

May 26, 1964

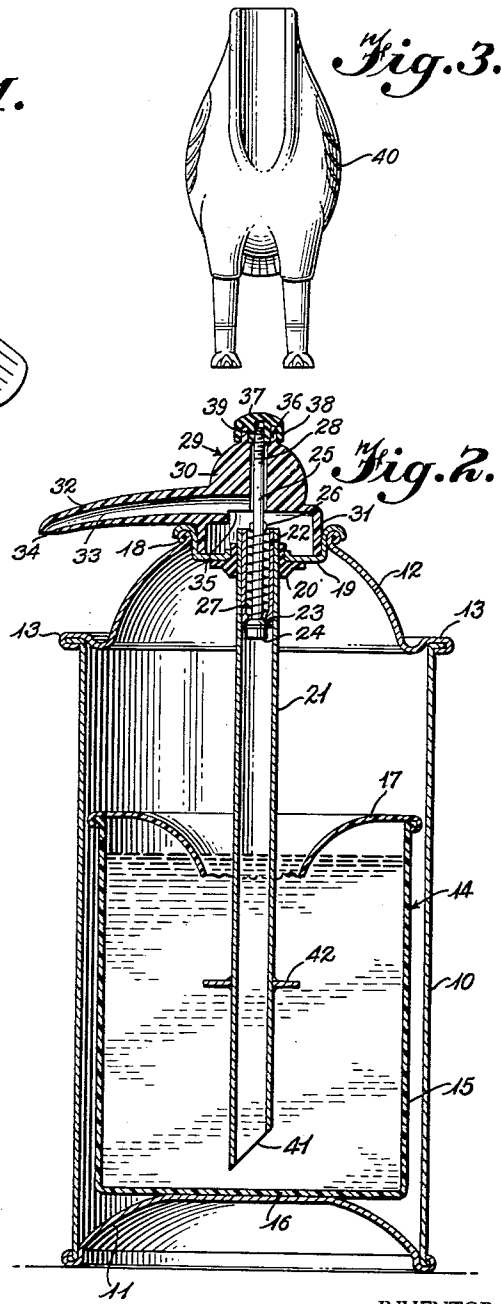
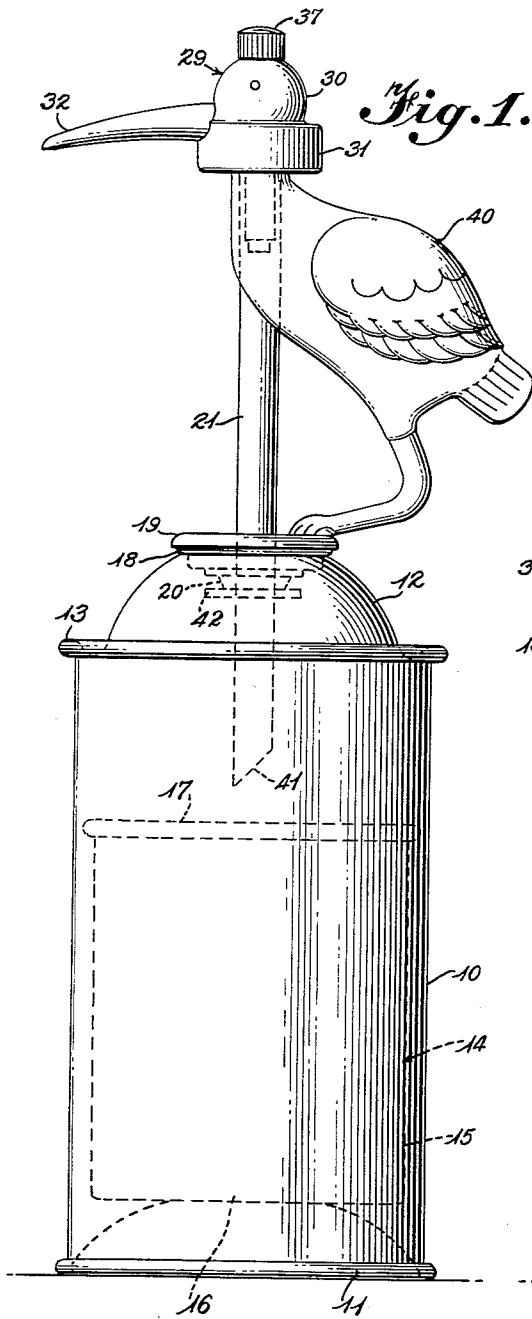
J. P. MODDERNO

3,134,505

PRESSURIZED DISPENSING DEVICE

Filed April 28, 1960

3 Sheets-Sheet 1



INVENTOR

*John Paul Modderno*

BY *Stevens, Davis, Miller and Mosher*  
ATTORNEYS

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Fig. 4.

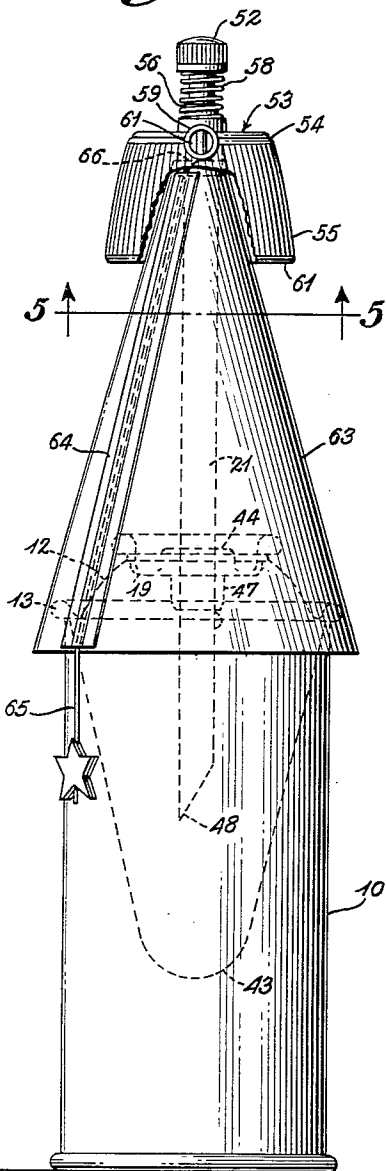


Fig. 5.

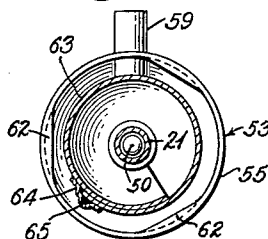


Fig. 6.

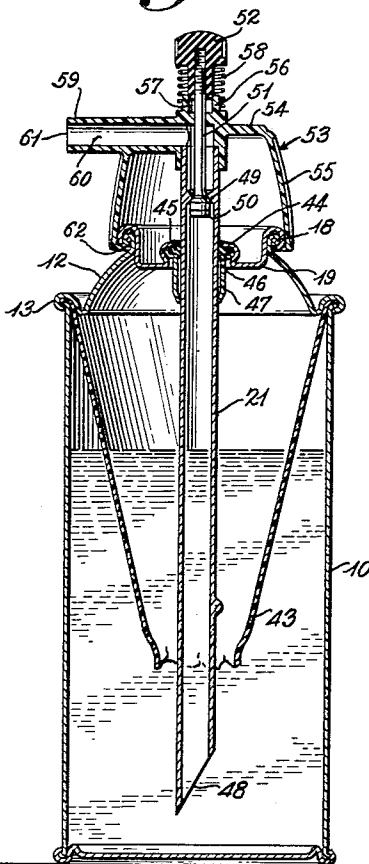


Fig. 6<sup>a</sup>.

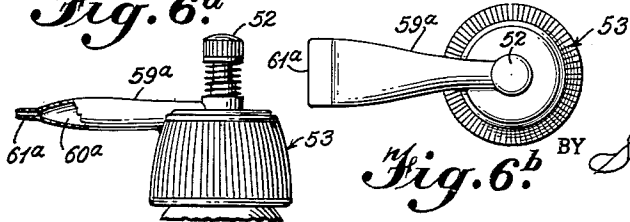


Fig. 6<sup>b</sup>.

BY Stevens, Davis, Miller and Mosher

INVENTOR

John Paul Modderno

ATTORNEYS

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Fig. 7.

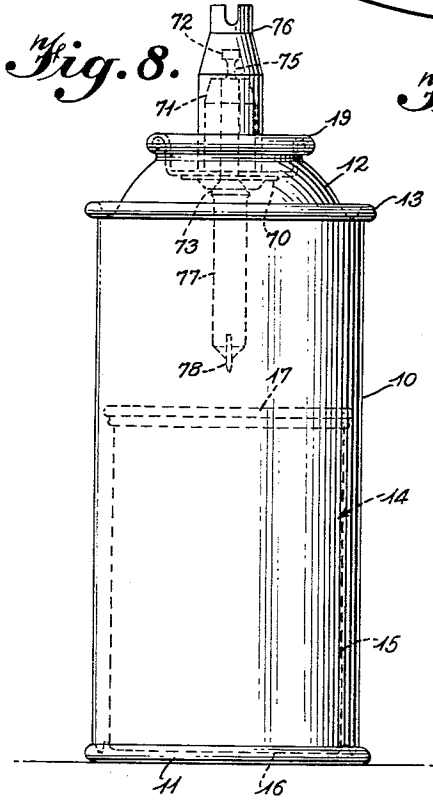
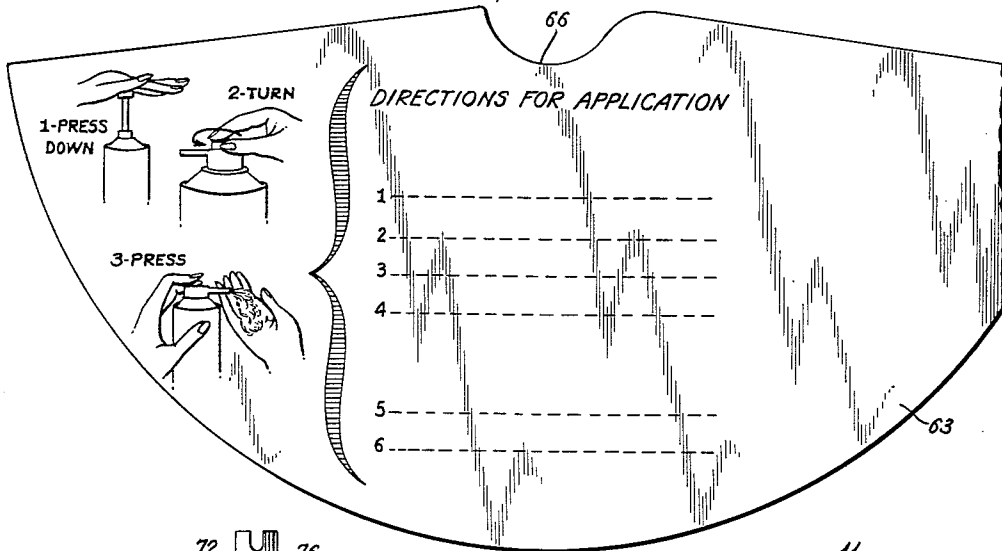
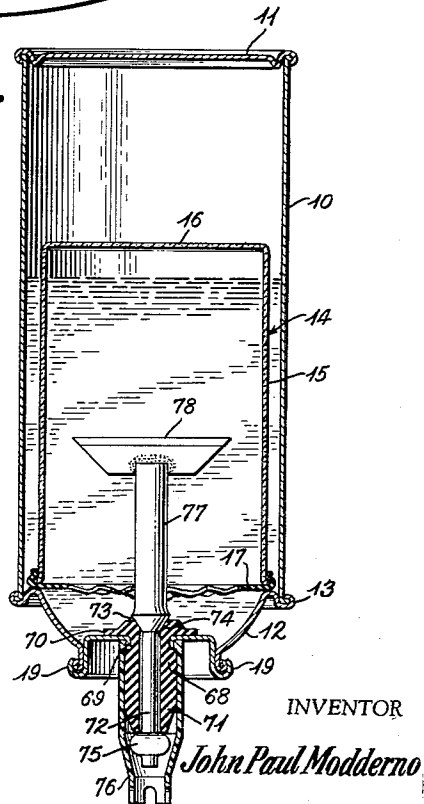


Fig. 9.



INVENTOR

John Paul Modderno

BY *Stevens, Davis, Miller & Mosher*  
ATTORNEYS

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3,134,505

**PRESSURIZED DISPENSING DEVICE**

John Paul Modderno, Gambrills, Md., assignor to Modern-Lab., Incorporated, Baltimore, Md., a corporation of Maryland

Filed Apr. 28, 1960, Ser. No. 25,347

7 Claims. (Cl. 222-82)

The present invention relates to a compartmental pressurized dispensing device for keeping two or more materials separated from each other until time of use. More particularly, this invention relates to a pressurized container for dispensing a plastic mass by displacing a divisional partition separating the container into compartments so that the ingredients from the compartments are thoroughly mixed and capable of being dispelled under pressure of gas forming a part of the contents of the container. This application is a continuation-in-part of my applications Serial No. 581,905, filed May 1, 1956, now abandoned, and Serial No. 614,014, filed October 4, 1956.

It will be appreciated that there are various compositions which cannot be marketed in premixed form. Such compositions may be composed of a solid granular portion and a liquid portion, two liquid portions, a gaseous and a liquid portion, or a gaseous and a solid granular portion, which cannot be mixed together prior to the time of actual use. These materials require a special type of package or dispensing device in order to maintain the portions distinct in storage condition during shipment and in storage prior to sale.

The present invention is directed broadly to dispensing all types of compositions of the above-mentioned character and has found specific utility with respect to coagulable compositions which form in situ on the human body a covering, mask, or the like, disclosed in co-pending application Serial No. 526,076, filed August 2, 1955, now abandoned, and to dispensable dental compositions and other body treating compositions disclosed in co-pending application Serial No. 611,386, filed September 21, 1956, now abandoned. The particular facial treating composition or the like is composed of a powdered portion and a liquid emulsion portion which cannot by the nature of their ingredients be brought together until use is desired. It is essential in the commercialization of a product of this nature to hold a portion of the composition in a state of inactivity for indefinite periods of time in order to account for shipping and storage periods and yet provide an effective product when needed.

The dispensing container of this invention meets this need and allows for instant use of the material when desired by providing a combination of partitioning means and a means to displace, such as by rupturing and the like, the partition, such as a film, diaphragm or extensible bag, so that the ingredients forming the desired composition can be utilized for home consumption in a manner heretofore unknown in the art.

Although pressurized containers, such as fire extinguishers, aerosol devices, and the like are known in the prior art, all of which serve varied functions, there is not known in the prior art a pressurized container which is uniquely adapted as a package for compositions such as described above, which allows for compartmentalizing ingredients to be brought together when desired for immediate use.

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It is an object of the present invention to provide a compartmentalized pressurized dispensing device suited for packaging compositions capable of setting or coagulating on the human body or dental impression compositions, the ingredients of which must be kept separate until use, and to provide a device for dispensing the compositions under pressure of a gas to produce a plastic coagulable mass.

It is a further object of the present invention to provide a novel compartmental pressurized dispensing device having a slidable mechanism which serves to break the dividing wall between ingredients to be mixed so that they may come together to form a composition which can be dispensed from the container.

A still further object of the invention is to provide a slidable discharge head and tube which, upon insertion through a seal on the top of the container and depressed, enters into locking engagement with the top portion of a compartmental container device so as to provide a dispensing unit capable of dispensing therefrom under pressure a material of plastic consistency when the tube has ruptured the partition forming the compartments.

Still another object of the invention is to compartmentalize a container with a rupturable diaphragm which forms a part of the seal around the clinched end of the container.

A further object is to provide a compartmentalized pressure dispensing container having a discharge nozzle capable of applying a ribbon of dischargeable product.

Another object is to provide a dual compartment within a pressurized container so that one of the compartments can be displaced by manipulation of the can without the loss of pressure to produce therein a pressurized dispensable material.

Additional objects of the present invention will become apparent from an examination of the drawings, specification, and claims.

The invention will be described further in connection with the accompanying drawings, which are to be considered an exemplification of the invention and do not constitute limitations thereof.

In the drawings:

FIGURE 1 is a view in side elevation of the pressurized packaging device of the present invention;

FIGURE 2 is a view in section of the device shown in FIGURE 1 with the slidable discharge and rupturing unit in a depressed position readied for operation;

FIGURE 3 is a view in elevation of a detail for retaining the discharge and rupturing unit in position until it is ready to be depressed;

FIGURE 4 is a view in side elevation of the pressurized packaging device with a conical retaining unit to hold the discharge and rupturing unit;

FIGURE 5 is a view taken along the line 5-5 of FIGURE 4 showing the under side details of the cap on the unit;

FIGURE 6 is a side view in section of the device shown in FIGURE 4 with the slidable discharge and rupturing tube in a depressed position ready for dispensing;

FIGURE 6a is a side elevation view of a modified form of a nozzle for applying the dispensed product directly to the body;

FIGURE 6b is a plan view of the modified nozzle shown in FIGURE 6a;

FIGURE 7 is a plan view of the conical retaining unit;

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FIGURE 8 is a view in side elevation of a modification of the pressurized packaging unit shown utilizing a dual container system with a dispensing puncturing element; and

FIGURE 9 is a view in section of the pressurized dispenser shown in FIGURE 8 in operative condition with the compartmentalizing diaphragm ruptured.

Referring now to the drawings, FIGURES 1 to 7 illustrate a preferred form of the pressurized dispensing device of the present invention. The device consists of an open top main container 10 having a bottom portion 11 and a cup-shaped cover 12 fitted onto the open top of container 10 and clinched by rolling a flange 13 to provide an hermetic seal between the cover 12 and the container 10. Disposed within the container 10 and resting upon its bottom 11 is a compartment 14 having side 15 and a bottom 16. The top of the compartment 14 is closed by means of partition 17, such as the flexible diaphragm shown in FIGURE 1. This flexible diaphragm can be made of a thin sheet of a suitable rubber compound, synthetic material, or any material capable of separating the contents of compartment 14 from the remainder of the container and which lends itself to displacement such as rupturing. In this regard, it would be possible to utilize in place of flexible diaphragm 17 some other sheet material provided it would be capable of being punctured and, prior to puncturing, provide a suitable closure.

The top of the cover 12 defines a central aperture with the portion of the cover 12 forming the boundary of the aperture being in the form of a rolled flange or bead 18. Seated into the aperture is an annular insert 19 having a flange which embraces the bead 18 and is clinched or rolled thereto to form an hermetic seal. An annular gasket member 20 is fitted into the insert 19. It will be noted that the insert 19 is characterized by a recess whereby the insert 19 partially projects into the interior space defined by the cover 12. Slidably received in the gasket 20 is a displacing tube 21, the lower end of which is shown with a sharp edge. The tube 21 in its normal position of repose extends from a point spaced slightly above the diaphragm 17 within the container 10 through the gasket 20 and terminates at a point spaced substantially above the cover 12 of the container. Received in the top of the tube 21 is a valve unit comprised of a sleeve 22 which defines at its lower end a valve seat 23 and a valve 24 having a valve stem 25 attached thereto and projecting through the sleeve 22 and out of the end of the tube 21. The valve stem 25 is crimped to form lugs 26, and a spring 27 is anchored to the valve stem 25 at one end adjacent to the lugs 26 with its other end resting against the top of the valve seat 23. The spring 27 is of the compression type and for this reason holds the valve 24 tightly against the valve seat 23.

The top portion of the valve stem 25 is threaded as indicated at 28. Received onto the valve stem 25 is a dispensing member 29 composed essentially of a central rounded portion 30 which merges with an annular depending skirt portion 31 having an outside diameter substantially equal to the inside diameter of the insert 19. Integral with the rounded portion 30 and the depending skirt portion 31 is an elongated spout or nozzle portion 32 defining a central bore 33. The free end of the spout portion 32 defines a discharge orifice or opening in its outer wall as indicated by the numeral 34 which is in communication with the central bore 33. Likewise, the rounded portion 30 in cooperation with the spout portion 32 within the depending flange portion 31 defines an opening 35 which is in communication with the central bore 33 and the interior space defined by the depending flange portion 31. The top of the rounded portion 30 defines an upstanding annular flange 36. The valve stem 25 extends through a bore defined in the rounded portion 30 and projects from the rounded portion of a point centrally within the upstanding flange 36. A top cap

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37 having an inner skirt 38, which is internally threaded, is received on the end of the valve stem 25. The top cap 37 additionally has an outer depending skirt 39 which cooperates with the inner skirt 38 to define an annular recess. When the top cap 37 is received on the valve stem 25, the upstanding flange 36 is received in the annular recess. The arrangement is such that with the cap 37 screwed down tightly onto the valve stem 25, the upstanding flange 36 will abut against the under surface of the cap 37 at a point between the two skirts 38 and 39. Thus, in this condition, it will not be possible for the valve 24 to be unseated. The outer depending skirt 39 of the cap 37 additionally contacts the surface of the rounded portion 30 and this serves as a further precautionary measure to keep the valve 24 from becoming unseated.

In order to prevent the tube 21 from puncturing the flexible diaphragm 17, there is provided between the depending skirt portion 31 and the insert 19 a retaining unit identified generally by the numeral 40, which can be made in the form of a fanciful figure. This retaining unit locks the tube 21 in position and prevents its accidental depression until rupture of the diaphragm 17 is desired. Rupture of the diaphragm is accomplished by depressing the tube so that the pointed end 41 thereof pierces the diaphragm 17. Positioned on the slidable tube 21 near the end 41 is an annular flange 42 surrounding the outer periphery of the tube and attached thereto so as to provide a means to prevent the tube from being forced out of the container when the container is pressurized.

An alternate embodiment of this invention is shown in FIGURES 4 to 7, inclusive. In this embodiment, a container 10 is provided with a downwardly depending sac 43 made of a pliant film so arranged that the upper sides thereof fit over the edge of the top rim of the container 10 so that the crimping of the cup-shaped cover 12 divides the container into two separate compartments sealed from each other by the pliant film (see FIG. 6). The top of the cover 12 defines a central aperture with the portion of the cover forming the boundary of an aperture being in the form of a rolled flange or bead 18. Seated into the aperture is an annular insert 19 having a rolled flange which embraces the bead 18 to form an hermetic seal at this point.

The annular insert 19 is so formed as to provide an inner circular flange 44 adapted to receive and retain an annular gasket 45 and a downward annular retaining member 46 which retains the gasket 45 against the flange 44 and has a downwardly extending annular guide 47.

Slidably disposed in the annular opening of gasket 45 and the downwardly extending annular guide 47 is a slidable tube 21. The lower end of the tube within the container is cut on a bias to provide a sharp piercing end 48. The sloping end 48 resides above the bottom of the pliable film sac 43 when the tube 21 is in its outermost position. Received in the top of the tube 21 is a valve unit comprising a valve seat 49 against which a valve 50 rests. The upper part of the valve is provided with a valve stem 51 which extends upwardly with its end threadedly engaging a top cap 52. Received onto the valve stem 51 is a dispensing member 53 composed essentially of a central rounded portion 54 and a depending skirt 55. On top of the dispensing member 53 and centrally located thereto is an annular boss 56 defining an opening 57 through which the valve stem 51 extends. Interposed between the boss 56 and the under side of the top cap 52 is a compressible spring 58 which serves to urge the valve 50 against the valve seat 49. By screwing the top cap so that it moves downwardly with respect to the container, the spring 58 is compressed thereby forming a closed seating of the valve to maintain the propellant gas under pressure in the can.

Integral with the central rounded portion 54 and the dependent skirt portion 55 is an elongated spout or nozzle

portion 59 defining a central bore 60. The free end of the spout portion 59 defines a discharge orifice or opening in its outer wall as indicated by 61. The inner end of the central bore 60 communicates with the top of the tube 21 above the valve seat so that a passageway is provided, when the valve is unseated, from the container through the tube and out through the bore 60.

The elongated spout or nozzle arrangement as shown in FIGURE 6 can be modified to present an elongated orifice lying transverse to the discharge bore so as to dispense a ribbon of the composition directly onto the body. FIGURES 6a and 6b illustrate a spout portion 59a defining a central bore 60a with a free end of the spout terminating in an elongated pinch discharge orifice or opening 61a. It is apparent that the spout nozzle described above is integral with the discharge arrangement 53 or may be adapted to fit over the spout portion 59 as shown in FIGURE 6 to form the nozzle. Also, the discharge orifice or opening 61a may be arranged at various angles so as to present the proper angle for application of the composition to the face when the container is held by the person applying the composition.

The bottom edge of the dependent skirt has an inwardly directed flange 62 which, when the slidable tube is depressed, snaps into locking engagement with the rolled portion of the annular insert 19 to retain the slidable tube in a locked and depressed position. A lug is positioned on the outer periphery of the tube 21 near the sharp end 48 and serves to prevent the tube from coming out of the opening in the annular insert.

Around the rolled flange edge 13 of the container and extending upwardly therefrom is a conical shaped supporting member 63 held in its conical shape by a sealing tape 64 having thereunder a tear cord 65 to facilitate cutting of the seal when the conical member is removed. The upper end of the conical member 63 extends into the annular recess defined by the dependent skirt 55 and rests against the under portion of the central rounded portion 54 to prevent the dispensing member from being depressed until use of the material is desired (see FIG. 4). The conical member 63, when assembled with the dispensing member in its upper position, forms the completed package comprising a compartmental container having a piercing tube arrangement for rupturing the bottom of the pliable film sac 43.

The conical support member when unwrapped from the container is a segment of a circle providing directions for application of the ingredients in the container as well as presenting pictorial instructions for operation of the slidable dispensing tube to effect operability of the package dispenser (see FIG. 7). The conical support member has a circular notch 66 centrally located with respect to the flat sides of the circular segment so that, when rolled in conical shape, it provides a resting surface for fitting into the annular recess defined by the downwardly depending skirt 55 to provide support for the dispensing member 53.

It is extremely important to the operation of this package to prevent the tube 21 from being depressed prematurely into container 10. If the tube is depressed into the container before use is desired, the sharp end of tube 21 will rupture the diaphragm and thereby produce a premature mixing of the contents of the can, which renders the material useless for all intents and purposes. In place of the conical support member, a fanciful winged figure, as shown in FIGURE 1, may be employed to maintain the slidable tube in storage position, and it is apparent from the drawings that the fanciful winged figure presents a design which lends attractiveness to the package and enhances its appearance. Also, when removed therefrom, this type of ornamentation may be used for decorative purposes.

In operation, the dispensing device as illustrated in FIGURES 4 through 6 is first charged with the desired liquid ingredient. A film, such as nylon or the like, in the form of a depending sac is then placed in the container

with the bottom of the sac positioned above the liquid. The upper wall of the sac is formed over the top edge of container 10 so as to provide two compartments within the container. Ingredients in the form of powder are then placed in the sac in the proper proportion to that required to be mixed with the liquid to form a dispensable product. The cup-shaped cover is then placed over the top edge of the container covering the upper wall of the sac. The cover is rolled in place by a clinching operation to provide an hermetic seal with the upper wall of the sac sealed between the container and the cover. This clinching operation provides for a dual compartmental arrangement within the dispensing container. The annular insert containing the slidable discharge tube is then assembled and rolled in place to provide an assembled container, or it may be assembled to the cup-shaped cover prior to its assembly to the container. The top cap 52 is then adjusted so that inert gas can be charged to the container through the orifice 61. After the container has been charged with inert gas and is under about 50 p.s.i. pressure, the top cap is screwed downwardly to seat the valve so that the gas cannot escape. The conical support member is then assembled and the package is ready for storage or shipment.

In like manner, the dispensing device illustrated in FIGURES 1 and 2 is assembled by first filling compartment 14 with a liquid portion and placing a diaphragm over the top thereof to maintain a completely separate compartment. The compartment containing the liquid is introduced into the main container 10. Thus, a container 14 holding the liquid portion with the diaphragm 17 in place forms a sub-assembly which can be previously prepared and introduced into the container 10. Thereafter, the powder portion or other liquid portion is introduced into the container 10 on top of the diaphragm 17 and the cover 12, annular insert 19, and slidable tube 21 are assembled together with the container 10. After assembly, pressure is built up in the container 10 by introducing a suitable inert gas under pressure into the container 10 via the valve unit and tube 21 until the pressure in the container has reached about 50 p.s.i. Next, the dispensing member is placed on the valve stem 21 and the cap 37 put in place. As a final step, the fanciful winged figure or another type of retaining unit 40 is added to serve as a spacer to prevent premature depression of the tube 21.

When it is desired to use the containers assembled as described above, the retaining unit 41 is removed and the tube 21 is at this time depressed into the container 10. This action causes the sharp edge at the end of tube 21 to rupture the flexible diaphragm 17 or the bottom of the sac 43 to enable mixing of the portions heretofore kept separate. With the tube 21 depressed, the depending skirt portion 31 cooperates with the recessed insert 19 to make the necessary seal, or, in the case of the embodiment using a sac to form the compartments, the depending skirt flange 61 engages bead 18 to make a seal at this point.

Dispensing of the composition is achieved by loosening the top cap one or two turns and, thereafter, depressing the cap to cause the valve to become unseated. The pressure of the gas introduced into the container exerts a force upon the top surface of the now mixed composition forcing the mixed ingredients through the tube, past the valve, and through the central bore and out of the discharge opening 35 ready for application.

In FIGURES 8 and 9, there is illustrated an alternate embodiment of the present invention. The container 10 and the compartment 14, having a flexible diaphragm cover, are essentially the same units as illustrated in FIGURES 1 and 2 and hereinbefore described. The cup-shaped top and annular insert are also the same. This embodiment differs only in that the annular insert is provided with an annular rubber gasket 68 which serves as an encasement for the valve mechanism. The gasket 68 has an annular recess 69 around its outer periphery into

which fits an annular upward extension of insert 19. The bottom portion of the annular gasket is provided with an outwardly flaring flange 70 which rests against the bottom of the annular insert. Extending upwardly, the gasket is provided with a tube-shaped member 71 which encases a valve stem 72. The valve stem is provided with a valve 73 which seats against a rubber valve seat 74 located in the lower part of the annular gasket. The top of the valve stem has a pinched section 75 which holds the gasket encasement as an assembly around the valve stem and provides the pressure for sealing the valve. Encasing the outer periphery of the extension of the gasket is a plastic sleeve 76 for guiding the dispensed product from within the can. Lateral movement of the plastic sleeve causes the extension on the annular gasket to deform, thereby providing a distorted passage-way and an unseating of the valve from which the material in the container is expelled by the pressure therein when the diaphragm is ruptured. Extending downwardly from the valve proper is a rod 77 which has at its lower extremity a piercing blade 78 located directly over the diaphragm 17.

In operation, the container is assembled with suitable ingredients as discussed hereinbefore in relation to the assembly of the embodiment of FIGURE 1. After the container is charged with the two materials, each in its separate compartment, and the container pressurized with an inert gas, it is necessary only to cause the inner compartment to be forced against the sharp edge of the cutting blade to rupture the diaphragm. Rupturing of the diaphragm permits the two portions of ingredients to come together and mix. The product is then in condition to be expelled from the container and slight tilting of the extension on the annular gasket causes deforming of the rubber surrounding the valve stem and the valve unseats, emitting the dispensed product.

The dispensing nozzle as shown in FIGURES 1 and 2 and in FIGURES 4, 5 and 6 can be flared at its outer end so as to provide an elongated orifice which will allow the material to be ejected in ribbon form and be applied directly onto the face or body as shown in FIGURES 6a and 6b. This type of aperture permits direct spreading of the product from the pressurized container and, consequently, saves time and energy, especially in cases where the material is coagulable for use as a mask or covering. The flared orifice may also be directed at an angle so that the container may be conveniently held in the hand at the proper angle to effect application.

The diaphragm or film used to form separate compartments in the container may be a "Mylar" film, which is a trade name for a highly durable transparent, water repellent film of polyethylene terephthalate resin characterized by outstanding strength and chemical inertness. Many other materials may be used, e.g., polyethylene, nylon, rubber, cellophane, and the like. The film can be impervious to gas or be of the membrane type, depending on the use to which it is put. The thickness of the material will depend, of course, upon the condition under which the pressurized container is to operate, and the type of film will in like manner depend on the nature of the ingredients and to some extent on the product to be dispensed from the container.

When a product having a heavy creamy consistency is desired, it has been found that argon gas provides an excellent propellant and dispensing agent for the device of this invention. It has been found that argon provides an aerosol propellant which will dispense a product with the minimum of foaming. Control of foaming is important where the composition desired must have a creamy consistency with a minimum amount of bubbles therein, such as molding of dental impressions. An excessive amount of bubbles would produce undesirable porosity, which would not allow the mold to present a continuous film surface having all the detailed impressions of the oral cavity that are necessary for making a usable denture.

It has also been found that the degree of solubility can be controlled by providing a propellant gas which will give the desired results by mixing an insoluble gas, such as argon, with a more soluble gas, such as nitrous oxide. Mixtures of gases prepared in this manner can be used to give the desired results depending upon the amount of foaming that is acceptable and the nature of the ingredients forming the dispensed product.

It has also been found that pressures between 30 and 50 p.s.i. give very good results, but other pressures can be used. When using high pressures, the thickness and bursting strength of the container must be taken into consideration. It has also been found that the range of pressure is somewhat dependent upon the physical conditions of the material to be dispensed and whether it is to be dispensed as an aerosol or a plastic mass.

It is to be understood that the container can be compartmentalized into a plurality of compartments having a series of partitions forming the boundaries therebetween and that this concept comes within the scope and breadth of this invention.

Also, where films are used as the partitions, the rupturing means may be any sharp or piercing device which ruptures the film, such as a plunger associated with the side of the can, or the like.

It will be appreciated that the upper compartment may contain materials such as liquids, solids, foams or the like, and that the partition when placed under pressure by gas in the lower compartment will compact and hold the product until the partition has been dislodged, whereby homogeneous mixing of the material and the gas will be effected to form the dispensable product.

Although the present invention has been shown and described in terms of preferred embodiments, nevertheless various changes and modifications such as are obvious to one skilled in the art are deemed to be within the purview of the invention.

What is claimed is:

1. A pressurized dispensing device comprising a pressure container; sealed compartments in said container for holding product forming ingredients separate from each other until use is desired, said compartments separated by an openable partition; a slidable tube means for conducting product from the container slidably mounted in a wall of said container, the top end of the tube extending above said container and the bottom end positioned above said partition; and valve means for effecting the discharge of product from the container to the atmosphere, operably connected to said tube means, whereby depression of the slidably mounted tube means causes the bottom end to open said partition and be positioned adjacent to the bottom of said container while effecting mixing of the ingredients from each compartment to form the dispensable product before its discharge through said tube means to the atmosphere.

2. The pressurized dispensing device of claim 1 in which said tube means has means associated therewith for holding the tube in a fixed position until depression thereof is desired.

3. The pressurized dispensing device of claim 1 in which means is provided to hold said tube means in a depressed position.

4. The pressurized dispensing device of claim 1 in which a means is associated with said tube means to prevent said tube from being accidentally depressed in said container.

5. The pressurized dispensing device of claim 1 in which the discharge means has an elongated orifice for spreading a ribbon of dispensed product from said container.

6. The pressurized dispensing device of claim 5 in which said elongated orifice is positioned at an angle to facilitate application of said product dispensed from said container.

7. A pressurized dispensing device as claimed in claim

1 in which said slidable tube means has a sharp element on the bottom end thereof.

## References Cited in the file of this patent

## UNITED STATES PATENTS

D. 136,098	Hartman	Aug. 3, 1943	2,659,370
695,323	Mittinger	Mar. 11, 1902	2,721,552
718,941	Wigmore	Jan. 20, 1903	2,738,228
1,106,327	Areson	Aug. 4, 1914	2,804,929
2,139,097	Piquerey	Dec. 6, 1938	2,829,801
2,594,161	Harrison	Apr. 22, 1952	2,859,898
			2,878,965
			2,899,106
			2,954,144
			778,124

Smith	Nov. 17, 1953
Nosik	Oct. 25, 1955
Mack	Mar. 13, 1956
Plummer	Sept. 3, 1957
Ayres	Apr. 8, 1958
Mendenhall	Nov. 11, 1958
Hirt et al.	Mar. 24, 1959
Weinert	Aug. 11, 1959
Elam et al.	Sept. 27, 1960

## FOREIGN PATENTS

Great Britain	July 3, 1957
---------------	--------------