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LINER FOR BOTTLE CAPS

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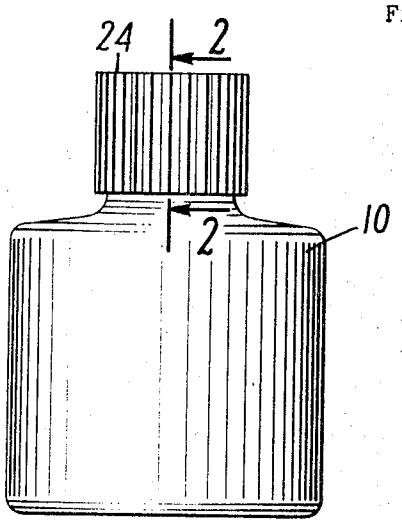

FIG. 1

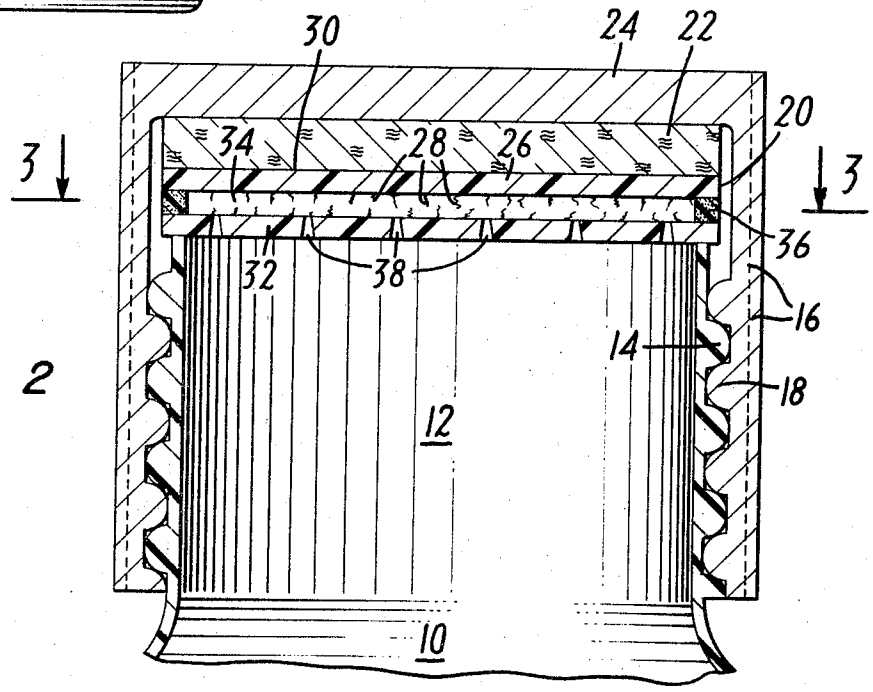

FIG. 2

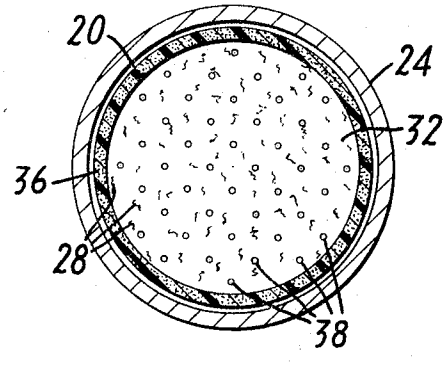

FIG. 3

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LINER FOR BOTTLE CAPS

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This invention relates to improvements in containers and closures therefor and, more particularly, to containers having closures which seal the containers against leakage of a liquid content therein but enable air to enter and gas to escape from the container when pressure differentials exist between the inside and the outside of the container.

Many types of liquid or semi-liquid products are currently sold in containers formed of polyethylene or polypropylene material because of the attractive appearance and low cost, as well as break-proof characteristics of these containers. Some dissatisfaction, however, arises from the use of these containers for the reason that upon changes in the temperature of the contents of the containers, they have a tendency to collapse somewhat and appear unfilled. Many liquids generate gas causing the containers to bulge and become unsightly. Also, some of the compositions or the materials sold in such flexible containers, as well as metal and glass containers evolve gases, and unless such gases are vented to atmosphere to relieve the pressure, a substantial danger exists that such containers will explode.

The known disadvantages of such containers have led others to devise closures which are intended to prevent leakage of the liquid contents of the container and at the same time, allow gases or increased pressure developed in the container, to escape to the atmosphere. Means for allowing the escape of gases proposed heretofore include one-way check valve of various designs, displaceable elements in a cap for uncovering venting apertures and the like. Many of these prior devices are effective for use for such venting purposes but in the check valve closures proposed heretofore, no provision is made for allowing the entry of air into the container if a reduced pressure is developed in the container and thus the prior devices are not effective to allow atmospheric air to enter the container to maintain substantial equilibrium conditions between the inside and the outside of the container.

In accordance with the present invention, a closure is provided for sealing a container against leakage of its contents, permit the escape of gas from, and relieve excess pressure in a container, and allow the entrance of air when the atmospheric pressure outside the container substantially exceeds the pressure within the container.

More particularly, in accordance with the present invention, the closure or closure cap for a container is a three-part liner, comprising a thin layer of material such as paperboard, about two to three one-hundredths of an inch thick, adhered to the inside of the closure cap. The smooth side of a thin flexible film or liner of liquid impermeable material, a few thousandths of an inch thick, formed of a synthetic plastic, such as vinyl resin, polyethylene, polypropylene, or the like, is adhered to the paperboard. This plastic liner is ordinarily supplied with a backing of suitable material, such as paper. In accordance with this invention, the plastic film liner is stripped from its backing before adhering it to the paperboard. The side of the film detached from the paper backing carries with it a thin surface layer of fibers or fuzz. A third layer of plastic film, mentioned above, is also detached from its backing and the fiber carrying side of the plastic is adhered to the fibrous side of the inner liner. By adhering the fiber carrying sides of the second and third layers of plastic together around their peripheries by

means of a suitable adhesive, such as ordinary paperboard glue, a thin fibrous mesh is provided between the two layers. The outermost liner which engages the lip of the bottle has a number of randomly spaced punctures therein, connecting the interior of the container with the fibrous mesh between the plastic liners. The inner liner is imperforate. Thus, it can readily be seen that a passage is created for either gas or air to move freely through the punctures, through the fibrous mesh, and through porosities in the adhesive connecting the peripheries of the second and third layers, the adhesive being made porous by virtue of the fibers associated with the second and third layers.

For a better understanding of the present invention, reference may be had to the accompanying drawings in which:

FIG. 1 is a front elevational view of a typical container embodying the present invention;

FIG. 2 is a view on the section taken on line 2—2 of FIG. 1; and

FIG. 3 is a view in cross section taken on line 3—3 of FIG. 2.

For the purpose of illustration, FIG. 1 shows a cylindrical bottle 10 formed of glass, polyethylene, polypropylene or the like, and having a neck 12 with external threads 14. A cap 16 having internal threads 18 can be secured on the neck with the threads 14 and 18 engaging loosely so that air or gas can flow between them.

In accordance with the present invention, the cap 16 is provided with a liner 20 of three part structure which, as mentioned above, seals the container against leakage of of the liquid contents therein, and also allows the inward and outward leakage of air and gas to equalize substantially the inner pressure of the bottle with the outer atmospheric pressure. As best illustrated in FIGS. 2 and 3, liner 20 comprises a backing 22 of suitable material, such as paperboard or cork, adhered to the inside of the top wall 24 of cap 16 by means of a suitable adhesive, such as ordinary paperboard glue. A thin, flexible, liquid-impervious liner 26 is adhered to the exposed face of the backing 22 by means of a suitable adhesive. Liner 26 is a thin layer of suitable plastic or the like, such as a vinyl resin, polyethylene or polypropylene and is mounted on a suitable backing formed of paper or the like. For the present application, the liner 26 is stripped from its backing and, in so detaching it, the liner carries with it small fibers or fuzz-like particles of the paper, which particles form a thin layer 28 of fibers on one side of the liner. The smooth side 30 of liner 26 is free of fibers and is adhered to the paperboard backing 22. A third layer or liner 32 is the same as the liner 26 and it also has a layer of fibers 34 or fuzz on one surface. The fibrous side 34 is adhered to the fibrous side 28 of liner 26 by means of a small amount of adhesive, such as ordinary paperboard glue, which is applied in a narrow zone 36 around the peripheries of the liners 26 and 32 so that only the peripheries of layers 26 and 32 are adhered together, with the fibrous sides of the liners 26 and 32 between them. The composite liner 20 is sufficiently wide to span the mouth of the bottle and extend out beyond the neck 12 of container 10 with which it is associated.

The liner 32 engaging the neck 12 of the bottle has a number of randomly spaced punctures or small holes 38 about .005 to .008 inch in diameter in it. The punctures or holes connect the interior of a container 10 and the layers of fibers 28 and 34 between liner 32 and liner 26, the latter being imperforate. Were it not for these punctures, a liquid-tight and gas-tight relationship would exist between the liner 20 and the neck 12 of container 10. Air or gas will flow through fibrous layers 28 and 34 in response to inequality of pressure inside and outside con-

tainer 10, for the reason that a complete air-tight adherence or check valve effect between the liners 26 and 32 is not possible, due to the porosity of the fiber layers.

Thus, it can readily be seen by reference to FIG. 2, that when the pressure inside the container 10 is greater than the pressure outside the container, gas will leak through the holes 38, through the fibrous layers 28 and 34, to the edges of the liners 26 and 32 and into the gap between the neck 12 of the container and the closure cap 16. When the pressure outside the container 10 is greater than the pressure inside the container 10, air will pass into container 10 via the fibrous layers and holes 38 in the liner 32.

It will be understood that the invention is susceptible to considerable modification, for example, in the method of adherence between layers 28 and 34. In the illustrated embodiment of the present invention, only a small part of layers 28 and 34 are adhered together around the edges, but they could be adhered by spaced spots of adhesive of longer total area without significantly reducing the passage of air or gas. Modifications can further be made in the shape of container 10, in the material of which the container 10 and the closure cap liner 20 are made and the number of punctures or holes 38 in the liner 32. Accordingly, it will be understood that the embodiment of the invention disclosed herein is illustrative and the invention is limited only by the terms of the following claims.

I claim:

1. A breathable closure for containers having a pouring opening defined by a circumferential rim, comprising a cap member having a top wall and a side skirt for removable mounting on a container, a first layer of material adhered to the inside of said top wall and substantially coextensive therewith, a second layer of liquid-impervious material adhered to said first layer and substantially coextensive therewith, a third layer of liquid-impervious material for engaging the rim of the container adhered to said second layer, a layer of fibers between said second and third layers and a plurality of punctures which communicate with the inside of said container and the layer of fibers between said second and third layers of material.

2. A breathable closure for containers having a pouring opening defined by a circumferential rim comprising a cap member having a top wall and a side skirt for removable mounting on a container, a first layer of porous material adhered to the inside of said top wall and substantially coextensive therewith, a second thin flexible layer of liquid-impervious material, without backing support, said second layer comprising a smooth side, adhered to said first layer and substantially coextensive therewith, and a fibrous side, a third thin flexible layer of liquid-impervious material, without backing support, said third layer comprising a fibrous side, adhered to said fibrous side of said second layer, and a smooth side for engaging the rim of said container in a water-tight relation, a layer of fibers between said second and third layers, and a plurality of randomly spaced punctures for allowing the passage of air and gas whenever a substantial inequality exists between the pressure outside said container and the pressure within said container.

3. A breathable closure for containers having a pouring opening defined by a circumferential rim comprising

a cap member having a top wall and a side skirt for removable mounting on a container, a first layer of porous material adhered to the inside of said top wall and substantially coextensive therewith, a second thin flexible layer of liquid-impervious material, without backing support, said second layer comprising a smooth side, adhered to said first layer and substantially coextensive therewith, and a fibrous side, a third thin flexible layer of liquid-impervious material, without backing support, said third layer comprising a fibrous film side, adhered to said fibrous side of said second layer, the adherence accomplished by means of an adhesive connecting the peripheries of said first and second layers of material, and a smooth side for engaging the rim of said container in a water-tight relation, and a plurality of randomly spaced punctures for allowing the passage of air and gas through said punctures, through said layer of fibers and through said peripheral adhesive whenever there is a substantial inequality between the pressure outside said container and the pressure within said container.

4. A container comprising a receptacle having a pouring opening defined by a rim, a closure for said pouring opening having a top and a side wall, a liner adhered to the inside of the top of said closure for engaging said rim of said receptacle to retain the contents of said receptacle therein, said liner comprising a first layer of porous material adhered to the inside of said top wall and substantially coextensive therewith, a second thin flexible layer of liquid-impervious material, without backing support, said second layer comprising a smooth side, adhered to said first layer and substantially coextensive therewith, and a fibrous side, a third thin flexible layer of liquid-impervious material, without backing support, said third layer comprising a fibrous side, adhered to said fibrous side of said second layer, the adherence accomplished by means of an adhesive connecting the peripheries of said first and second layers of material, and a smooth side for engaging the rim of said container, a layer of fibers between said second and third layers and a plurality of randomly spaced punctures for allowing the passage of air and gas through said layer of fibers and through said peripheral adhesive whenever there is a substantial inequality between the pressure outside said container and the pressure within said container.

5. A breathable container as set forth in claim 4 in which said first layer is paperboard and said second and third layers are synthetic plastic removed from their respective paper backings.

6. A breathable container as set forth in claim 4 in which said receptable is a flexible bottle.

7. The breathable container set forth in claim 4 in which the said fibrous sides of said second and third layers are adhered to and substantially coextensive with each other.

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