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PRESSURE CAN CONSTRUCTION INCLUDING FREE PISTON

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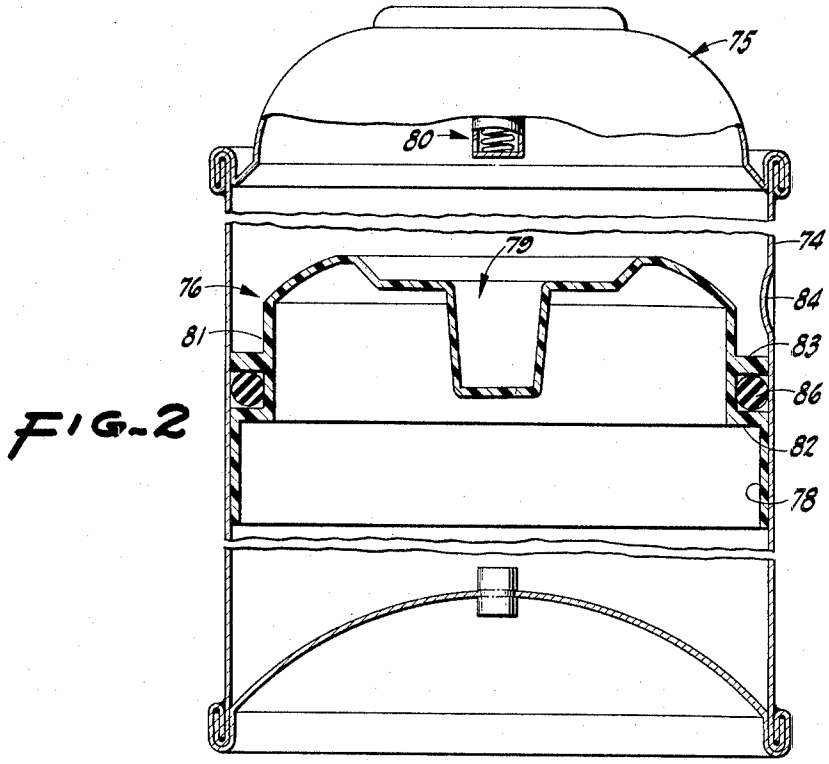


FIG. 2

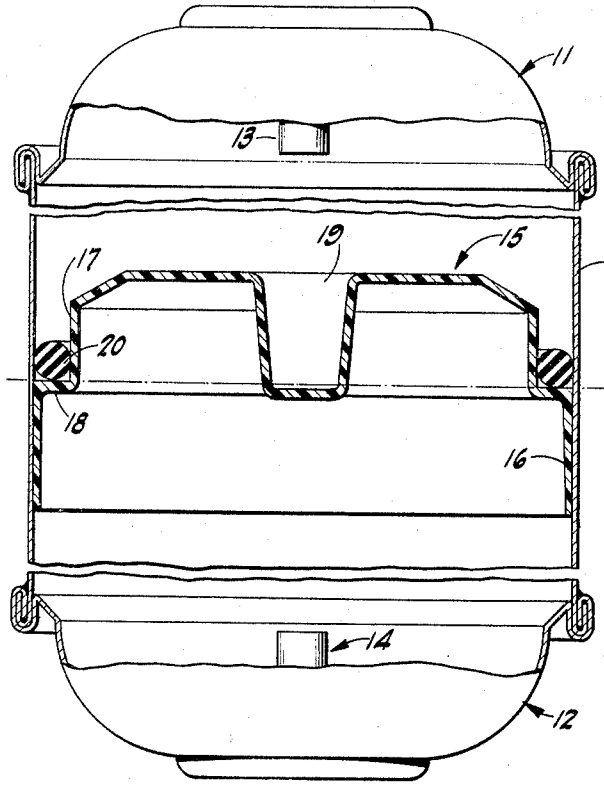


FIG. 1

PARTING LINE

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PRESSURE CAN CONSTRUCTION INCLUDING FREE PISTON

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This application is a continuation-in-part of patent application Serial No. 375,563, dated June 16, 1964.

This invention relates to pressurized cans and more particularly to the type of pressurized cans used for dispensing liquids and which are commonly referred to as aerosols.

The invention is concerned with the type of pressurized can wherein the product to be dispensed is separated from the propellant by a piston which is slidably disposed on the side walls of the can.

Heretofore, pressurized dispensing containers of the type having a free piston separating the product from the propellant have had only a limited use in comparison with the true aerosol type of dispenser wherein the propellant is mixed with the product. In many cases, however, it is essential to separate the product from the propellant since to permit the mixture of the two would destroy the product for its intended purpose. One example of a product requiring separation from the propellant is a foodstuff which may undergo an undesirable reaction when mixed with the propellant even if the latter is nontoxic. Another example is paint colorant which requires very exact formulation and which includes a solvent which tends to separate from the vehicle and pigment.

One of the reasons for the heretofore limited use of the free piston type of pressurized can has been the likelihood of leakage past the piston which, even when occurring to a limited extent, destroys the product for its intended purpose or adversely affects the dispensing operation by causing spraying or foaming.

In the case of paint colorant, it has been found that a conventional free piston type pressurized can such as disclosed in U.S. Patent No. 3,132,570 does not provide a sufficiently good seal to prevent solvent in the colorant from flowing past the piston into the propellant chamber thus changing the critical proportions of the ingredients of the colorant. Furthermore, because of leakage, this type of prior art piston is not suitable for liquid propellants such as Freon and its use is therefore limited to gases such as nitrous oxide and carbon dioxide.

Since it is desirable to maintain the same pressure when the pressurized can is almost empty of product as when the can is filled the use of liquid propellant is necessary is most instances. In fact, in the case of a highly viscous product such as paint colorant, the use of a liquid propellant is considered essential to complete evacuation of the can.

The main object of the present invention is to generally improve the construction of pressurized cans of the free piston type.

Another object of the invention is the provision of an improved free piston construction which incorporates therein an effective seal to prevent leakage between the product and propellant compartments of the can.

Still another object of the invention is the provision of a free piston that is relatively inexpensive to construct

and which may be injection molded without adversely affecting the efficacy of the seal formed thereby.

Yet another object of the invention is the provision of an improved method of assembling a pressurized can with optimum efficiency at minimal expense.

Other objects and advantages of the invention will be apparent from the following specification and the drawings:

FIG. 1 is a vertical cross section through a free piston type of pressurized container showing one form of the present invention.

FIG. 2 is a view similar to FIG. 1 showing another form of the invention.

With reference to FIG. 1 a preferred form of the pressurized can comprises cylindrical side walls **10** to which are fixedly secured dome-like ends generally designated **11**, **12**, respectively. Fixed in said ends **11**, **12**, are valve structures **13**, **14**, which may be identical and of conventional design. These valve structures **13**, **14**, permit introduction under pressure of a product into the can and also permit the discharge of such product when actuated in the manner described in greater detail in patent application Serial No. 375,563. The product is introduced through valve structure **13** while the propellant is introduced through valve structure **14**.

Separating the product and propellant is a free piston generally designated **15**, which, when the can is filled, is adapted to rest at the lower end and, as the contents of the can are discharged, slides along the side walls **10** toward the valve structure **13**.

The piston **15** comprises a cylindrical skirt portion **16** which is slidably received on the inner surface of side walls **10**. Integral with the upper end of skirt portion **16** is an annular ring **18** which extends radially inwardly from said skirt portion and which is integrally secured to the head of the piston. The head of the piston includes a cylindrical portion **17** which is spaced radially inwardly from the side walls **10** of the can and a central cavity **19** which is formed so as to receive therein the valve structure **13**. The particular shape of the head of the free piston surrounding the annular ring **18** is not critical and it is formed generally complementary to the inner configuration of the adjacent end of the can so as to permit as much of the product as possible to be discharged.

The piston **15** may be made inexpensively by injection molding and is preferably formed of a molding grade of acetal resin such as that known under the trademark Delrin.

The annular ring **18** provides an axially directed shoulder against which an O-ring **20** of suitable rubber or plastic is positioned. It will be noted that the assembly of the piston and O-ring is simplified by the fact that the space between cylindrical portion **17** of the piston and side walls **10** of the can is unobstructed so that the O-ring **20** may readily be inserted axially along the cylindrical portion **17** of the piston to the position shown in FIG. 1. Preferably O-ring **20** is snugly fitted around portion **17** to retain it with the piston prior to assembly.

The design of the piston **15** shown in FIG. 1 is extremely important in that it lends inself to molding by means of a split mold in which the parting line is at the juncture between the cylindrical portion **17** and the annular ring **18**. This parting line is indicated in FIG. 1 and it will be apparent that the "fin" which normally results on the molded article at the parting line of the mold

halves does not engage the O-ring 20. For this reason the O-ring 20 makes perfect contact with both the cylindrical portion 17 of the piston and the shoulder defined by the annular ring 18. It has been found in this connection that production of a similar piston by molding with the mold halves parted in a central diametral plane extending axially of the piston results in a molding fin (especially after some use of the molds) which engages the O-ring and permits a minute opening to exist on each side of the fin at the O-ring. In the case of a paint colorant for which the present invention is particularly adapted even a minute leakage permits the Freon or other propellant to pass the piston and combine with the separable solvent in the paint vehicle or other liquid constituting the product.

It will also be understood that a piston construction which incorporated a radially outwardly opening recess (similar to FIG. 2) for receiving the O-ring therein requires the use of complicated mold inserts which also form fins adjacent the O-ring. The addition of an operation for cleaning off such fins is not warranted in most cases since such additional operation raises the cost of the can beyond a commercially acceptable limit.

By the use of Freon or other propellant having a relatively high vapor pressure it is possible to introduce such propellant through the valve structure 14 in a liquid form thereby establishing a relatively high uniform pressure to discharge the product. Products of extremely viscous nature may be dispensed by the pressure can disclosed herein without permitting even a minute leakage past the piston.

It will be understood that the dome-like end 12 may be replaced by a concave end provided with valve structure 14 in the event a free standing can is desired.

Another form of the invention, shown in FIG. 2, is particularly adapted to use with pressure cans having aluminum side walls which are more likely to become dented than steel side walls such as side walls 10 of FIG. 1. In FIG. 2 the can is provided with side wall 74 of aluminum or like metal and is provided at one end with a dome-like head generally designated 75. A fluid to be dispensed is in the space between the head 75 and the free piston generally designated 76. The propellant is on the opposite side of the piston and the end of the can opposite head 75 may be closed in any convenient manner.

The free piston of FIG. 2 comprises a cylindrical skirt portion 78 which is in slidable engagement with the side walls 74 of the pressure can. The upper end of free piston 76 is provided with an upwardly opening cavity 79 for receiving therein the valve structure, generally designated 80, of the pressure can. Between the upper end of the piston 76 and the skirt portion 78 there is provided a generally cllindrical portion 81 connected to the skirt portion 78 by an annular transverse section 82. Formed on the cylindrical portion 81 and integral therewith is an outwardly extending annular flange 83 which is substantially thicker than the thickness of the material forming the remainder of the piston. For example, if the wall thickness of the piston is about .030" the thickness of the flange 83 may be about .063" or substantially twice as thick. These dimensions are given assuming the side wall 74 of the can are made of aluminum of a thickness of about .014". The function of flange 83 is to provide a relatively rigid member which, coacting with the side wall 74, serves to remove any dents such as dent 84, which may be formed in said side wall due to rougher than usual handling. An O-ring 86 is interposed between transverse section 82 and flange 83. In the side walls 74 of the can become dented so that leakage past the O-ring 86 would normally occur, the flange 83 serves to remove such dents by conforming the lighter metal of the side walls 74 to the true cylindrical shape of the skirt 78. The above dimensions of piston 76 are given assuming that the same is made of a molding grade of acetal resin such as Delrin.

The structure of FIG. 1 is particularly economical to construct using steel side walls because the dome-shaped ends 11, 12, and the valve structures 13, 14, are standardized and may be provided at a very low cost. When the pressurized can is employed for dispensing paint colorant which is highly viscous in nature, said colorant may be injected into the can under pressure and, of course, is dispensed under pressure. Certain advantages accrue from the maintenance of the colorant under pressure at all times.

The very specific description of the preferred forms of the invention given above is not to be taken as restrictive as it will be apparent that various modifications in design will occur to those skilled in the art without departing from the following claims.

I claim:

1. In combination with the container body of a pressurized dispenser having cylindrical sidewalls, a free piston comprising:

a generally cylindrical skirt slidably received on said side walls,

an annular ring integral with said skirt and extending radially inwardly from one end thereof to define an axially directed shoulder,

a piston head including a cylindrical portion of less diameter than said skirt and integrally secured to said ring,

an O-ring seal positioned on said shoulder in sealing engagement with said side walls,

the annular space between said portion and said side walls being substantially unobstructed from said shoulder along the entire axial extent of said head to permit said O-ring to be inserted axially through said space and onto said shoulder.

2. In a pressurized dispensing container having cylindrical side walls and a free piston slidably supported for movement along the inner side of said side walls and separating the product from the propellant, said piston comprising:

a cylindrical skirt slidably engaging said inner side,

a first annular ring integral with said skirt and extending radially inwardly from one end thereof to define an axially directed shoulder,

a piston head including a cylindrical portion of less diameter than said skirt and integrally secured to said ring,

a second annular ring integral with said head and spaced axially from said shoulder toward said head to define a radially outwardly opening circular recess between said rings,

an O-ring seal within said recess in sealing engagement with said side walls,

the thickness of said second annular ring being substantially greater than the thickness of said skirt to provide a rigid smoothing means for removing inwardly directed projecting dents on said side walls as said piston moves along the length of the latter.

3. In combination with the container body of a pressurized dispenser having cylindrical sidewalls, a free piston comprising:

a generally cylindrical skirt slidably received on said side walls,

an annular ring integral with said skirt and extending radially inwardly from one end thereof to define an axially directed shoulder,

a piston head including a cylindrical portion of less diameter than said skirt and integrally secured to said ring,

an O-ring seal positioned on said shoulder in sealing engagement with said side walls,

the annular space between said portion and said side walls being substantially unobstructed from said shoulder along the entire axial extent of said head to permit said O-ring to be inserted axially through said space and onto said shoulder,

said piston being molded with the parting line of said mold in the plane of said shoulder.

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