Sept. 13, 1966 J. FRANGOS 3,272,402

AEROSOL DISPENSING APPARATUS

Filed Dec. 24, 1963

FIG. 1

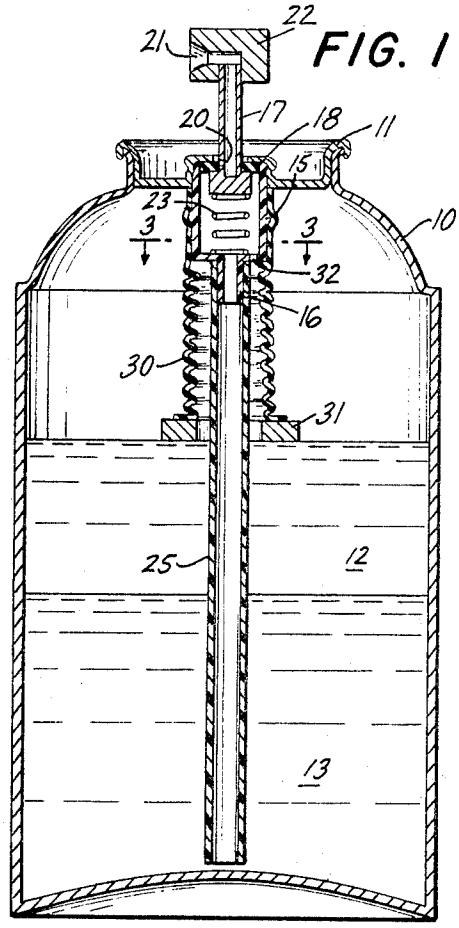
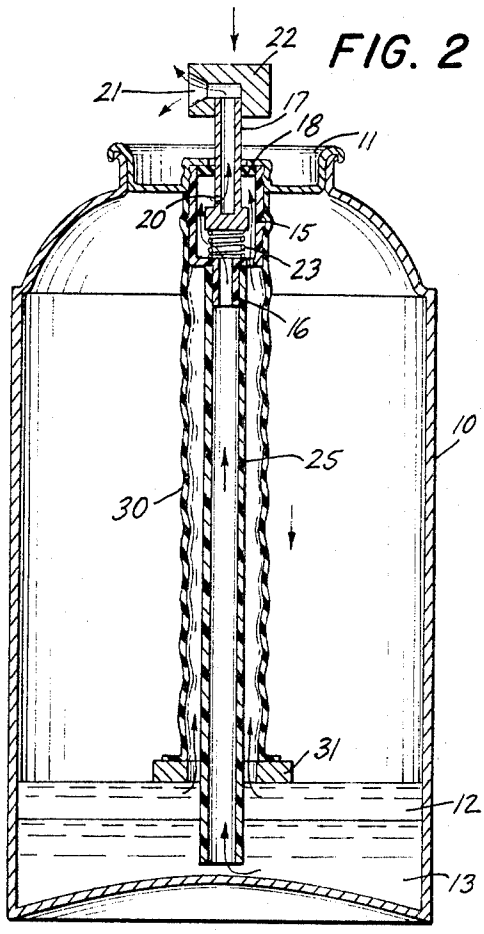


FIG. 2



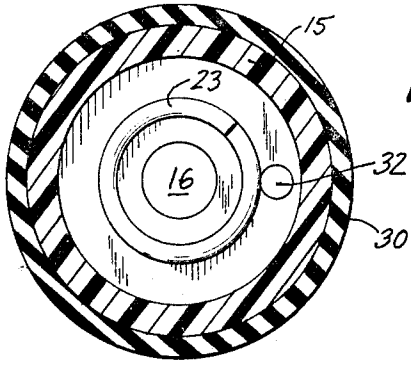


FIG. 3

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AEROSOL DISPENSING APPARATUS

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This invention relates to dispensing fluids from pressure containers under the propelling action of a gas or other propellant within the container and, more particularly, to the dispensing from a single container simultaneously a mixture of two immiscible liquids which form in the container two or more separate and non-interspersed layers.

As will be understood, a wide variety of materials may be dispensed from pressurized containers under the action of gaseous or vaporizable propellent therein as with the so-called aerosol types of packaging. Generally in situations of this character, the material to be dispensed is admixed with a propellent (gas or highly volatile liquid, etc.) in a sealed container having a valved eduction tube therein whereby opening the valve provides for the propellent to force the material to be dispensed up the eduction tube and out of the container.

If, however, the particular materials to be dispensed are in the nature of immiscible liquids (one of which may be the propellent) which form separate or distinct and non-interspersed layers within the container, difficulty may be experienced in obtaining a simultaneous dispensing of both layers and/or a desirably homogeneous mixture thereof, especially if the immiscible materials are such as to resist interspersion or admixture by shaking or otherwise immediately prior to opening the dispensing valve.

According to this invention, however, apparatus is provided for dispensing from aerosol containers simultaneously and with predetermined proportioning separate and immiscible materials forming in the container two or more distinct separate layers, and in a manner whereby the simultaneous dispensing from all layers and the predetermined proportioning thereof is maintained for the entire capacity of the container and regardless of the changing levels of liquid therein. Generally, in accordance herewith, separate or individual eduction tubes are provided for each of the several distinct and immiscible layers with that for the upper layer being arranged to follow the liquid level thereof downwardly in the container as the contents of both layers are used up and dispensed.

With the foregoing and additional objects in view, this invention will now be described in more detail, and other objects and advantages thereof will be apparent from the following description, the accompanying drawings, and the appended claims.

In the drawings:

FIG. 1 is an axial section of an aerosol container embodying and for practicing this invention with the valve therein indicated as being in closed position and with the level of liquids substantially filling the container;

FIG. 2 is a view similar to FIG. 1 but with the valve shown in open position and with the level of liquid in the container shown as when the container is almost empty; and

FIG. 3 is a transverse section on somewhat larger scale taken along the line 3—3 of FIG. 1.

In the drawings, in which like characters of reference refer to like parts throughout the several views thereof, there is shown as a purely illustrative embodiment of this invention, aerosol dispensing apparatus including a conventional pressure container **10** having a sealed closure **11** at the top thereof and including two immiscible liquid materials forming distinct and non-interspersed layers indicated as **12** and **13**. It is to be understood that one of the layers **12** or **13** may actually be the propellant immiscible with the material to be dispensed in the other layer, and/or both layers **12** and **13** may be immiscible materials to be dispensed with the propellant included in one or the other thereof, or the propellant may be a compressed gas such as nitrogen in the space above layer **12**.

A conventional aerosol dispensing valve arrangement is indicated as carried by closure **11** and including a valve body **15** having an inlet port or nipple **16** and a reciprocal ejection stem **17** penetrating to the outside of closure **11** through a seal **18**, all in known manner. Upon depressing valve stem **17** (to the position shown in FIG. 2) outlet port **20** therein is moved from a sealed position above or within seal **18** to the position shown in FIG. 2 permitting material contained within valve body **15** to be ejected through the axial hollow passage in stem **17** and out of dispensing nozzle **21** shown as incorporated in a cap **22**, again all in known manner. Release of finger pressure on cap **22** allows spring **23** to raise valve stem **17** again into the close position of FIG. 1.

In the illustrated embodiment, a conventional eduction tube **25** is shown leading from adjacent the bottom of container **10** up to inlet nipple **16**, whereby liquid in layer **13** adjacent the bottom of the container will be ejected through eduction tube **25** by the pressure of propellant in the container whenever the valve is opened to permit communication between valve body **15** and the atmosphere through valve stem **17**. As will be apparent from the foregoing, however, if eduction tube **25** were the only outlet arrangement, the device would dispense only liquid from layer **13**, at least until layer **13** was completely exhausted, and then only liquid from layer **12**. In accordance herewith, however, it is also desired simultaneously to dispense liquid from upper layer **12** each time the valve is opened.

To this end, in the illustrated embodiment, an auxiliary eduction tube **30** is provided in the form of flexible and, preferably, pleated plastic tube the upper end of which is fitted around the outside of the valve body **15** and lower end of which carries a float **31** adapted to float upon the upper surface of layer **12** and to follow this liquid level as it is gradually lowered upon dispensing of material from the container. Also an auxiliary inlet port **32** is provided communicated from within flexible eduction tube **30** into the interior valve body **15**.

In such manner, as will be apparent from the foregoing, opening of the value as in FIG. 2 provides ejection of liquid from lower layer **13** up through eduction tube **25**, along with simultaneous ejection of material from upper layer **12** up through auxiliary eduction tube **30**, with the mixing of the two materials within valve housing **15** and the final ejection or dispensing of both admixed together through hollow stem **17** and ejection nozzle **21**. By virtue of float **31** floating on the liquid surface in the container, the foregoing situation with simultaneous ejection through both tubes **25** and **30** is maintained throughout the life of the container and irrespective of the particular changing liquid level therein as more and more material is dispensed. Similarly, by the appropriate adjustment or correlation of the sizes of inlet ports **16** and **32** into valve body **15**, a predetermined ratio or proportioning of the quantity of the relative quantities of materials from layers **12** and **13** is also maintained as may be desired so that materials from both layers will be simultaneously dispensed at the desired relative quantities whether the container is almost full or almost empty.

As will also be understood from the foregoing, the stratification of the various immiscible liquid layers **12** and **13** necessarily presupposes a difference in specific

gravities of the materials therein contained. Accordingly, in situations where more than two distinct lawyers of immiscible materials are maintained or to be expected, they can be similarly simultaneously dispensed in accordance with this invention by the provision of additional flexible auxiliary eduction tubes such as 30 each having a "float" such as 31 configured or arranged so as to float upon the surface or interface of an intermediate liquid layer but being too heavy to float upon the surface of the lightest top layer, etc.

There is, thus, provided in accordance herewith an arrangement whereby two or more immiscible materials tending to form distinct layers within container 10 are readily and simultaneously dispensed in predetermined proportions upon depressing a valve stem 17 and without the necessity of any attempt to intersperse or admix the various layers as by shaking the container or otherwise prior to dispensing it. Even inadvertent admixing of the materials during handling the container forms but a momentary situation which resolves itself automatically as the container is at rest between uses. Even in situations where only a single material is desired to be dispensed with the other layer comprising propellent only, the utility of the aerosol arrangement is enhanced in accordance herewith by assuring that a portion of the propellent will be dispensed along with each portion of material to avoid the otherwise undesirable situation where the material in the lower layer is dispensed without an accompanying portion of expanding or vaporizable propellent and/or where the container would still appear not to be empty even though all the material in the lower layer had been exhausted.

Yet the foregoing arrangement is provided with extremely simple apparatus and without the necessity of complicated manufacturing or design considerations, especially in instances where it is desired to have the container and the valve therefor extremely small. As will also be understood, although the valving arrangement shown is generally of the type in which material is dispensed so long as valve stem 17 is held depressed, this invention is readily applicable to situations where it is desired to have the principal valving arrangement formed as a metering or dosage valve in known manner for dispensing only a pretetermined quantity or dose of material each time the valve is depressed.

While the forms of apparatus herein disclosed constitute preferred embodiments of this invention, this invention is not limited to these precise forms of apparatus and changes may be made therein without departing from the scope of this invention which is defined in the amended claims.

What is claimed is:

1. In a pressure container and dispenser of the character described adapted to contain a plurality of immiscible liquids forming separate liquid layers and to dispense a mixture of materials from all said layers simultaneously under the action of a propellant in said container, the combination which comprises dispensing valve means in said container for emitting materials contained therein under the action of said propellant upon opening of said valve means, an eduction tube disposed in said container and having one end in flow communication with said valve means and the opposite end disposed adjacent the bottom of said container for conducting material in the lowest of said plurality of layers from adjacent the bottom of said container to said valve means, at least one supplementary eduction tube having one end in flow communication with said valve means and the opposite end disposed within one of said immiscible layers other than said lowest layer of material in said container, and float means on said supplementary eduction tube at the end thereof opposite to said valve means and adapted for floating on the one of said immiscible layers to be dispensed through said supplementary eduction tube.

2. In a pressure container and dispenser of the character described adapted to contain a plurality of immiscible liquids forming separate liquid layers and to dispense a mixture of materials from all said layers simultaneously under the action of a propellant in said container, the combination which comprises dispensing valve means in said container for emitting materials contained therein under the action of said propellant upon opening of said valve means, an eduction tube disposed in said container and having one end in flow communication with said valve means and the opposite end disposed adjacent the bottom of said container for conducting material in the lowest of said plurality of layers from adjacent the bottom of said container to said valve means, at least one supplementary eduction tube having one end in flow communication with said valve means and the opposite end disposed within one of said immiscible layers other than said lowest layer of material in said container, and float means on said supplementary eduction tube at the end thereof opposite to said valve means and adapted for floating on the one of said immiscible layers to be dispensed through said supplementary eduction tube, said supplementary eduction tube being expandable for following said float means downwardly in said container as said layer on which it is floating is gradually dispensed through said first eduction tube and said valve means.

3. In a pressure container and dispenser of the character described adapted to contain two immiscible liquids forming separate liquid layers and to dispense a mixture of materials from both said layers simultaneously under the action of a propellant in said container, the combination which comprises dispensing valve means in said container for emitting materials contained therein under the action of said propellant upon opening of said valve means, an eduction tube disposed in said container and having one end in flow communication with said valve means and the opposite end disposed adjacent the bottom of said container for conducting material in the lower of said layers from adjacent the bottom of said container to said valve means, a supplementary eduction tube having one end in flow communication with said valve means and the opposite end disposed within the upper of said immiscible layers, and float means on said supplementary eduction tube at the end thereof opposite to said valve means and adapted for floating on said upper immiscible layer, said supplementary eduction tube being expandable for following said float means downwardly in said container as said lower layer is gradually dispensed through said valve means.

4. A pressure container as recited in claim 3 in which said dispensing valve means includes a valve body within said container and in flow communication with the upper ends of said eduction tubes, a movable valve stem having a hollow channel therein leading from said valve body out of said container when said valve stem is moved into dispensing position, and spring means urging said valve stem away from said dispensing position.

5. A pressure container as recited in claim 3 in which said propellant is contained in one of said layers.

6. A pressure container as recited in claim 3 in which said proepllant is a compressed gas within said container and above said liquid layers therein.

7. In a pressure container and dispenser of the character described, adapted to contain two immiscible liquids forming separate liquid layers and to dispense a mixture of materials from both layers simultaneously under the action of a propellant in said container, the combination which comprises dispensing valve means in said container for emitting materials contained therein under the action of said propellant upon opening of said valve means, an eduction tube disposed in said container and having one end in flow communication with said valve means and the opposite end disposed adjacent the bottom of said container for conducting material in the lower of said layers from adjacent the bottom of said container to said

valve means, a flexibly corrugated and extensible supplementary eduction tube disposed coaxially around said first mentioned eduction tube and having one end in flow communication with said valve means and the opposite end disposed within the upper of said immiscible layers, and float means on said supplementary eduction tube at the end thereof opposite said valve means and adapted for floating on said upper immiscible layer, said supplementary eduction tube being extensible for following said float

means downwardly in said container as said lower layer is gradually dispensed through said valve means.

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