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[33] **France**
[31] **69 02290 and 69 06986**

[54] **DISPENSING CONTAINER**
13 Claims, 2 Drawing Figs.

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ABSTRACT: A container for fluids which are to be pressurized at the moment of use comprising a dispensing valve at one end, a free piston slidable within the container, and a base encircling a slidable pin at the bottom of the container. The lower face of the piston carries a separate rupturable cartridge of pressurizing fluid positioned to be ruptured when the pin is forced inward, and a flexible peripheral flange which is urged against the wall of the container by a ring of resilient foam material.

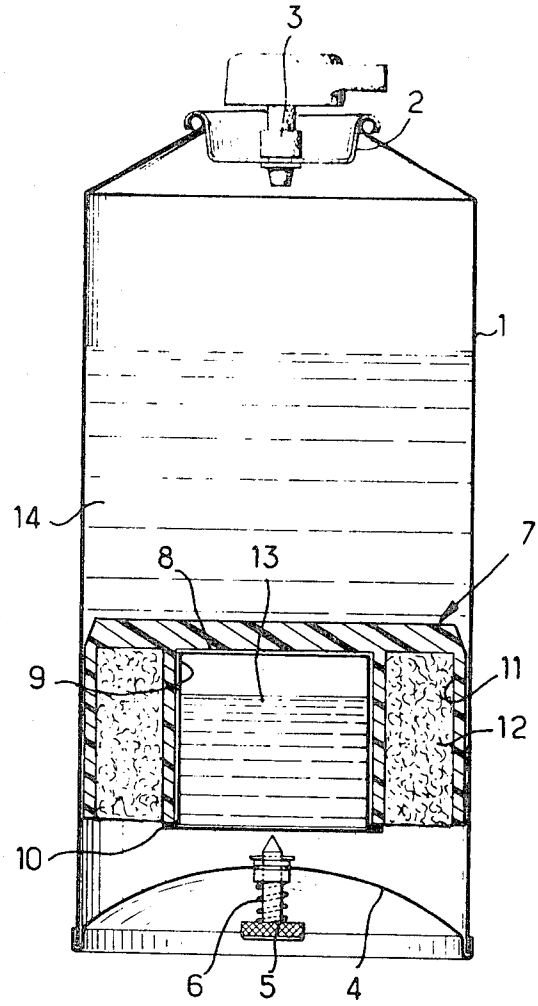


FIG. 1

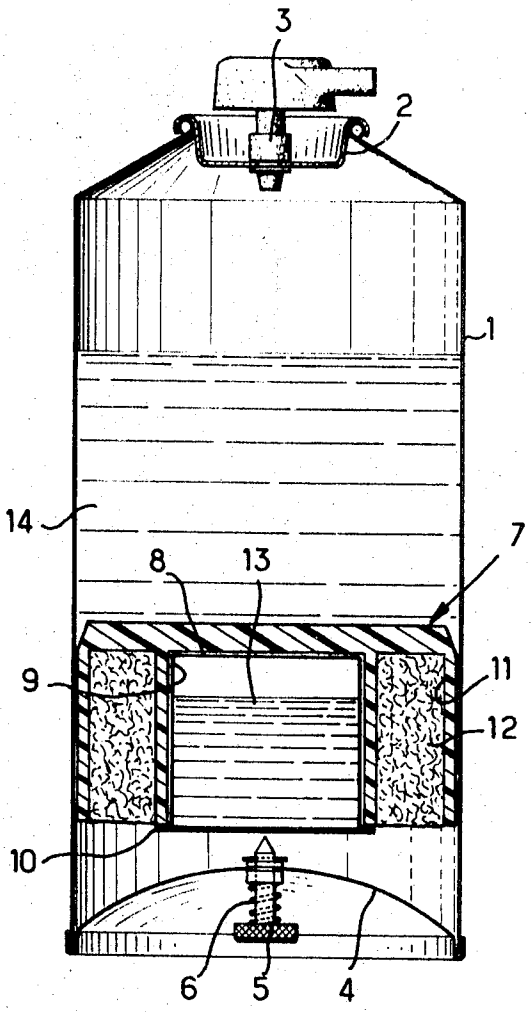
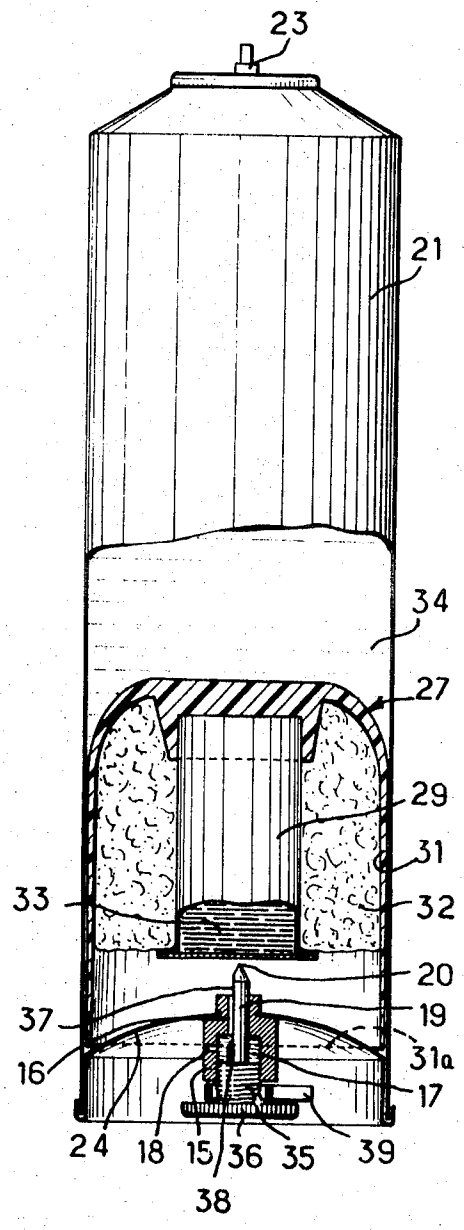


FIG. 2



DISPENSING CONTAINER

SUMMARY OF THE INVENTION

Containers for holding products which are to be dispensed in the form of aerosols generally comprise a cylindrical outer wall having a circular top which carries a dispensing valve. This top may be fastened to the outer wall of the container by crimping for example. The container also comprises a base which may be fastened to the outer wall in any suitable way, such as by crimping or soldering.

When the products to be dispensed are not to be placed under pressure until the moment of distribution, the bottom of the container may be equipped with a pin which may be moved from outside the container by the user. This pin perforates the wall of an inner reservoir holding the pressurizing fluid. This pressurizing fluid is generally a propellant gas, for example, butane, trichlorofluoro-methane, dichloro-difluoro-methane or dichloro-tetrafluoroethane. The chamber which holds the pressurizing fluid is attached to the base of the container and may consist of a small container attached to the center of the base, or a chamber utilizing the base itself for its lower wall and having an upper wall nearly as large as the base and attached thereto around its periphery. In the latter case a double soldering or double crimping of the upper wall of the chamber and the base to the lower part of the cylindrical outer wall of the container which constitutes the dispenser is required. It should be noted that this arrangement has substantial disadvantages from the point of view of manufacture because, once it has been put together, it must be tested to determine its fluid tightness and strength. If this test yields unsatisfactory results, it is then necessary to throw away the entire assembly comprising the outer wall of the container, its base, and the chamber intended to hold the pressurizing fluid, since they have already been fastened together.

Moreover, in the case of containers of the aerosol bomb type, in which the products to be dispensed cannot be placed under pressure until the moment of distribution, a piston is commonly provided inside the chamber, the products to be dispensed are positioned above this piston, which occupies, at the moment at which the container is filled, a position near the base of the container. This piston places the products to be dispensed under pressure when it is subjected to the force exerted by the pressurizing fluid against its lower face when that pressurizing fluid is caused to escape from the chamber in which it is retained during storage.

When such a piston is used, an essential problem consists in assuring a fluidtight seal between the piston and the wall of the container in which it is to slide so that, when it is placed under pressure, the products to be dispensed, which are initially positioned above the movable piston, cannot escape toward the bottom of the container, and are thus required to pass out completely through the dispensing valve at the top of the container.

Various arrangements have been suggested to insure a good seal between the piston and the outer wall, but these arrangements have, in general, been complicated and relatively expensive.

The purpose of the present invention is to provide a device which may be used for holding products to be dispensed in the form of aerosols and which must be placed under pressure at the moment of distribution by means of a movable piston positioned inside the outer wall of the container. This device comprises simple and inexpensive means for insuring a good seal between the piston and the container wall and eliminates the above disadvantages with respect to the attachment of the chamber holding the pressurizing fluid to the base of the container. In one embodiment of the device according to the invention, the container permits the evacuation of gas resulting from any possible decomposition of the product held above the movable piston to the extent that such gases form.

It is an object of the present invention to provide a new article of manufacture which consists of a container adapted to dispense as an aerosol products which have been retained

under ambient pressure but which are subjected at the moment of distribution to pressure designed to insure such distribution. This container comprises a cylindrical outer wall carrying at its upper end a top equipped with a dispensing valve and a base at its lower end. This base carries a central pin which may be moved from outside the container by the user. There is a movable piston within the container, the central part of which, opposite the base of the container, is provided with a recess holding a cartridge of pressurizing fluid which is separable from the piston. A second recess which is annular in shape encircles the first recess and contains an elastic material. The peripheral wall of the piston is made of a flexible material.

In a preferred embodiment of the invention the elastic material in the annular recess in the piston is an open-cell foam material and is positioned in the recess, which acts as a seat therefor, under an initial compression of between 10 and 30 percent and preferably about 15 percent. This cellular material may advantageously be an open-cell polyurethane foam. A peripheral flange on the piston may be made of a flexible synthetic material such as polyethylene, the thickness of this wall being such that the initial compression of the elastic material exerts sufficient force compressing the peripheral flange of the piston against the wall of the container to ensure fluid tightness during storage.

The separate cartridge in the central recess in the piston is made of a relatively thin perforable material. This may be a thin sheet of aluminum from 0.1 to 0.5 mm. thick. It is obvious that the wall of the cartridge containing the pressurizing fluid should be sufficiently thick to resist the pressure of the pressurizing fluid but capable of being easily perforated by the pin in the container, allowing for the frictional force resulting from the seal between the piston and the container wall, which force makes it possible to keep the piston in position at the moment of perforation of the cartridge wall by the pin. There is accordingly a combination between the effects due to the presence of the independent cartridge in the central part of the piston and those due to the presence of the elastic material in the annular recess in said piston. The pressurizing fluid inside the cartridge may be selected from the group consisting of butane, trichlorofluoro-methane, dichloro-difluoro-methane, dichloro-tetrafluoro-ethane, and mixtures of these fluids.

When the user of a container according to the invention wants to dispense the fluid contained therein, he presses on the pin in the base of the container so as to perforate the wall of the cartridge carried by the movable piston. At this time the cartridge is positioned in the lower part of the container, that is to say, near the base thereof. At the moment of perforation, the piston is held in place by the friction between its peripheral flange and the wall of the container, which friction results from the action of the elastic material in the annular recess in the flexible outer portion of the piston. After perforation, the pressurizing fluid escapes from the cartridge in which it was contained and exerts pressure against the lower surface of the movable piston. In response to this pressure, the movable piston moves in the direction of the dispensing valve, and this movement pressurizes the products to be distributed which were initially inserted above the movable piston. Simultaneously, by reason of the flexibility of the peripheral portion of the piston, the pressure produces an increase in the fluidtightness of the seal between the piston and the outer wall of the container. It will be thus seen that the device according to the invention eliminates all problems relative to the fluidtightness of the seal around the movable piston. It will also be seen that separate cartridge holding the pressurizing fluid which is mounted in a recess in the central part of the movable piston makes it possible to test these cartridges independently before they are mounted in the container according to the invention. If one is found defective, only the cartridge for holding the pressurizing fluid need be thrown away, since it has not yet been attached to the other part of the container.

In another embodiment of the invention as described above, the container is also characterized by the fact that the pin car-

ried by the base of the container and actuated from outside of the container by the user comprises a passageway capable of bringing the space between the lower part of the piston and the base of the container into communication with the outside of the container, when this pin occupies the storage position, said passageway being closed when the container is in the position which permits perforation of the cartridge wall. In a preferred variation of this embodiment, the lower part of the flexible peripheral wall of the piston rests, in storage position, on the base of the container. The pin is held in position during storage by a removable ring which the user removes at the moment of use. The pin travels in a support comprising at its lower end a chamber which is connected to the outside through an orifice. This chamber is internally threaded and the pin has a matingly threaded enlarged portion so that it blocks this orifice and cuts off the chamber from contact with the outer air when the pin is screwed in. The pin has a longitudinal groove through which the chamber in the support may be brought into communication with the space between the base of the container and the lower part of the movable piston. This groove may be blocked when the pointed end of the piston reaches the vicinity of the cartridge wall.

It will be noted that, in this embodiment of the container according to the invention, during the time the container and contents are stored, the space between the lower wall of the piston and the base of the container is constantly in communication with the ambient atmosphere. It follows that, if pressure due to slight decomposition of the product above the movable piston develops in the upper part of the container, the gas generating this pressure may escape as it forms by passing between the flexible flange of the movable piston and the side wall of the container. It may then be evacuated, for example, through the groove in the pin and the orifice in the chamber supporting this pin. Under these circumstances, no excessive pressure can be maintained inside the container according to the invention while the components thereof are in storage position. When the user brings the pin to its perforating position, the connection between the open air and the space between the bottom of the container and the lower surface of the movable piston is closed so that, at the moment of perforation of the cartridge containing the pressurizing fluid, the pressure due to this fluid may effectively develop and act against the lower surface of the movable piston.

In order that the invention may be better understood two embodiments thereof will now be described, purely by way of illustration and example, with reference to the accompanying drawings in which:

FIG. 1 is a schematic axial cross section through a container according to the invention comprising a movable piston having two recesses; and

FIG. 2 shows a device according to the invention provided with a movable piston and a pin providing access to the open air.

Referring now to Figure 1 of the drawings, it will be seen that reference numeral 1 indicates the outer wall of the container and reference numeral 2 indicates the cup at the top of the container which carries the dispensing valve 3. A base 4 is crimped to a bottom of the container wall. A pin 5 encircled by a spring 6 is mounted in the center of the base.

A piston 7 is located inside the container 1 and comprises a central recess on its lower surface within which an independent cylindrical cartridge is seated. The dimensions of the cartridge 9 are such that it is a force fit into the recess 8.

The cartridge 9 made of a sheet of "A 5 " aluminum. Its walls are 0.2 mm. thick. One of the end walls of the cartridge overlaps the wall of the recess and is cold welded thereto forming a flange 10. When the cartridge is seated in the recess 8 in the piston 7, the flange 10 faces the base 4.

Piston 7 is also formed with an annular recess 11 containing a ring of open-cell polyurethane foam material 12. The foam material 12 is forced into the recess 11 so as to have an initial compression of about 15 percent. The peripheral wall of the piston 7 and the recess 11 is about 0.8 mm. thick. The piston as a whole has a height of about 50 mm. and is made of polyethylene.

A mixture of 65 percent trichloro-fluoro-methane and 35 percent dichloro-difluoro-methane is placed inside the cartridge 9. Reference numeral 13 indicates this pressurizing fluid. The products which are to be dispensed by the container according to the invention are indicated by reference numeral 14.

In manufacturing the container according to the invention, the foam ring 12 is placed inside the piston 7 and the cartridge 9 containing the propellant gas 13 is introduced into the recess 8. This cartridge has first been tested to ensure its mechanical strength and sealing properties. The piston which has been made in this manner is then positioned inside the jacket 1. The base 4 carrying the pin 5 is then crimped to the bottom of the container wall 1. It will be appreciated that the piston 7 must be so positioned that its lower surface is close to the base 4. The product 14 which is to be dispensed is then introduced into the upper part of the container after which the top of the container is closed by fastening thereto the cup 2 carrying the dispensing valve 3.

When such a container is to be used, pressure is exerted on the pin 5 compressing the spring 6. The pin then perforates the wall of the cartridge 9 and the propellant 13 escapes from the cartridge and exerts pressure against the lower surface of the piston 7. This moves in the direction of the valve 3 until the pressure of the product 14 becomes equal to the pressure exerted by the propellant 13 at the temperature in question. The user need then only actuate the dispensing valve 3 in order to distribute the product 14, which may be in the form of an aerosol, under pressure.

It will be appreciated that the container according to the invention avoids all those problems relative to the seal between the piston and the container wall, since the pressure of the propellant 13 increases the tightness of the seal at the moment at which the product 14 is placed under pressure. Moreover, the testing of the cartridges 9 which contain the propellant is effected on these cartridges separately, which is a substantial advantage in that only the cartridge itself need be thrown away, if the cartridge is found to be defective. Finally, the container according to the invention avoids the necessity of a double crimp at the base of the container.

Turning now to FIG. 2 of the drawings, it will be seen that, in this embodiment, reference numeral 21 indicates the container according to the invention as a whole. This container is substantially cylindrical and carries at its upper end a dispensing valve 23 and at its lower end a base 24 crimped to the outer wall of the container 21. Reference numeral 27 indicates the movable piston as a whole. This piston is located inside the container 21 and comprises a flexible outer wall 31 the lower part 31*a* of which rests on the base 24 of the container 21. In the central part of the piston is a cartridge 29 of pressurizing fluid which contains a liquefied pressurizing gas 33. Between the wall 31 and the cartridge 29 is a ring of open-cell polyurethane foam 32. A liquid 34 covers the piston 27.

The base 24 of the container 21 carries a pin support 15. The support 15 comprises an axial cylindrical recess 16 in the part which passes through base 24. In alignment with the recess 16 is a chamber 17 which is internally threaded. In the zone adjacent the recess 16 the chamber 17 comprises an orifice 18 communicating with the outside of the container. The pin 19 comprises a point 20, one end of which is positioned inside the container 1. At its other end it has a threaded part 35 which cooperates with the internal threads in the chamber 17 of the support 15. The pin 19 is actuated by the user by means of a knurled button 36. The pin 19 is provided with a longitudinal peripheral groove 37 which extends from a point near its tip 20 to a shoulder 38.

In the storage position of the container 20 the pin 19 is in its lower position, that is to say, the point 20 is a certain distance from the lower wall of the cartridge 29 containing the pressurizing fluid. No contact between the wall of the cartridge 29 and the point 20 can take place because the base 31*a* of the

piston 27 rests on the base 24 of the container. The position of the pin 19 is contained by a removable cardboard ring 39. In this position, the space between the lower surface of the piston 27 and the base 24 is in communication with the outside of the container through the groove 37 and the orifice 18. If an excess pressure due to slight decomposition of the product 34 develops inside the container 21, the gas resulting from this decomposition passes between the lateral wall of the container 21 and the flexible wall 31 and is evacuated through the groove 37, the chamber 17, and the orifice 18. The container 21 cannot, therefore, explode.

When the user desires to operate the device according to the invention, he removes cardboard strip 39 and, starting from the position shown in the drawing, screws the part 35 into the chamber 17. During this movement the orifice 18 becomes blocked, and moreover, because of the shoulder 38, the communication between the chamber 17 and the space between the base 24 and the lower surface of the piston 27 is cut off. When the user continues to rotate the knurled button 36 to screw the pin into its support, the point 20 perforates the wall of the cartridge 29. This results in the development of a pressure corresponding to that of the pressurizing fluid 33 in the space below the piston 27. The piston 27 then moves in the direction of the dispensing valve 23 which places the liquid in the container 21 under pressure.

It will of course be appreciated that the foregoing embodiments have been described purely by way of illustration and example, and may be modified as to detail without thereby departing from the basic principles of the invention. In particular, the product may be distributed through the valve 3 in the form of a liquid rather than an aerosol.

What is claimed is:

1. In a container for dispensing aerosol products to be stored under ambient pressure but subjected to greater pressure at the moment of distribution, which container comprises a cylindrical outer wall, a top carrying a dispensing valve at the upper end of said wall and a base at its lower end, a pin in said base which is movable from a point outside the container, and a movable piston within said container, the improvement according to which the movable piston comprises at the center of the surface thereof facing the base of the container a first recess receiving a separable cartridge of pressurizing fluid and a second recess encircling said first recess, which second recess contains an elastic material, and the peripheral portion of the piston forming the outer wall of said second recess is made of a flexible material.

2. Container as claimed in claim 1 in which said elastic material is an open-cell material.

3. Container as claimed in claim 2 in which said open-cell material is a polyurethane foam.

4. Container as claimed in claim 1 in which the elastic material in said recess is compressed to from 70 to 85 percent of its free volume.

5. Container as claimed in claim 1 in which said piston comprises a peripheral wall made of polyethylene.

6. Container as claimed in claim 1 in which the wall of said cartridge is made of a thin, easily perforable material.

7. Container as claimed in claim 6 in which said cartridge is made of aluminum sheet material from 0.1 to 0.5 mm. thick.

8. Container as claimed in claim 1 in which the cartridge contains a fluid selected from the group consisting of butane, trichlorofluoromethane, dichlorodifluoromethane, dichlorotetrafluoroethane, and mixtures consisting of a plurality thereof.

9. Container as claimed in claim 1 in which the pin carried by said base is provided with a passageway connecting the space between said base and piston to the outside of said container when said pin is out of contact with said cartridge, but said passage is blocked when said pin is in a cartridge perforating position.

10. Container as claimed in claim 1 in which the lower edge of the flexible peripheral part of said piston rests on the base of said container when said cartridge is intact.

11. Container as claimed in claim 1 comprising a removable ring positioned to prevent contact between said pin and said cartridge as long as said ring is in place.

12. Container as claimed in claim 9 comprising a support in which said pin is slidably mounted, said support defining an internal chamber and an orifice connecting said chamber to the outside of said container, the inner surface of the wall of said chamber being threaded and said pin having a matingly threaded enlarged portion which blocks said orifice when said pin is screwed into said chamber until said cartridge is ruptured.

13. Container as claimed in claim 12 in which said pin is provided with a longitudinal passageway positioned to connect said chamber with the space between the base of the container and the piston when said pin is out of contact with said cartridge, but blocked when said pin is in cartridge-perforating position.