April 14, 1964 J. J. KUSTER 3,128,922

DISPENSER WITH MOVABLE PISTON

Filed June 6, 1960 2 Sheets-Sheet 1

Fig. 1.

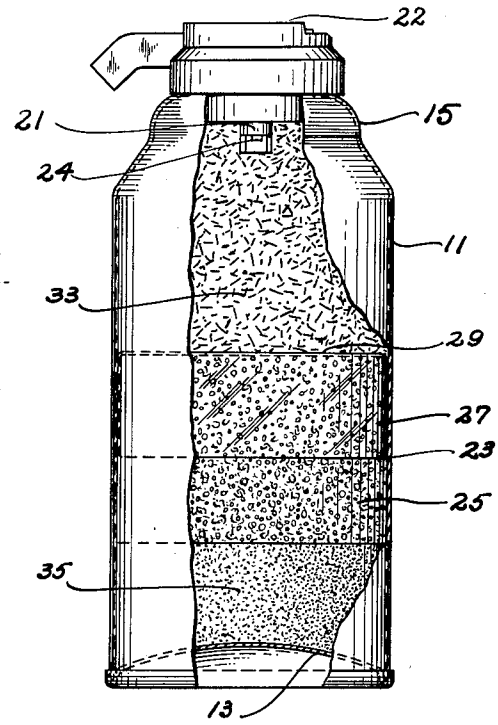

Fig. 2.

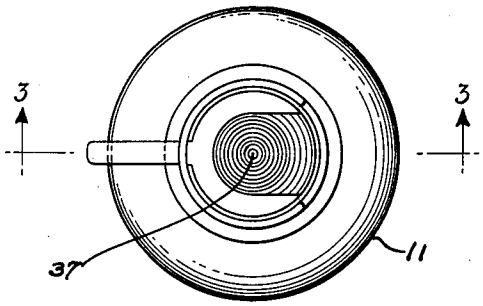

Fig. 3.

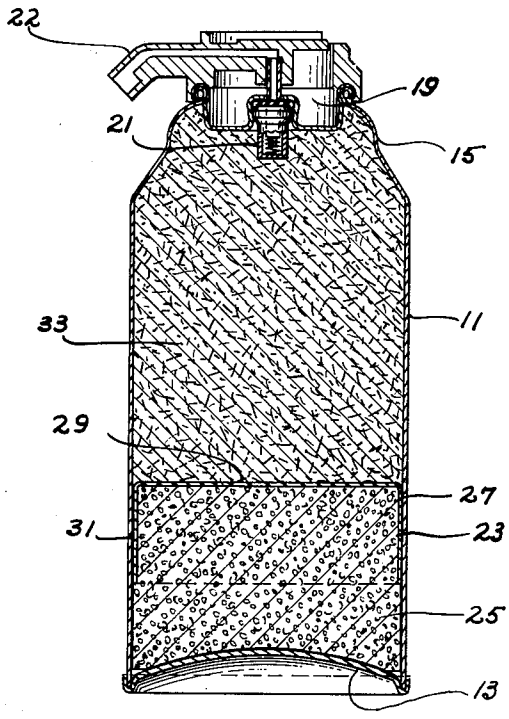

Fig. 4.

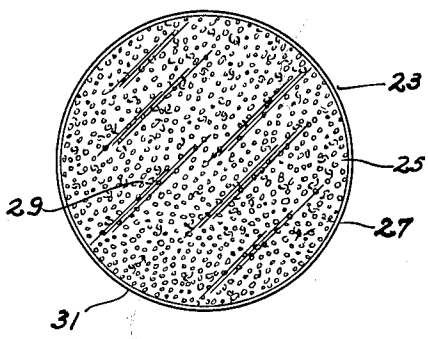

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Fig. 7.

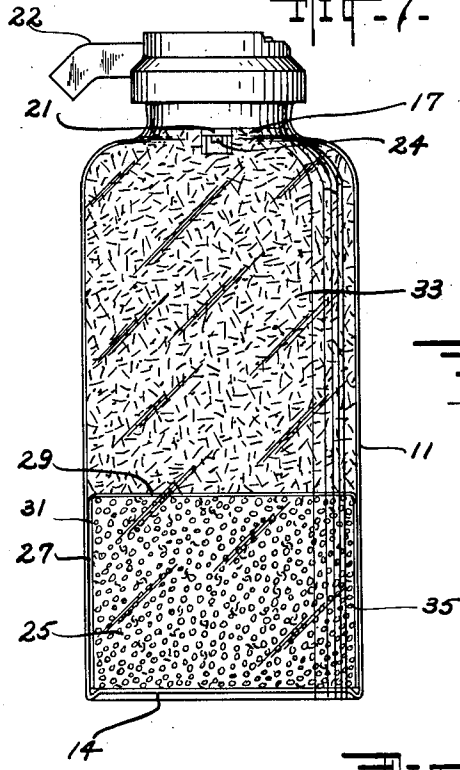


Fig. 5.

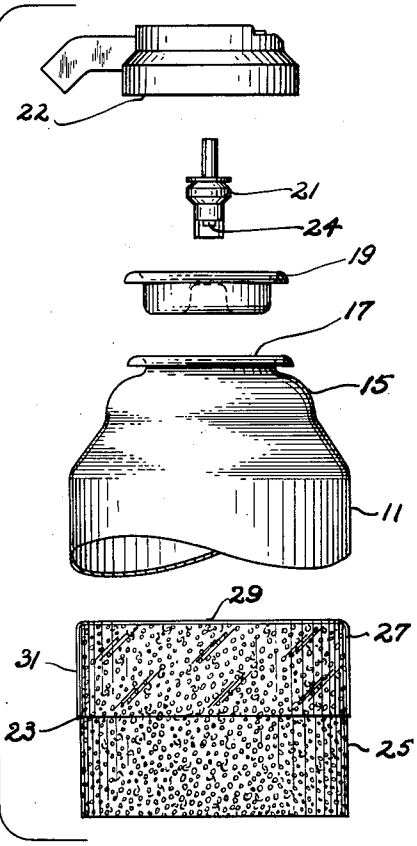


Fig. 8.

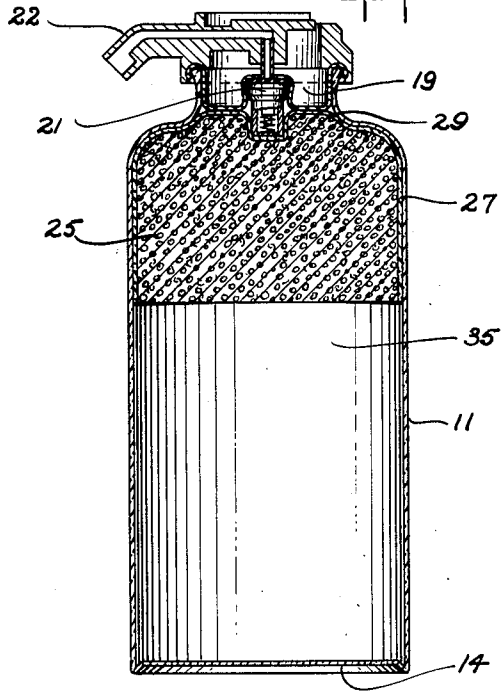
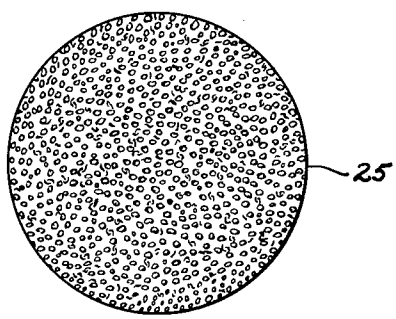


Fig. 6.



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3,128,922

DISPENSER WITH MOVABLE PISTON

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Filed June 6, 1960, Ser. No. 34,171
8 Claims. (Cl. 222—389)

The subject of this invention is a pressurized dispenser for fluid materials. More specifically, the invention relates to a dispenser in which a propellant fluid under pressure forces a novel and particularly advantageous type of piston to expel dispensable contents when a passageway to a region of lower pressure is opened.

In the last decade, pressurized dispensing of a multiplicity of industrial, agricultural, insecticidal, household, cosmetic, food and pharmaceutical products has been undertaken on a large scale. Among the major products which have been commercially successful in pressurized or "aerosol" form are lather shaving creams, space deodorants, dentifrices, insecticides, hair sprays, paints, polishes, whipped creams and perfumes. It will be seen that several of these products are dispensed in what may be called the true aerosol or spray form while others are expelled from the pressurized container as liquids, pastes, foams or even powders. In some products, the propellant is dissolved in, or emulsified with, the material to be dispensed, while in others it constitutes a separate phase.

In containers having no barriers separating propellant and product, a dip tube is almost universally employed at present to conduct the product to a dispensing opening because, being lighter, pressurized gas, which may be from a liquefied gas, collects in the space above the material to be dispensed, thereby necessitating the employment of a tube extending into the contents to allow for dispensing at the upper part of the container. Of course, if the dispenser is inverted, the contents may be dispensed from a valve without the use of a tube, but such downward dispensing is inconvenient and has met with only little consumer acceptance.

The use of a dip tube requires the expense of an additional part, a separate operation for its installation on the dispensing valve and the molding or shaping of the dispensing valve with a projecting inlet stub tube on which the dip tube may be snapped or fitted. During storage, with certain types of products the dip tube may be swelled or loosened and may come off the valve, making the dispenser inoperative and causing the loss of the contents remaining. When dispensing relatively thick products such as paints, dental creams and various food products, including syrups, flavorings, toppings and dressings, dip tubes tend to become blocked, causing failure of the dispenser and wastage of the product content. Some materials are even too thick to flow through the relatively narrow passage of the tube and cannot be dispensed from the conventional pressurized container. Blocking of the tubes can be alleviated by increasing their internal diameters but even when this is done there is normally a loss of product due to the viscosity of the thick material preventing its ready flow to the dip tube inlet when the contents are being dispensed. This lag of the product permits propellant gas to fill the cavity around the dip tube inlet and to be discharged from the dispenser when the valve is opened. Such loss of propellant lowers the internal pressure of the dispensing container, causing slower discharge of the remaining contents and, in some instances, may sufficiently decrease the pressure to halt discharge when there is still an appreciable quantity of viscose material to be dispensed. In addition to loss of usable product, another significant disadvantage in the accidental dispensing of propellant gas is that the sputtering discharge of the mixture of propellant gas with contents material often causes an uncontrolled and annoying product dispensing action.

The long list of undesirable properties of pressurized dispensers utilizing dip tubes does not prevent the use of these dispensers under proper conditions. With materials that are of low viscosity and which do not tend to block the dip tube or the valve where the dip tube joins it, the disadvantages recited do not prevent the manufacture of a workable product, witness the wide scale use of these dispensers in commerce today. In such cases, where the slight additional expenses of the dip tubes can be tolerated, they are operationally acceptable.

Although the pressurized dispenser including a dip tube is an adequate container for many preparations it still has limitations which impair its utility. Thus, even though the product might not block the tube or valve, the user must take care to keep the container in an upright position while dispensing, or the propellant gas, itself, will be dissipated through the tube and discharge valve. This problem becomes more acute as the product is consumed, because holding the can at a slight angle will often uncover the dip tube bottom. Many consumers object to the loss or waste of that portion of the product which cannot be dispensed from the can, and therefore refuse to purchase pressure dispensing packages. To assure that the consumer is able to use all the product which has been packed in the dispenser, the very careful manufacturer has the dip tube so placed in the container that, when the consumer holds it tilted downward in a certain indicated direction, the last quantity of product will still cover the tube bottom and will not be lost. However, such operations require special care, additional expense, and are not foolproof. In the last analysis, the success of total dispensing of such a product depends on the consumer consciously following the manufacturer's specific directions for holding the container in a certain manner. The ultimate aim of the pressurized product manufacturer is to have the consumer correctly and satisfactorily use a product without the necessity for consciously following a set of use directions. Stated otherwise, the dispenser should be one which the consumer will naturally tend to use in the correct manner, i.e., one which is difficult to use incorrectly. The present invention is such a dispenser. In accordance with the present invention a dispenser for fluid materials comprises a container for dispensable material and propellant fluid under pressure and a movable piston, in the container, separating dispensable contents and propellant sections thereof, the piston having a face of substantially imperforate flexible material at the contents section of the container, a peripheral side portion of flexible material and an open celled sponge body which helps to hold the piston in position separating contents and propellant sections of the container.

In a more specific and highly desirable form, the invention is a dispenser in which the container is cylindrical, has a bottom affixed thereto and a top with an opening for affixation of a normally closed dispensing valve, means for sealing the dispensing valve to the container and closing the top opening, and a piston of special structure inside the container, separating contents and propellant sections thereof. In this preferred form, the piston is substantially cylindrical in shape, and conforms closely to the walls of the container. It has a substantially imperforate face of flexible material in contact with the contents part of the container and a sealing peripheral side portion of similar material integral with the piston face. The piston body is an open celled resilient sponge of substantially cylindrical shape. It is greater in diameter than the inside of the sealing peripheral side portion of the piston and is preferably of greater diameter than the inside of the container, when unrestrained, and

exerts a force on the side seal of the piston holding it against the interior cylindrical container walls.

The open celled piston body allows the propellant fluid to fill the voids therein and to exert upward and lateral fluid pressure on the imperforate face and sealing side portion of the piston. When the container discharge valve is opened this pressure will urge the piston and contents to be dispensed upward through the discharge valve. At the same time the difference in pressure between the propellant section or piston body and the side of the container adjacent to the piston seal will effectively press the seal against the container, preventing passage of contents or propellant between them. During the storage period, when the dispensing valve is closed, the piston will be sufficiently close to the container walls to prevent contents and propellant from mixing and the equalization of pressures on both sides of the piston will discourage transmigration even if a somewhat permeable material is employed for the piston face or side, especially when the propellant is insoluble in the dispensable material.

The flexibility of the piston face and side, in combination with the pressure exerted thereon during dispensing and preferably, also during storage, makes the flexible surfaces conform to the container walls despite the presence of minor imperfections, such as dents and distortions, and prevents leakage at those points. Even leakage at irregular side seams can often be overcome. The presence of the resilient open celled sponge is also required to help maintain the conformity of the flexible surface and the container and to prevent tilting or distorting of the piston surface when the container is subjected to sudden shocks, such as by dropping. Because the piston fills most of the container cross-section it effectively holds the sealing surface in place, preventing leakage of propellant into the contents section of the dispenser.

Several major features of the invention have been discussed above and the general mode of operation of the inverted structure is now apparent. The invention will now be described in greater detail with respect to specific embodiments thereof. The construction, operation, properties, advantages and scope of the invention will be apparent from the description and claims herein, taken in conjunction with the accompanying illustrations in which:

FIG. 1 is a partially cut away elevation of an invented dispenser;

FIG. 2 is a top plan view of this dispenser;

FIG. 3 is a vertical section along plane 3—3;

FIG. 4 is a top plan of a piston member;

FIG. 5 is a disassembled elevation, showing some principal elements of the dispenser;

FIG. 6 is a plan of the resilient sponge piston body, when relaxed;

FIG. 7 is an elevation of another form of filled and sealed dispenser according to this invention, the container being of transparent material so that the action of contents, piston and valve may be observed;

FIG. 8 is a view of the same container after dispensing of all the contents.

Numeral **11** designates a cylindrical aerosol container of metal, glass, plastic or other suitable material of construction or combinations thereof, which is capable of withstanding the internal propellant pressure. As illustrated, tube or cylinder **11** has a concave bottom **13** or flatter bottom **14** sealed and seamed to it and integrally molded with it, respectively. At its upper end, cylinder **11** has a drawn, stamped or molded stepped crown **15** terminating at a top opening **17** substantially less in area than the cross section of the container. Mounting cup **19** has valve **21** staked to it and the valve and mounting cup assembly is rolled outwardly after insertion in the container to hermetically seal off the container top, when a metal container is used. For other containers suitable valve mounting and container top sealing means and methods are employed. Combination actuator and dispensing spout member **22** is provided to discharge viscous contents downwardly, as is usually most convenient. It may be replaced by a button and spray orifice or other discharge regulator, according to the type of product contained. Sealing gaskets, usually of the flow type are included in these dispensers to secure a gas-tight seal at the top and bottom where the mounting cup and concave bottom are joined to the container. Because their use is conventional and they are difficult to illustrate they have not been shown on the drawing. As described so far, the aerosol dispenser is essentially the same as many packages currently in commercial use and well known in the "aerosol" industry. Of course, as will be seen from the description given, the invention is not limited to these particular cans and valves but has wide application to a great diversity of packages incorporating suitable containers and discharge valves.

Containers may be cylindrical or tubular, having elliptical, polygonal or other cross-sectional shapes. They may even have changing cross-sectional areas and/or shapes, providing only that the piston employed is sufficiently resilient to adapt itself to engage the container walls in sealing contact. Thus, so-called hour glass containers, in which the circular or elliptical section is greater at top and bottom than at an intermediate height, are useful together with the right resilient piston.

Dispensing valves may have body portions flush with the container top, even above it, but more often the valve will extend a short distance below the top, into the container. The inlet ports **24** of valve **21** are preferably at the sides of the valve but may also be at the bottom. When the valve extends into the container and the inlet ports are on the sides, the valve presses against the center of the piston when the contents have almost all been dispensed, creating a small depression into which contents drain, and from which they can be withdrawn through the valve inlets. Such structure promotes the total dispensing of contents without waste and prevents the piston from obstructing the valve inlet.

The valves used with the invented dispenser are usually those intended for intermittent operation and the contents can be dispensed through them in a multiplicity of individual discharges, the valve seating in fluid tight closure after each use. However, for special applications, such as in fire extinguishers, where the entire contents may be dispensed at one time, single use valves, i.e., those which do not re-seal after being opened, may also be used.

Although they may appear to be externally indistinguishable from previously known pressurized containers, the invented dispensers differ markedly from them in internal structure and possess many significant advantages with respect to suitability for use with viscous products, ability to discharge contents independently of container position, and in economical and functional structure capable of efficiently and most completely dispensing propellant products. Piston **23** comprises an open celled sponge body **25** and an integral partial cover **27** which has a substantially imperforate face **29** and a peripheral side portion or skirt **31**. Above the imperforate piston face **29** is the fluid **33** material to be dispensed and below the piston and in the open cells thereof is the fluid propellant **35**. In the piston illustrated the integral cover is a separate unit from the sponge body, fitted to it and held in shape and against the container walls by the force exerted by the sponge itself, together with the pressure differential against the side sealing portion during the dispensing operation.

Piston body **25** may be made of any suitable resilient open celled sponge material. Among the most satisfactory of these products is that known as polyurethane foam, but other acceptable synthetic sponge materials are also within the invention. Polyurethane foam is excellent because it can be manufactured in a variety of strengths,

porosities and densities so that the best type of piston body material may be readily selected for the particular application contemplated. Polyurethane foams are nontoxic and contain no plasticizer which might slowly dissolve in the material to be dispensed, which might cause contamination thereof, which would be especially harmful in the dispensing of foods or products designed for use in the oral cavity, such as dentifrices, mouth washes, nasal and throat sprays and so forth.

Open celled foams may be made by a controlled foaming process in which a gas is distributed throughout the foam material, forming communicated cells and passageways so that the foam is permeable to and allows the ready transmission of fluid. Alternatively, the foam may be initially made of closed cell structure and subsequently subjected to a crushing operation designed to fracture the cells. The later foams, among which are those from polyurethanes, generally contain a more regular supporting cellular structure and allow the free passage of fluid without objectionable channeling and without the presence of volumes of sponge effectively sealed off from the rest, which would prevent equal distribution of pressure throughout the piston. The foams used are preferably light weight, e.g., polyurethane of 1–8 lbs. per cubic foot, the lighter materials usually being more flexible and capable of holding more propellant gas.

Generally the cross-section of the piston should conform with that of the container in which it is to move, and in the illustration given both are substantially cylindrical. Although the diameter or cross-section of the relaxed piston may be less than that of the inside of the container, it is prefered that it be at least about that of the inside of the peripheral side sealing portion of the piston assembly. Usually, the piston body will be of the container internal diameter or somewhat greater, so that when placed in the dispenser, the resilience of the sponge will press the sealing side of the piston assembly against the container walls, thereby preventing escape of propellant into the contents portion of the dispenser and, conversely, blocking leakage of contents into the volume below the piston face, where they would not be dispensable. Even if the piston sponge body is smaller than the interior of the sealing portion, so that it does not exert an appreciable sealing force against the piston assembly side, the piston assembly will operate usefully and will satisfactorily separate propellant and fluid contents to be dispensed in many systems. Thus, where a comparatively viscous material, such as dental cream, is dispensed, when the pressures on both sides of the piston are equalized, the viscosity of the cream, itself, and its intial resistance to flow will inhibit passage through relatively small openings, such as those which may be found between piston assembly and container wall. When the pressures become unbalanced, as during dispensing of product when the contents section of the dispenser is opened to the atmosphere by depression of valve actuator or button 37, there is a tendency for propellant fluid to flow past the piston into the contents section. However, the pressure differential between the container sections also serves to force the peripheral sealing portion of the piston cover against the container walls during the period of unbalanced pressure, inhibiting leakage past the piston. In response to the pressure difference the piston moves upward, expelling contents, and comes to rest at a position where the pressures are equalized, at which position viscosity of the contents is sufficient to prevent movement of the piston. If the viscosity of the contents is very low, the piston body will be made larger so that it will press the side portion of the cover against the container, making a seal strong enough to prevent movement of the piston in response to opening of the discharge valve.

The flexible resilient sponge piston body adheres to the imperforate surface and sealing side of the cover and moves upwardly with the cover when material is being dispensed. The means for promotion of adherence may be an adhesive, integral formation of elements, complementary shaping of the body and cover, lateral pressure of the sponge against the sealing surface or any other suitable means. In its association with the sealing cover the sponge piston performs an additional important function by restricting the tilting or angular movement of the piston. If only a thin flexible resilient face and side seal were employed, it would be relatively easy for a shock, such as that experienced in dropping a container, or even just the weight of the contents to cause the piston to move angularly, thereby opening a passage between contents and propellant. With the resilient piston of size approximating the container internal cross-section, the piston cannot be inclined sufficiently for leakage to occur. To adequately safeguard the piston against objectionable angular movement, it should be of a sufficient height to diameter ratio so that the tilting forces will not be able to overcome the tendency of the resilient piston to maintain its position coaxial with the container. Usually height to diameter ratios of at least 0.5 are most desirable and only rarely will they exceed unity. Another advantage in using a sponge which is relatively thick is that the propellant gas or other fluid may occupy the volume of the sponge cells, requiring little or no extra volume below the sponge when the container is packed. Thus, the sponge may rest on the container bottom and contents added will not tend to cause a tilting of the piston with attendant escape of propellant to the contents chamber.

The piston cover, comprising a resilient face and a sealing peripheral portion integral therewith, is made of flexible resilient material capable of conforming to the container walls, despite minor imperfections therein. Various plastic materials have been found useful for this purpose. Polyethylene and other lower poly alkylene plastics, polyvinyl chlorides, polyvinyl alcohols (for non-aqueous systems) and other similar synthetics are preferred, although metallic foils, such as aluminum and tin foils, paraffinic or micro-crystalline waxes and other sealing substances may be used, too. Usually the cover will be a thin film, generally less than $\frac{1}{16}$ in. thick and preferably about .0005 to .025 in. The cover may be made of the same or different material on both face and sides. The face and sides may be joined together or each may be fastened or otherwise held to the piston body. In some pistons the cover may be a coating, e.g., synthetic plastic, such as polyvinyl chloride, applied to the sponge or may be fused or dissolved sponge surface material which is made to form a protective skin about the piston body. The essential characteristics of the cover are that its face in contact with the contents should be imperforate and should not allow the appreciable passage of propellant fluid when the dispenser valve is opened and that peripheral sides must be able to conform to the container and prevent leakage of contents and propellant between the container and piston.

As is evident from the above description, pistons comprising a part of the invented dispensers may have foam body portions integral with the covers which render the piston impermeable to the passage of propellant at the top and sides or the cover member may be separate from the sponge body, although held to it in the dispenser. Apparatuses of both types have been made and tested and were found to be successful.

The piston face may be of any suitable shape and, if desired, could be made to conform with the shape of the upper part of the dispensing container. Usually, it will not be necessary or even advantageous to so shape the piston face because when the contents are expelled the resilient piston conforms to the upper container surfaces, discharging the entire can contents, as is seen in FIG. 8. Therefore, the most preferred form of the piston face is a disc and the piston body is a right cylinder having a flat upper face. About the periphery of the piston is the skirt or sealing portion. Normally the skirt extends down-

wardly from the piston face for at least about ¼ in. but in some applications the peripheral sealing portion may be only an extension of the surface, providing that a satisfactory seal is obtainable. The piston cover skirt is actually the portion of the piston that is pressed against the container, maintaining the necessary sealing engagement. In practice it has been found that a bag-like piston cover, made from thin plastic sheeting (1 mil polyethylene film) heat sealed at end and side, is satisfactory, even though the end of the bag does not fit tightly against the piston body end, without folding. So long as the cover end is imperforate and the sides are capable of sealing contact with the container, the cover is operative and is within the scope of this invention.

Pressurized dispensers including the novel structure of this invention are competitive in cost with the older dispensers, are easily adapted for quick, efficient sealing and give a final product which is significantly better in many respects than dispensers heretofore known. Conventional valves and containers may be employed and the only additional part required is the particular sponge piston. Foam pistons may be inexpensively molded and are easily inserted mechanically into the container. Various filling methods may be used, of which the following are mentioned as representative.

Pressure filling of a bottomed container takes place after the container bottom seal has been tested. The acceptable containers are then gassed with suitable propellant, e.g., nitrogen, compressed air, to the required pressure, the piston is inserted through the container top and, while still holding the container under pressure, contents to be dispensed are forced in above the piston after which the dispensing valve is sealed in place. To save the necessity for a sponge inserting machine operating under gas pressure, the piston may be placed in the bottomed container followed by gassing and other operations. As the container is gassed the peripheral seal will be opened automatically allowing the gas to pressurize the propellant section of the container. Pressurized filling of the types mentioned above may take place in a large pressurized chamber or special filling heads may be used.

The necessity for a pressure chamber or complex filling head may be avoided by adding propellant fluid or gas at the bottom of the container. However, this requires the use of special closure means which are not yet widely used in the industry and an additional expense is involved in making such special container parts. In sealing a dispenser according to this method the piston is placed in the container, the correct amount of dispensable contents is added and the top valve is crimped in place. Next, propellant is added under the piston through the can bottom, usually by insertion through a grommet-like check valve or other special valve. Among other techniques that may be used for pressurizing these dispensers is one that utilizes a dissolvable tube connected to the upper valve and communicating it with the volume under the piston. After insertion of the piston and filling of contents above it the valve with communicating tube is crimped in place, and gas is added to the container through the valve. After pressurizing, the tube dissolves, preventing discharge of gas through the valve. The above filling methods are not the only ones that may be successfully used with the invented structure and are described here only as examples of techniques that can be used.

In exploring the various aspects of this invention, pressurized dispensers have been made with a variety of piston shapes, different covers and means for holding them to the piston body and various dispensable compositions have been filled, stored, operated and examined. It has been found that dentifrices (dental creams), hair tonic (emulsion type), powders, even water can be discharged almost completely from the containers without any leakage of propellant fluid into the contents portion. In a series of checks on the degree of exhaustion of contents it was found that usually 95–99% was dispensed, even when the more viscous products were pressurized. This degree of dispensing is superior to that presently obtained with the best designed dip tube style containers, which usually run to about 85–90% exhaustion.

In some of the experiments undertaken the operation of the dispenser was closely observed by using a glass cylinder for the container. Opening of the discharge valve caused an instantaneous ejection of material accompanied by responsive movement of the piston. No propellant entered the contents and the container walls were wiped clean of contents by movement of the piston sealing portion.

To test the resistance of the dispensers to being made inoperative by irregularities in the container walls, the containers were intentionally dented in several places and then were examined. It was found that the sponge pressed the sealing part of the piston tightly against the dented wall section and did not allow propellant to channel through such an area. In other tests the containers were repeatedly dropped to subject them to sharp shocks such as might be encountered in shipping. Dropping did not cause tilting of the piston nor did any interchange of contents and material take place within the container.

The rigorous tests conducted on the present pressurized dispensers prove them to be practically and commercially acceptable, as well as theoretically operatively superior in many respects to the best aerosol packages presently available. This invention gives the manufacturer an increased versatility in packaging; he can now pack and pressurize compositions hitherto unsuitable for aerosol dispensing, can do so economically and obtains a package which gives the consumer greater advantages in using.

The present invention has been described in conjunction with a drawing of specific embodiments thereof. The invention is not limited to the specific embodiments shown but, on the contrary, it is obvious that modifications may be made and equivalents substituted without departing from the spirit of the invention or going outside the scope of the claims.

What is claimed is:

1. A dispenser for fluid materials comprising a container for both fluid material to be dispensed and a compressed propellant fluid for expelling said material to be dispensed from said container, said container having a normally closed dispensing valve operable to permit discharge therethrough of said material to be dispensed, and a movable piston inside the container conforming to the walls of the container and separating it into contents and propellant sections, the piston having a face of substantially imperforate flexible material where it adjoins the contents section of the container, a peripheral side portion of flexible material contiguous with the imperforate face, and an open celled resilient sponge body of greater size, when unrestrained, than the inside of the piston peripheral side portion, which sponge body holds the piston in substantially coaxial relationship with the container wall in position separating contents and propellant sections thereof, and which exerts force on the side of the piston to hold it sufficiently close to the container wall to prevent passage of contents and propellant past the piston.

2. A pressurized dispenser for fluid materials comprising a bottomed tubular container for contents to be dispensed and propellant fluid under pressure, a normally closed dispensing valve at the top of the container, closing the top thereof, and a movable piston inside the tubular container, conforming to the walls of the container and separating it into contents and propellant sections, the piston having a face of substantially imperforate flexible material where it adjoins the contents section of the container, a sealing peripheral side portion of flexible material integral with the imperforate face, and an open celled resilient sponge body, of greater size than the inside of the piston peripheral side portion,

when unrestrained, which holds the piston in substantially coaxial relationship with the container wall in position separating contents and propellant sections thereof, and which exerts force on the side of the piston to hold it sufficiently close to the container wall to prevent passage of contents and propellant past the piston.

3. A pressurized dispenser for fluid materials comprising a bottomed cylindrical container for contents to be dispensed and a propellant fluid under pressure, said container having a normally closed dispensing valve, means for affixing the dispensing valve to the top of the container and closing the top opening thereof, and a movable substantially cylindrical resilient piston inside the container, conforming to the walls of the container and separating it into contents and propellant sections; the piston having a face of substantially imperforate flexible material where it adjoins the contents section of the container, a sealing peripheral side portion integral with the imperforate face, and a substantially cylindrical open celled resilient sponge body of greater diameter than the cylindrical container, when unrestrained, which exerts a force on the flexible peripheral side sealing portion of the piston, holding it against the interior cylindrical container wall, and which holds the piston in substantially coaxial relationship with the container walls in position separating contents and propellant sections of the container and preventing passage of contents and propellant past the piston at the container wall.

4. A pressurized dispenser for fluid materials according to claim 3 in which the container top has an opening of area substantially less than the cross-sectional area of the cylindrical part of the container, the normally closed dispensing valve is held to a mounting means which is affixed to the container top, closing the opening therein, the piston face and side sealing portion are of thin flexible material and the piston is sufficiently resiliently flexible so that, upon application of a compressing force, it is reduced in size and can be inserted into the cylindrical container through the top opening before affixation of the valve and mounting means, and will then resiliently expand to a position sufficiently close to the container wall to prevent passage of contents and propellant past the piston.

5. A pressurized dispenser for fluid materials comprising a bottomed cylindrical container for contents to be dispensed and a propellant fluid under pressure, said cylindrical container having an opening for valve affixation at the top of the container, a normally closed dispensing valve, means for affixing the dispensing valve to the container and closing the top opening thereof, and a movable substantially cylindrical piston inside the cylindrical container, conforming to the walls of the container and separating it into contents and propellant sections, the piston having a face of substantially imperforate flexible material where it adjoins the contents section of the container, which material prevents passage of propellant fluid through the piston face when the pressure in the contents section of the container is less than the pressure in the propellant section thereof, as occurs when the dispensing valve is opened to allow dispensing of contents, a sealing peripheral side portion of flexible material integral with the imperforate face, and a substantially cylindrical open celled resilient sponge body of greater diameter than the internal diameter of the sealing peripheral side portion of the piston, when unrestrained, which exerts a force on said side portion, holding it against the interior cylindrical container walls with sufficient force to maintain a seal between piston and container walls which will prevent the passage of contents and propellant therethrough and will conform the flexible peripheral side portion of the piston to the walls of the container, despite minor imperfections therein, and which holds the piston in substantially coaxial relationship with the container walls in position separating contents and propellant sections of the container, so that subjection of the container of fluid material to be dispensed to sudden shock, as by dropping, will not tilt the piston to such an extent that the contents and propellant sections of the container will be communicated.

6. A pressurized dispenser for fluid materials comprising a bottomed cylindrical container for contents to be dispensed and propellant fluid under pressure, said cylindrical container having an opening for valve affixation at the top of the container, a normally closed dispensing valve, means for affixing the dispensing valve to the container and closing the top opening thereof, and a movable substantially cylindrical piston inside the cylindrical container, conforming to the walls of the container and separating it into contents and propellant sections, the piston having a face of substantially imperforate thin flexible material where it adjoins the contents section of the container, which material prevents passage of propellant fluid through the piston face when the pressure in the contents section of the container is less than the pressure in the propellant section thereof, as occurs when the dispensing valve is opened to allow dispensing of contents, a sealing peripheral side portion of thin flexible material integral with the imperforate face, and a separate substantially cylindrical open celled resilient sponge body of greater diameter than the cylindrical container, when unrestrained, which exerts a force on the flexible peripheral side sealing portion of the piston, holding it against the interior cylindrical container walls with sufficient force to maintain a seal between piston and container walls which will prevent the passage of contents and propellant therethrough and will conform the flexible peripheral side portion of the piston to the walls of the container despite minor imperfections, irregular side seams, dents and distortions, and which holds the piston in substantially coaxial relationship with the container walls in position separating contents and propellant sections of the container, so that subjection of the container containing fluid material, to be dispensed, to sudden shock, as by dropping, will not tilt the piston to such an extent that the contents and propellant sections of the container will be communicated.

7. A pressurized dispenser for fluid materials according to claim 6 in which the piston face and sealing peripheral side portion integral therewith are of poly-lower alkylene plastic and the piston body is of polyurethane foam.

8. A pressurized dispenser for fluid materials in accordance with claim 6 in which the piston face and sealing peripheral side portion integral therewith are of polyethylene, the piston body is a polyurethane foam of low density, the height/diameter ratio of the piston body is at least about 0.5, the void volume of the piston body is sufficient to contain substantially all the propellant gas required to satisfactorily and substantially completely expel dispensable contents from the container, and the propellant fluid is a gas under pressure.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,128,922 April 14, 1964

John Jacob Kuster

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 3, line 39, for "inverted" read -- invented --; column 5, line 17, for "later" read -- latter --; line 51, for "intial" read -- initial --.

Signed and sealed this 10th day of August 1965.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents