A method of inserting a barrier pack, with a perimeter flange, into a container to be pressurized. The container to be pressurized includes a base, a side wall, and a dome having a perimeter bead, with the perimeter bead of the dome defining an opening having transverse cross-sectional area which is less than a transverse cross-sectional area defined by the side wall of the container to be pressurized. The method comprising the steps of forming the barrier pack with a transverse dimension which is less than a transverse dimension of the opening of the dome. Inserting the barrier pack, with the transverse dimension less than the transverse dimension of the opening of the dome, through the opening of the dome, without application of force, so that the barrier pack is accommodated within an internal compartment of the container to be pressurized with a flange of the barrier pack supported by an annular bead of the dome. Applying a mounting cup, supporting a valve assembly, and crimping the mounting cup to the dome. Filing the barrier pack with a product to be dispensed, pressurizing the container and affixing an actuator to a valve stem of the valve assembly.
METHOD OF ASSEMBLING AEROSOL CONTAINER INCORPORATING BARRIER PACK

[0001] This is a continuation in part of Ser. No. 09/668, 402 filed on Sep. 22, 2000.

FIELD OF THE INVENTION

[0002] The present invention relates to an aerosol container incorporating an improved barrier pack in which a perimeter flange of the barrier pack is sandwiched between a container bead and a mounting cup, of the aerosol container, to form a fluid tight seal therebetween, and a method of assembling an aerosol container with the improved barrier pack located therein.

BACKGROUND OF THE INVENTION

[0003] Currently on the market, there are a variety of aerosol containers which facilitate dispensing of a desired product in a desired manner. Some of these currently available prior art aerosol containers relate to arrangements which separate the product to be dispensed from the propellant. While such product to be dispensed/propellant separation is known, the currently available systems tend to be somewhat costly to manufacture and assemble and such systems do not minimize consumption of raw materials. Further, the assembly of the dispensing container, with separate dispensing and propellant compartments, have associated drawbacks which prevent efficient manufacture and assembly of such aerosol containers.

[0004] One current problem associated with manufacturing an aerosol container having a barrier pack, containing and separating the product to be dispensed from the propellant, is that the barrier pack is manufactured from nylon and is typically supplied to the manufacturing facility in a folded/deflated state. Accordingly, the barrier pack must be steamed, prior to use, to soften the nylon so that the barrier pack will be somewhat relatively easy to be received within the opening defined by the bead of the aerosol container. This additional steaming process step increases the manufacturing costs associated with manufacturing the aerosol container and decreases the associated production time for manufacturing the aerosol container. Alternatively, if the barrier pack is installed within the container, at the container manufacturing facility, the container manufacture still has the same associated problems of efficiently placing the barrier pack within the container.

[0005] Another associated drawback is that the typical accordion-style liner or barrier pack is incorporated into a specially manufactured container which is then combined with a valve assembly and mounting cup to complete assembly of the container. However, as this container is specially manufactured, it is generally fairly costly, in comparison to other aerosol containers, to manufacture and such specialty item leads to increased production costs in the manufacture of the aerosol container for dispensing the product to be dispensed.

SUMMARY OF THE INVENTION

[0006] Wherefore, it is an object of the present invention to overcome the above mentioned shortcomings and drawbacks associated with the prior art barrier pack and aerosol containers incorporating the same.

[0007] It is an object of the present invention to provide an improved barrier pack which minimizes the consumption of raw materials and facilitates essentially complete dispensing of the product to be dispensed from the improved barrier pack.

[0008] Another further object of the present invention is to provide an improved flange, having a uniform thickness similar to that of a lathe cut gasket, which facilitates an improved seal between the bead of the aerosol container and the mounting cup during the assembly process.

[0009] A still further object of the present invention is to provide an improved barrier pack which is readily received within an opening, defined by a bead of the aerosol container, without requiring a steaming step. The elimination of a processing step facilitates quicker assembly and manufacture of the aerosol container incorporating the improved barrier pack according to the present invention.

[0010] Another object of the present invention is to streamline the manufacturing process of an aerosol container, having a barrier pack separating the product to be dispensed from the propellant, to thereby reduce the associated manufacturing costs and production time in producing the aerosol container.

[0011] A further object of the present invention is to eliminate any steaming or other pretreatment procedure of the barrier pack, prior to use, to simplify installation of the barrier pack within for the aerosol container.

[0012] A still further object of the present invention is to provide an improved filling process for pressurizing the aerosol container with a desired propellant to facilitate dispensing of the product to be dispensed from the improved barrier pack.

[0013] Yet another object of the present invention is to provide a small radius transition, located between the neck portion and a remainder of the upper section of the improved barrier pack, to promote expansion of a side wall of the improved barrier pack when the improved barrier pack is filled with a desired product to be dispensed and minimize distortion of the neck portion.

[0014] Yet another object of the present invention is to efficiently and cost effectively drop, place or insert a barrier pack within an interior compartment of a pressurizable container, during manufacture of the pressurized container, in manner which facilitates filling of the barrier pack with a product to be dispensed, during a filling stage, and subsequent dispensing of the product to be dispensed from the barrier pack during use by an end user.

[0015] A still further object of the present invention is to provide a barrier pack insertion station in which the barrier pack is quickly, efficiently, easily and reliably inserted through an opening in a dome formed in top surface of the container to be pressurized so that the barrier pack is accommodated within the interior compartment of the container to be pressurized.

[0016] A further object of the present invention is to reduce the outer circumferential dimension or diameter of the barrier pack, either prior to or as the barrier pack is inserted through the opening in the dome of the container to be pressurized, so to minimize the possibility of any tearing,
ripping, deformation or other damage occurring to the barrier pack during assembly.

[0017] Another object of the present invention is to evacuate the interior space of the barrier pack, via application of a suitable vacuum source, as the barrier pack is handled during assembly of the container to be pressurized to reduce the outer circumferential dimension or diameter of the barrier pack so that the barrier pack is quickly, efficiently, easily and reliably inserted through the opening in the dome of the container to be pressurized during manufacture of the pressurized container.

[0018] Yet another object of the present invention is to install a flangible seal or band, about the outer circumference of the barrier pack, once the outer circumferential dimension or diameter of the barrier pack has been sufficiently reduced to a minimal dimension, i.e. a dimension slightly smaller than the transverse dimension of the opening of the dome, so that the barrier pack is retained in that minimize dimension or diameter configuration during assembly and is quickly, efficiently, easily and reliably inserted through the opening and accommodated within the interior compartment of the container to be pressurized. Following completion of the barrier pack assembly process, the flangible seal or band is broken upon filling the interior space of the barrier pack with the product to be dispensed.

[0019] A still further object of the present invention is to place a valve assembly within the inlet of the barrier pack, prior to inserting of the barrier pack through the opening in the dome of the container to be pressurized, and then evacuate the interior space of the barrier pack, via a vacuum source, to remove a substantial portion of the air or other gaseous fluid contained within the interior space of the barrier pack and thereby reduce the outer dimension or diameter of the barrier pack to a minimal dimension. Once this occurs, the valve assembly is allowed to return to its normally biased closed position which maintains the evacuated state of the barrier pack and retains the barrier pack in its minimize dimension or diameter configuration so that the barrier pack may be quickly, efficiently, easily and reliably inserted through the opening in the dome of the container to be pressurized during manufacture of the pressurized container.

[0020] Another object of the present invention is to form the barrier pack in an initially expanded condition and, prior to solidification of the barrier pack, apply a vacuum source to the interior space of the barrier pack to reduce the barrier pack to a minimize dimension or diameter configuration so that the barrier pack may be cost effectively shipped in bulk, while occupying a minimal amount of shipping and storage space, and such configuration also facilitate insertion of the barrier pack through the opening in the dome of the container to be pressurized without applying force to the barrier pack during installation.

[0021] The term “container to be pressurized having a dome with a reduced opening” means a container having a dome formed integral with a top surface of a side wall of the container with the dome having a central opening therein which provides access to an interior compartment defined by the container to be pressurized, and a transverse dimension of the central opening of the dome is less than the transverse dimension between the inwardly facing surface of the side wall of the container to be pressurized.

[0022] The present invention relates to a method of inserting a barrier pack, with a perimeter flange, into a container to be pressurized in which the container to be pressurized includes a base, a side wall, and a dome having a perimeter bead, with the perimeter bead of the dome defining an opening having transverse cross-sectional area which is less than a transverse cross-sectional area defined by the side wall of the container to be pressurized, the method comprising the steps of providing the barrier pack with a transverse dimension which can be reduced to a transverse dimension which is less than a transverse dimension of the opening of the dome; and inserting the barrier pack, with the transverse dimension less than the transverse dimension of the opening of the dome, through the opening of the dome so that the barrier pack is accommodated within an internal compartment of the container to be pressurized with a flange of the barrier pack supported by an annular bead of the dome.

[0023] The present invention relates to a method of inserting a barrier pack, with a perimeter flange, into a container to be pressurized in which the container to be pressurized includes a base, a side wall, and a dome having a perimeter bead, with the perimeter bead of the dome defining an opening having transverse cross-sectional area which is less than a transverse cross-sectional area defined by the side wall of the container to be pressurized, the method comprising the steps of reducing providing a transverse dimension of the barrier pack to have a transverse dimension which is less than a transverse dimension of the opening of the dome; and inserting the barrier pack, with the transverse dimension less than the transverse dimension of the opening of the dome, through the opening of the dome, without application of force, so that the barrier pack is accommodated within an internal compartment of the container to be pressurized with a flange of the barrier pack supported by an annular bead of the dome.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] The invention will now be described, by way of example, with reference to the accompanying drawings in which:

[0025] FIG. 1 is a diagrammatic front elevational view of the improved barrier pack, according to the present invention, shown in its originally molded deflated state;

[0026] FIG. 2 is a top plan view of FIG. 1;

[0027] FIG. 3 is a bottom plan view of FIG. 1;

[0028] FIG. 4 is a diagrammatic front elevation view of the improved barrier pack, according to the present invention, shown in its inflated state and containing a desired quantity of the product to be dispensed;

[0029] FIG. 4A is a diagrammatic front elevation view of a second embodiment of the improved barrier pack, according to the present invention, shown in its inflated state;

[0030] FIG. 5 is a top plan view of FIG. 4;

[0031] FIG. 6 is a bottom plan view of FIG. 4;

[0032] FIG. 7 is a diagrammatic cross-sectional view of an aerosol container, without an actuator button, incorporating the improved barrier pack according to the present
invention with the improved barrier pack shown in its deflated state prior to being filled with a desired quantity of the product to be dispensed;

FIG. 8 is a diagrammatic cross-sectional view of an aerosol container, without an actuator button, incorporating the improved barrier pack according to the present invention with the improved barrier pack shown in its inflated state after being filled with a desired quantity of the product to be dispensed;

FIG. 9 is an enlarged diagrammatic partial cross-sectional view showing the bead, the mounting cup, the actuator valve and the spray actuator of the aerosol container;

FIG. 10 is a diagrammatic schematic flow diagram showing the process for assembling a container to be pressurized in accordance with the method of the present invention;

FIG. 11 is a diagrammatic view showing a flanged band wrapped about the outer circumference of the barrier pack;

FIG. 12 is a diagrammatic schematic flow diagram showing the pre-assembly process for assembling the barrier pack with the valve assembly in accordance with the method of the present invention;

FIG. 13 is a diagrammatic view of the combined valve assembly and barrier pack unit in accordance with the method of the present invention;

FIG. 14 is a diagrammatic schematic flow diagram of the second embodiment showing the process for assembling a container to be pressurized in accordance with the method of the present invention;

FIG. 15 is a diagrammatic schematic flow diagram of the third embodiment showing the process for assembling a container to be pressurized in accordance with the method of the present invention; and

FIG. 16 shows a partial cross section of a modification of the barrier pack and the mounting cup to facilitate locking engagement of the barrier pack with the mounting cup following placement of the valve assembly within the neck portion of the barrier pack.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Initially a detailed discussion concerning the improved barrier pack, according to the present invention, will be provided. This discussion will then be followed by a detailed description concerning an aerosol container incorporating the improved barrier pack as well as a method of manufacturing the same.

With reference now to FIGS. 1-6 and 9, and initially FIGS. 1-3, the various features of the inflatable barrier pack 2 can be discerned. As can be seen in these Figures, the improved barrier pack is general designated as element 2 and has an inlet 3 at a first end 4 thereof and is closed at an opposite end 6. As can be seen in FIGS. 1, 4 and 9, the inlet of the improved collapsible is defined by a neck portion 8 which includes a perimeter flange 10 with an outwardly flaring exterior surface which is contoured to closely follow the exterior profile or contour of a bead 40, of an aerosol container 30, and be sandwiched between the bead 40 and the inwardly facing surface of the curl of a mounting cup (see FIG. 9) during manufacture of the aerosol product. The perimeter flange 10 has a uniform thickness of about 0.015 to 0.020 of an inch and is generally flat and smooth on both opposed surfaces thereof, similar to a lathe cut gasket, to facilitate forming a fluid tight seal. A further detailed description concerning the sandwiching and sealing feature will follow below.

The improved barrier pack 2 generally comprises an upper section 12 (see FIG. 4), which includes the neck portion 8, the flange 10, and an outwardly tapering region 13 which tapers outwardly in the inflated state of the improved barrier pack 2, a mid-section 14 which is generally cylindrical in shape in both the deflated and inflated states of the improved barrier pack 2, and a lower section 16 which tapers inwardly, in the inflated state of improved barrier pack 2, and forms the closed end 6 of the improved barrier pack 2.

The preferred wall thickness dimensions for the neck 8 is on the order of between 0.010 and 0.030 inch, and most preferably about 0.015 inch. A remainder of the sidewall of the upper section 12, the mid-section 14 and the lower section 16 all have a substantially uniform and constant wall thickness of between 0.005 and 0.025 inch, and most preferably a wall thickness of about 0.006 inch. As can be seen in FIGS. 1 and 4, there is a gradually transition in the wall thickness from the wall thickness of the flange 10 and neck portion 8 to the thinner wall thickness of the remaining portion of the upper wall section 12. This gradually transition generally occurs at a small radius transition 28.

The axial length of the improved barrier pack 2, in the deflated state, is between 3 and 8 inches, and most preferably about 7.56 inches while the diameter of the improved barrier pack 2, in the deflated state, is between 0.5 and 1.0 inch, and most preferably about 0.875 inch. The axial length of the neck portion 8 is between 0.5 and 1.0 inch, and most preferably about 0.69 inch. Preferably the improved barrier pack 2 is manufactured from a resilient, durable, readily expandable material such as nylon, polyethylene, polytetrafluoroethylene or any other conventional material which is typically used for molding flexible components.

An important aspect of the improved barrier pack 2 is that the neck portion 8 must have a sufficiently small outer diameter to be readily received within central opening 41 defined by the bead 40 of an aerosol container 30 while the flange 10 must be of a sufficient large diameter to adequately engage with and sufficiently at least partially overlap the curl of the bead 40 of the aerosol container 30 and thereby adequately support and seal the improved barrier pack 2 on the bead 40. The flange 10 has a radius or curvature of about 0.062 inch and has a maximum diameter, at the remote free end of the flange 10, of about 1.15 inches. This arrangement facilitates proper positioning of the flange 10 of the improved barrier pack 2 and sandwiching of the flange 10 between the bead 40 and the perimeter curl 33 of the mounted cup 32 (see FIGS. 7 and 8) during a conventional crimping process. In event that there is inadequate overlap and sandwiching of the flange 10 between the bead 40 and the mounting cup 32, the aerosol container 30 may not be adequately sealed and a leak can develop thereby resulting in an inadvertent gradual discharge of a significant portion of the propellant 92.
The neck portion 8 must also have a suitably sized internal diameter so that the neck portion 8 can readily receive a lower pedestal region of the mounting cup 32, when mounted therein during manufacture of the valve, and this receiving feature will be discussed below in further detail with respect to the discussion of the process for manufacturing the aerosol container 30.

The neck portion 8 and the flange 10, of the upper sidewalk 12, are both devoid of any longitudinally extending pleats 22 while the remainder of the sidewalk of the upper section 12, the sidewalk of the mid-section 14 and the sidewalk of the lower section 16 each include a plurality of continuous longitudinally extending pleats 22, e.g. between 4 and 36 and preferably 16 (please note that only 1 pleat is shown for illustration purposes in FIGS. 1 and 4). Each longitudinally extending pleat 22 is formed by alternating longitudinal extending peaks 24 and valleys 26 (see FIGS. 4 and 5). The longitudinal extending peaks 24 and valleys 26 are all radius and all of the peaks 24 have substantially the same configuration and all of the valleys 26 have substantially the same configuration. Each of the longitudinal extending peaks 24 and each of the longitudinal extending valleys 26 lies in a longitudinally extending plane which passes through a central longitudinal axis A of the improved barrier pack 2. The longitudinal extending peaks 24 and the longitudinal extending valleys 26 each extend substantially the entire length of the lower section 16 and the mid-section 14 and a lower portion of the upper section 12, except for the neck portion 8 and the flange 10.

When the deflated improved barrier pack 2 (see FIGS. 1-3) is inflated with a desired product to be dispensed 18, e.g. shaving cream, the improved barrier pack 2 expands and assumes the configuration shown in FIGS. 4-6 of the drawings. The tips of all of the longitudinally extending peaks 24 are located at a distance of approximately 1 inch from the central longitudinal axis A of the improved barrier pack 2 while the bases of all of the longitudinally extending valleys 26 are located at a distance of approximately 0.90 inches from the central longitudinal axis A of the improved barrier pack 2. The longitudinally extending peaks 24, in their expanded state, have a radius of curvature of approximately 0.115 inches while the longitudinally extending valleys 26, in their expanded state, have a radius of curvature of approximately 0.060 inches.

In the deflated state of the improved barrier pack 2 (see FIGS. 1-3), a pair of longitudinally extending planes, which extend through a pair of adjacent sidewalks joining the longitudinally extending peaks 24 with a common longitudinally extending valley 26, form an angle therewith of about 40 degrees (see FIG. 3) while, in the inflated state of the improved barrier pack 2, a pair of longitudinally extending planes, which each extend through an adjacent one of the longitudinally extending peaks 24 and the central longitudinal axis A of the inflated improved barrier pack 2, form an angle therewith of about 22.5 degrees (see FIG. 6).

The small radius transition 28, referred to above, is located between the neck portion 8 and the remainder of the upper section 12 of the improved barrier pack 2. This small radius transition 28 provides a reduced diameter area which separates the inlet 3 from a remainder of the improved barrier pack 2. That is, the inner diameter of the neck portion 8, adjacent the inlet, is between 1.035 and 0.930 inch, and most preferably about 0.960 inch, while the inner diameter at the small radius transition 28 is between 0.975 and 0.870 inch and most preferably about 0.91 inch. The exterior radius of curvature of the small radius transition 28 is about 0.065 inch. The purpose of the constriction, formed by the small radius transition 28 in the improved barrier pack 2, is to facilitate and promote bending of the outwardly tapering sidewalk 13 when the improved barrier pack 2 is filled with a desired product to be dispensed 18. The small radius transition 28 may also assist with providing a partial seal between the inwardly facing surface of the improved barrier pack 2 and the exterior outwardly facing surface of the valve body 42 (see FIG. 9) to minimize the amount of shaving cream, or some other product to be dispensed 18, which can flow along the exterior surface of the valve body 42 toward the seal formed between the bead 40 and the mounting cup 32.

In the inflated state of the improved barrier pack 2, the outwardly tapering sidewalk 13 of the upper section 12 forms an angle of about 29° with the sidewalk 15 of the mid-section 14 while the sidewalk 15 of the mid-section 14 forms an angle of about 40° with the inwardly tapering sidewalk 17 of the lower section 16. The axial length of the improved barrier pack 2, when filled with a desired product to be dispensed 18, is approximately 6.8 inches.

Turning now to FIGS. 7-9, a brief description concerning the various components of the aerosol valve, to be used with the improved barrier pack 2, will now briefly discussed. As can be seen in this embodiment, the aerosol container 30 comprises a conventional mounting cup 32 installed on a base container 34. The mounting cup 32 supports an actuator assembly 38. The actuator assembly 38, see specifically FIG. 9, comprises a valve body 42 supporting an upstanding valve stem 46, a biasing spring 48 and a gasket 50. The biasing spring 48 and the gasket 50 are assembled within the valve body 42 and the valve body 42 is clamped or crimped to the mounting cup 32 in a conventional manner by means of a plurality of indentations or crimps 52, e.g. four or six indentations or crimps are formed in the exterior sidewalk of the pedestal portion 54 to permanently attach the actuator assembly 38 to the mounting cup 32. The crimping operation forces the valve body 42 slightly upward, relative to the mounting cup 32, to bias and compressively seal the gasket 50 against the inwardly and downwardly facing surface of the mounting cup 32.

A portion of the valve stem 46 protrudes through a central aperture 56 provided in the pedestal portion 54 of the mounting cup 32 and this protruding portion of the valve stem 46 supports an actuator button 44. The actuator button receives and snugly fits over an exterior surface of the valve stem 46. The product inlet 60, in turn, communicates with a discharge outlet 64 of the actuator button 44, via a button cavity 66 and at least one radial supply passageway 68.

The valve stem 46 includes a central bore 62 having a dispensing end which communicates with product inlet 60. The opposite end of the central bore 62 communicates with at least one radial orifice 70, and possibly two, three, four or more radial orifices 70 equally spaced about the circumference of the valve stem 26, which are each temporarily blocked from discharging product by a seal formed between the gasket 50 and an annular sealing rib (not shown) when the valve is in its normally spring biased
closed position. When the actuator assembly 38 is sufficiently depressed by an operator, this seal is broken and communication is established between the radial orifice(s) 70 and the interior cavity 78 of the valve body 42 for discharging the product to be dispensed 18 from the improved barrier pack 2 of the aerosol container 30, during the dispensing process, to the discharge outlet 64 of the actuator button 44 at a desired product dispensing rate.

[0057] The valve body 42 has a thickened mouth 76. The valve body 42 also includes a side wall 80 and a floor wall 82 which is provided with an inlet aperture 84. During the crimping operation with the pedestal portion 54, the plurality of indentations or crimps 52 engage a lower portion of the thickened mouth 76 and force the valve body 42 upwardly so as to compress and seal the gasket 50 against the inwardly and downwardly facing surface of the mounting cup 32.

[0058] The valve stem 46 includes an enlarged head 86. The enlarged head 86 is centrally connected to the valve stem 46 at a vertically lower end of the valve element. An annular recess 87 is formed in the undersurface of the enlarged head 86 to receive and center a top portion of the spring 48. The spring 48 is compressibly disposed between the floor 82 and the enlarged head 86 to urge the valve element away from the floor 82 into its elevated normally closed position. The upwardly facing surface of the enlarged head 86 is provided with an annular sealing ring or rib (not shown) which normally seats against the lower or downwardly facing surface of the gasket 50 to form a fluid tight seal therebetween. The radial orifice(s) 70 is located adjacent the enlarged head 86 but is normally closed off by abutting engagement between the annular sealing rib (not shown) with the gasket 50 and by a seal formed between an axially extending sidewall of the gasket 50 and the radial orifice(s) 70, when the valve element is in its elevated normally closed position (see FIG. 9).

[0059] A product inlet 88 communicates with an internal cavity 78 of the valve body 42, via the inlet central aperture 84, to supply a product to be dispensed 18 to the valve. If desired, a product dip tube 94 may be fitted over the lower end of the valve body 42 and surround the product inlet 88. A lower end of the product dip tube 94 communicates with the closed end 6 of the improved barrier pack 2 (see FIG. 7) to facilitate dispensing of the product to be dispensed 18 therefrom as desired.

[0060] When an operator desires to dispense product, the above described valve operates in a conventional fashion. Upon initial depression of the actuator, the valve stem 46 compresses the biasing spring 48 which moves the annular scaling rib out of abutting engagement with the gasket 50 and establishes fluid communication between the radial orifice(s) 70 and the internal cavity 78 to allow the product to be dispensed 18 to flow up along and through the dip tube 94, if utilized, into the internal cavity 78, via the inlet central aperture 84. The product to be dispensed 18 then flows between an inwardly facing surface of the valve body 42 and along an outer surface of the enlarged head 86 of the valve stem 46. The product to be dispensed 18 then flows radially through the space formed between gasket 50 and the annular scaling rib and through the radial orifice(s) 70 and along the central bore 62 of the valve stem 46.

[0061] Next, the product to be dispensed 18 is then conveyed to the central product inlet or aperture 60 of the actuator button 44 into the button cavity 66. Finally, the product flows along the at least one radial passageway 68 and thereafter is dispensed directly into the atmosphere via the discharge outlet 64 of the actuator button 44.

[0062] Prior to sale of the aerosol container 30, the improved barrier pack 2 is directly received in the opening defined by the bead 40 and the interior space 29 of the improved barrier pack 2 is filled with a product to be dispensed 18, e.g. shaving cream, while a remaining interior region 90 of the aerosol container 30, located between the exterior surface of the improved barrier pack 2 and the interior surface of the aerosol container 30, is filled with a suitable quantity of a pressurized gas or propellant 92 to supply the necessary dispensing pressure to the exterior surface of the improved barrier pack 2 and facilitate dispensing of the product to be dispensed 18 when the operator actuates the aerosol valve.

[0063] In order to assemble the aerosol container 30, according to the first embodiment of the present invention, the base of the aerosol container 34 is first assembled in a conventional fashion so as to form a container bottom, a container sidewall and a contain top or dome 95 supporting the perimeter bead 40. The perimeter bead 40 defines a central opening 41 providing access to the interior region 90 of the aerosol container 30.

[0064] The valve assembly 38 is also manufactured in a conventional fashion such that the actuator button 44 will preferably be attached to the valve stem 46 of the actuator assembly during the valve assembly 38 manufacturing process. Likewise, the improved barrier pack 2 will be manufactured, via conventional blow molding equipment, and supplied to the aerosol container production facility for assembly with an desired aerosol container 30. If desired, the improved barrier pack 2 may be coupled to the valve assembly 38 by gluing or other conventional and common attachment arrangement so that those two components are combined or assembled with one another and form a single unit.

[0065] During assembly of the aerosol container 30, a plurality of container bases 34 are conveyed, via conventional conveying equipment (not shown) to an assembly area. At the assembly area, the improved barrier pack 2 is placed and received within the opening defined by the bead 40 so that the closed end of the improved barrier pack 2 is located adjacent the bottom of the aerosol container base 34 and outwardly flaring exterior surface of the perimeter flange 10, of the neck portion 8, engages with the exterior surface of the bead 40, of the aerosol container 30. Thereafter, the mounting cup 32, with the attached valve assembly 38 and actuator button 44, is placed over the bead 40 and received within the inlet 3 of the improved barrier pack 2 such that a major portion of the valve assembly 38 is received by and located within the interior cavity 29 of the improved barrier pack 2 and the perimeter flange 10 is sandwiched between the bead 40 and the inwardly facing surface of the perimeter cup 33 of the mounting cup 32 (see FIG. 9) during manufacture of the aerosol product.

[0066] Once this has occurred, the perimeter cup 33 of the mounting cup 32 is crimped to the bead 40 of the aerosol container 30, in a conventional manner, to permanently attach the mounting cup 32 to the bead 40 and sandwich the flange 10 of the improved barrier pack 2 therebetween. Such
crimping forms a fluid tight seal between those two mating components. After this has occurred, the aerosol container 30 is then ready to be filled with a desired product to be dispensed 18 as well as a desired propellant 92.

The unfilled and unpressurized aerosol container 30 is then conveyed to a filling station where the desired product to be dispensed 18 is supplied to the non-pressurized aerosol container 30 via a conventional button-on filling process. During the button-on filling process, the actuator button 44 is sufficiently depressed, by the associated filling equipment, in a conventional manner, such that a first product flow path is established with the interior cavity 29 of the improved barrier pack 2 via the discharge orifice 64, the radial supply passageway 68, the button cavity 66, central product inlet aperture 60, the central passage 62, and the radial orifice(s) 70, the internal cavity 78, the inlet aperture 84 and the product dip tube 94 (if employed). The filling equipment is operated to dispense a desired quantity of product into the interior cavity 29 and completely fill the improved barrier pack 2. Once this has occurred, the button-on filling process is discontinued and another aerosol container(s) is then similar filled. The button-on filling process is repeated at the manufacturing facility as necessary.

Thereafter, a propellant 92 is supplied via an access aperture 91 in the base of the container 34 to the interior region 90 of the aerosol container 30 (see FIG. 7). Once a sufficient supply of propellant 92 is supplied to the interior region 90, the filling process ceases and a conventional rubber plug 93, or some other stopper member, is inserted in the access aperture 91 of the base of the container 34 to seal to hole and prevent propellant 92 from leaking from the aerosol container (see FIG. 8).

As such filling process is conventional and fairly well known in the art, a further detailed description concerning the same is not provided.

According to a second embodiment of the present invention, the base of the aerosol container 34 is assembled in a conventional fashion so as to form a container bottom, a container sidewall and a contain top supporting the perimeter bead 40. The perimeter bead 40 defines the central opening 41 providing access to the interior region of the aerosol container 30.

Likewise, the valve assembly 38 is manufactured in a conventional fashion such that the actuator button 44 will preferable be attached to the valve stem 46 of the actuator assembly during the valve assembly 38 manufacturing process. The improved barrier pack 2 will also be manufactured, via conventional blow molding equipment, and supplied to the aerosol container production facility for assembly with an desired aerosol container 30. If desired, the improved barrier pack 2 may be coupled to the valve assembly 38 by gluing or other conventional and common attachment arrangement so that those two components are combined or assembled with one another and form a single unit.

During assembly of the aerosol container 30, a plurality of container bases 34 are conveyed along via conveying equipment to an assembly area. At the assembly area, the improved barrier pack 2 is placed and received within the opening defined by the bead 40 so that the closed end of the improved barrier pack 2 is located adjacent the bottom of the aerosol container base 34 and outwardly flaring exterior surface of the perimeter flange 10, of the neck portion 8, engages with the exterior surface of the bead 40, of the aerosol container 30. Thereafter, the mounting cup 32, with the attached valve assembly 38 and actuator button 44, is placed over the bead 40 and received within the inlet 3 of the improved barrier pack 2 such that a major portion of the valve assembly 38 is located within the interior cavity 29 of the improved barrier pack 2 and the perimeter flange 10 is sandwiched between the bead 40 and the inwardly facing surface of the curl of the mounting cup 32 (see FIG. 9).

Next, the improved barrier pack 2, the mounting cup 32, the attached valve assembly 38 and the actuator button 44 are all engaged with the associated under-the-cup filling equipment in a conventional manner. The interior region 90 of the aerosol container 30 is then filled with a desired quantity of a propellant 92 and then the improved barrier pack 2, the mounting cup 32, the attached valve assembly 38 and the actuator button 44 are all lowered, via the associated under-the-cup filling equipment, into the opening 41 of the bead 40 so that the closed end of the improved barrier pack 2 is located adjacent the bottom of the aerosol container base 34 and outwardly flaring exterior surface of the perimeter flange 10, of the neck portion 8, engages with the exterior surface of the bead 40, of the aerosol container 30. Thereafter, the perimeter curl 33 of the mounting cup 32 is crimped to the bead 40 of the aerosol container 30, in a conventional manner, to permanently attach the mounting cup 32 to the bead 40 and sandwich the flange 10 of the improved barrier pack 2 and form a fluid tight seal between those two mating components. Once this has occurred, the aerosol container 30 is adequately pressurized and then ready to be filled with a desired product to be dispensed 18 as well as a desired propellant 92.

The pressurized aerosol container 30 is then conveyed to a filling station 106 where the desired product to be dispensed 18 is supplied to the pressurized aerosol container 30 via a conventional button-on filling process. During the button-on filling process, the actuator button 44 is sufficiently depressed, by the associated filling equipment in a conventional manner, such that a first product flow path is established with the interior cavity 29 of the improved barrier pack 2 via the discharge orifice 64, the radial supply passageway 68, the button cavity 66, central product inlet aperture 60, the central passage 62, and the radial orifice(s) 70, the internal cavity 78, the inlet aperture 84 and the product dip tube 94 (if employed). The filling equipment is operated to dispense a desired quantity of product into the interior cavity 29 and completely fill the improved barrier pack 2. Once this has occurred, the button-on filling process is discontinued and another aerosol container is then similar filled. The process is repeated at the manufacturing facility as necessary.

It is to be appreciated that a conventional button-off filling process could also be employed, if desired, instead of a button-on filling process, and after filling of the aerosol container with the product to be dispensed, via the button-off filling process, the actuator is then install on the valve stem in a conventional fashion. If a button-off filling process is utilized, the actuator is supplied to the aerosol manufacturing facility separately from a remainder of the valve assembly 38.
With reference now to FIG. 10, a detailed description concerning one preferred process for assembly of a container to be pressurized, incorporating the barrier pack 2 according to the present invention, will now be discussed in detail. As is diagram schematically shown in FIG. 10 of the drawings, a plurality of containers 30 to be pressurized are conveyed, along an assembly line, to a barrier pack assembly station 102. Each one of the containers to be pressurized 30 is substantially identical to one another and each comprises a base surface integrally formed with a lower portion of a side wall of the container. The upper portion of the side wall is integrally formed with a dome 95. The dome 95 has a central opening 41 which provides access to an interior compartment of the container to be pressurized 30 and the transverse dimension of the central opening 41 of the dome 95 typically is about one inch or so while the transverse dimension between the inwardly facing surfaces of the side wall of the container to be pressurized 30 is typically between about 1½ inch to 3 inches or so. Accordingly, the dome 95 forms a restricted central opening 41 which allows access to the interior compartment defined by the container to be pressurized 30 through which the barrier pack 2 must be inserted during assembly.

Once each container to be pressurized 30 reaches a barrier pack assembly station 102, a barrier pack 2 is inserted through the central opening 41 in the dome 95 of the container to be pressurized, by conventional handling equipment so that the barrier pack 2 is accommodated within the interior compartment of the container to be pressurized. It is to be appreciated that the barrier pack 2 must have a transverse dimension which is somewhat less or smaller than the transverse dimension of the central opening 41 of the dome 95 so that the barrier pack 2 can be easily and readily passed therethrough without the application of force so as to minimize the possibility of any tearing, ripping, rupturing, damage, etc. of the barrier pack 2 during such insertion. In addition, it is most desirable to avoid mechanically forcing, coercing or cramping of the barrier pack 2 through the opening 41 in the dome 95 of the container to be pressurized 30 into the interior compartment of the container as this expedites a more accurate placement of barrier pack 2 within the interior compartment and facilitates an improved sealing of the barrier pack 2 with respect to the mounting cup 32, as will be described below in further detail. Preferably, the barrier pack 2 is simply “dropped” into the container to be pressurized 30 via the central opening 41.

Once the barrier pack 2 is properly inserted through the central opening 41 in dome 95 of the container to be pressurized, the container to be pressurized 30 is then conveyed to a valve assembly station 104. It is to be appreciated that once the barrier pack 2 is properly placed within the interior compartment of the container to be pressurized, the flange 10 of the barrier pack 2 will rest upon and partially overlap the bead 40 of the dome 95 so that the flange 10 of the barrier pack 2 can provide a suitable seal with the valve once crimped to the container to be pressurized 30 in a conventional manner. It is to be appreciated that the axial length of the barrier pack 2 may typically be slightly longer, e.g. ½ an inch or so, than the axial length of the container to be pressurized 30 when the barrier pack 2 is in its minimal transverse dimension or diameter configuration (see FIG. 1) while the barrier pack 2, once filled with the product to be dispensed 18, occupies a small axial dimension than the axial dimension of the pressurized container (see FIG. 4). To facilitate proper placement of the barrier pack 2 within the container to be pressurized, it may be desirable to form the bottom portion of the container in an accordion-style configuration (see FIG. 11) so that the bottom portion of the barrier pack 2 can be slightly compressed, during insertion of the barrier pack 2 through the central opening 41 of the dome 95 of the container to be pressurized, and so as to facilitate mating engagement between the flange 10 of the barrier pack 2 and the bead 40 of the dome 95.

At the valve assembly station 104, a normally closed valve, supported by a mounting cup 32, is then placed over the dome 95 of the container to be pressurized so that the flange 10 of the barrier pack 2 is located between a downward-facing surface of an perimeter curl 33 of the mounting cup 32 and the upwardly facing bead 40 of the dome 95. The normally closed valve supports a valve stem 46 which facilitates dispensing of the product to be dispensed 18 from the container to be pressurized 30 once an actuator is affixed thereto. As soon as the mounting cup 32 is sufficiently engaged with the upwardly facing bead 40 of the dome 95, the mounting cup 32 of the valve assembly 38 is crimped to the dome 95 of the container to be pressurized 30 with the flange 10 of the barrier pack 2 located therebetween, to provide a fluid-type pressurized seal between the mounting cup 32 and the dome 95.

It is to be appreciated that the valve assembly 38 may or may not, depending upon the specific application, include a dip tube 94 to facilitate dispensing product located adjacent a base portion of the barrier pack 2.

As such dip tube feature is conventional and well known in the art, a further detailed description concerning the function and purpose of the same is not provided.

Next, the container to be pressurized 30 is conveyed to a product filling station 106 where the product to be dispensed 18, by the pressurized container, is supplied to the interior space 29 of the barrier pack 2 by a conventional button-off filling process. That is, a conventional button-off filling head is lowered into engagement with the upwardly projecting valve stem 46 of the valve and sufficiently depresses the valve stem to open the valve. Once the valve is opened, the interior space 29 of the barrier pack 2 is initially subjected to a vacuum source to evacuate any remaining air or other gaseous fluid contained within the barrier pack 2. Once this is completed, the barrier pack 2 is then completely filled with the product to be dispensed 18, e.g. about 7 ounces of the product to be dispensed 18 are supplied to the interior space 29 of the barrier pack 2 by the button-off filling head in matter of a few seconds or so. Once the interior space 29 of the barrier pack 2 is completely filled with the product to be dispensed 18, the product filling head is removed from the valve stem 46, which allows the valve to close, and the container is then conveyed to the pressurization station 108.

At the pressurization station 108, the container to be pressurized 30 is then sufficiently pressurized with a suitable aerosol propellant 92 or possibly pressurized air. Generally, the base surface the container to be pressurized 30 has a small access aperture 91 provided therein and a conventional propellant pressurizing nozzle engages with and may possibly extend partially through the access aperture 91 to communicate with the interior compartment of the
container to be pressurized. Once the propellant pressurizing nozzle appropriately engages with the access aperture, a sufficient quantity of a pressurize propellant is supplied to the interior compartment of the container to be pressurized, and this propellant is located between the exterior surface of the barrier pack and the inner side wall of the container to be pressurized, e.g. about 30-60 psi of propellant is supplied to the container to be pressurized. After this occurs, a plug, e.g. a rubberized plug, is inserted into the access aperture, in a conventional manner, to seal the access aperture and prevent the escape of the supplied propellant from the interior compartment of the container to be pressurized. Finally, the pressurized nozzle is withdrawn from the access aperture.

Lastly, the container to be pressurized is then conveyed to a button application station where a suitable spray button or actuator is applied to the valve stem in a conventional manner. It is to be appreciated that, depending upon the application, the button may be applied alone or in combination with an overcap. As both the application of the button/actuator alone or in combination with an overcap, are conventional and well known assembly processes, a further detailed description concerning the same is not provided.

During blow molding of the barrier pack, it is preferable to mold the barrier pack in its fully expanded configuration but, prior to solidification of the mold barrier pack, to subject the molded barrier pack to an evacuation pressure to reduce outer circumference of the barrier pack to a minimal dimension or diameter configuration (see FIG. 1). Preferably, the barrier pack will be allowed to solidify in its minimal dimension or diameter configuration so that the barrier pack will permanently retain this configuration after completion of the injection molding process. In the event that the barrier pack does not retain its minimal dimension or diameter, following completion of the injection molding process, e.g. the barrier pack slightly expands and increases in circumference, it may be desirable to wrap the exterior surface of the central portion of the barrier pack with a frangible seal or band, e.g. a paper band, which can be easily or readily fractured, during the button-off filling process, whereby the frangible seal or band will be broken by expansion of the circumference of the barrier pack but will remain inside the container to be pressurized following completion of the manufacturing process. An elongate line of weakening (not separately numbered) may be provided to assist with fracture of the frangible seal or band. It is to be appreciated that when the barrier pack occupies its minimal dimension or diameter, this configuration also facilitates inserting of the barrier pack through the opening in the dome of the container to be pressurized and minimizes the possibility of any damage or other malfunction occurring during barrier pack assembly.

In the event that the barrier pack, following completion of the blow molding process, does not retain its minimal transverse dimension or diameter, it may be desirable to convey the formed barrier pack through a pair of nip rollers (not shown), or some other sandwicking arrangement, which reduces the transverse dimension of the barrier pack to a minimal dimension or diameter. Either when the barrier pack is located within a nip between the rollers, or prior to the barrier pack sufficiently re-expanding upon exiting from the nip rollers, a frangible seal or band is placed or wrapped around the outer circumference of the barrier pack to maintain the barrier pack in its minimal dimension or diameter configuration. Thereafter, the formed barrier pack can be shipped in a minimal dimension or diameter configuration which facilitates inserting or dropping of the barrier packs through the central opening in the dome of the container to be pressurized at the manufacturing facility.

Alternatively, to ensure that the barrier pack occupies a minimal transverse dimension or diameter at the time the barrier pack is inserted through the central opening in the dome of the container, each inserted barrier pack can be retrieved by a conventional suction pick-up head with suction capability. The pick-up head, upon engaging with the inlet of the barrier pack, subjects the barrier pack to a vacuum source to remove a substantial portion of the air or other gaseous fluid container within the interior space of the barrier pack. Such suction action collapses the barrier pack upon itself and reduces the barrier pack to a minimal dimension or diameter configuration (see FIG. 1). The vacuum source is maintained on the barrier pack until the barrier pack is inserted through the central opening of the dome of the container to be pressurized. In order to compensate for the longer axial length of the barrier pack, with respect to the container to be pressurized, it may be desirable, once the barrier pack has been substantially inserted within the interior compartment of the container to be pressurized, to inflate the barrier pack with air so that the barrier pack will occupy the minimal axial length configuration (see FIG. 4) and be properly positioned within the container to be pressurized so that the flange of the barrier pack rests upon the bead of the dome. Thereafter, the mounting cup of the valve assembly can be suitably positioned over the perimeter of the barrier pack and crimped in position as described above.

Alternatively, it is to be appreciated that the barrier pack and the valve assembly can be combined with one another, at a pre-assembly station in which the exterior pedestal portion of the mounting cup is received within the inlet of the barrier pack and the flange of the barrier pack is matingly received by a downwardly facing undersurface of the cup portion of the mounting cup. To facilitate such retention of the barrier pack by the mounting cup, an inwardly facing surface of the inlet of the barrier pack may be provided with one or more annular lips, protrusions, or some other conventional retaining member, while an outwardly facing exterior surface of the pedestal portion of the mounting cup can be provided with a mating recess or member to facilitate permanent retention of the barrier pack with the pedestal portion of the mounting cup. Once the assembly of the barrier pack with the valve assembly is completed, the combined valve assembly and barrier pack unit can then be shipped to a manufacturing facility where the combined valve assembly and barrier pack unit is assembled with a desired container to be pressurized in the manner described above.

With reference now to FIG. 14, a detailed description concerning a second preferred manufacturing embodiment, according to the present invention, will now be described. As this manufacturing process for this embodiment is quite similar to that of the first manufacturing embodiment, only the differences between the first manu-
facturing embodiment and the second manufacturing embodiment will be discussed in detail.

[0090] As with the previous embodiment, a plurality of containers to be pressurized 30 are sequentially conveyed along a conventional conveyor apparatus to a barrier pack 2 assembly station. The major difference between the second manufacturing embodiment, and the first manufacturing embodiment, is that the step of inserting the barrier pack 2 and the step of inserting the mounting cup 32 are combined with one another into a single step. To achieve this, the combined valve assembly and barrier pack unit 99, received from the pre-assembly station 112, are conveyed, by conventional handling equipment, and the barrier pack 2 is inserted, at a combined valve assembly and barrier pack unit assembly station 114, through the central opening 41 in the dome 95 of the container to be pressurized 30 so that barrier pack 2 is received within the central opening 41 of the dome 95 and the perimeter curl 33 of the mounting cup 32 engages the bead 40 of the dome 95 with the flange 10 of the barrier pack 2 being located therebetween. Once the combined valve assembly and barrier pack unit 99 is suitably positioned, the mounting cup 32 of the valve assembly 38 is crimped to the dome 95 of the container to be pressurized, by conventional crimping equipment, to provide a fluid-type pressurized seal between the mounting cup 32 and the dome 95.

[0091] The container to be pressurized 30 is then conveyed to a product filling station 106, where the product to be dispensed 18 by the pressurized container is supplied to the interior space 29 of the barrier pack 2 by a conventional button-off filling process, as discussed above with respect to the first preferred manufacturing embodiment. Once the interior space 29 of the barrier pack 2 is sufficiently filled with the product to be dispensed 18, the container to be pressurized 30 is then conveyed to a pressurization station 108. At the pressurization station 108, the container to be pressurized 30 is then sufficiently pressurized with a suitable aerosol propellant 92 or possibly pressurized in air, in a conventional manner and a plug 93 is inserted into the access aperture 91 to seal the access aperture 91 and prevent the escape of the propellant 92 from the interior compartment of the container to be pressurized, as discussed above. Finally, the container to be pressurized 30 is conveyed to a button application station 110 where a suitable spray button, actuator or combined actuator/overcap is applied to the valve stem in a conventional manner.

[0092] With reference now to FIG. 15, a detailed description concerning a third preferred manufacturing embodiment, according to the present invention, will now be described. As the manufacturing process for this embodiment is quite similar to the process of the second preferred manufacturing embodiment, only the differences between the third manufacturing embodiment and the second manufacturing embodiment will be discussed in detail.

[0093] As with the second manufacturing embodiment, a plurality of containers to be pressurized 30 are sequentially conveyed along a conventional conveyor apparatus to a combined valve assembly and barrier pack unit assembly station 114 where the combined valve assembly and barrier pack unit 99 are conveyed, by conventional handling equipment, and the barrier pack 2 is inserted through the central opening 41 in the dome 95 of the container to be pressurized 30 so that barrier pack 2 is received within the central opening 41 of the dome 95 and the perimeter curl 33 of the mounting cup 32 engages the bead 40 of the dome 95 with the flange 10 of the barrier pack 2 being located therebetween. Once the combined valve assembly and barrier pack 2 unit is suitably positioned, it is not yet crimped in place as with the second manufacturing embodiment.

[0094] Thereafter, each container to be pressurized, with the installed but not yet crimped combined valve assembly and barrier pack unit 99, is conveyed to a conventional under-the-cup product filling station 116 where a conventional under-the-cup filling head engages with the mounting cup 32 and raises and spaces a bottom surface of perimeter curl 33 of the mounting cup 32 and the flange 10 of the supported barrier pack 2 a small distance away from the bead 40 of the dome 95, e.g. spaces those components from one another by a distance of 1/8 of an inch to about 1/4 of an inch or so. During the under-the-cup filling process, the container to be pressurized 30 is located within a filling head compartment so that the filling head compartment separates the container to be pressurized 30 from a remainder of the production facility. Once a sealed pressurization chamber is defined by the under-the-cup filling head and the container to be pressurized, the under-the-cup filling head supplies a source of pressurized fluid to the formed filling head compartment and this pressurized fluid flows between the bottom surface of the mounting cup 32 and the barrier pack 2 and the top surface of the bead 40 of the dome 95 and flows between the exterior surface of the barrier pack 2 and the inwardly facing surface of the container to be pressurized 30 and pressurizes the internal compartment of the container to be pressurized 30. Once the container to be pressurized 30 is suitably pressurized with a desired pressurize of the propellant 92, e.g. is pressurized to about 30-60 psi of pressurized propellant, the mounting cup 32 is then lowered into engagement with the bead 40 of the dome 95, with the flange 10 of the barrier pack 2 being located therebetween. Next, the mounting cup 32 is crimped to the bead 40 of the dome 95 in a conventional fashion to form a permanent seal between those components with the flange 10 of the barrier pack 2 located therebetween. It is to be appreciated that this lowering and crimping action all occur prior to opening 41 the formed pressurization chamber. Once the mounting cup 32 is adequately crimped to the container to be pressurized, the under-the-cup filling head is removed and the pressurized container is then conveyed downstream for further processing.

[0095] At the next station, a button-off filling head engages with the valve stem of the valve assembly 38 and fills the product to be dispensed 18 by the pressurized container, similar to the above described process. At the button-off filling station 118, the product to be dispensed 18, by the pressurized container, is supplied to the interior space 29 of the barrier pack 2 by a conventional filling process. Typically, a conventional button-off filling head is lowered into engagement with the valve stem 46 and sufficiently depresses the valve stem 46 and opens the valve. Once the valve is opened, the interior space 29 of the barrier pack 2 may be initially depressurized and a pressurized or other gaseous fluid contained within the barrier pack 2 to be expelled by the internal pressure of the pressurization of container.
[0096] Once this is completed, the barrier pack 2 is then sufficiently filled with the product to be dispensed in the matter of a few seconds or so. Once the interior space 29 of the barrier pack 2 is filled with the product to be dispensed 18, the product filling head is removed from the valve stem 46 and the container is then conveyed to a button/overcap assembly station 110 where the button or actuator alone, or in combination with an overcap, is applied to the valve stem of the valve in a conventional manner.

[0097] With reference now to FIG. 16, a slight variation of the barrier pack 2 and the mounting cup 32 will now be discussed. As this embodiment is very similar to the previous embodiment, only the differences will be discussed in detail. According to this embodiment, the intermediate area of the neck portion 8 of the barrier pack 2 is provided with an annular groove 130. The annular groove 130 has a radius curvature about 0.045 inches or so. The mounting cup 32 is provided with a mating or cooperating element, such as a plurality of dimples 132, e.g. 2-8 dimples preferably about 3 dimples (only one of which is shown), located to mate with the annular groove 130 once the mounting cup 32 is lowered into an engagement with and received by the neck portion 8 of the barrier pack 2. These mating elements 130, 132, once engaged with one another, become fastened or locked with one another so that the mounting cup 32 and the barrier pack 2 thereafter move together and in unison with one another. Accordingly, this arrangement facilitates installation of the barrier pack 2 separately from the mounting cup 32 but later allows the barrier pack 2 to essentially become integral with the mounting cup 32, following engagement, to facilitate raising the barrier pack 2 away from the dome 95 and allow pressurization of the interior compartment of the aerosol container by a conventional under-the-cap filing process.

[0098] To assist with manipulation of the barrier pack during assembly, it may be desirable to subject the barrier pack to a steam treatment process or merely to subject the barrier pack to a suitable humidity, prior to installation, in which the barrier pack is allowed to absorb sufficient moisture to soften or decrease the rigidity of the walls of the barrier pack. Preferably, the barrier pack will be exposed to a steam or humidity treatment step so that the barrier pack absorbs sufficient moisture to have a moisture content of at least 5 to 6 percent of the weight of the barrier pack, and may possibly absorb additional moisture so as to have a moisture content which comprises about 10 to 11 percent of the weight of the barrier pack.

[0099] During manufacture of the barrier pack, preferable the barrier pack is extrude and the bottom portion of the barrier pack is pinched and pulled to assist with molding of the barrier pack.

[0100] Preferably the barrier pack is manufactured from a laminated material which comprises PET or nylon.

[0101] Since certain changes may be made in the above described improved barrier pack, an aerosol container utilizing the improved collapsible barrier pack and a method of assembling an aerosol container with the improved barrier pack, without departing from the spirit and scope of the invention herein involved, it is intended that all of the subject matter of the above description or shown in the accompanying drawings shall be interpreted merely as examples illustrating the inventive concept herein and shall not be construed as limiting the invention.

Wherefore, I/we claim:

1. A method of inserting a barrier pack, with a perimeter flange, into a container to be pressurized in which the container to be pressurized includes a base, a side wall, and a dome having a perimeter bead, with the perimeter bead of the dome defining an opening having transverse cross-sectional area which is less than a transverse cross-sectional area defined by the side wall of the container to be pressurized, the method comprising the steps of:

   providing the barrier pack with a transverse dimension which can be reduced to a transverse dimension which is less than a transverse dimension of the opening of the dome; and

   inserting the barrier pack, with the transverse dimension less than the transverse dimension of the opening of the dome, through the opening of the dome so that the barrier pack is accommodated within an internal compartment of the container to be pressurized with a flange of the barrier pack supported by an annular bead of the dome.

2. The method according to claim 1, further comprising the steps of, following insertion of the barrier pack through the opening of the dome, placing a mounting cup, supporting a valve assembly, over the bead of the dome with the flange of the barrier pack being located between the perimeter curl portion of the mounting cup and the bead of the dome, and crimping the mounting cup to the dome of the container to be pressurized to form a fluid tight seal therebetween.

3. The method according to claim 2, further comprising the step of, following crimping of the mounting cup to the dome of the container to be pressurized, filling an internal cavity of the barrier pack, defined by a side wall and an end wall of the barrier pack, with a product to be dispensed.

4. The method according to claim 3, further comprising the step of, following filling of the internal cavity of the barrier pack with an product to be dispensed, pressurizing an internal cavity defined between the exterior side and end wall of the barrier pack and an inwardly facing surface of the container to be pressurized to form a pressurized container.

5. The method according to claim 4, further comprising the step of, following pressurization of the internal cavity, affixing an actuator to a valve stem of the valve assembly to facilitate dispensing of the product to be dispensed from the pressurized container.

6. The method according to claim 3, further comprising the step of using a button off filling process for filling the internal cavity of the barrier pack.

7. The method according to claim 1, where in the step of inserting the barrier pack through the opening of the dome further comprises the step of picking the barrier pack up with a pick-and-place head, having a vacuum source attached thereto, and applying a vacuum source to the barrier pack to evacuate gas contained within the internal space of the barrier pack and reduce the barrier pack to a minimal transverse dimension, which is less than the transverse dimension of the opening of the dome, to facilitate passage of the barrier pack through the opening of the dome.

8. The method according to claim 1, further comprising the step of surrounding an exterior surface of the barrier pack with a frangible band, when in a minimal transverse dimension configuration, to maintain the barrier pack in that reduced transverse dimension configuration and facilitate
insertion of the barrier pack through the opening defined in the dome of the container to be pressurized.

9. The method according to claim 1, further comprising the step of receiving a valve assembly, supported by a mounting cup, within an inlet of the barrier pack to form a combined valve assembly and barrier pack unit, and inserting the combined valve assembly and barrier pack unit through the opening in the dome.

10. The method according to claim 9, further comprising the step of at least partially evacuating an air contained within the internal cavity of the barrier pack, so as to reduce the barrier pack to a minimal dimension configuration and maintain the barrier pack in this minimal dimension once the valve assembly is biased to its closed position.

11. The method according to claim 10, further comprising the step of, following insertion of the combined valve assembly and barrier pack unit and placement of a flange of the barrier pack between a perimeter curl portion of the mounting cup and the bead of the dome, crimping the mounting cup to the dome of the container to be pressurized to form a fluid tight seal therebetween.

12. The method according to claim 11, further comprising the step of, following crimping of the mounting cup to the dome of the container to be pressurized, filling an internal cavity of the barrier pack, defined by a side wall and an end wall of the barrier pack, with a product to be dispensed.

13. The method according to claim 12, further comprising the step of, following filling of the internal cavity of the barrier pack with the product to be dispensed, pressurizing an internal cavity defined between the exterior side and end wall of the barrier pack and an inwardly facing surface of the container to be pressurized to form a pressurized container.

14. The method according to claim 13, further comprising the step of, following pressurization of the internal cavity, affixing an actuator to a valve stem of the valve assembly to facilitate dispensing of the product to be dispensed from the pressurized container.

15. The method according to claim 10, further comprising the step of, following insertion of the combined valve assembly and barrier pack unit, pressurizing an internal cavity defined between the exterior side and end wall of the barrier pack and an inwardly facing surface of the container to be pressurized to form a pressurized container and then crimping the mounting cup to the dome of the container to be pressurized to form a fluid tight seal therebetween.

16. The method according to claim 15, further comprising the step of, following crimping of the mounting cup to the dome of the container to be pressurized, filling an internal cavity of the barrier pack, defined by a side wall and an end wall of the barrier pack, with a product to be dispensed.

17. The method according to claim 16, further comprising the step of, following filling of the internal cavity of the barrier pack with the product to be dispensed, affixing an actuator to a valve stem of the valve assembly to facilitate dispensing of the product to be dispensed from the pressurized container.

18. The method according to claim 17, further comprising the step of using a button off filling process for filling the internal cavity of the barrier pack.

19. The method according to claim 17, further comprising the step of using an under-the-cup process for pressurizing the internal cavity defined between the exterior side and end wall of the barrier pack and an inwardly facing surface of the container to be pressurized to form a pressurized container.

20. A method of inserting a barrier pack, with a perimeter flange, into a container to be pressurized in which the container to be pressurized includes a base, a side wall, and a dome having a perimeter bead, with the perimeter bead of the dome defining an opening having transverse cross-sectional area which is less than a transverse cross-sectional area defined by the side wall of the container to be pressurized, the method comprising the steps of:

   reducing providing a transverse dimension of the barrier pack to have a transverse dimension which is less than a transverse dimension of the opening of the dome; and

   inserting the barrier pack, with the transverse dimension less than the transverse dimension of the opening of the dome, through the opening of the dome, without application of force, so that the barrier pack is accommodated within an internal compartment of the container to be pressurized with a flange of the barrier pack supported by an annular bead of the dome.

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