Dec. 20, 1966 J. FRANGOS 3,292,827

AEROSOL DISPENSING APPARATUS

Filed Dec. 24, 1963

FIG. 1

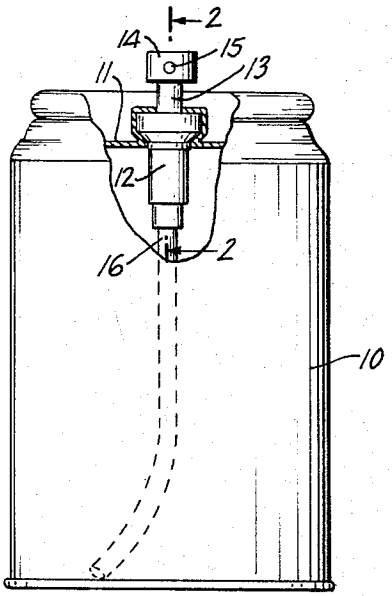


FIG. 2

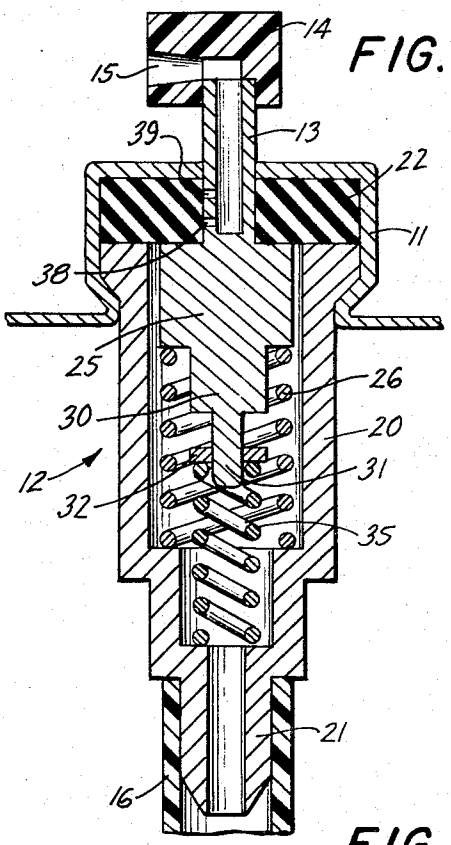


FIG. 3

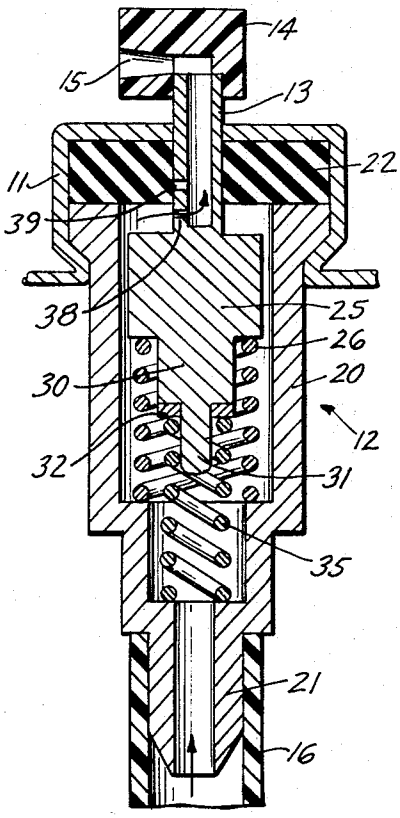
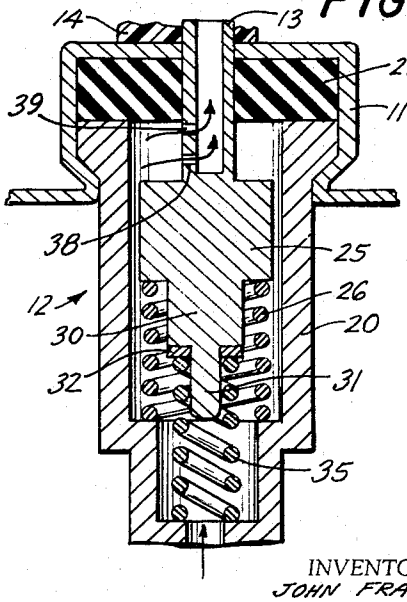


FIG. 4



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AEROSOL DISPENSING APPARATUS

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9 Claims. (Cl. 222—402.24)

This invention relates to dispensing fluids from pressure containers under the propelling action of a gas or other propellent within the container and, more particularly, to an arrangement whereby the rate of flow of such pressure dispensing can readily be controlled by the operator to a plurality of different rates from the same container.

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. Such a wide variety of materials are now packaged in this manner—including such widely different products as shaving foam, plastic foams, pigmented paints and lacquers, hair sprays and dyes, insect repellents, perfumes, medicaments, etc.—that it is obviously necessary or desirable to accommodate the valving mechanism to different types of materials, and with particular regard to the viscosities or pigmentation of the material, the quantity or rate of flow desired, and such similar considerations.

Even with such conventional coordination of designed considerations, however, the valve mechanism controlling the dispensing or pressure ejection of the material in the container for any particular type of material is generally of the on-off type. Especially in such valve constructions which are desirably of as small size as possible and where the outlet orifice is necessarily desirably quite small in order to emit a fine spray of material (e.g., with such commodities as hairset sprays, etc.), considerable difficulty may be experienced if it is attempted to provide in the valving arrangement means for controlling the flow rate of the spray to different rates. Even if it were conceivable for the user of the device to depress or open the valve or outlet orifice only part way in order to obtain a less-than-maximum ejection stream or rate, the difficulty of readily accomplishing such fine control is manifest when it is recalled that the outlet orifice of the valve is usually of almost pinpoint size and actually invisible or hidden when the apparatus is in use.

Nevertheless, there may be a variety of uses or applications for such aerosol dispensing apparatus where it is desired for the user readily to obtain two or more different flow rates for the material being ejected or dispensed. As purely illustrative of such possible applications, one may note certain cosmetic preparations, hair sprays, sprayable surgical dressings, and even paints or lacquers where it might be helpful or desirable for the user to obtain a rather intense spray or high flow rate at one time and a much reduced flow rate at another time for the purpose of, for example, spraying the entire head of hair with a setting spray at one moment and then providing a much smaller quantity just to catch a few loose ends, or obtaining maximum flow and intensity to cover a large area, while later desiring only a much smaller spray to "touch up" a small area. Thus, such versatility of application or use may be difficult to obtain when the only control the user has is the length of time the valve is opened and/or when only a single rate of flow or the maximum rate of flow occurs whenever the valve is opened.

According to this invention, however, there are provided arrangements of apparatus in such aerosol dispenser valving mechanisms for obtaining selectively any of a plurality of different dispensing flow rates from a single container and which can be readily selected by the user to provide the desired variety of ejection quantity or flow intensity, either as a plurality of distinct stepwise variations or a continuous variation from maximum to minimum flow; and, as a further feature of this invention, means are provided permitting the user to select any of the available different flow rates by touch alone during actual operation of the valve and notwithstanding the fact that the apparatus may be held or used at that moment in some position in which it is not readily visible to the user (as by spraying the back of the user's own head, etc.).

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

In the drawings:

FIG. 1 is an elevation view with parts broken away showing apparatus embodying and for practicing this invention;

FIG. 2 is an axial section on a somewhat larger scale through the valving apparatus of FIG. 1 taken on the line 2—2 thereof and with the valve in closed position;

FIG. 3 is a view similar to FIG. 2 but showing the valve opened to a first or low flow rate position; and

FIG. 4 is a view similar to FIGS. 2 and 3 showing the valve opened to a second or high flow rate position.

Referring to the drawings, in which like reference characters refer to like parts throughout the several views thereof, one form of apparatus embodying and for practicing this invention is illustrated in FIG. 1 as comprising a pressurized container **10** in which is contained the material to be dispensed and a propellent therefor, in known manner, and including a sealed top closure **11** in which is supported valve mechanism indicated generally by the numeral **12** and described in more detail hereafter. Valve **12** includes a valve stem **13**, penetrating through top **11** of container **10** and carrying an operating cap **14** thereon with a dispensing nozzle **15** therein. Depressing cap **14** by finger pressure opens valve **12** and permits material within container **10** to be pressure ejected up eduction tube **16** and out dispensing nozzle **15**, all as will be understood and in generally known manner.

Referring more particularly to FIGS. 2–4, valve **12** is illustrated as comprising a hollow valve body **20** having a reduced diameter inlet port or nipple **21**, for accommodating the upper end of eduction tube **16**, and a resilient seal **22** at the upper end of valve body **20** and in sealing engagement around stem **13**. Valve stem **13** is provided at the lower end thereof with an enlarged cylindrical portion **25** forming an abuttment against which a spring **26** acts to bias portion **25** and valve stem **13** into the upper or closed position of FIG. 2, but against which valve stem **13** may be forced downwardly into one or another of the open positions of FIGS. 3 and 4. Below portion **25** is a reduced diameter portion **30** and a smaller axially extending pin **31** engaging an annular spacer or washer **32**, which in turn is urged upwardly by the action of a second compression spring **35**.

Thus, when the user depresses cap **14** and valve stem **13** initially, the user's finger pressure is resisted only by spring **26** until such time as the lower end portion **30** engages washer **32**, at which point the user's downward finger pressure on cap **14** is resisted by both springs **26** and **35**. Although neither of these springs is strong enough to make difficult the depressing of valve stem **13**, the addition of force of spring **35** to that of spring **26** when

the valve stem is depressed to the point illustrated in FIG. 3 forms a readily sensible signal to the user's finger.

When the valving arrangement is in the closed position of FIG. 2, as will be apparent from the foregoing, the container is sealed and no material is allowed to pass upwardly through eduction tube **16** or outwardly through valve stem **13**. When, however, valve stem **13** is depressed to the position indicated in FIG. 3, outlet port **38** in the side of valve stem **13** is moved below the bottom or inner side of seal **22**, thus permitting passage of pressurized material up eduction tube **16**, through the inside of valve body **20**, and, via outlet port **38**, up hollow valve stem **13** and out discharge nozzle **15** in cap **14** to produce the desired dispensing spray or flow.

When cap **14** and valve stem **13** are further depressed to the position shown in FIG. 4, an additional outlet port **39**, previously sealed in the positions of FIGS. 2 and 3, is moved out of sealing engagement with seal **22** to provide a further communication between the inside of hollow valve body **20** and hollow valve stem **13**, thus enlarging the effective area of flow communication from the interior of container **10** and valve body **20** to the atmosphere through hollow valve stem **13**.

As will be apparent from the foregoing, if outlet openings **38** and **39** were both the same size, the flow rate out of the dispensing apparatus in the position of FIG. 4 (with both outlet ports communicating between valve body **20** and valve stem **13**) would be twice that of the arrangement in FIG. 3 when only outlet port **38** was permitting ejection of material from container **10**. In the same manner, by providing upper valve port **39** of a different size or cross sectional area than lower port **38** (or by providing a different number of upper ports **39** than lower ports **38**) permits a virtual infinitude of different or relative flow rates as between the position illustrated in FIG. 3 and that in FIG. 4. Furthermore, providing an axial slot extending between ports **38** and **39**, instead of the axially spaced individual ports, gives further versatility as permitting a gradual variation in the open effective flow area communicating between the interior of valve body **20** and valve stem **13** for the ejection of material to be dispensed therethrough.

As will also be apparent from the foregoing, particularly in instances where the desired difference or variation in flow rate is readily discernable merely from observing the spray being ejected or dispensed through nozzle **15**, the provision of spring **35** and washer **32**, etc., may not be necessary, especially in constructions where a fairly substantial axial spacing is provided between the several ports **38**, **39** so that the proper extent of depressing valve stem **13** may be found by visual observation. Nevertheless, the illustrated construction is preferred as providing a tangible indication readily felt by the user's finger when valve stem **13** has been depressed sufficiently to bring only port **38** but not **39** into flow communication between valve body **20** and stem **13** to obtain the predetermined lower flow rate, with the higher flow rate being readily obtained merely by depressing valve stem **13** farther.

As will also be apparent, a selection of specifically different flow rates greater than the two indicated in the drawings are also readily comprehended within this invention merely by providing additional axially spaced outlet ports in stem **13**, each of which is sequentially brought into flow communication between the inside of valve body **20** and the hollow stem **13** communicating with the atmosphere so that, with the moving of each successive outlet port out of sealing engagement with seal **22**, the effective open cross sectional flow area of communication between the inside of valve body **20** and hollow valve stem **13** is increased in stepwise fashion thus to increase the rate of flow of material therethrough to virtually any extent desired up to whatever maximum is permitted by the sizes of the hollow passage in valve stem **13** and of dispensing nozzle **15** in cap **14**.

From the foregoing, it is thus apparent that there are provided in accordance with this invention arrangements of apparatus for selectively controlling the flow rates of dispensing of materials from such aerosol containers to any of a plurality of selectively different rates and readily controlled by the user of the device. Furthermore, the invention comprehends the provision of a signal sensitive to the user's finger pressure for indicating the respective different flow rates, even if the device is being used under circumstances where the actual spray being ejected is not readily observable, and with all the foregoing being accomplished by apparatus which is relatively simple and economic of manufacture and can be accommodated within the size or compass generally conventional for dispensing valve mechanism in conventional aerosol containers of various sizes. For example, even with the multiple spring sensing arrangement as illustrated, such structure can be accommodated without substantially or inordinately increasing the diameter of the valving arrangement, but only increasing somewhat the axial extent, which is of no particular consequence in a conventional spray container and/or the conventional closures or packaging machinery associated therewith.

While the forms of apparatus described herein are preferred embodiments of this invention, this invention is not limited to these precise forms of apparatus and modifications may be made therein without departing from the scope of this invention which is defined in the appended claims.

What is claimed is:

1. In dispensing valve apparatus of the character described for controlling the dispensing of a fluid from a pressure container therefor under the action of a propellant in said container and selectively at a plurality of different dispensing flow rates, the combination which comprises means for mounting said valve apparatus at the top of said container, a valve stem extending from inside said container to the outside thereof, said valve stem being axially movable from an open dispensing position in which stem is partially depressed within said container to a closed position in which said valve stem extends out of said container, an axial flow passage in said valve stem having an outer end forming a discharge opening for fluid dispensed from said container and an inner end adjacent the end of said valve stem which is disposed within said container, a plurality of spaced outlet ports in said valve stem and disposed adjacent said inner end thereof in flow communication with said axial passage, said ports being disposed and spaced on said valve stem to be sequentially brought into flow communication between the interior of said container and said axial passage as said valve stem is depressed into said open dispensing position and sequentially closed as said valve stem is moved axially outwardly into closed position, and a plurality of biasing means for increasing tangibly in stepwise manner the force necessary to depress said valve stem before said valve stem is sufficiently depressed within said container to open each successive said outlet port for flow therethrough of fluid from within said container through said port and out said passage in said valve stem.

2. In dispensing valve apparatus of the character described for controlling the dispensing of a fluid from a pressure container therefor under the action of a propellant in said container and selectively at a plurality of different dispensing flow rates, the combination which comprises means for mounting said valve apparatus at the top of said container, a valve stem extending from inside said container to the outside thereof, said valve stem being axially movable from an open dispensing position in which said stem is partially depressed within said container to a closed position in which said valve stem extends out of said container, an axial flow passage in said

valve stem having an outer end forming a discharge opening for fluid dispensed from said container and an inner end adjacent the end of said valve stem which is disposed within said container, a plurality of spaced outlet ports in said valve stem and disposed adjacent said inner end thereof in flow communication with said axial passage, said ports being disposed and spaced on said valve stem to be sequentially brought into flow communication between the interior of said container and said axial passage as said valve stem is depressed into said open dispensing position and sequentially closed as said valve stem is moved axially outwardly into closed position, first biasing means within said container for urging said valve stem outwardly, and second biasing means for increasing tangibly in step-wise manner the force necessary to depress said valve stem against said biasing means before said valve stem is sufficiently depressed within said container to open each successive said outlet port for flow therethrough of fluid from within said container through said port and out said passage in said valve stem.

3. In dispensing valve apparatus of the character described for controlling the dispensing of a fluid from a pressure container therefor under the action of a propellant in said container and selectively at a plurality of different dispensing flow rates, the combination which comprises means for mounting said valve apparatus at the top of said container and including resilient sealing means, a valve stem penetrating said sealing means and extending from inside said container to the outside thereof, said valve stem being axially movable with respect to said sealing means from an open dispensing position in which said stem is partially depressed within said container to a closed position in which said valve stem extends out of said container, an axial flow passage in said valve stem having an outer end forming a discharge opening for fluid dispensed from said container and an inner end adjacent the end of said valve stem which is disposed within said container, a plurality of axially spaced outlet ports in said valve stem and disposed adjacent said inner end thereof in flow communication with said axial passage, said ports being axially disposed and spaced on said valve stem to be sequentially brought into flow communication between the interior of said container and said axial passage as said valve stem is depressed into said open dispensing position and sequentially closed by said resilient sealing means as said valve stem is moved axially outwardly into closed position, first biasing means for urging said valve stem outwardly, and second biasing means for increasing tangibly in step-wise manner the force necessary to depress said valve stem against said biasing means before said valve stem is sufficiently depressed within said container to open each successive said outlet port for flow therethrough of fluid from within said container through said port and out said passage in said valve stem.

4. In dispensing valve apparatus of the character described for controlling the dispensing of a fluid from a pressure container therefor under the action of a propellant in said container and selectively at a plurality of different dispensing flow rates, the combination which comprises means for mounting said valve apparatus at the top of said container, a valve stem extending from inside said container to the outside thereof, said valve stem being axially movable from an open dispensing position in which said stem is partially depressed within said container to a closed position in which said valve stem extends out of said container, an axial flow passage in said valve stem having an outer end forming a discharge opening for fluid dispensed from said container and an inner end adjacent the end of said valve stem which is disposed within said container, a plurality of axially spaced outlet ports in said valve stem and disposed adjacent said inner end thereof in flow communication with said axial passage, said ports being axially disposed and spaced on said valve stem to be sequentially brought into flow communication between the interior of said container and said axial passage as said valve stem is depressed into said open dispensing position and sequentially closed as said valve stem is moved axially outwardly into closed position, a plurality of axially spaced abutments on said valve stem and disposed inwardly of said container from said ports, a plurality of resilient biasing means within said container sequentially engaging said abutments to urge said valve stem outwardly, the force with which said biasing means engage said abutments significantly increasing as each successive said biasing means sequentially engages each successive abutment for producing a tangible difference at each said engagement of the force necessary to depress said valve stem against the biasing action of said biasing means, and the axial spacing of each said abutment along said valve stem and the point of contact thereof with each successive said biasing means being correlated with the axial spacing of said outlet ports whereby a tangible difference in the force necessary to depress said valve stem is produced before said valve stem is sufficiently depressed within said container to open each successive said outlet port for flow therethrough of fluid from within said container through said port and out said passage in said valve stem.

5. In dispensing valve apparatus of the character described for controlling the dispensing of a fluid from a pressure container therefor under the action of a propellant in said container and selectively at a plurality of different dispensing flow rates, the combination which comprises means for mounting said valve apparatus at the top of said container and including resilient sealing means, a valve stem penetrating said sealing means and extending from inside said container to the outside thereof, said valve stem being axially movable with respect to said sealing means from an open dispensing position in which said stem is partially depressed within said container to a closed position in which said valve stem extends out of said container, an axial flow passage in said valve stem having an outer end forming a discharge opening for fluid dispensed from said container and an inner end adjacent the end of said valve stem which is disposed within said container, a plurality of axially spaced outlet ports in said valve stem and disposed adjacent said inner end thereof in flow communication with said axial passage, said ports being axially disposed and spaced on said valve stem to be sequentially brought into flow communication between the interior of said container and said axial passage as said valve stem is depressed into said open dispensing position and sequentially closed by said resilient sealing means as said valve stem is moved axially outwardly into closed position, a plurality of axially spaced abutments on said valve stem and disposed inwardly of said container from said ports, a plurality of resilient biasing means within said container sequentially engaging said abutments upon depressing of said valve stem to urge said valve stem outwardly, the force with which said biasing means engage said abutments significantly increasing as each successive said biasing means sequentially engage each successive abutment for producing a tangible difference at each said engagement of the force necessary to depress said valve stem against the biasing action of said biasing means, and the axial spacing of each said abutment along said valve stem and the point of contact thereof with each successive said biasing means being correlated with the axial spacing of said outlet ports with respect to said resilient sealing means whereby a tangible difference in the force necessary to depress said valve stem is produced before said valve stem is sufficiently depressed within said container to open each successive said outlet port for flow therethrough of fluid from within said container through said port and out said passage in said valve stem.

6. In an apparatus of the character described for controlling the flow rate of liquids dispensed from a pressurized container, the combination which comprises a sealed top closure, a valve body disposed in said container and

adjacent said top, a stem extending from said valve body and through said sealed top with a channel running axially therethrough to an ejection nozzle at the top thereof, two ports disposed axially along said stem and providing flow communication between said channel and said valve body depending upon the position of said stem through said sealed top, two abutments disposed axially along said stem below said hollow channel, first spring means engaging one of said abutments for biasing said stem outwardly of said valve body, second spring means coaxially disposed with said first spring means and engaging the other said abutment for additional biasing of said stem outwardly of said valve body, said first spring means providing resistance to pressure applied to said stem for moving it axially toward said valve body and bringing one of said radial ports into flow communication with said valve body to provide a first flow rate from said stem, and said second spring means offering a tangible increase in resistance to pressure applied to said stem as it is moved further axially toward said valve body bringing the second of said radial ports into flow communication with said valve body thus increasing the flow rate of liquid to be dispensed through said stem and said ejection nozzle.

7. Apparatus as recited in claim 6 in which said ports are of equal diameter so that bringing the second port into flow communication with said valve body will double the flow rate from that flowing in said first flow rate.

8. Apparatus as recited in claim 6 in which said port disposed on said stem nearest to said valve body is twice the size of the said other port so that bringing the second port into flow communication with said valve body will triple the flow rate from that flowing in said first flow rate.

9. In dispensing valve apparatus of the character described for controlling the dispensing of a fluid from a pressure container therefor under the action of a propellant in said container and selectively at a plurality of different dispensing flow rates, the combination which comprises a valve stem extending from inside said container

to the outside thereof, said valve stem being movable from an open dispensing position in which said stem is partially depressed within said container to a closed position in which said valve stem extends out of said container, an axial flow passage in said valve stem having an outer end forming a discharge opening for fluid dispensed from said container and an inner end adjacent the end of said valve stem which is disposed within said container, outlet port means through said valve stem and in flow communication between the inside of said container and said axial flow passage when said valve stem is in an open dispensing position, said outlet port means being disposed axially along said valve stem for successively increasing the open cross-sectional area of said port means as said valve stem is depressed into said open dispensing position and successively decreasing said cross-sectional area as said valve stem is moved axially outwardly into closed position, first biasing means urging said valve stem outwardly into closed position, and second biasing means for increasing tangibly in step-wise manner the force necessary to depress said valve stem in at least one intermediate depressed position thereof a point where substantially less effective cross-section of said outlet port means is in flow communication between the interior of said container and said axial passage in said valve stem.

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