Sept. 26, 1961 G. L. MAISON ET AL 3,001,524

AEROSOL DISPENSING APPARATUS

Filed March 5, 1957 2 Sheets-Sheet 1

Fig. 1

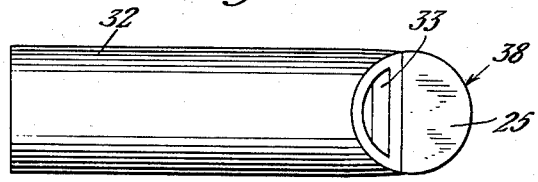


Fig. 2

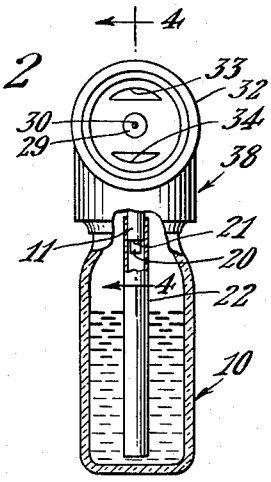


Fig. 4

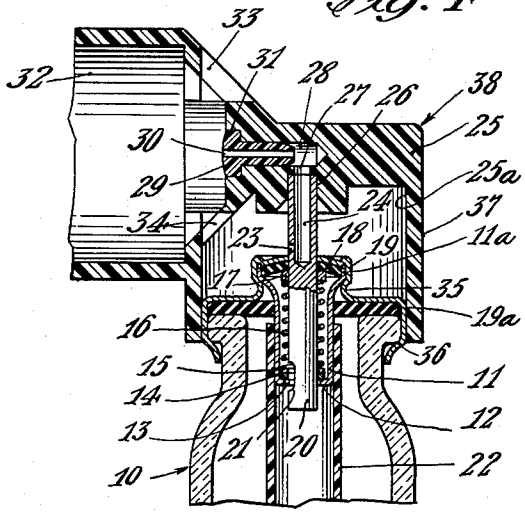


Fig. 3

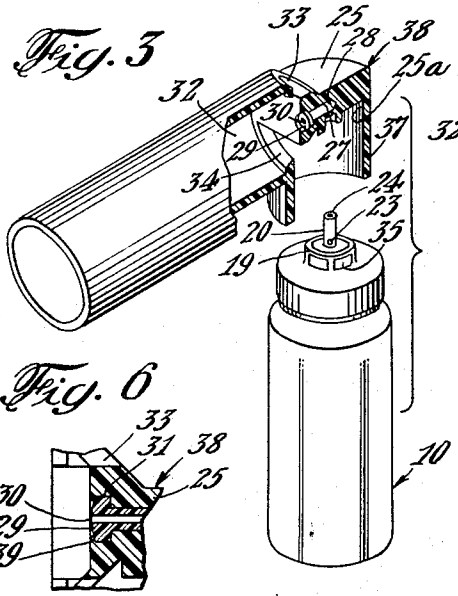


Fig. 5

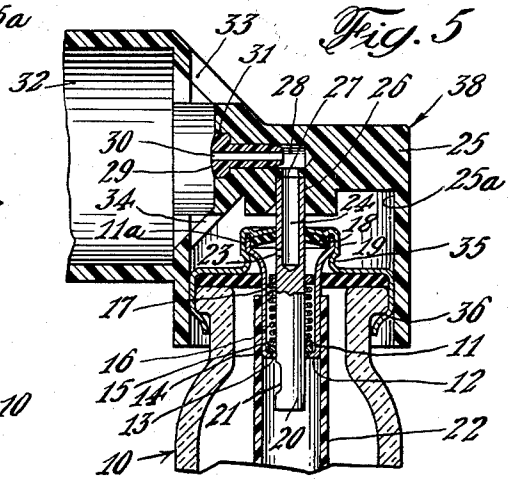


Fig. 6

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AEROSOL DISPENSING APPARATUS

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Fig. 7

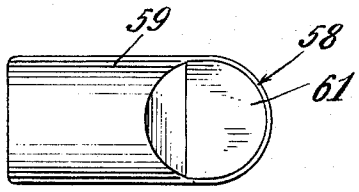


Fig. 8

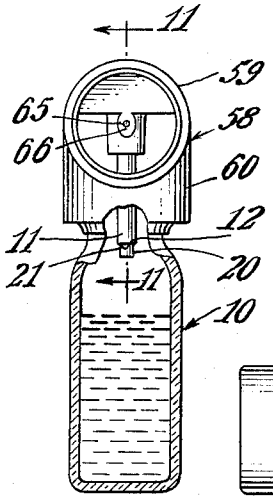


Fig. 9

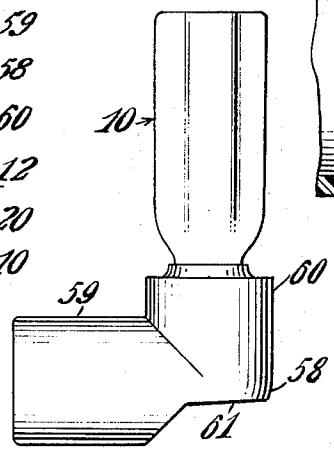
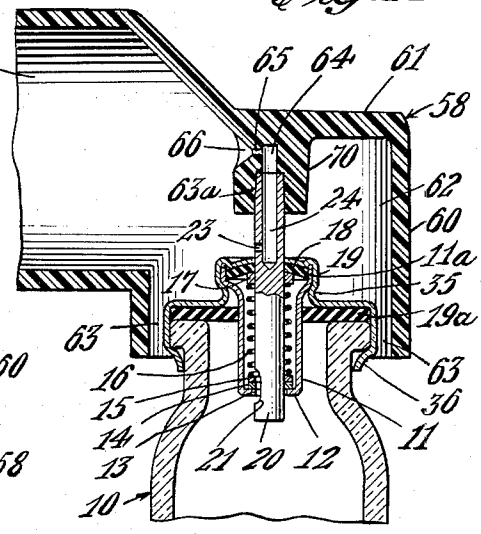


Fig. 11



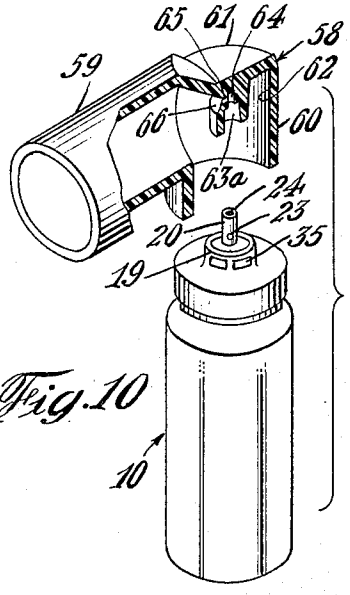
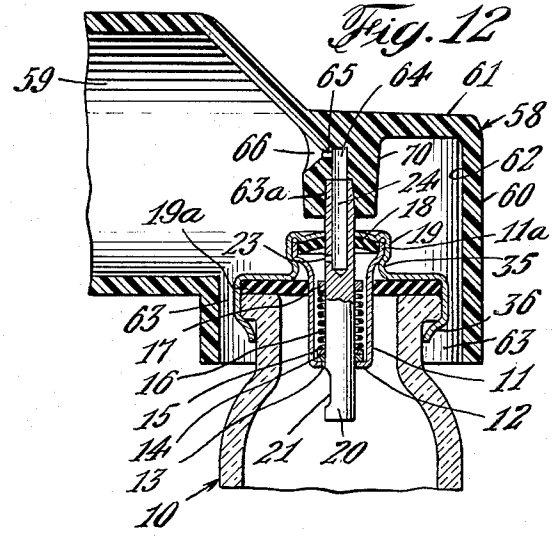


Fig. 10

Fig. 12



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Patented Sept. 26, 1961

3,001,524

AEROSOL DISPENSING APPARATUS

George Louis Maison and Irving Porush, Los Angeles, Calif., assignors to Riker Laboratories, Inc., Los Angeles, Calif., a corporation of Delaware

Filed Mar. 5, 1957, Ser. No. 643,954
6 Claims. (Cl. 128—173)

This application is a continuation-in-part of our copending application, Serial No. 572,965, filed March 21, 1956, and now abandoned.

The present invention relates to an aerosol dispensing apparatus which is particularly suitable for dispensing and administering measured amounts of a medicament-containing aerosol for inhalation therapy.

A great amount of previous effort has been directed to provide suitable means for dispensing and administering therapeutic agents or medicaments for inhalation therapy. The devices of these prior efforts suffer from one or more serious shortcomings. In most cases the prior art has relied upon cumbersome mechanical devices which employ a rubber airbulb to aspirate a solution containing a medicament. These devices are often cumbersome, inconvenient, frangible and expensive. Some devices replace the rubber airbulb with a source of a compressed air or oxygen. This latter expedient has the serious limitation of requiring that the medicament be administered in close proximity to a cylinder of the compressed air or oxygen, usually in a doctor's office or hospital. At best the amount of medicament dispensed by the prior art devices is not readily controlled, leading to the administration of erratic, unmeasured doses of medicament. In a case where the medicament being administered to the patient is highly active, potent or somewhat toxic, the excessive amounts which may be administered may result in an unwanted response on the part of the patient.

The shortcomings of the prior art devices are discussed in a scientific article of Dr. George F. Harsh entitled, "A Comparative Study of Commercial Nebulizers," which appeared in "Annals of Allergy," vol. 6, pp. 534–546 (1948). As pointed out in this article, not only was the physical dispersion of the spray or mist produced by the prior art devices unsatisfactory and erratic, but, as stated on page 537, a single compression of a rubber airbulb in different devices might deliver from 0.4 mg. to 13.0 mg. of a medicament-containing solution. With the less efficient prior art devices many chronic asthmatics were found to develop thick callouses on their hands from the repeated squeezing of the rubber airbulb required to obtain relief. Obviously, such devices leave much to be desired.

For these reasons, as well as others, the benefits of inhalation therapy have not been fully realized and progress in this mode of medication has lagged.

By means of the present invention the medical profession is provided with a convenient, inexpensive apparatus which is suitable for dispensing and administering in aerosol form measured, constant amounts of a medicament without requiring any substantial labor on the part of the user or a separate source of compressed air or oxygen. This apparatus may be transported in the pocket or purse of the user and the medicament rapidly self-administered and inhaled by the patient without inconveniencing or affecting others nearby. This apparatus employs self-propelling, medicament-containing compositions containing a liquefied, propellant gas as the means of discharging the medicant in aerosol form. The apparatus of the invention further provides that the aerosol of the medicament as inhaled by the patient shall be substantially free of unvaporized liquid propellant which might cause irritation of the delicate mucous membranes of the nasal and oral passages. This is an important advantage of the apparatus of the invention.

It is, therefore, one object of this invention to overcome the disadvantages of the prior art devices intended for inhalation therapy.

It is also an object of the present invention to provide an improved, convenient apparatus which will produce in aerosol form suitable for inhalation therapy measured, constant amounts of a medicament, without requiring any substantial amount of work on the part of the user or any external source of a propellant gas, and the ejected dose and the fineness of nebulization are fixed and do not depend upon the force exerted by the patient's fingers.

It is a further object of the present invention to provide an improved, convenient apparatus by which a patient may self-administer by inhalation a measured, constant amount of a medicament in aerosol form which is dry or substantially dry and free from unvaporized, liquid particles of propellant.

It is also an object of the present invention to provide an improved, convenient apparatus for administering a medicament in which the medicament remains uncontaminated, stable, protected against spillage throughout the entire period of its use, and is never exposed to light, heat or air before it is administered.

It is another object of the invention to provide a convenient apparatus for administering a medicament by inhalation therapy which may be carried in the pocket or purse of the user and which provides a means of covering the container in which the self-propelling medicament-containining composition is stored.

It is an additional object of this invention to provide an apparatus suitable for inhalation therapy that is inexpensive to manufacture and efficient for its purpose.

The above enumerated objects, as well as other objects, together with the advantages of the invention, will be readily comprehended by persons skilled in the art upon reference to the following description, taken in conjunction with the annexed drawings, which describe and illustrate two preferred forms of apparatus in accordance with the invention.

In the drawings:

FIG. 1 is a top view of the combination of one preferred form of an applicator member and an aerosol dispenser embodying the invention;

FIG. 2 is a front view of the combination of the applicator member and an aerosol dispenser shown in FIG. 1 looking into the mouth of the applicator member and with the aerosol dispenser member partially shown in section;

FIG. 3 is an exploded view of the combination shown in FIGS. 1 and 2 with the applicator member and the aerosol dispenser separated from each other;

FIG. 4 is an enlarged section of the combination of the applicator member and an aerosol dispenser taken along the line 4—4 of FIG. 2 with the dispenser in the normal or closed position;

FIG. 5 is a view corresponding to that of FIG. 4 but with the dispenser valve in the down or open position to dispense a measured amount of aerosol;

FIG. 6 describes a construction in which the plastic insert of the applicator member shown in FIGS. 4 and 5 is locked into place;

FIG. 7 is a top view of the combination of another preferred form of an applicator member and an aerosol dispenser embodying the invention;

FIG. 8 is a front view of the combination of the applicator member and an aerosol dispenser shown in FIG. 7 looking into the mouth of the applicator member and with the aerosol dispenser member partially shown in section;

FIG. 9 is a side view of the combination of the applicator member and aerosol dispenser shown in FIGS. 7 and 8 with the applicator member and aerosol dispenser in an inverted position at the time of use;

FIG. 10 is an exploded view of the combination shown in FIGS. 7, 8 and 9 with the applicator member and the aerosol dispenser separated from each other;

FIG. 11 is an enlarged section of the combination of the applicator member and an aerosol dispenser taken along the line 11—11 of FIG. 8 with the dispenser in the normal or closed position;

FIG. 12 is a view corresponding to that of FIG. 11 but with the dispenser valve in the down or open position to dispense a measured amount of aerosol.

Referring now to the drawings, wherein like reference numerals denote corresponding parts throughout the several views, the aerosol dispensing apparatus includes an applicator member **38** or **58** and an aerosol dispensing bottle or container **10**. It is contemplated that these two components may be separated from each other as shown in FIGS. 3 and 10 and dismantled into these two basic components when packaged for transportation and sale or when carried in the pocket or purse of the user. In such case a protective cap (not shown) is desirably placed over the top of the dispensing container **10** to protect the protruding valve nozzle at the top of the container. Alternately, the barrel or delivery tube **32** or **59** may be capped over the dispensing container **10** to protect the protruding valve nozzle. In this situation a protective cap is desirably placed over the cylindrical portion or skirt **37** or **60**.

One preferred form of the dispensing container **10** has a valve housing or shell **11** mounted in the mouth of the container. Said valve shell may be made of any rigid, impervious and corrosive-resistant material, but stainless steel is very suitable. The shell **11** has an aperture **13** at the bottom **12** of the shell at one of its ends. The other end of the shell has an enlarged shoulder **11***a* leading to an enlarged mouth adapted to receive a gasket **18** of rubber or other resilient material. The housing is mounted in the metal closure or collar **19** which seals the container containing a medicament-containing, self-propelling liquid and is crimped at **35** to hold the housing rigidly in position and to provide a seal over the bead **36** of the mouth of the container. This construction serves to both mount the housing in the container and to secure the closure to the mouth of the container. Also assisting in positioning the housing and providing an airtight seal to the closed container is a large resilient or rubber disk **19***a* which surrounds the housing and which is positioned between the closure **19** and the neck of the container.

The gasket **18** is provided with a substantially cylindrical aperture through which a valve plunger **20** of cylindrical configuration projects upwardly through the gasket and the closure wall. The plunger is a unitary member formed of a solid rod provided with a hollow cylindrical portion **24** and adapted to be slidably mounted in the cylindrical aperture of the gasket **18** and pass through the top of the closure. The cylindrical aperture of the gasket is of such diameter that it frictionally engages the outer walls of the hollow cylindrical portion **24** of the valve plunger **20** and yet provides a substantially airtight seal although readily permitting the plunger to be longitudinally moved therethrough from the closed position of the plunger shown in FIGS. 4 and 11 to the discharge position shown in FIGS. 5 and 12.

The valve plunger **20** has desirably positioned below the hollow cylindrical portion **24** an enlarged portion or shoulder **17** extending outwardly from the plunger so as to engage the surface of the gasket **18** which faces inward. As shown, the shoulder is of such dimension larger than the cylindrical aperture of the gasket that when the plunger is in the closed position the gasket will be pressed between the shoulder and the top of the metal closure to produce a secondary seal. Below the shoulder the plunger is provided with a recess **21** which registers with the aperture **13** at the bottom **12** of the shell. The aperture **13** and the cylindrical aperture through the gasket **18** are in axial alignment so as to position the valve plunger in a non-tilting position and to limit the plunger to substantially longitudinal movement. This further prevents leakage between the cylindrical aperture of the gasket and the cylindrical portion of the plunger.

In order to press the valve plunger into the normally closed position, a spring **16** is positioned within the shell **11** so as to press the shoulder **17** against the gasket **18** and close the system.

The plunger **20** is further equipped with a lateral opening **23** which is in communication with the hollow cylindrical portion **24** at the upper end of the plunger. The lateral opening is so positioned (as shown in FIGS. 5 and 12 with the plunger in the open position) that when the plunger is depressed to the position where the lateral opening **23** is in communication with the interior of the valve shell **11**, fluid under pressure within the shell passes through the lateral passage into the hollow cylinder **24** of the top of the plunger and out of the dispensing container member.

Measured amounts of fluid under pressure are delivered by means of a second valve means coordinated with the first valve means provided by the lateral opening **23**. This second valve means is made up, according to one embodiment of the invention illustrated by the drawings, of a second sealing gasket **14** of rubber or other resilient material positioned in the bottom **12** of the shell **11** and held in place by a rigid washer **15** of steel or other rigid material which is in turn pressed toward the bottom of the shell by the spring **16**. The second sealing gasket **14** and the rigid washer **15** each have a communicating bore or aperture through them through which the plunger **20** passes. The recess **21** of the valve plunger is in registration wth the sealing gasket **14** when the plunger is in the closed position, as shown in FIGS. 4 and 11. In this position the fluid passes through the channel provided by the recess in the plunger to within the space defined by the shell **11**. When the valve plunger is depressed to the open position, as shown by FIGS. 5 and 12, the recess in the plunger moves downward outside the shell so that it no longer registers with the sealing gasket **14**. The cylindrical portion of the plunger which is then in registration with the gasket provides a substantially airtight seal with the gasket and prevents further flow of the fluid into the shell. At the same time the lateral opening **23** of the plunger moves below the rubber gasket **18** into communication with the inner confines of the shell **11** thus permitting the fluid within the shell to escape through the lateral opening **23** into the hollow delivery cylinder or opening **24** of the plunger and out of the dispensing container. When the valve plunger is released the spring **16** forces it to return to the closed position and the space within the valve shell is refilled with a fresh supply of fluid through recess **21** and the process repeated.

It will be apparent that the volume of fluid discharged during each depression of the plunger **20** will be dependent primarily upon the volume within the shell **11** and the gasket **18**. The measured and constant amount

of fluid is discharged each time. By determining the volume within the valve shell a desired constant quantity of medicament may be discharged by dissolving the medicament in a suitable amount of propellent fluid held under pressure.

The valve shell **11** may be fitted with a dip-tube **22**, desirably of flexible material such as nylon. The liquid within the container as shown in FIG. 2 is forced up the dip-tube, which desirably extends almost to the bottom of the container, by means of the pressure exterted on the liquid by the gaseous fluid above the liquid.

The dip-tube is not an essential part of the apparatus of the invention and it may be omitted as shown in FIG. 8, in which case the dispensing container must be inverted at the time of discharge as shown in FIG. 9 so that the liquid will be brought into contact with the bottom of the valve shell **12**. The omission of the dip-tube may be in some instances preferred since there is a possibility that vapor may become entrapped in the dip-tube during changes in position or shaking of the dispensing container while being transported or carried in the pocket or purse of the user. This may result in delivery of an irregular and reduced amount of liquid into the valve shell. In severe cases several priming movements of the valve plunger may be necessary to remove such vapor traps from the dip-tube. If the dip-tube does not reach to the bottom of the container, residual amounts of liquid may be lost since they cannot be forced into the valve shell. Thus omission of the dip-tube may reduce the waste of residual quantities of liquid in the container.

An important and essential component of the apparatus of the invention is the applicator member **38** or **58**. Described in conjunction with the several figures of the drawings are two preferred embodiments of the applicator member. One embodiment is described in conjunction with FIGS. 1–6 and the other in conjunction with FIGS. 7–12.

In accordance with one preferred embodiment of the invention shown in FIGS. 1–6 of the drawings, the applicator member **38** has a base **25** which has one cylindrical portion or skirt **37** having an inner wall **25***a* which has a diameter slightly larger than that of the closure **19** at the point of its largest diameter so that it will provide a slidable engagement between the two surfaces. Within the cylindrical portion **37** there is provided a seat **26** to engage and accommodate the extended portion of the valve plunger **20**. Adjacent to the seat is a channel **27** which communicates with the hollow portion **24** of the plunger which is in turn in communication with chamber **28** into which a plastic insert **29** suitably of nylon is frictionally fitted. A portion of the walls of chamber **28** are extended as shown at **31** to provide a seat for the plastic insert. The plastic insert is provided with an orifice **30** having an extremely small diameter of close tolerances. This is an important advantage provided by the plastic insert since it would not otherwise be practical to provide an orifice of precise diameter such as is required to produce a spray of extremely fine particle size.

If desired the plastic insert **29** may be locked in the base of the applicator member by means of a lip **39** as shown in FIG. 6.

The orifice **30** opens into a hollow cylindrical tube **32** equipped with lateral air inlet openings **33** and **34** at the top and bottom of the cylindrical tube at the end adjacent the base **25** of the applicator member. The air inlet openings permit aspiration of air into the hollow cylindrical tube. These openings are desirably at least ¼ inch in their smallest dimension to permit a sufficient volume of air to sweep into the delivery tube and flush the medicament-containing aerosol into the mouth of the user.

In order to obtain the optimum results which the above described embodiment of the apparatus of the invention is capable of providing, the applicator member **38** and its component parts are desirably produced in sizes having certain prescribed dimensions. For example, the hollow cylindrical tube **32** desirably has a length of from 2¾ to 4 inches.

The delivery tube **32** is desirably of a diameter or cross-section of from ½ to 1¼ inches. Narrower tubes may result in significant amounts of medicament depositing on the walls and unvaporized droplets of propellant reaching the mouth of the user. Wider tubes are cumbersome and may not conveniently fit into the mouth of the user.

The orifice **30** of the nylon insert **29** through which the propellant composition is introduced into the cylindrical tube is desirably of extremely fine and precise diameter between $^{13}/_{1000}$ in. and $^{18}/_{1000}$ in. At the pressures preferred for the dispensing container (in the order of about 25 to 60 pounds per square inch gauge) a smaller orifice produces aerosolization at too slow a rate. A larger orifice will produce a spray containing a large number of particles of unvaporized propellant. Also the aerosol ejected through the orifice is not directed to the center of the cylindrical delivery tube and a significant amount of medicament may be deposited on the walls of the tube. Desirably the bore of the plastic insert is of uniform diameter throughout as shown in drawing. This assists in directing the aerosol along the longitudinal axis of the delivery tube and minimizes deposition of medicament on the walls.

In accordance with another preferred embodiment of the invention described in conjunction with FIGS. 7–12 of the drawings, the applicator **58** has a base **61** which has one cylindrical portion or skirt **60** having an inner wall **62** which has a diameter substantially larger than that of the closure **19** at the point of its largest diameter so as to provide an air passage **63** to permit the aspiration of air into the hollow delivery tube **59**. The air passage **63** is desirably large enough to permit a sufficient volume of air to sweep into the delivery tube and flush the medicament-containing aerosol into the mouth of the user.

Within the cylindrical portion **70** there is provided a seat **63***a* to engage the extended portion of the valve plunger **20**. Adjacent to the seat is a channel **64** which communicates with the hollow portion **24** of the plunger which is in communication with nozzle or orifice **65** having a small diameter to produce a spray of extremely fine particle size, which orifice leads into an enlarged flared opening **66**. The orifice **65** and the flared opening **66** open into a hollow cylindrical delivery tube **59**.

In order to obtain the optimum results which this second preferred embodiment of the apparatus of the invention is capable of providing, the applicator member **58** and its component parts are desirably produced in sizes having certain dimensions. For example, the hollow cylindrical tube **59** is desirably of a length of about one inch.

The delivery tube **59** is desirably of a diameter or cross-section of from ½ to 1¼ inches. Narrower tubes may result in significant amounts of medicament depositing on the walls and unvaporized droplets of propellant reaching the mouth of the user. Wider tubes are cumbersome and may not conveniently fit into the mouth of the user.

The orifice **65** through which the propellant composition is introduced into the cylindrical tube is desirably of a diameter of about 0.02 inch. At the pressures preferred for the dispensing container (in the order of about 25 to 60 pounds per square inch gauge) employing a self-propelling aerosol suspension a smaller orifice produces aerosolization at too slow a rate. A larger orifice will produce a spray containing a large number of particles of unvaporized propellant. Also the aerosol ejected through the orifice is not directed to the center of the cylindrical delivery tube and a significant amount of medicament may be deposited on the walls of the tube.

One of the advantages of the second preferred embodiment of the invention described in conjunction with FIGS. 7–12 of the drawings is its small size which permits the convenience of storage in the purse or pocket of the user.

Another advantage is that it permits more rapid delivery of aerosol to the patient. It has a larger discharge orifice which does not require the use of a separate nylon insert having a small orifice restricted to fine tolerances.

The embodiments having the skirt **37** or **60** are preferred since the skirt has the additional function of safeguarding against tilting and bending of the valve stem **20** when attaching the applicator member to the aerosol dispenser and when depressing the applicator to operate the apparatus.

In the operation of the apparatus of the present invention for inhalation therapy, the applicator member and aerosol dispensing container member (charged with medicament-containing propellant fluid) are assembled. The lips of the user are placed closely around the open end of the hollow cylindrical delivery tube **32** or **59**. The base **25** or **61** of the applicator is depressed firmly which causes a measured dose of aerosol containing the medicament to discharge through the narrow orifice **30** or **65** into the hollow cylindrical delivery tube **32** or **59**. The user simultaneously inhales through the delivery tube, aspirating air through inlets **33** and **34** or the air passage **63** which scavenges the medicament-containing aerosol through the delivery tube into the mouth of the user. In the case of the embodiment shown in FIGS. 8 and 9, the container and applicator member are used in the inverted position since the container does not employ a dip-tube.

As has been mentioned above, the applicator member is an important component of the apparatus of the present invention. It provides a convenient base for depressing the valve plunger of the container which releases the measured constant amount of fluid. It provides the requisite space for the vaporization of the propellant. It also serves as a conduit to channel the aerosol form of the medicament directly to the mouth of the user when the open end of the hollow cylindrical tube **32** or **59** is placed in the mouth of the user. Thus substantially none of the medicament is lost into the atmosphere and the user can be sure that a constant dose of medicament has been administered which is substantially free of unliquefied propellant.

The applicator component provides another important function. As the aerosol form of the medicament leaves the hollow portion **24** of the plunger it may contain a substantial number of unvaporized, liquid particles of propellant. If these liquid particles of propellant were permitted to strike the delicate mucous membranes of the nose or mouth they might cause an unpleasant taste or other sensory response or cause irritation. The rapid evaporation of these liquid particles of propellant may also cause discomfort to the mucous membranes because of the resulting chilling.

By interposing the hollow cylinder of the applicator between the narrow orifice of the plunger and the mouth of the user, as contemplated by the present invention, any unvaporized, liquid propellant particles are given an additional space through which they must travel before reaching the user. In traveling through this space, substantially all of the propellant liquid particles are vaporized, thereby eliminating any undesirable reaction which might be caused by liquid particles of propellant reaching the delicate mucous membranes of the user.

The applicator member may be made of one of a number of synthetic resins or plastics which are reasonably rigid. For example, plastics such as polymethylmethacrylate ("Lucite"), cellulose acetate, cellulose acetate-butyrate, and polyethylene, etc., may be employed.

The container **10** may be made of different types of material, depending primarily upon the size of the container and pressure generated on the walls by the liquefied propellant. Desirably colored or actinic-light excluding glass or materials may be used to protect light-sensitive medicaments. It is preferred that the material be transparent so as to be able to observe when the contents are nearly exhausted. For smaller sizes of containers, glass of suitable wall thickness may be employed with the outer wall coated with a resinous or plastic film which prevents shattering of the glass if the container is dropped. For larger sizes metal containers, such as those of steel, are most suitable.

While various medicament-containing, self-propelling compositions may be employed with the aerosol dispensing and administering apparatus of this invention, best results are obtained by employing a composition in which the medicament is dissolved in a non-toxic, liquefied fluorinated or fluorochlorinated lower alkane containing not more than 2 carbon atoms and which possesses a boiling point of less than 75° F. at 760 mm. pressure and a vapor pressure of between about 25 and 65 pounds per square inch gauge at 70° F., and preferably about 30 and 40 pounds per square inch gauge. These liquid propellants are well known and are sold under the trademark "Freon."

The medicament may be dissolved in the liquefied propellant by means of a co-solvent which is chemically inert to the medicament and which has the property of being a solvent for the medicament and which is itself soluble in the liquefied propellant. These medicament-containing, internally-contained propellant or self-propelling compositions are discussed more fully in our copending application, Serial No. 572,788 filed March 21, 1956, now Patent No. 2,868,691. Another type of self-propelling composition is the suspension type disclosed in the application of Charles G. Thiel, et al., Serial No. 637,353, filed January 31, 1957 and now abandoned. The suspension type compositions are particularly suitable for use with the preferred embodiment of the invention described in FIGS. 7–12 of the drawings. It is expressly intended to incorporate into this application by reference the disclosures of these applications in their entirety.

It will be obvious to those skilled in the art that the aerosol dispensing apparatus of this invention which has been described above may be subject to many modifications. For example, the hollow cylindrical delivery tube **32** or **59** of the adapter member may be curved or it may be made up of one or more sections which may be separated. A curved tube is not preferred inasmuch as the medicament-containing aerosol which is discharged from the orifice **30** or **65** will be more likely to impinge upon the walls of the tube and deposit significant portions of the medicament. Also the two air inlet openings **33** and **34** may be replaced by a number of smaller perforations in the walls of the hollow cylindrical tube **32** adjacent the orifice **30**.

In the case of medicaments which have a wide latitude of posology, the applicator member may be employed with a dispensing container having a control valve member which does not provide for the discharge of metered amounts of medicament.

The terms and expressions employed are used as terms of description and not of limitation, and it is not intended, in the use of such terms and expressions, to exclude any equivalents of the features shown and described or portions thereof, but it is recognized that various modifications are possible within the scope of the invention claimed.

What is claimed is:

1. A device suitable for use in combination with an aerosol dispensing container equipped with a metering valve means and charged with a medicament-containing, self-propelling liquid composition, which comprises in combination an aerosol dispensing container charged with a medicament-containing, self-propelling liquid composition and equipped with metering valve, and a means for actuating said metering valve means and a delivery tube member so shaped and so proportioned as to conform to

an oral cavity of the user and capable of administering into a body cavity a measured dose of medicament in aerosol form substantially free of droplets of unvaporized, liquid propellant to accomplish inhalation therapy, said actuating means being equipped with air inlet means between it and said dispensing container permitting scavenging of the medicament-containing aerosol from the tube into the body cavity of the user, said delivery tube member being of substantially straight longitudinal axis and of sufficient length to deliver a dose of medicament substantially free of unvaporized liquid propellant while preventing substantial loss of medicament-containing aerosol, said device being small enough to transport in the pocket of the user, said container and said actuating means being usable in detachable engagement with each other.

2. A dispensing and administering apparatus suitable for use with a medicament-containing, self-propelling liquid composition for inhalation therapy, comprising in combination an aerosol dispensing container equipped with a control valve means and charged with a medicament-containing, self-propelling liquid composition, said valve means having an operating member having a discharge opening, and an applicator means comprising an actuating means and a delivery tube member, said actuating means being capable of actuating said operating member and having a seat which engages said operating member, said seat having a channel communicating with said discharge opening and said delivery tube member and terminating at the end adjacent said delivery tube member through a narrow orifice, said delivery tube member extending forwardly from said actuating means and providing an unobstructed passage for the aerosol which forms upon discharge of the medicament-containing, self-propelling liquid composition through said discharge means and said channel, said delivery tube means having a substantially straight longitudinal axis, said applicator means having air inlet means proximate to said actuating means, said delivery tube member being capable of administering into a body cavity a dose of medicament in aerosol form to accomplish inhalation therapy without substantial loss of medicament-containing aerosol to the surrounding atmosphere.

3. A dispensing and administering apparatus suitable for use with a medicament-containing, self-propelling liquid composition for inhalation therapy, comprising in combination an aerosol dispensing container equipped with a control valve means and charged with a medicament-containing, self-propelling liquid composition, said valve means having an operating member having a discharge opening, and an applicator means comprising an actuating means and a delivery tube member, said actuating means being capable of actuating said operating member and having a seat which engages said operating member, said seat having a channel communicating with said discharge opening and said delivery tube member and terminating at the end adjacent said delivery tube member through a narrow orifice, said delivery tube member extending forwardly from said actuating means and providing an unobstructed passage for the aerosol which forms upon discharge of the medicament-containing, self-propelling liquid composition through said discharge means and said channel, said delivery tube means having a substantially straight longitudinal axis, said applicator means having air inlet means proximate to said actuating means, said delivery tube member being capable of administering into a body cavity a dose of medicament in aerosol form to accomplish inhalation therapy without substantial loss of medicament-containing aerosol to the surrounding atmosphere; said apparatus being small enough to transport in the pocket of the user; and said aerosol dispensing container and said applicator means being usable in detachable slidable engagement with each other.

4. A dispensing and administering apparatus suitable for use with a medicament-containing, self-propelling liquid composition for inhalation therapy, comprising in combination an aerosol dispensing container equipped with a control valve means and charged with a medicament-containing, self-propelling liquid composition, said valve means having an operating member having a discharge opening, and an applicator means comprising an actuating means and a delivery tube member, said actuating means being capable of actuating said operating member and having a seat which engages said operating member, said seat having a channel communicating with said discharge opening and said delivery tube member and terminating at the end adjacent said delivery tube member through a narrow orifice, said narrow orifice opening into said delivery tube member at the end of said delivery tube adjacent said actuating means, said delivery tube member extending forwardly from said actuating means and providing an unobstructed passage for the aerosol which forms upon discharge of the medicament-containing, self-propelling liquid composition through said discharge means and said channel, said delivery tube means having a substantially straight longitudinal axis, said applicator means having air inlet means proximate to said actuating means, said delivery tube member being capable of administering into a body cavity a dose of medicament in aerosol form to accomplish inhalation therapy without substantial loss of medicament-containing aerosol to the surrounding atmosphere; said apparatus being small enough to transport in the pocket of the user; said aerosol dispensing container and said applicator means being usable in detachable slidable engagement with each other; and said actuating means actuating said operating member of said control valve by a reciprocating action.

5. A dispensing and administering apparatus suitable for use with a medicament-containing, self-propelling liquid composition for inhalation therapy, comprising in combination a container provided with a metering valve means and charged with a medicament-containing, self-propelling liquid composition, and an applicator means so shaped and so proportioned as to conform to an oral cavity of a user and comprising means capable of actuating said metering valve means and slidably engaging with said container, a delivery tube means capable of administering a measured dose of medicament in aerosol form into a body cavity of the user, and an orifice communicating into said delivery tube means having an extremely fine diameter capable of producing a medicament-containing aerosol when a medicament-containing, self-propellent liquid is passed through said orifice under pressure, said delivery tube means having air inlet means at the end adjacent to the valve actuating means and being of substantially straight longitudinal axis and of sufficient length and diameter to deliver a dose of medicament substantially free of unvaporized, liquid propellent while preventing substantial loss of medicament-containing aerosol into the surrounding atmosphere, said apparatus being small enough to transport in the pocket of the user, said container and said applicator being usable in detachable engagement with each other.

6. A dispensing and administering apparatus suitable for use with a medicament-containing, self-propelling liquid composition for inhalation therapy, comprising in combination a container provided with a metering valve means and charged with a medicament-containing, self-propelling liquid composition, and an applicator means so shaped and so proportioned as to conform to an oral cavity of a user and comprising means capable of actuating said metering valve means and slidably engaging with said container, a delivery tube means capable of actuating said metering valve and administering a measured dose of medicament in aerosol form into a body cavity of the user, and an orifice in communication with said metering valve means and passing into said delivery tube

means having an extremely fine diameter capable of producing a medicament-containing aerosol when a medicament-containing, self-propellent liquid is passed through said orifice under pressure, said delivery tube means having air inlet means at the end adjacent to the valve actuating means and being of substantially straight longitudinal axis and of sufficient length and diameter to deliver a dose of medicament substantially free of unvaporized, liquid propellent while preventing substantial loss of medicament-containing aerosol into the surrounding atmosphere, said apparatus being small enough to transport in the pocket of the user, said container and said applicator being usable in detachable engagement with each other.

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UNITED STATES PATENT OFFICE

CERTIFICATION OF CORRECTION

Patent No. 3,001,524 September 26, 1961

George Louis Maison et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 2, line 3, for "medicant" read -- medicament --; column 5, line 10, for "exterted" read -- exerted --; column 7, lines 42 and 43, for "unliquefied" read -- unvaporized --.

Signed and sealed this 3rd day of April 1962.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents