Nov. 5, 1968 D. C. SCOTT 3,409,160

VENTING CLOSURE

Filed Oct. 3, 1966 2 Sheets-Sheet 1

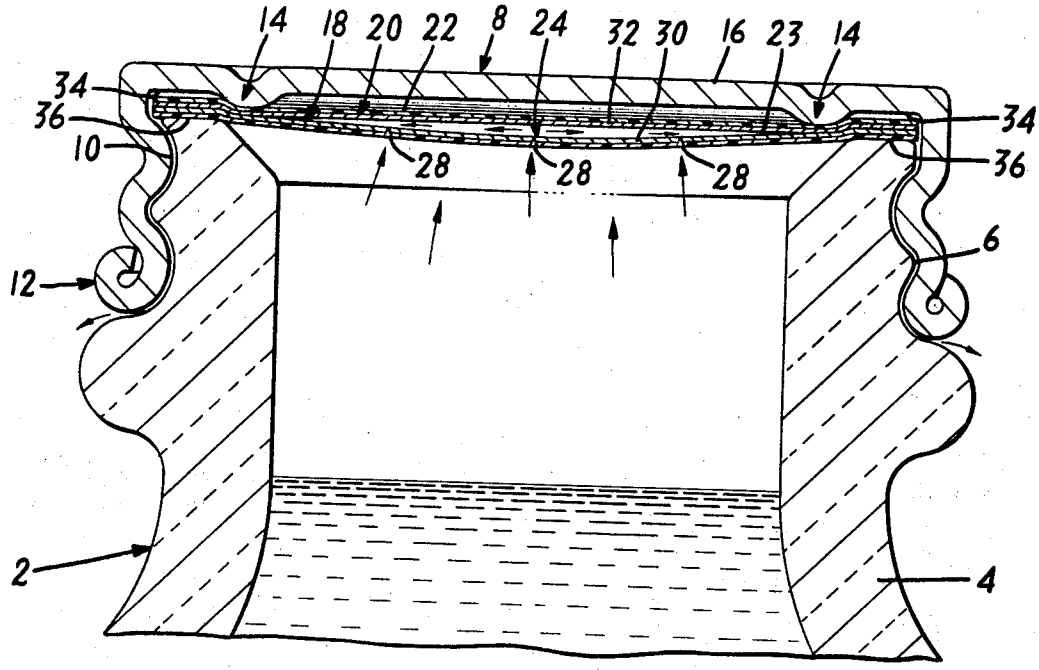


FIG. 1

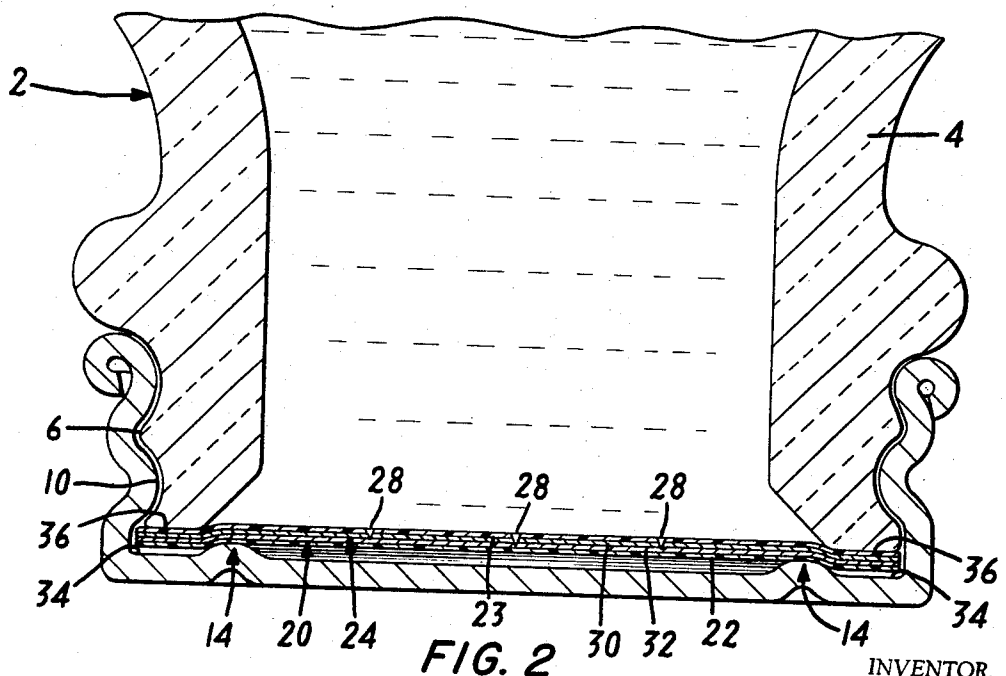


FIG. 2

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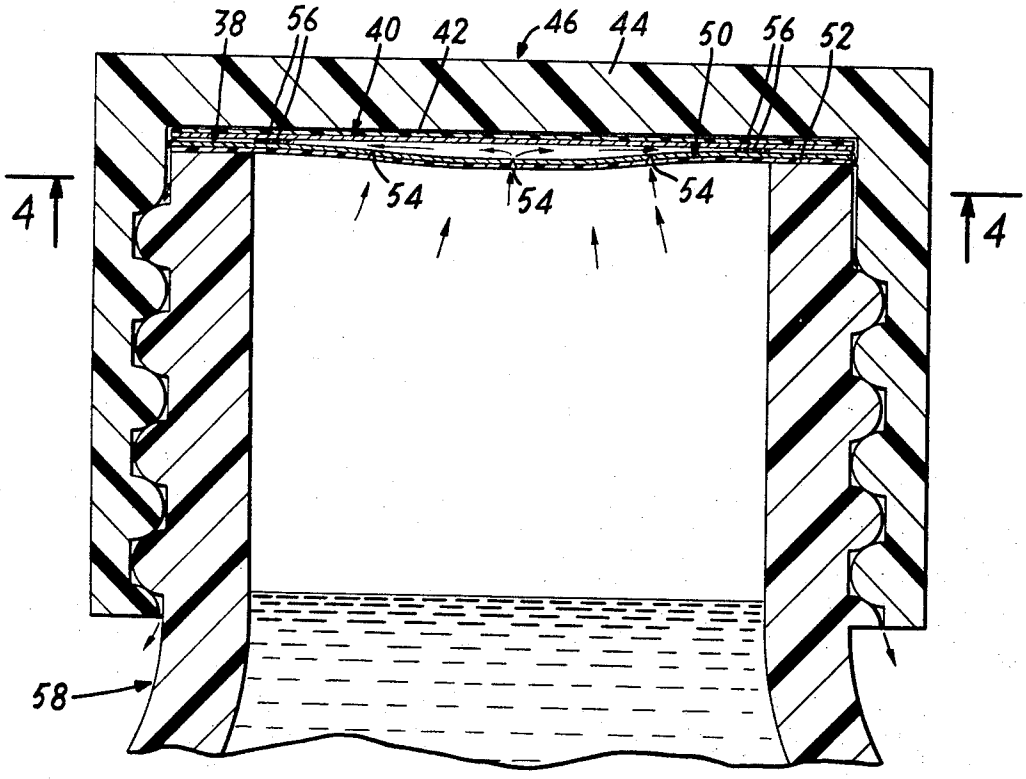


FIG. 3

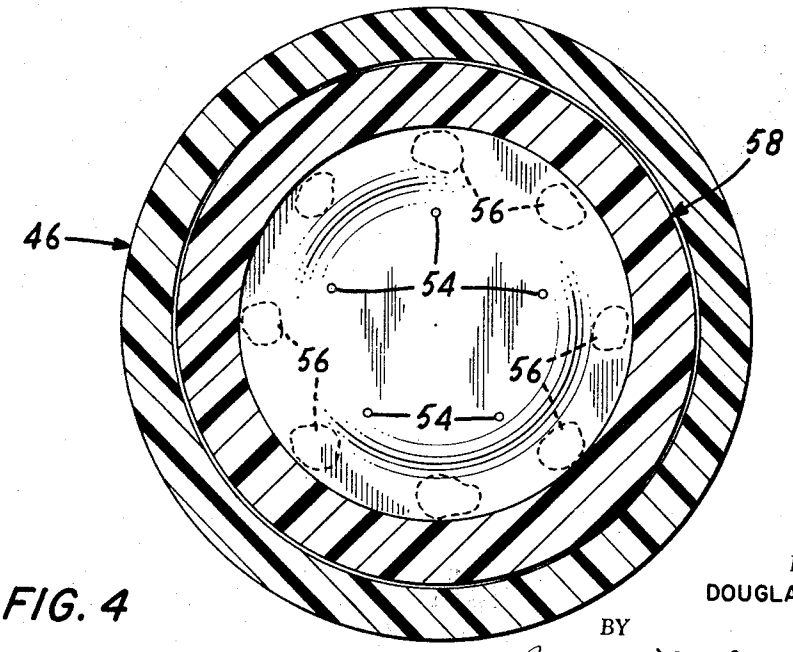


FIG. 4

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VENTING CLOSURE

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ABSTRACT OF THE DISCLOSURE

A venting liner for containers comprising a first flexible paper disk having a layer of liquid impervious material disposed adjacent to the inside of the cap member for the container and substantially coextensive therewith and a second flexible paper disk having a layer of liquid impervious material having a plurality of punctures therethrough engages the rim of the container in liquid tight relation.

This invention relates in general to improvements in containers and closures therefor and more particularly to containers having closures which seal the container against leakage of a liquid content therein but enable gases or increased pressures developed in the container to escape to atmosphere when the pressure inside the container exceeds the atmospheric pressure outside of the container.

Liquid bleach, peroxides and other similar gas-evolving products tend to release gases or vapors under pressure, especially on increase of temperature, and unless the containers of these products provide some means whereby such excess pressure may be automatically relieved, a real danger exists that such containers will explode. Where closures are used with venting means therein to permit escape of excess pressure, it is important that the closure be leak proof under normal pressure and relieve excess pressure no matter how often the pressure in the container should fluctuate.

The known problem of gas-evolving product containers has lead 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 pressures developed within the container to escape to atmosphere. Means for allowing the escape of gases proposed heretofore include one way check valves of various designs, displaceable elements in the cap for uncovering venting apertures and the like. Many of these prior devices are effective for such venting purposes. However, the prior devices are not effective in withstanding leakage for prolonged periods of time when the container is inverted or set on its side.

In accordance with the present invention, a closure is provided for sealing a container against leakage of its contents over substantial periods of time when the container is inverted or set on its side and permitting the escape of gas and excess pressure developed in the container to atmosphere when the pressure inside the container exceeds the pressure outside the container.

More particularly, in accordance with the present invention, the closure or closure cap for a container is provided with a two-part liner, including two thin flexible disks of a suitable material such as paper about .003 to .004 of an inch thick, having a facing liner of less than one thousandth of an inch thick of a liquid impermeable material formed of a synthetic plastic such as polyvinyl resin, polyethylene or polypropylene or the like. The first disk is imperforate with its plastic coated surface facing the inside of the top of the closure cap and its paper surface facing outwards while the second perforated disk is placed with its paper surface facing inwards and in contact with the paper surface of the first disk and its

plastic coated surface facing outwards for engaging the rim of the neck of the container. The two disks are of substantially the same diameter as the inside of the top of the closure cap and engage behind the threads or in a groove located in the inner part of the skirt of the closure cap with the result that the disks can be retained within the cap without the aid of adhesive and without being adhered to each other. The closure cap can be tightened readily by hand onto the neck of the container so that a sealing relationship is established between the facing liner of the outermost disk and the neck of the container. Since a much thinner combination of materials is used than in prior devices, the closure cap can engage the neck of the bottle with more turns of the thread and holds the second disk firmly against the lip of the bottle. The first disk is not adhered to the second disk so that any excess pressure within the container can be dissipated by passing through the small randomly placed pin-hole perforations in the second disk and diffusing between first and second disks to escape to atmosphere. Flow of the gas between the disks equalizes the pressure on opposite sides of the perforated disk so that it is not held tightly against the imperforate disk. If the container is inverted or set on its side, the perforated disk adjacent to the lip of the bottle can move like a check valve with the pressure of the liquid against it and constrict the passage of liquid through the pin-hole perforations.

In accordance with another embodiment of the invention, the closure or closure cap for a container is provided with a two part liner including a thin flexible disk formed of a suitable material such as paper about .003 to .004 of an inch thick coated on one surface with a layer less than one thousandth of an inch thick of a liquid impermeable material such as synthetic plastic and adhered, by means of a suitable vinyl adhesive, to the inside of the top of the closure cap with the paper surface of the disk facing outward. A second thin flexible disk of a suitable material such as paper about .003 to .004 of an inch thick coated on one surface with a layer less than one thousandth of an inch thick of a liquid impermeable material such as synthetic plastic and containing several randomly placed pin-hole perforations is adhered by means of spaced apart spots of adhesive to the first disk so that the paper surface of the second disk is in contact with the paper surface of the first disk. The two disks are substantially the same diameter as the inside of the top of the closure cap so that the coated surface of the second disk engages the rim of the neck of the container in liquid tight relation when the closure cap is tightened onto the neck of the container. Excess pressure contained within the container will pass through the perforations in the second disk and lift the non-adhered portions of the first disk away from the lip of the container thus allowing such excess pressure to escape to atmosphere.

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

FIGURE 1 is a view in section of a typical container in upright position embodying the present invention.

FIGURE 2 is a view in section of the container shown in FIGURE 1 in an inverted position.

FIGURE 3 is a view in section of another embodiment of the present invention.

FIGURE 4 is a view in cross-section taken on line 4—4 of FIGURE 3.

In FIGURE 1, the top of a typical bleach bottle **2** formed of glass, polyethylene, propylene, or the like includes a neck **4** of reduced transverse dimensions at one end provided with thread **6** for receiving a closure cap **8** provided with internal threads **10**. The threads **6** and

10 mesh loosely so that escaping gas can flow readily between the neck 4 and the skirt 12 of the closure cap which telescopically receives the neck. Closure caps and containers of the type described thus far are conventional. Preferably the closure cap 8 is made of metal and includes a groove and inwardly directed ridge 14 in the top wall 16 of the cap 8.

In accordance with the present invention, the closure 8 is provided with a sealing liner 18 of two part structure which, as mentioned above, seals the container against leakage of liquid therein, but nevertheless allows gases developed in the container to escape to atmosphere when the pressure inside the container exceeds the pressure outside of the container. As best seen in FIGURE 1 liner 18 comprises a first thin flexible disk 20 of a suitable material such as paper having on its upper surface a thin film of liquid impervious material 22 formed of a suitable plastic or the like such as polyvinyl, resin, polyethylene, or polypropylene. The smooth plastic coated surface 22 is disposed adjacent to the inside of the top wall 16 of the cap 8 and is substantially coextensive with it. A second thin flexible disk 24 of a suitable material such as paper having on one surface a thin film of liquid impervious material 23 formed of a suitable plastic or the like as described above and containing a plurality of randomly placed very small (approximately .003 to .005 of an inch) perforations 28 is disposed adjacent to the first disk 20 so that the paper surface 30 of the second disk 24 is in contact with the paper surface 32 of the first disk 20. The disk 24 is also substantially coextensive with the inside of the top wall 16 of the cap 8. The outer peripheries of the two disks 20 and 24 engage a knurled portion 34 located in the upper portion of the skirt 12 of the cap 8 and behind the innermost turn of the thread 10 which retains the disks within the cap without the use of adhesive.

When the closure cap 8 is tightened on the neck 4 of the container, the impressed groove 14 presses the two disks 20 and 24 into engagement with the rim 36 of the neck 4 of the container in liquid tight relation with some indentation of the disks 20 and 24. When the pressure in the interior of the container exceeds the atmospheric pressure outside of the container air or gas will flow through the perforations 28 in the disk 24 causing the pressure on opposite sides of the disk 24 to be equalized and loosing the contact pressure between the disks 20 and 24. Inasmuch as the disk 20 is not adhered to the disk 24 it allows the gas or air to escape between the disks and diffuse through the compressed zone between the cap and the lip of the container and be vented from the container. As shown in FIGURE 2 when the container is inverted or set on its side, the hydrostatic pressure of the liquid causes disk 24 to move like a check valve against the disk 20 closing the perforations 28 and preventing escape of liquid through the perforations which, in any event, are too small to permit any substantial flow of liquid therethrough. The liner 22 serves to protect the cap from contact with liquid which might escape through the perforations 28 and prevents corrosion of the cap if it is formed of metal.

In accordance with another embodiment of the present invention, as illustrated in FIGURE 3, a plastic closure cap is provided with a sealing liner 38 of two part structure, similar to the sealing liner described above and serves to seal the container against leakage of the liquid content therein but at the same time, allow excess pressure developed in the container to escape to atmosphere. Liner 38 comprises a first thin flexible disk 40 of a suitable material such as paper having on its upper surface a thin film or facing liner of liquid impervious material 42 formed of a suitable plastic or the like such as polyvinyl resin, polyethylene, or polypropylene. The smooth plastic coated surface 42 is adhered to the inside of the top wall 44 of a cap 46, which does not have threads

extending inwardly far enough to retain the disk in the cap, by means of a suitable adhesive. A second thin flexible disk 50 of a suitable material such as paper having on one surface a thin film of liquid impervious material 52 formed of a suitable synthetic plastic or the like as described above and containing a plurality of randomly placed pin-hole perforations 54 is adhered to the first disk 40 by means of spaced apart spots of a suitable adhesive 56 such as paperboard glue so that the perforated disk 50 is attached to the imperforate disk 40.

When the closure cap 46 is tightened onto the neck of a container 58, the facing liner disk 40 engages the rim in liquid tight relation. As shown in FIGURE 3 when the pressure in the interior of the container exceeds the atmospheric pressure air or gas will flow through the perforations 54 in the disk 50. Since the disk 50 is adhered to the disk 40 only in several randomly spaced spots, it can be displaced by means of the pressure of the gases flowing through the perforations 54 to allow such gases to flow between and diffuse through the paper layers compressed between the cap and the lip of the bottle and escape from the container.

It will be understood that the invention is susceptible to considerable modifications, for example in the number of punctures in the second paper disk, and the material of which the cap is made, and that the cap may be used to close the entire open end of the container rather than the neck of reduced size thereof.

I claim:

1. A venting closure for containers having a pour opening defined by a circumferential rim comprising, a cap member having a top wall and side skirt for removable mounting on the container; a first thin flexible paper disk having on one surface a liner of synthetic plastic disposed adjacent to the inside of said top wall and substantially coextensive therewith; a second thin flexible paper disk having on one surface a liner of synthetic plastic for engaging said rim of said container in liquid tight relation, said second paper disk and liner thereon having a plurality of punctures for allowing passage of air and gas therethrough whenever the pressure inside said container exceeds the pressure outside said container.

2. A venting closure for containers having a pour opening defined by a circumferential rim comprising, a cap member having a top wall and side skirt for removable mounting on the container; a first thin flexible paper disk having on one surface a liner of synthetic plastic, said liner being disposed adjacent to the inside of said top wall of said cap member and the paper surface of said first paper disk facing outward, and a second thin flexible paper disk having on one surface a liner of synthetic plastic and having a plurality of punctures therethrough, said second paper disk being disposed with its paper surface in contact with said paper surface of said first paper disk and its liner facing outwards for engaging said rim of said container in liquid tight relation.

3. A venting closure as set forth in claim 2 further including adhesive means for adhering said liner of said first layer to the inside of said top wall of said cap member and means for adhesively securing at least a portion of said paper surface of said second layer to said paper surface of said first layer.

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