

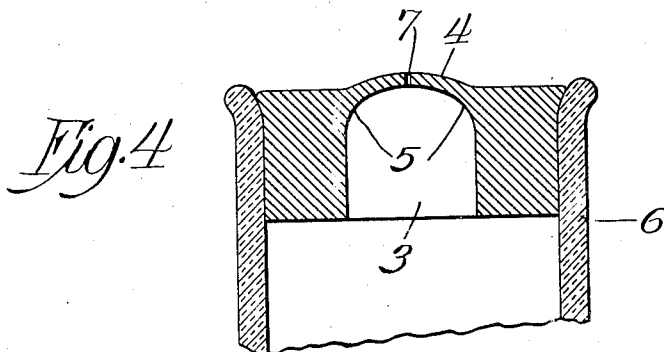
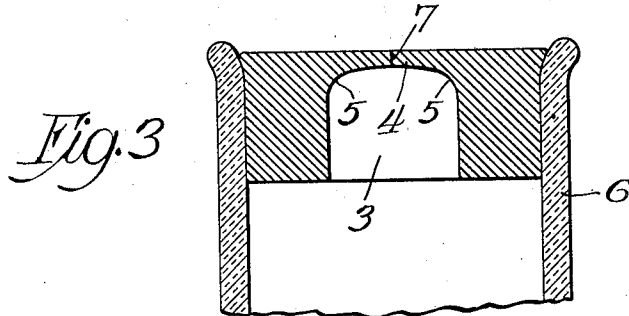
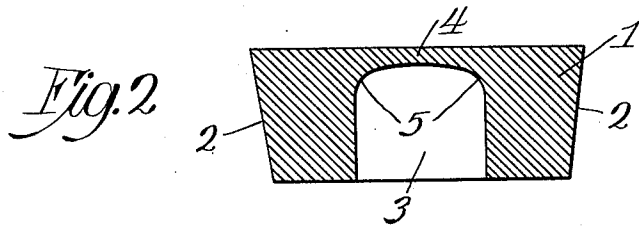
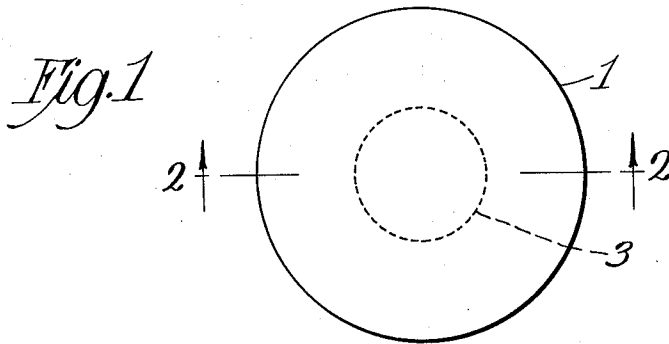
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A. O. FOX ET AL

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CONTAINER STOPPER

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UNITED STATES PATENT OFFICE

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A CORPORATION OF DELAWARE

CONTAINER STOPPER

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This invention relates to bottle stoppers, and more particularly to those that are adapted to yield and prevent internal expansion or pressure from breaking the bottle, or other container.

Generally stated, the object of the invention is to provide an improved bottle stopper which may be inserted in the smooth mouth of the neck of an ordinary bottle, and which is provided with means adapted to yield under internal pressure, if expansion or gases develop inside, thereby to prevent breakage of the bottle, or other container.

Another object of the invention is to provide a simple and inexpensive form of bottle stopper, having means normally closed for sealing the bottle against admission of air, but adapted to automatically open when subjected to gaseous pressure within the bottle, or other container, and to then automatically close tightly after thus relieving the pressure within.

It is also an object to provide certain details and features of construction tending to increase the general efficiency and the desirability of a self-venting bottle stopper of this particular character.

To these and other useful ends, the invention consists in matters hereinafter set forth and claimed and shown in the accompanying drawings, in which—

Figure 1 is a plan view of a bottle stopper embodying the principles of the invention;

Figure 2 is a vertical section on line 2—2 in Figure 1;

Figure 3 is a view similar to Figure 2, showing the stopper inserted in the neck of a bottle, and showing the center of the stopper provided with a normally closed opening for venting any gaseous pressure within the bottle;

Figure 4 is a view similar to Figure 3, showing the action of the stopper when pressure develops within the bottle.

As thus illustrated, the invention comprises a stopper having a body 1, of rubber or other suitable resilient material. The sides 2 of the stopper are preferably tapered downwardly, as shown, and the central portion of the stopper has a cavity 3 formed on its un-

der side, as shown. The top of said cavity has an integral diaphragm closure 4, and the bottom of said cavity is open. The said diaphragm is preferably concave on its lower side, having fillets 5 to eliminate a sharp corner that might cause the rubber to tear easily when the diaphragm is pushed upwardly by the pressure within the bottle, or other container.

In use, the stopper is inserted in the bottle neck 6, as shown in Figure 3, and a normally closed opening 7 is pricked in the center of the diaphragm 4, with a needle or pin, thus forming a normally closed tight opening, which will not open until more or less gaseous pressure is developed within the bottle, or other container. Under sufficient internal pressure, the diaphragm 4 will bulge upwardly, as shown in Figure 4, and the opening 7 will open enough to vent or release the gases to the atmosphere.

The stopper, preferably, is enough larger than the mouth of the bottle neck to provide a tight fit, causing some compression of the stopper, as shown in Figures 3 and 4 of the drawings.

The fillets 5, it will be seen, tend to thicken the outer edge portions of the diaphragm 4, where these edge portions join the main body of the stopper, thus giving the diaphragm more strength and tension to recover its normal position after the internal pressure has been reduced. The opening 7 automatically opens, when the diaphragm bulges upward, and automatically closes when the diaphragm moves downward into its normal position, in which latter the bottle, or other container, is effectively sealed against entrance of air.

The cavity 3 tends to insure a substantial space above the contents of the bottle, or other container, thereby not only to prevent escape of any liquid in the bottle, but also to insure space for the development of a substantial pressure before the stopper operates to begin venting the internal pressure to the atmosphere. When made of elastic material, such as rubber, the diaphragm 4 can be used without the pricked opening 7, to allow for expansion within the bottle, or container, if such is necessary or desirable. The outward

bulging of the diaphragm 4 is not limited or restrained in any way, except by its own inherent elasticity and capacity to stretch before bursting, so that the ultimate bursting point is the only limitation imposed on its outward bulging movement. For other purposes, however, the pricked opening 7 may be desirable and necessary, and hence this opening can be used if necessary or desirable, or may be omitted, depending upon the particular use made of stoppers of this kind. The device, therefore, is a combination container closure and pressure release valve, for use in the packaging of materials which may have a tendency to expand, or which are in any way affected by outside or inside conditions, which would tend to cause more or less pressure within the container. The object, therefore, is to protect the containers against undue expansion within, and consequent breakage thereof, by venting the gases or other fluids, and at the same time to provide a satisfactory container closure which will prevent all leakage under ordinary normal conditions. Obviously, moreover, the invention provides a bottle stopper which can be made in various sizes, and can be used in ordinary bottles having ordinary smooth necks, just as ordinary corks, or other plug-like stoppers, would be used. In this way, even large bottles, when loaded with some things, can be laid on their sides, and will remain closed unless gas pressure is exerted from the inside, in which event the stopper will automatically open and vent the pressure to the atmosphere, thus preventing breakage of the bottles. For other purposes, such as the bottling of some kinds of liquids, or liquid preparations, the bottles will stand upright to prevent escape of the liquid, or liquid-like contents, when the stopper automatically opens to vent any generated gas to the atmosphere. Thus, the diaphragm 4 is free to balloon out to the limit of its elasticity, in the sense that no structural element is in position to obstruct such bulging or ballooning-out of the diaphragm. Therefore, the normally closed puncture 7 is free to open wider and wider, as the diaphragm bulges outwardly, whereby, under suddenly developed or excessive internal pressure, this valve opening could open promptly and very widely to promptly relieve the pressure.

Another advantage of the cavity 3, it will be seen, is that it facilitates lateral compression of the stopper, making it somewhat easier to press the stopper into the mouth of the bottle container. Then, when internal pressure develops, the pressure outwardly against the sides of this cavity tends to expand the stopper very tightly and with added pressure against the sides of the mouth of the bottle or other container, thus giving the stopper added frictional resistance to the blowing out or expulsion of the stopper

by the interior pressure. Thus, with the stoppers properly sized or proportioned for bottles or containers of different sizes, so as to give each stopper the right compression and wedging action in the throat of the bottle neck, or other container, the diaphragm of the stopper is substantially certain to balloon out and release the excess of pressure, before the stopper is forced or blown out of the bottle neck.

While, for convenience of illustration, the stopper is shown in a vertical position, and with the axis thereof extending vertically, it will be understood that this and any reference to such position in the claims is merely for convenience of description, and that the stopper can be used with its axis disposed horizontally or at any angle, without departing from the principles and the spirit and intent of the invention.

It will be seen that the sides of the cavity 3 are several times thicker than the wall 4, whereby said wall may balloon out under the pressure without distortion of the body of the stopper, and without loosening the stopper in the bottle or container. Furthermore, the thickness of the sides of the stopper, or the sides of the cavity, permits compression of the sides by the mouth of the bottle or container, without distortion of the wall or diaphragm 4, and substantially without distortion of the cavity. Again, the stopper is of disk-like form, as its diameter is substantially greater than its depth, the depth being the distance between the two flat sides of the stopper. In this way, a comparatively smaller amount of rubber is necessary for the stopper than would be the case if it were of greater depth, for any given size of stopper. Although of disk-like form, the stopper will have sufficient frictional engagement with the bottle or container to prevent it from blowing out, inasmuch as the wall or diaphragm 4 is of a thickness to balloon out and vent the pressure, before the internal pressure becomes great enough to force the stopper out of the mouth of the bottle or container. At the same time, the frictional contact of the stopper with the neck of the bottle or container and the peripheral compression thereof, are sufficient to provide an air-tight seal for the bottle or container.

What I claim as my invention is:

1. As an article of manufacture, a bottle or container stopper having a substantial taper to fit tightly in the mouth of the bottle or other container, formed with a cavity in the central portion thereof, which cavity is open to the contents of the bottle or other container, and formed with an elastic diaphragm providing an outer wall for said cavity, which wall is adapted to balloon out under internal pressure to prevent breakage of the bottle or other container, forming a bond between the

sides of the cavity, the sides of said stopper being substantially thick to provide a body of such mass that distortion thereof by inflation of said diaphragm is prevented, permitting the diaphragm to balloon out under pressure without loosening the stopper in the mouth of the container.

2. As an article of manufacture, a bottle or container stopper having a substantial taper to fit tightly in the mouth of the bottle or other container, formed with a cavity in the central portion thereof, which cavity is open to the contents of the bottle or other container, and formed with an elastic diaphragm providing an outer wall for said cavity, which wall is adapted to balloon out under internal pressure to prevent breakage of the bottle or other container, the sides of said stopper being substantially thick to provide a body of such mass that distortion thereof by inflation of said diaphragm is prevented, permitting the diaphragm to balloon out under pressure without loosening the stopper in the mouth of the container, forming a bond between the sides of the cavity, said diaphragm having a normally closed puncture serving as a valve to automatically open and permit escape of any generated gas pressure to the atmosphere, adapted to automatically close when the diaphragm again assumes its normal position, the stopper being of disk-like form with its periphery beveled to form said taper.

3. A closure for bottles or other containers, comprising a body having an elastic diaphragm adapted to bulge outward under internal expansion or pressure, said diaphragm being free outside to bulge to the limit of its inherent elasticity, said diaphragm being concave on its inner surface, whereby the outer edges of the diaphragm are thicker than the middle portion thereof.

4. As an article of manufacture, a bottle stopper having a substantial body portion tapered to fit tightly in the mouth of the bottle or other closure, formed with a cavity in the central portion thereof, which cavity is open to the contents of the bottle or other container, and formed with an elastic diaphragm providing an outer wall for said cavity, which wall is adapted to balloon out under internal pressure to prevent breakage of the bottle or other container, said diaphragm being concave on its inner surface, whereby the outer edges of the diaphragm are thicker than the middle portion thereof.

5. A stopper for bottles or containers comprising a body of elastic and resilient material having a cavity therein, which cavity is opened to the contents of the container, and having the outer side of said cavity closed by a wall of a thickness to stretch and balloon out under internal pressure, forming an elastic bond between the sides of said cavity, which sides are substantially thicker than said wall, permitting said wall to balloon out un-

der pressure without distorting said thicker sides, and without loosening the stopper in the mouth of the container.

6. A stopper as specified in claim 5, the thickness of said sides permitting compression thereof by the mouth of the bottle or container, substantially without distortion of said diaphragm.

7. A stopper as specified in claim 5, the thickness of the sides permitting compression thereof by the mouth of the bottle or container, without distortion of both said cavity and said diaphragm.

8. A stopper as specified in claim 5, said diaphragm having a normally closed aperture for venting the pressure to the atmosphere, adapted to open when the diaphragm is inflated and ballooned out by the pressure.

9. A stopper as specified in claim 5, said body being disk-like in form, whereby the diameter of the stopper is substantially greater than the depth thereof.

Specification signed this fourteenth day of Dec. 1928.

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JOHN A. KEENAN.