nozzle so that mixture is discharged in stable condition ready for use. On release of the actuator surface 128, the spring 72 and the gasket 100 act to return the valve core 70 to its vertical position and close the two valves.

In an alternate embodiment metering orifices 42 and 58 may be enlarged and dip tubes 38 and 56 selected as to length and inner diameter to provide the desired proportioned flow rates.

A further embodiment is shown in FIGS. 7-10. That embodiment includes an outer container 10' that has an opening defined by bead 12' to which is secured a mounted cup 16' which in turn supports a valve assembly housing 18'. Inner container 22' has a neck 24' which is secured to stub 30' of valve housing 18'. An axially extending groove 32' is formed in one wall of container 22'.

Structure within stub 30' defines a cylindrical passage 36' of 0.085 inch inner diameter and about one-fourth inch long that receives a dip tube 38' of 0.090 inch outer diameter and 0.050 inch inner diameter that extends to the bottom of inner container 22'. An annular section 42', the surface of which is of 0.034 inch radius, provides a transition to metering orifice 43. Cylindrical output section 44' has a diameter of 0.036 inch and conical section 46' (45° angle for a length of 0.025 inch) provides passage enlargement to a diameter of 0.085 inch). The base surface 52' of the mixing chamber 62' is disposed at an angle of 9°.

The valve assembly housing includes a second stub 34' which projects downwardly at an angle from the housing and defines an entrance passage 54', 0.085 inch in diameter which receives a dip tube 56' of 0.090 inch O.D., 0.050 inch I.D. and 5½ inches in length. Dip tube 56' is connected by cylindrical passage 58' (0.052 inch in diameter) to mixing chamber 62'. Chamber 62' has two parallel side wall surfaces 64 and a flat end wall surface 65 having a recess in it defined by parallel side wall surfaces 66 and end wall surface 68 in which the end of passage 58' is disposed (as indicated in FIG. 10).

The valve housing 18' receives a valve core 70'. Secured to the lower end of core 70' is a spring 72' to which in turn is secured valve plug 74'. Plug 74' has a valve surface that includes a central spherical component 76', a conical surface component 78', and a series of guide ribs 82' (FIG. 10) which terminate adjacent spring seat surface 84' above which extends cylindrical projection 86'. The upper end of spring 72' is received in seat 88' formed in core 70'.

A flat surface 89 is formed on one side of the body of core 70' and flat side wall portion 91 connect surface 89 to cylindrical surface 93. Also formed at the upper end of the body of core 70' is an annular flange 90' which includes an upwardly extending annular rib 92' which forms a valve surface. Webs 95 extend radially inward from rib 92' to stem 94'. A discharge passage 96' extends through the wall of stem 94' and provides communication between mixing chamber 62' and stem passage 98'.

A gasket 100' is interposed between the upper annular surface 103 of housing 18' and the horizontal surface 101' of mounting cup 16'.

Mounted on stem 94' is an actuator cap 110' which defines a discharge orifice 112', an inclined passage 114' and a vertical passage 116'. The passage in cap 110' is enlarged at the base of passage 116' and receive stem 94' of valve core 70'. Stem 94' has semi-circular upper surface 140 and a semi-circular intermediate surface 142 that is 0.120 inch below surface 140. Vertical wall surfaces 144 connect surfaces 140 and 142.

The actuator cap 110' at the base of passage 116' has a recess 146 which separates vertical surfaces 148 which mate with vertical transition surfaces 144 of stem 94'. A horizontal lower surface 150 is seated on stem intermediate surface 142. A conical skirt 120' surrounds the sleeve 118' that defines passage 116' and extends downwardly to overlie the central portion of the mounting cup 16'. Three webs 122', 124' and 126' extend radially from sleeve 118' to skirt 120'. Webs 122' and 126' define horizontal stop surfaces which seat on portion 101' of mounting cup 16' and define a tilt axis while web 124' has a bottom surface that is inclined downwardly in the radially outward direction and acts as a stop. No web is provided on the discharge nozzle side of sleeve 118' so that manual pressure on surface 128' is translated into tilting action.

Thus, through coordination of surfaces 69 and 91, surfaces 65 and 89 and surfaces 144 and 148, the discharge port 112' of the actuator cap 110' is maintained in alignment with dip tube 56'. The operation of this valve assembly is similar to that described in connection with FIGS. 1-6. To dispense a mixture of the ingredients in inner container 22' and outer container 10', actuator surface 126' is depressed, tilting the valve assembly and permitting material to flow through metering port 43 for mixing with material from the outer container which flows through passage 58'. The amount of material from the outer container is determined by the length of dip tube 56' and the flow of material from the inner container is determined principally by the size of orifice 43 in this embodiment. It will be understood that the metering ratios may be varied by changing the dimension of the metering components taking into account such factors as viscosity of the materials and in particular embodiments dip tube metering may be used with both compartments. The resulting mixture flows from chamber 62' over rib 92', through discharge port 96' and stem 98' for dispensing through port 112'. On release of the actuator surface 126', the spring 72' and gasket 100' act to return the valve core 70' to its vertical position and close metering passage 43 and discharge passage 96'.

While particular embodiments of the invention have

been shown and described, modifications thereof will be apparent to those skilled in the art and therefore it is not intended that the invention be limited to the disclosed embodiments 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 pressurized dispensing package comprising container structure defining a rigid outer container for storing a first ingredient and a second container of self-supporting structure for storing a second ingredient separate from said first ingredient, said second container disposed within said outer container,

a valve assembly common to said first and second containers, said valve assembly having two inlet ports, and two dip tubes, one dip tube connected between said outer container and one inlet port and the other dip tube connected between said second container and the other inlet port, the lengths and internal cross-sectional areas of said dip tubes being selected to provide selected flow rates for the proportioned metering of the ingredients through said valve assembly for discharge in the desired mixture,

said outer container having an opening of substantially the same configuration as the cross-section of said second container, and said second container having a groove in a wall thereof extending the axial length of said second container for receiving the dip tube associated with said outer container,

said valve assembly further including a connector structure of tubular configuration, and said second container further including a flexible top wall and a bottom wall, and a cooperating tubular connector structure formed internally within said top wall and slidably connected in overlapping sealing relation to said connector structure of said valve assembly, said second container having a length such that when said two containers and said valve assembly are secured together the bottom wall of said second container engages the bottom wall of said outer container and said top wall is flexed so that a biasing force is exerted to maintain said connector structures in sealing relation,

said valve assembly further including a discharge passage structure and said package further including an actuator cap adapted to fit on said discharge passage structure for actuating said valve assembly to discharge a mixture of said two ingredients, said actuator cap including structure defining a flow passage that has an outlet orifice and stop means for engaging said outer container to prevent operation of said valve assembly in said axial mode in response to force manually applied to said actuator cap structure while permitting operation of said valve assembly in said tilting mode.

2. The package as claimed in claim 1 wherein said stop means includes structure which engages said container structure and defines a tilt axis for said actuator cap, and a rib on the opposite side of the cap body from said outlet orifice for limiting the permitted direction of tilting of said actuator cap about said tilt axis.

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