

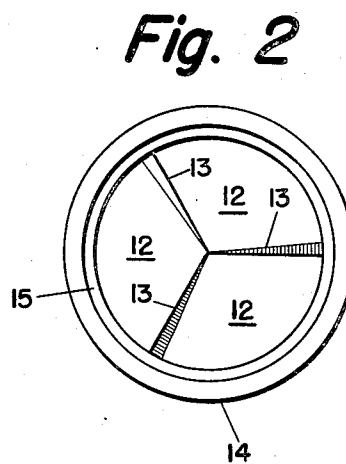
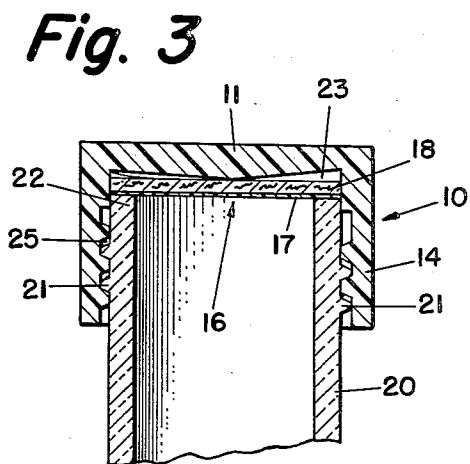
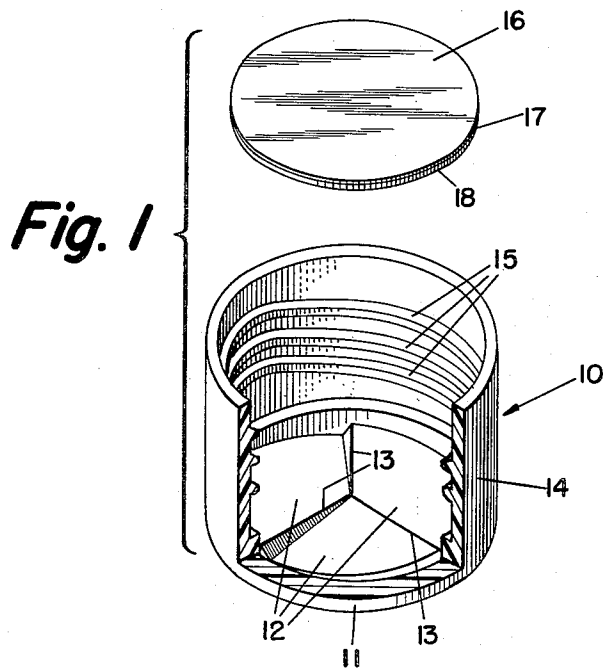
Dec. 20, 1960

F. M. LIPMAN

2,965,257

CLOSURE FOR CONTAINERS

Filed Jan. 12, 1959



INVENTOR.
FREDERICK M. LIPMAN
BY *Roger W. Bowdler*

ATTORNEY

1

2,965,257

CLOSURE FOR CONTAINERS

Frederick M. Lipman, Yonkers, N.Y., assignor to Charles Marchand Company, New York, N.Y., a corporation of Delaware

Filed Jan. 12, 1959, Ser. No. 786,068

2 Claims. (Cl. 215—56)

This invention relates to closures for containers, and more particularly to an improved self-venting closure for bottles and jars containing unstable liquids, which tend to decompose, whereby to build up undesirably high internal pressures during storage.

A rather serious problem relating to bottle breakage exists in the cosmetic industry, especially in connection with the storage of compositions for bleaching hair. The usual method of marketing such composition is to package a bottle containing a stabilized solution of hydrogen peroxide in a carton, along with one or more envelopes containing an activator for the hydrogen peroxide. Since a four-ounce bottle of peroxide contains sufficient peroxide to yield over two liters of oxygen gas, if the peroxide were to be completely decomposed; and since the standard bottle, when filled, contains only about fifteen milliliters of free space, it is obvious that any substantial decomposition of the peroxide will cause the build-up of sufficient pressure within the bottle to cause an explosion, if the bottle is kept tightly sealed.

Ordinarily, the bottle of peroxide, as shipped, is sufficiently stable so that it may be stored for extended periods of time without noticeable decomposition. However, it is possible that if the bottle is stored in an unfavorable environment, such as over a radiator, or in a showcase next to an electric light bulb, that decomposition may be rapid enough to cause sufficient pressure to be built up within the bottle to shatter it.

A more serious breakage problem, however, occurs in the use of the package of hair bleach. Usually the bottle will contain sufficient peroxide for two or more treatments. The instructions accompanying the package will instruct the user to pour out a portion only of the contents of the bottle, and add to the solution thus poured out, the contents of one envelope of the activator. Addition of the activator will cause controlled decomposition of the peroxide to release nascent oxygen, which is effective to bleach hair. The user is enjoined to discard any of the liquid which has been admixed with the activator, if any should be left over after the treatment. Some people, however, cannot bear to throw anything away. They will return unused liquid to the bottle, and cap it tightly. Since the liquid returned to the bottle contains activator, a rapid decomposition of the remaining peroxide will ensue, pressure will build up, and the bottle will explode. Serious injuries have been reported as a result of such explosions.

In a search for a solution to the foregoing problem, various types of self-venting bottle caps have been proposed. Some of these provide for spring-biased valves which will open when abnormal pressure builds up. Others, such as the construction shown in U.S. Patent 2,738,091 to Mattox, provide a free space in the top of the cap into which a part of the cap liner may be forced to allow gas or liquid to escape. These prior proposals have not, to my knowledge, achieved commercial success, due to the high cost of manufacture of the spring-loaded valve type, and due to the fact that closures of the

2

Mattox type require that a mold insert be used in addition to the one-piece screw plug used as the male portion of the die in the molding of bottle caps of conventional construction. Use of the insert makes compression molding impractical, since there is a tendency to force the molding powder into the clearance between the screw plug and the insert, which makes it extremely difficult to unscrew the cap from the mold. Injection molding is possible, since the pressures used are less than in compression molding, and there is less tendency for the material to be forced between the screw plug and the insert. However, injection molding is restricted to thermoplastic materials, which rules out the use of inexpensive phenolic resins when using this type of molding. Furthermore, the initial cost of multiple-part dies is far greater than the initial cost of single-piece dies, and the manufacturing costs involved in the case of multiple-part dies is higher.

It is an object of this invention to provide a bottle or jar closure which will provide a tight seal against the escape of gas or liquid from the container during normal shipping or use, but which will operate to vent gas or liquid in the event that abnormal pressures should build up in the bottle.

It is a further object of this invention to provide a self-venting container closure which is adapted to manufacture by compression molding.

I have found that the foregoing object can be attained by providing the inner surface of the top of a screw cap with a plurality of inclined ramps extending outwardly from the axis of the cap, which ramps terminate in raised edges which lie in the same plane, perpendicular to the axis of the cap, which raised edges will provide support for a cap liner when the cap is in use. The pitch of the ramps is in the same direction, and equal to or less than the pitch of the screw threads, so that they present no obstruction to unscrewing the cap from the screw plug, which forms the male portion of the die, at the end of the molding operation. While in normal usage, the resilience of the cap liner, when compressed between the lip of the container and the ramp edges, serves to maintain a tight seal and prevent the escape of liquid from the container; in the event that abnormal pressures build up, the material of the cap liner will be forced upwardly into the space formed by the depressed portions of the ramps, breaking the seal with the lip of the container, and allowing gas or liquid to escape via the space between the threads of the cap and the container.

In order that those skilled in the art may more fully understand the nature of my invention, it will be more fully described in connection with the accompanying drawings, in which:

Fig. 1 is an exploded view of a container cap and cap lining in accordance with my invention, in which the skirt of the cap is partially broken away to illustrate details of the construction;

Fig. 2 is a bottom view of the cap of Fig. 1, and

Fig. 3 is a cross-sectional view of the cap as it would appear in place on the neck of the container.

Referring now more particularly to Fig. 1, it will be noted that the cap, illustrated generally at 10, is provided with a top sealing portion 11 which carries on its inner surface three ramp members 12 which terminate in raised edges 13 extending from the center of top sealing portion 11 to its juncture with a cylindrical skirt 14, which raised edges 13 lie in the same plane, perpendicular to the axis of skirt 14. Skirt portion 14 of cap 10 depends from top sealing portion 11, and carries on its interior surface screw threads 15. It will be noted, that the pitch of ramps 12 relative to the plane of the top sealing portion 11 is illustrated as being equal to the pitch of screw threads 15 relative thereto. It is essential that the

3

pitch of ramps 12 be not greater than the pitch of screw threads 15, since if it were greater, the cap could not be unscrewed from the screw plug at the conclusion of a molding operation. The pitch of ramps 12 may be less than the pitch of screw threads 15, but it is preferred that the pitches be equal in order to leave as large a space as possible for venting the container, as will be hereinafter more fully described. Cap liner 16 is provided with a thin flexible sealing sheet 17, which may be made of any substance inert to the contents of the container to which the cap may be attached, such as, for example, 5 mil vinyl plastic, and also with a resilient backing member 18, which may be made of cork, fiber board, or any other suitable deformable material.

Fig. 3 illustrates the cap 10, together with liner 16, in place on the neck 20 of a bottle, which neck is provided with exterior screw threads 21 which mesh with screw threads 15 of cap 10. Lip 22 of bottle neck 20, when cap 10 is screwed down thereon, contacts liner 16 in sealing engagement with sealing sheet 17, while backing member 18 rests against the raised edges 13 of ramp members 12. When no abnormal pressure is present in the bottle, liner 16, pressing against the lip 22 serves to effectively seal against the escape of liquid. However, when abnormal pressures build up, liner 16 will be forced up into space 23 between the liner and the depressed areas of ramp members 12 to allow gas or liquids to escape through the path 25 between screw threads 15 and screw threads 21.

The effectiveness of caps made according to the present invention to seal bottles under normal conditions, was tested by sending bottles of hydrogen peroxide solution, capped as described above, in their regular shipping containers, on return trips from New York to Los Angeles and Chicago. On their return they were inspected and no leakage was found. In order to test the ability of the cap to vent the bottle under abnormal pressure conditions, the contents of an envelope of activator powder was dissolved in a part of the hydrogen peroxide solution taken from a bottle. This liquid was then returned to the bottle, the cap was applied tightly, and the bottle was inverted in a rack in an enclosed space. When the pressure within the bottle became sufficiently great, liquid flowed readily out of the bottle between the screw threads.

It will be observed from the foregoing that the present invention has provided a container closure which is effective to seal the container under normal conditions while venting the container when abnormal pressures build up therein, and which may be readily fabricated in a compression molding machine,

4

While in the foregoing description, but three ramp members have been set forth, in sealing wide-mouth bottles it may be desirable to have four or more in order to provide proper support for the cap liner, and my invention should be construed to cover those constructions in which the top sealing portion carries four or more ramp members. Likewise, two ramp members may be used in place of three, but this construction is not preferred, since there is a tendency for the liner to wobble when the cap is being screwed onto the bottle, and an imperfect seal may result.

The invention claimed is:

1. A container closure including in combination a top sealing portion, a cylindrical skirt depending from the top sealing portion, screw threads on the interior wall of said skirt, and a plurality of inclined sector shaped ramp members carried on the inner surface of said top sealing portion, said ramp members terminating in raised edges extending from the center of the top sealing member to the skirt and lying in a plane perpendicular to the axis of the skirt, the pitch of said ramp members at their peripheral edges being in the same direction as the pitch of the screw threads, and not greater than the pitch of said screw threads relative to the plane of the top sealing member.

2. A closure for use on a container having a mouth defined by a top circumferential lip comprising a top sealing portion, a cylindrical skirt depending from the top sealing portion, interior screw threads on said cylindrical skirt adapted to engage exterior screw threads on said container mouth, a plurality of inclined sector shaped ramp members carried on the inner surface of said top sealing portion, said ramp members terminating in raised edges extending from the center of the top sealing member to the skirt and lying in a plane perpendicular to the axis of the skirt, the pitch of said ramp members at their peripheral edges being in the same direction as the pitch of the screw threads, and not greater than the pitch of said screw threads relative to the plane of the top sealing member, and a resilient disc-shaped liner in said closure adapted to be compressed between the raised edges of said ramp members and said circumferential lip in sealing relationship thereto.

References Cited in the file of this patent

UNITED STATES PATENTS

2,254,815	Barnby	Sept. 2, 1941
2,738,091	Mattox	Mar. 13, 1956