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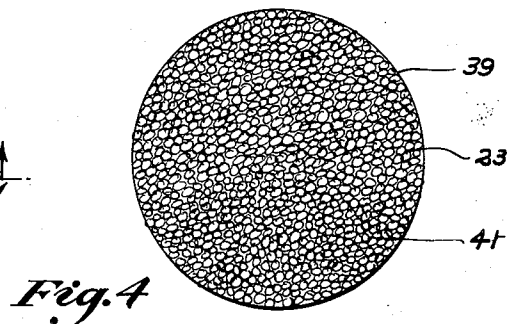
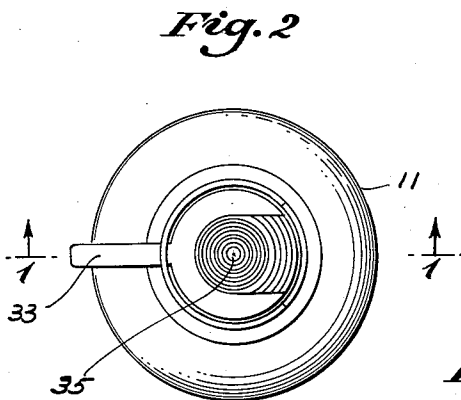
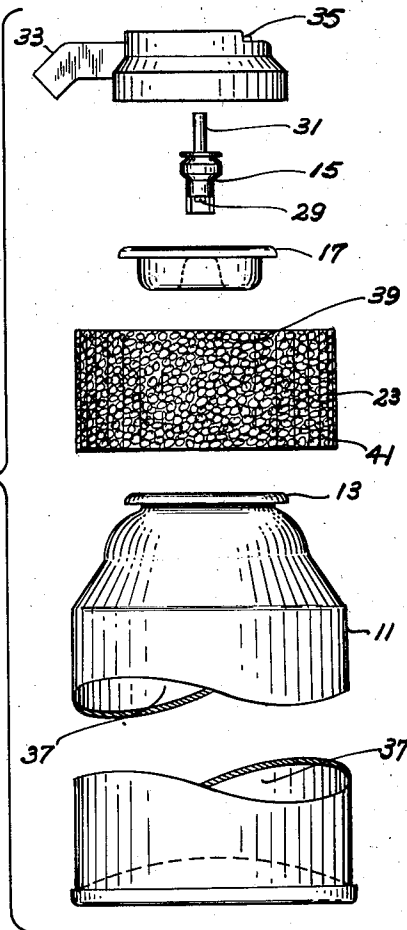
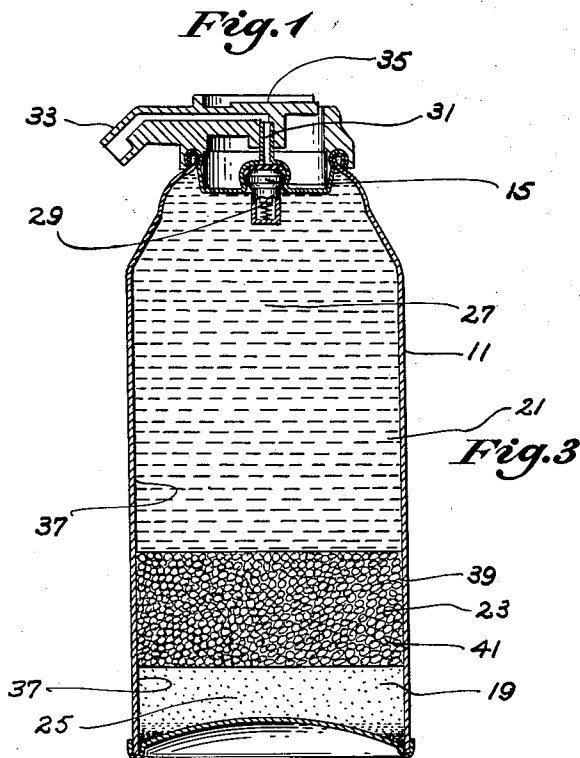
G. DE WAYNE MILES

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PRESSURIZING OF DISPENSING CONTAINERS

Original Filed June 6, 1960

2 Sheets-Sheet 1



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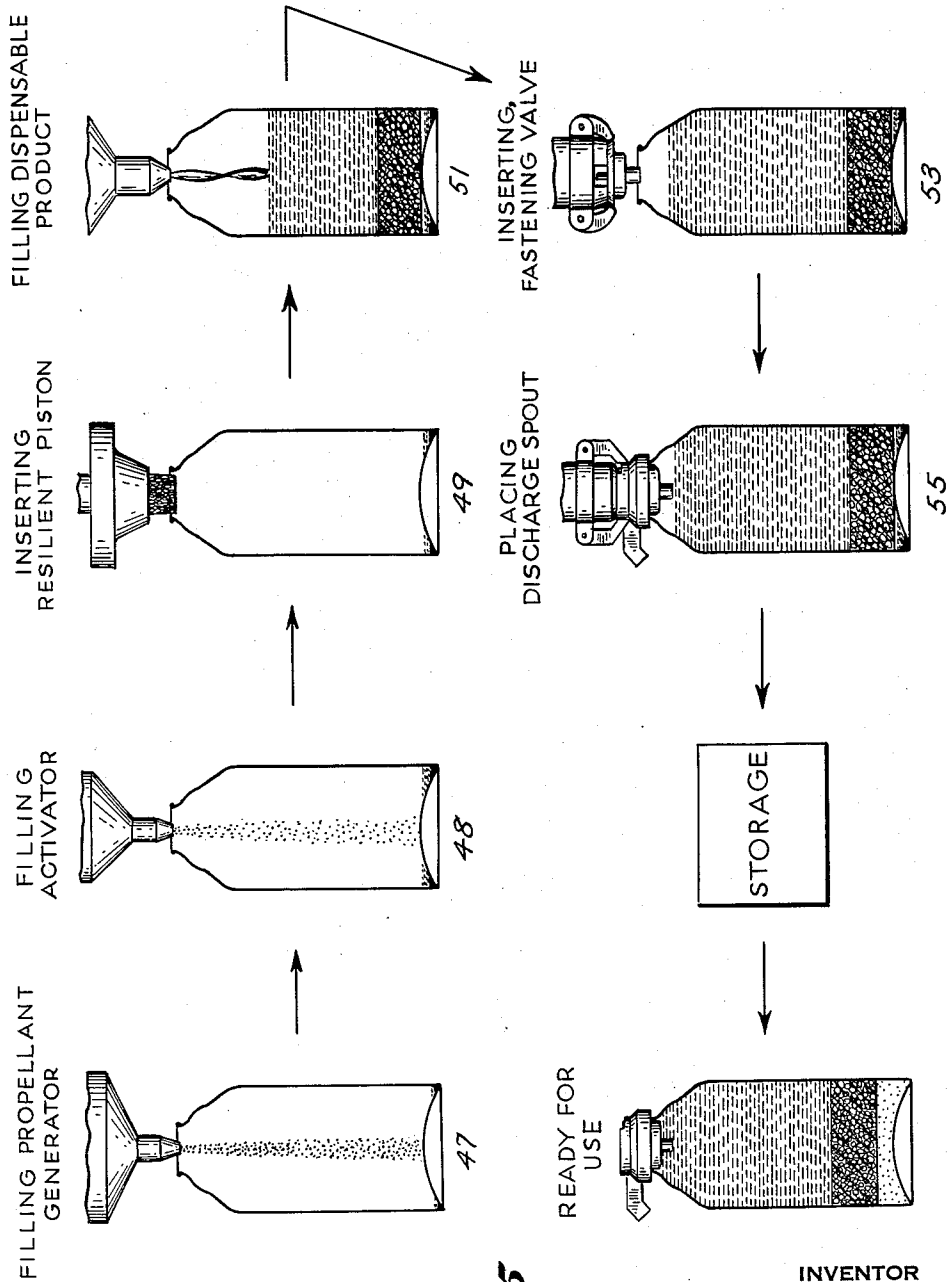
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PRESSURIZING OF DISPENSING CONTAINERS

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Continuation of application Ser. No. 34,255, June 6, 1960. This application July 12, 1963, Ser. No. 295,297

8 Claims. (Cl. 53—36)

This invention relates to a process of pressurizing dispensing containers in which the propellant is generated within the container after packaging. More particularly, the invention involves the addition of a non-gaseous material to a dispensing container at atmospheric conditions, followed by generation of propellant gas from that material after sealing of the package.

In manufacturing the portable and disposable pressurized dispensing containers which are presently in widespread commercial use, propellant is usually added to the container as a gas through the dispensing valve after sealing of the container. Before the development of commercial methods of pressure filling, refrigerated liquefied gas propellant had been added to the cooled container prior to placement of the dispensing valve and container closure. After sealing the container, heating of the liquefied gas caused development of a dispensing pressure. This so-called cold-fill method required refrigeration of the propellant, led to condensation of atmospheric moisture and the presence of water in the pressurized packages (which might react with some propellants) used to cause a corrosive effect on metallic parts and resulted in loss of propellant due to vaporization during filling. Also, the use of refrigeration with liquefied gas propellant was restricted to those products which would not be harmed by exposure to the low temperatures necessary. The cold-fill techniques did not allow the manufacturer to use the lower boiling "non-condensable" gases which could not be liquefied at a workable temperature. With the advent of pressure dispensing of fluids, powders and pastes designed to be flowed rather than sprayed from the container, the employment of non-condensable gaseous propellants became highly desirable, even necessary in some applications.

When propellant gas is added to a conventional container designed for pressurized dispensing, it is usually the last material placed in the container. This is so because the non-pressurized contents to be dispensed may be more conveniently added to the container at atmospheric pressure through a relatively large filling opening, the filling machinery required being much less intricate and consequently, more economical. The addition of propellant gas through the relatively restricted openings in a discharge valve is usually a slow operation, when considered in comparison with the speed capability of the automatic filling machinery employed. When the dispensing container interior is compartmented or otherwise divided to separate product and propellant gas, it is necessary to add the propellant gas through a different opening in the container from that intended for product discharge. Thus, if a piston or bag separator is used in the container the product to be dispensed through the discharge valve will communicate with one side of the separator and the propellant must be added on the other side. Where product is discharged from the top of the can it is usually necessary to have a separate pressurizing opening at the bottom. After filling of product and sealing of the filling opening by placement of the discharge valve, a bottom filling opening allows addition of gas under pressure. For such containers it is seen that an additional manufacturing step is necessitated and additional and more complex filling machinery is required, adapted to fill product and propellant

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at separate parts of the container. The necessity for these additional structures and operations increases the expense of manufacturing such products and adds to the container more possible sources of leakage, corrosion and other problems.

It is an object of this invention to provide a pressurized dispenser including separate product and propellant sections which can be filled without the necessity for additional filling openings other than that adjacent to the discharge valve. It is also an object to pressurize such dispensers by the addition thereto of a propellant material at an initially low pressure, preferably atmospheric pressure. Another object is to quickly charge the container with pressurizing material so that the speed of production of pressurized containers may be substantially increased over comparable methods in which the pressurizing fluid is added to the container through a restricted opening or passageway. A further object is to provide a dispenser utilizing a non-communicating cellular foam piston, separating product and propellant.

In accordance with the invention a method of manufacturing a pressurized dispensing container of fluid material comprises filling fluid product to be dispensed into the container in a section thereof communicating with a dispensing outlet, said section being separated from a propellant section of the container, adding to the propellant section of the container, which is non-communicating with the dispensing outlet, non-gaseous material capable of releasing a propellant gas and developing a dispensing pressure in the container when activated and activating the propellant generating material to cause release of propellant gas.

The invention and further objects thereof will be readily understood from the following description, taken together with the drawing, in which:

FIG. 1 is an axial vertical elevation of a dispensing container of fluid material while propellant generator is releasing pressurizing gas;

FIG. 2 is a top plan thereof;

FIG. 3 is a disassembled view of the elements of such container;

FIG. 4 is a horizontal section through a relaxed cellular sponge piston element of the dispensing container; and

FIG. 5 is a schematic representation of a method of manufacturing pressurized dispensers in accordance with this invention.

Numeral 11 designates a dispensing container having a top opening defined by a rim 13 adapted for having sealed thereto a normally closed dispensing valve 15 which may be directly staked to the container or may, as illustrated, be fastened to a valve fitment 17 which, in turn, is staked and rolled into pressure tight engagement with container 11 at rim 13. Gaskets between the container, valve and fitment assure pressure tight joints. Dispensing valve 15 and container 11, as well as any sealed joints or seams therein, must be capable of withstanding, without leaking, a dispensing pressure, which is often about 40 pounds per square inch but in some instances may be from about 20—200 pounds per square inch.

Inside the container and separating its interior into a propellant section 19 and dispensing or product section 21 is a resilient piston 23 of non-communicating cellular structure, of cell diameters within the range between about 0.01 and 0.2 inch and of wall thickness between 0.001 and 0.005 inch. The cellular piston is made of a foam of a synthetic organic resinous material, such as polystyrene, polyethylene or other foamable, preferably resilient plastic. In propellant section 19 is a pressurized gas 25 which acts to move the piston upward forcing fluid product 27 through openings 29, valve stem 31 and out spout 33 when valve button 35 is manually depressed to open position. Piston 23 presses tightly against the

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interior side walls 37 of container 11 to maintain the separation of propellant and product sections. Walls 39 of cells 41 of the piston 23, in the embodiment illustrated, are permeable to the propellant gas to allow gradual entry of gas at higher pressure through the cells which are initially at about atmospheric pressure. This permeability prevents collapse of closed cell foam pistons due to development of dispensing pressures in the container. The fluid product 27 is preferably one in which propellant gas is insoluble. Aqueous pastes such as dental creams dissolve only very small amounts of gases such as nitrogen and therefore such substances are among those in which a continuing flow of pressurizing gas through the product, with the consequent diminution of dispensing pressure, will be hindered.

In FIG. 5 there are schematically illustrated the processing operations for manufacturing a pressurized product according to this invention. Numeral 47 is a highly accurate gravimetric filling machine which adds a precise small quantity of non-gaseous propellant generating material to the container. With the propellant there may be included a pre-blended proportion of activating material which causes the slow release of propellant gas from the generator. In the absence of pre-blending an additional small quantity of activator may be added before, with or after the propellant generator, as at filler 48, or may otherwise be placed in the propellant section of the container with it. The amounts of generator and activator employed will be such as to cause the release of sufficient pressurizing gas to satisfactorily discharge fluid product contents at desired working pressure and the activator will be sufficient to release all available propellant gas from the generating material. After the addition of the propellant generating substances, the container is then advanced to an inserting machine 49 which places the resilient cellular piston into the can through the top opening thereof. In the embodiment illustrated, it will be noted that the piston must be partially distorted to allow insertion through the restricted top opening in the container. Filling machine 51 automatically adds the required quantity of dispensable fluid product atop the piston. Because the piston presses tightly against the side walls of the container and because the cells, though permeable to gas, do not allow the passage of liquid or pasty substances, none of the product charged reaches the propellant section.

Still at atmospheric pressure, as in the preceding operations, and assembly of valve and valve fitment is automatically inserted, staked and rolled in place by conventional machinery 53 for this purpose. Subsequently, a spout member is installed by machinery 55. From this point, the handling and packing operations proceed as with other products, with a single exception. The heat testing of filled containers is omitted, because it would usually cause a premature release of propellant gas. Such heat testing may be conducted, if desired, after the dispensing container has been stored for a sufficiently great length of time without actuation of the discharge valve to develop all the propellant pressure for which it was designed.

During the storage period the slow generation of propellant continues until all the propellant generator has released its gas content. The pre-measured amount of generator, computed to be that necessary to raise the dispensing container to correct pressure, is preferably completely consumed. This gives most accurate dispensing pressure control. The period in which propellant is developed may be as short as several hours or, as has been observed in other compositions, as long as three months. The development of full pressure in a few hours can be effected without premature release of gas during the filling operation by utilizing slow starting compositions. These may be mixtures in which the activator is not initially in intimate contact with the propellant generator or may be those where the products of reaction have an accelerating effect on propellant re-

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lease. In the former case, either activator or propellant may be encapsulated by coating with an insulating material which is slowly dissolved or otherwise penetrated by a reactant. It is to be understood, in those cases where either the propellant generating material or the activating material is encapsulated, that the encapsulating material is considered to be part of the material with which it is used and the materials are considered to be in contact with each other even though the encapsulating material itself is not an active part of either the propellant generating material or activating material. Suitable encapsulating materials are gelatin, polyvinyl alcohol, methylcellulose and the natural gums. Comparatively quick release of propellant is sometimes advantageous because it permit a minimum of hold up of filled containers awaiting testing before they can be shipped. However, where the propellant generating materials and activators are very accurately measured into the containers with the precision equipment presently available it is expected that special pressure testing of all filled cans will not be required. Even if it should be necessary to test every filled package, other testing methods, such as those which are based on electronic means and are suitable for checking an entire packed case, may be used to assure that no off pressure product is released to market.

Normal warehousing of filled product may continue for as long as three months and therefore the required holding time for the slower developed propellants is not a significant disadvantage of the production method. On the contrary, the gradual release of propellant and slow increase of internal pressure in the container are decidedly useful, even necessary for the manufacture of certain types of piston aerosol dispensers. Those pistons made of what are commonly termed closed cell foams, i.e., those in which the globular cells are non-communicating, are usually foamed at atmospheric pressure and therefore the gas pressure in the cell interior is lower than the desired dispensing pressure. When such a piston is inserted in a dispenser and the dispenser is subsequently pressurized, the external pressure, which may be from about 20-200 pounds per square inch, even higher in some special cases, will cause the collapse of resilient pistons or of any foam in which the cell wall itself cannot withstand the high pressure differential that is imposed upon it. If the piston is resilient or elastic and permeable to gas penetration, the pressures will become equalized and it will return to enlarged form. However, the initial collapse upon pressurizing will create passageways between the propellant and product sections of the container which will allow pressurizing gas to mix with fluid to be dispensed and therefore will destroy the utility of the compartmenting piston. One the other hand, if the propellant is slowly released by a gas generating substance after sealing of the container, the rate of generation will more closely match the rate of diffusion into the foam cells and will permit pressurizing without collapse of the piston. Thus, by the invented method a desirable piston material may be employed in pressurizing dispensers which otherwise would be useless.

Various mixtures of propellant generator and activating compound may be used to develop the pressurizing gas. The particular substance to be employed will often be determined by the nature of the material being dispensed. In products intended for human consumption, the propellant should be tasteless, odorless and have no harmful effects. Care should be taken that the by-products of the reaction, if any, are also harmless. Although the separatory piston acts to prevent transmission of the by-products or propellant gas to the product dispensed, as a precautionary measure, complete reliance should not be placed on this separator even though tests indicate that such reliance would be justified. Among the propellant-activator substances one may mention hydrogen peroxide controllably decomposed by the presence of heavy metal cations or enzymes. A strong solution of

the peroxide, which may be from 20 to 90% or more H_2O_2 , with copper or iron salts in very small quantity, usually from about 0.05 to 0.5% by weight of the hydrogen peroxide or with equivalent amounts of peroxidase, catalase or other suitable enzymes, will slowly release oxygen to pressurize the dispenser and diffuse into the foam piston. The by-product of such reaction is water so that both the gas and by-product are harmless. Thus, minor diffusion of gas or by-product through the foam or piston will not be detrimental to the product.

Among other materials for generating propellant may be mentioned metal alkyls or organo-halo metallic compounds such as aluminum triethyl, aluminum triisopropyl, Grignard reagents, aluminum chloro dialkyls, all of which release hydrocarbons in the presence of water. The decomposition of ammonium nitrite and release of nitrogen gas propellant may be catalyzed by boric acid. Hydrides such as sodium borohydride, which in aqueous solution will release hydrogen upon addition of catalyst such as cobalt ion, carbonates, which decompose in the presence of enzymes such as carbonic anhydrase and nitrogen releasing materials such as azo and diazo compounds which decompose slowly in the presence of heavy metal catalysts at a suitable temperature are other useful substances. In place of or in addition to an activating compound or catalyst, other means may be employed for activating or decomposing a propellant generator, such as pH control and heating, but such techniques present manufacturing problems and are often not feasible commercially.

Because the gas generated does not ordinarily contact the fluid being dispensed the solubility of the gas in that material is usually inconsequential. There may be employed propellant gases which are quite soluble in the aqueous or other fluid products to be dispensed and the amounts of propellant generator needed will be lower than would be required if the product and propellant portions of the dispenser were not separated. Thus, only about $1\frac{1}{2}$ grams of hydrogen peroxide are needed to generate sufficient oxygen to raise the pressure of a 6 ounce standard dispenser to 7 atmospheres, 103 pounds per square inch, with the gas occupying an initial volume about half that of the container.

The following examples illustrate several forms of the invention.

Example I

Into a standard 6 oz. drawn steel cylindrical "aerosol" container having a concave bottom sealed to it there were added in succession 3.4 grams of a 50% hydrogen peroxide solution, 0.6 gram water and 1 milliliter of 0.42% ferrous ammonium sulfate solution. An open celled polyurethane foam piston 2 inches in diameter and $1\frac{3}{4}$ inches high, of density of about 0.03 gram per cc. and average wall thickness of about 0.01 mm. was next inserted through the container on top of the propellant generator and activator. A standard dental cream or toothpaste composition was poured on top of the sponge piston. Because the resilient piston, which was coated with latex except for approximately half the area of the piston bottom, pressed against the inner container walls to separate the package into propellant and product sections, the dental cream did not flow past the piston and contact with the propellant was avoided.

No decomposition of the hydrogen peroxide was noted during the period of approximately 5 minutes in which the various sealing and packing operations were undertaken. After addition of the correct amount of dental cream, approximately 5 oz., a conventional discharge valve was staked and rolled into sealing relationship with the container top. The container was stored for 11 days after which the pressure was checked and the product was dispensed. It was found that the pressure had increased to 75 lbs./sq. in. gauge and this pressure was

sufficient to completely dispense the entire contents of the container.

When 1 milliliter of 0.28% ferrous sulfate was used instead of the ferrous ammonium sulfate the pressure developed was 20 lbs./sq. in. gauge, apparently due to a greater degree of reaction of the propellant generator and activator with the container. The reaction was noted despite the use of $\frac{1}{4}$ lb. tin plate and coating of the can sides with phenolic resin and the bottom with phenolic-vinyl. Such reactions do not take place with glass or aluminum containers and, where the expense of these packages can be tolerated they will often be used to obtain maximum pressure from the propellant generator and also to result in better reproducibility of pressures.

In an alternative method, the valve is first sealed to the top of the aerosol container, the can is inverted and the various components are added in the order: product, piston, mixture of propellant generator and activator, following which the concave bottom is sealed into place. When desired, one of the reactants, either propellant or activator, may be initially deposited on or absorbed by the piston material. However, it is usually preferable to make mixtures of propellant and activator in concentrations at which they do not immediately react, even when intimately mixed together. In such mixtures it is assured that a proportion of the propellant generator will not be inaccessible to the activator which is needed to cause release of propellant gas.

When pistons having open celled foam structures are used, the rate of gas generation may be much greater than when the closed cell pistons are employed. Thus, to utilize a polyethylene piston of closed cell structure, one should usually control the concentrations to generate propellant gas at a rate at which it can diffuse into the cell structure. For acceptable thin walled foams, containers should not usually be brought to a pressure of over about 100 lbs./sq. in. and the pressure rise should be less than about 5 lbs./sq. in. per day.

Example II

A heavy glass walled dispensing cylinder was charged with 1.8 grams sodium nitrite, 1.4 grams ammonium chloride and 2.0 grams of 3.7% boric acid solution. Through the top of the cylinder there was placed a resilient closed cell polyethylene foam of diameter slightly greater than the container interior and a fluid dental cream of the type commonly marketed in pressurized containers was added on top of the polyethylene piston. The container was sealed and the pressure was allowed to rise as nitrogen was developed due to the catalytic action of the boric acid on the ammonium nitrite. At first, at the low initial pressures, the dispenser discharged dental cream when the valve was opened. However, too rapid generation of the propellant, exceeding the speed of permeation through the piston sponge cell walls, caused a diminution in size of the piston and eventually the piston withdrew from the container walls, allowing intermingling of propellant and product, and contracted to a volume very much smaller than its original size. Thus, at 55 lbs./sq. in. external pressure, probably at less than 20 lbs./sq. in. internal pressure the sponge had been reduced to only a minor fraction of its original size. When the concentration of catalyst is decreased the rate of gas generation can be held to less than that which will cause a pressure rise of about 5 lbs./sq. in./day. Such a low rate of pressure increase will not collapse the usable permeable foams.

Example III

1.8 grams sodium nitrite, 1.45 grams ammonium chloride and 2.0 cc. of 3.7% boric acid solution were added to the bottom of a black iron drawn aerosol container having a phenolic coated tin plate interior. A polyethylene separator and a polyester-polyether urethane foam open celled resilient piston were then inserted, followed by

fluid dental cream. The can was sealed and valved and allowed to stand for development of nitrogen propellant. After 11 days the container pressure was 96 lbs./sq. in. and repeated operation of the dispensing valve resulted in complete controlled exhaustion of the contents, completely free of any detectable impurities or by-products of the propellant generating reaction.

This application is a continuation of application Serial No. 34,255, filed June 6, 1960, and now abandoned.

The above invention has been described with respect to examples illustrating several embodiments thereof. It is not to be construed as limited to such processes, the scope of the invention being that set forth in the allowed claims.

I claim:

1. A method for manufacturing a pressurized dispensing container for fluid material having a valve controlled dispensing outlet comprising providing a readily deformable substantially fluid tight separator in said container to form a product section communicating with said outlet and a separate propellant section, filling the product section with product to be dispensed, providing slow release activating material in said propellant section, introducing into said propellant section into contact with said activating material a non-gaseous material capable of releasing a propellant gas in the presence of said activating material, sealing the container and developing a dispensing pressure in the sealed container by slow release of propellant gas from said non-gaseous material in the presence of said activating material.

2. A method of manufacturing a pressurized dispensing container of fluid material which comprises filling fluid product to be dispensed into the container in a section thereof communicating with a dispensing outlet, said section being separated from a propellant section of the container by a readily deformable, resilient, substantially fluid tight piston, adding to the propellant section of the container, which section is non-communicating with the dispensing outlet, and in contact with each other (a) non-gaseous material capable of slowly releasing a propellant gas and developing a dispensing pressure in the presence of an activating material, the amount of non-gaseous propellant generating material being sufficient to develop a volume of gas at a desired dispensing pressure so that the dispensable fluid product may be substantially completely discharged from the container, and (b) an activating material which causes the slow release of gas from the propellant generating material, and sealing the container.

3. A method of manufacturing a pressurized dispensing container of fluid material which comprises filling fluid product to be dispensed into the container in a section thereof communicating with a normally closed valved dispensing outlet, said section being separated from a propellant section of the container by a piston of cellular foam material in which the cells are thin walled and non-communicating, adding to the propellant section of the container, which section is non-communicating with the dispensing valve, and in contact with each other (a) a non-gaseous material capable of slowly releasing a propellant gas and developing a dispensing pressure in the presence of an activating material, the amount of non-gaseous propellant generating material being sufficient to develop a volume of gas at a desired dispensing pressure so that the dispensable fluid product may be substantially completely discharged from the container in response to repeated openings of the discharge valve, and (b) an activating material which causes the slow release of gas from the propellant generating material, the amount of activating material being sufficient to cause the release of all available gas from the propellant generator, the rate of release being slow to allow all manipulative operations in the manufacture of the dispensing container to be conducted substantially at atmospheric pressure, and sealing the container.

4. A method of manufacturing a pressurized dispensing container of fluid material which comprises filling

fluid product to be dispensed into the container in a section thereof communicating with a normally closed valved dispensing outlet, said section being separated from a propellant section of the container by a piston of resilient cellular foam material in which the cells are thin walled, gas permeable and non-communicating, adding to the propellant section of the container, which section is non-communicating with the dispensing valve, and in contact with each other (a) a non-gaseous material capable of slowly releasing a propellant gas, insoluble in the product to be dispensed, and (b) an activating material and developing a dispensing pressure in the presence of said activating material, the amount of non-gaseous propellant generating material being sufficient to develop a volume of gas at a desired dispensing pressure so that the dispensable fluid product may be substantially completely discharged from the container in response to repeated openings of the discharge valve, the amount of activating material being sufficient to cause the release of all available gas from the propellant generator, the rate of release being slow to allow all manipulative operations in the manufacture of the dispensing container to be conducted substantially at atmospheric pressure and the rate of gas generation being low so that the pressure in the propellant section of the container will be sufficiently in equilibrium with that of the gas in the permeable cells of the resilient piston so as to prevent collapse of that piston which would cause objectionable connection of propellant and dispensing sections of the container, and sealing the container.

5. A method of manufacturing a pressurized dispensing container of fluid material, which container comprises a walled enclosure having a filling opening at the top, a normally closed discharge valve assembly adapted to be sealed to the container and to close the top opening thereof and a piston inside the container, which divides the container interior into two incommunicable sections, which method comprises measuring out quantities of non-gaseous material capable of slowly releasing a propellant gas and developing a dispensing pressure in the presence of an activating material in amount sufficient to develop a volume of gas at a desired dispensing pressure so that the dispensable fluid product may be substantially completely discharged from the container and an activating material which causes the slow release of gas from the propellant generating material, in sufficient quantity to release all the available propellant gas from the propellant generator, adding said non-gaseous propellant material and activating material to the container through the top opening therein and into contact with each other, inserting a piston in the container through the top opening, adding fluid product to be dispensed through the top opening to the dispensing section communicating with the discharge valve, and sealing the discharge valve assembly in place, thereby closing the container, all the previously recited operations being effected at atmospheric pressure.

6. A method of manufacturing a pressurized dispensing container, which container comprises a walled enclosure having a normally closed discharge valve at the top thereof and a filling opening at the bottom and a piston inside the container which divides the container interior into two incommunicable sections, which method comprises inverting the container, adding product to be dispensed through the bottom to the product section of the container in communication with the discharge valve, inserting the piston through the bottom to position atop the product and separating product and propellant sections, measuring quantities of non-gaseous material capable of slowly releasing a propellant gas and developing a dispensing pressure in the presence of an activating material and of activating material which causes the slow release of gas from the propellant generating material, in sufficient quantity to release all the available propellant gas from the propellant generator, adding the propellant generating material and activating material to the propellant section of the container to position atop

and in contact with each other and with the piston, and sealing the container bottom in place, thereby closing the container, all the previously recited operations being effected at atmospheric pressure.

7. A method of manufacturing a pressurized dispensing container of fluid material which comprises filling fluid product to be dispensed into the container in a section thereof communicating with a normally closed valved dispensing outlet, said section being separated from a propellant section of the container by providing therein a resilient piston of cellular foam synthetic organic resinous material in which the cells are of diameters within the range between about 0.01 and 0.2 inch, of wall thickness between about 0.001 and 0.005 inch and are non-communicating, adding to the propellant section of the container, which section is incommunicable with the discharge valve, and in contact with each other (a) a non-gaseous material capable of slowly releasing a propellant gas and developing a dispensing pressure between 20 and 200 pounds per square inch in the presence of an activating material, the amount of non-gaseous propellant generating material being sufficient to develop a volume of gas at a desired dispensing pressure so that the dispensable fluid product may be substantially completely discharged from the container in response to repeated openings of the discharge valve, and (b) a non-gaseous activating material which causes the slow release of gas from the propellant generating material, the amount of activator being sufficient to cause the release of all available gas from the propellant generator, the rate of gas release being low to allow all manipulative operations in the manufacture of the dispensing container to be conducted substantially at atmospheric pressure and the rate of gas generation also being low so that the pressure in the propellant section of the container will be sufficiently in equilibrium with that of the gas in the cells of the piston so as to prevent a collapse of that piston which would cause objectionable connection of propellant and dispensing sections of the container, and sealing the container.

8. A method of manufacturing a pressurized dispensing container of fluid material which comprises filling fluid product to be dispensed into the container in a sec-

tion thereof communicating with a normally closed valved dispensing outlet, said section being separated from a propellant section of the container by providing therein a resilient piston of cellular foam synthetic organic resinous material in which the cells are of diameters within the ranges between about 0.01 and 0.2 inch, of wall thickness of 0.001 and 0.005 inch and are non-communicating, the resilient piston having on the bottom thereof a non-gaseous activating material which is capable of slowly releasing gas from a propellant generating material, adding to the propellant section of the container, which section is incommunicable with the discharge valve, a non-gaseous material capable of slowly releasing a propellant gas and developing a dispensing pressure between 20 and 200 pounds per square inch in the presence of the activating material, the amount of non-gaseous propellant generating material being sufficient to develop a volume of gas at a desired dispensing pressure so that the dispensable fluid product may be substantially completely discharged from the container in response to repeated openings of the discharge valve, the rate of gas release being low to allow all manipulative operations in the manufacture of the dispensing container to be conducted substantially at atmospheric pressure and the rate of gas generation also being low so that the pressure in the propellant section of the container will be sufficiently in equilibrium with that of the gas in the cells of the piston so as to prevent a collapse of that piston, which would cause objectionable connection of the propellant and dispensing sections of the container, and sealing the container, the amount of activating material present on the piston bottom being sufficient to cause the release of all available gas from the propellant generator.

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