

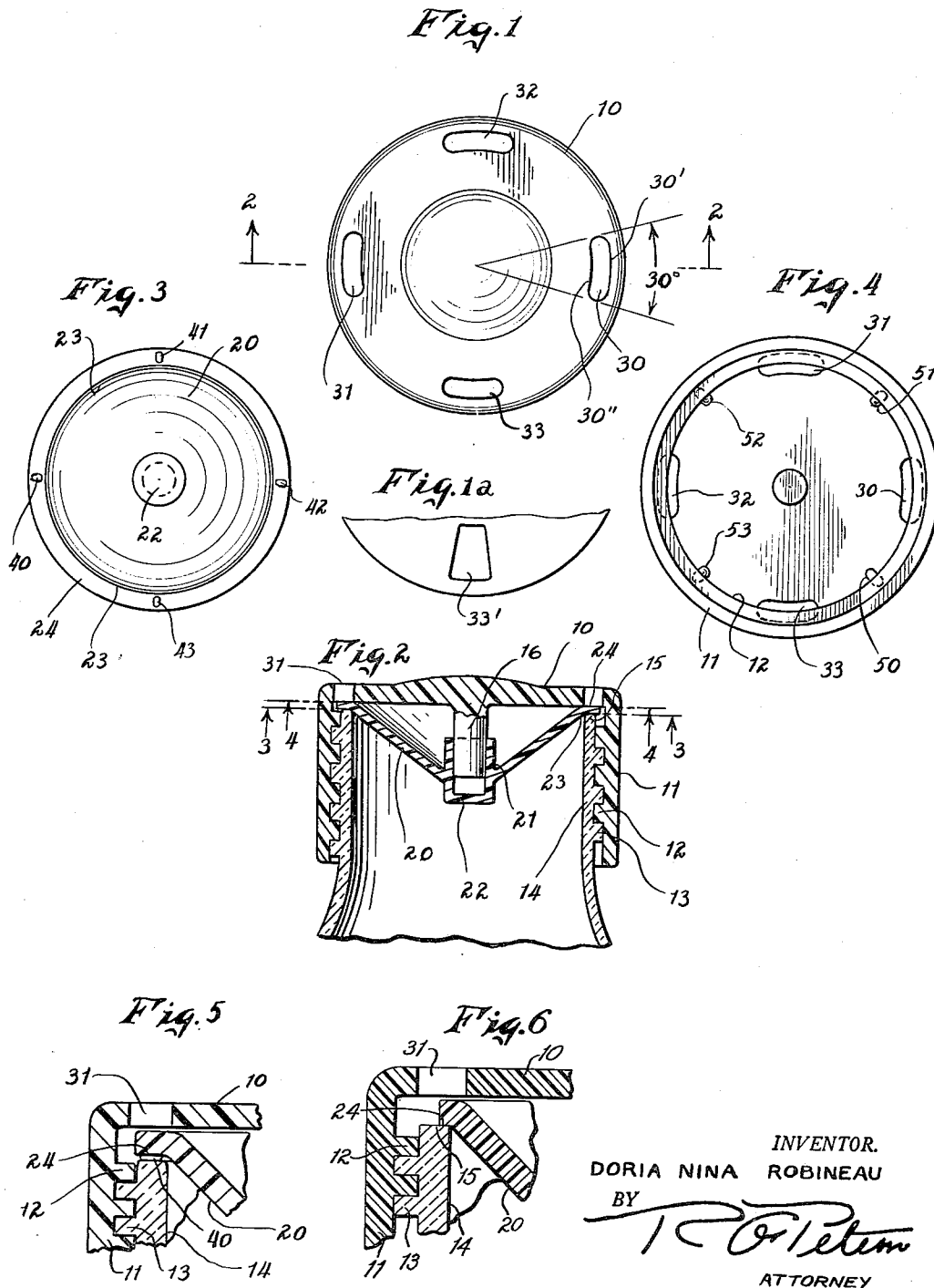
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BOTTLE CLOSURE

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BOTTLE CLOSURE

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This invention relates to closures for bottles, jars or similar screw top containers and, in particular, it is concerned with a form of closure in combination with a gasket for sealing such containers effectively against liquid leakage, but in a manner which will permit release of pressure developed within the sealed container by decomposition or evaporation of the liquid.

Particularly in the chemical arts it is common experience that many liquids like aqueous ammonia, aqueous hydrogen peroxide, and others undergo slow decomposition during storage with the evolution of a gas. Containers of such liquids have been known to burst as a result of excessive internal pressure so developed. A similar situation arises in the storage of extremely volatile organic compounds, such as acetone, ether and alcohols. In this case the vapor pressure of the liquid which, despite instructions carried on the bottle, will frequently be stored at excessively high temperatures, becomes so high that the sudden release of pressure creates a hazard when the closure is opened.

It is, accordingly, a fundamental object of this invention to provide a closure suitable for use on bottles, typically screw tops, which is characterized by its forming a reliable liquid seal, but which will permit gases formed within the container to escape when their pressure passes a given level.

It is another object of the invention to provide a bottle closure suitable for use with containers of conventional design such that adequate liquid seal may be developed within the said container.

Other objects and advantages of the invention will in part be obvious and in part appear hereinafter.

The invention, accordingly, is embodied in a sealing cap, typically a screw top, for a bottle having an external threaded neck portion, the cap being provided with an internally extending stud which is matched to an internal conical gasket fitted onto said stud. The cap is further characterized by having pressure release orifices in the top portion directly over the end of the bottle neck section, the bottle itself being sealed by the gasket which is aligned with the pressure release orifices, and, with the cap, is formed to aid in the release of pressure.

A better understanding of the invention may be had by reference to the drawings wherein:

Fig. 1 is a plan view of the typical closure for the bottle;

Fig. 1a is a fragmentary view and showing a modification;

Fig. 2 is a section taken along the line 2—2 of Fig. 1; and

Fig. 3 is a view taken along the line 3—3 of Fig. 2; and Fig. 4 is a view taken along the line 4—4 of Fig. 2 to illustrate an alternative form of cap;

Fig. 5 is a fragmentary section, enlarged to illustrate operation of the seal.

Fig. 6 is a view corresponding to that of Fig. 5 but showing an alternative form or structure.

Referring now to Figs. 1 and 2, the device comprises a

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cap 10 having axial cylindrical portion 11 provided with internal threads 12 to engage corresponding threads 13 on the bottle neck 14.

The bottle or container is of conventional design in that the body itself may be of any shape, having a neck which terminates in a definite thickness or ring 15 which is transverse to the axis of the mouth of the container itself. The cap 10 may be formed of hard plastic or any other material of suitable mechanical strength for forming a bottle closure. Extending inwardly from the bottle cap 10 is the internal stud 16 which may be solid or hollow.

The sealing member is generally of the construction described in U.S. Patent 2,734,651, issued Feb. 14, 1956, on application Ser. No. 213,847, filed Mar. 5, 1951, by Alrik C. Lindstrom. The sealing member itself comprises a single piece gasket 20 of resilient material, generally of a frusto-conical shape having a central longitudinal sleeve 21, which is closed at its lower end by the integral web 22. The conical surface extends at an angle of about 45° to a circle 23 corresponding to the internal diameter of the neck of the bottle, whereupon the end section is compressed between the cap 10 and bottle end 15 and bent outwardly substantially in a plane transverse to the axis of the central cylindrical sleeve to form end section 24 of the sealing member. The section 24 of the sealing member extends over end ring 15 of the wall of the bottle itself, so that in a relaxed position when placed in a container of matching size the conical portion of the sealing member fits within the neck of the bottle and the rim section 24 will be sufficient to rest on the end of the bottle neck.

The internal stud 16 and sleeve 21 are provided to give accurate centering of the sealing member within the cap.

The end portion 24 of the sealing neck is pressed against the inner face of the cap 10 when the center sleeve 21 is placed on the cap by slipping the sleeve 21 on the stud 16. In this way the sealing member is accurately centered on the neck of the bottle and facilitates engagement of the cap threads with the threads of the bottle.

To permit escape of gas formed in the container when it is sealed, the cap 10 is provided with at least one orifice 30 and preferably with two or more as indicated in Fig. 1 where four symmetrically placed orifices 30, 31, 32, and 33, are shown. The orifices themselves are concentric with the cap itself so that the orifice 30, in one form for example, is arcuate and elongated, with its outer edge 30' substantially aligned with the outer circumference of the section 24 of the internal gasket 20. The inner edge 30'' of the orifice 30 is preferably of a radius smaller than the inside radius of the bottle neck. This alignment of the orifice 30 over the neck of the bottle is shown in Fig. 2 where the longitudinal section reveals the relationship of the parts.

Fig. 1a shows a modified orifice 33' extending radially. In Fig. 3, one structure of the underface of the sealing member 20 is shown. The characteristic of this underface is in the formation integrally with the member of at least one and preferably a plurality of projections or ribs 40, 41, 42, 43, each of the order of a millimeter in height above the plane of the face 24.

In Fig. 4 an alternative structure of the lower face of the cap is shown. Here it will be seen that it is provided with a series of integral projections or ribs 50, 51, 52, 53, similar to those formed integrally with the sealing member.

In Fig. 5 an enlarged fragmentary section of the bottle neck, orifice 33 and end section 24 is shown in order to clarify the manner of operation.

In a preferred form shown in Fig. 6, the diameter of

the flaring lip 24 of the liner in less than that of the outer walls of the container mouth. The outer edge of the lip 24 lies under the opening 31.

The functioning of the bottle as sealed with this closure is that by forming the sealing member of a resilient plastic material having a slight elastic lag, such as high molecular weight polyvinyl chloride, polyethylene, or polytetrafluorethylene, sealing and release of gas are obtained efficiently.

The bottle is sealed as shown by virtue of the fact that the major portion of the circumference of the end of the bottle neck 14 is in contact with the end section 24 of sealing member 20 and the resilient material is compressed between the several sections of the cap 10 between orifices. The pressure is such that the small projections 40, 41, 42, 43 and the like are compressed sufficiently to develop complete liquid seal. Upon the formation of a given proportion of gas within the container, pressure builds up sufficient to cause the portion of the sealing gasket intercepted by the arc of the orifice 33, for example, to be raised very slightly, as indicated in Fig. 5, to permit the escape of such gas between the sealing member beyond its edge and out through the orifice 33.

In this form of seal, the cap having a planar interior is used.

The alternative interior face of the cap 10 shown in Fig. 4 can be used with a planar sealing member or one like that shown in Fig. 3. In the form shown in Fig. 6, the pressure forces the edge of the lip 24 up into the opening 31 to permit escape of gas between the lip 24 and end 15 of the container mouth. The effect sought for completing sealing is a differential compression on the gasket or sealing member around the circumference of the bottle neck. The result is the sealing member is compressed against the bottle top throughout its circumference tight enough to seal the bottle against leakage, but the differential pressure develops between the sealing member and the container. The result is when gas pressure develops within the bottle the gas finds a route of escape through such a course where the area of less pressure against the sealing member is intercepted under the orifice 30; for example.

In this fashion the storage of volatile or even decomposable liquids within closed containers becomes possible, because by forming the sealing members of a material matched to the properties of the liquids to be stored, gas escape is permitted and dangerous internal container pressures do not develop.

Although the invention has been described with reference to only a single embodiment it is to be understood that variations thereof may be practiced without departing from its spirit or scope.

What is claimed is:

1. A closure for a container having a mouth defined by a container wall portion terminating in an end encircling the mouth in a plane transverse to the axis of the opening of the container mouth, said closure comprising a cap having at least one orifice therein, said orifice being oriented over the end of the wall defining the mouth of the container and extending over the mouth of the container, a cylindrical portion on said cap with means for tightening the same upon a container, an imperforate sealing member of resilient material fitted within said cylindrical portion against said cap, said sealing member being frusto-conical and flaring outwardly from a central portion of the sealing member to fit upon the mouth of the container, with the outer edge of said sealing member terminating under said orifice and over the end of the wall defining the mouth of the container, said sealing member cooperating with said cap and said container mouth to produce a differential compression of the edge of said resilient sealing member upon closure of said bottle.

2. A closure for a container having a mouth defined

by a container wall portion terminating in an end ring encircling the mouth in a plane transverse to the axis of the opening of the container mouth, said closure comprising a cap having a cylindrical portion and a flat portion parallel to said end surface with at least one orifice in said flat portion, said orifice being oriented over the end of said end ring, an imperforate sealing member of frusto-conical form and of resilient material within said cylindrical portion, the base portion of said sealing member extending outwardly to a diameter corresponding to the internal diameter of said cylindrical cap portion, spacer means between said cap and said container mouth whereby a differential compression of said resilient sealing member is effected upon closure of said container, and cooperating means comprising telescoping elements located centrally of said sealing member and said cap member slidably supporting said sealing member on said cap member.

3. The closure as recited in claim 2 in which the orifice has its sides defined by arcs of concentric circles having their centers at the center of the cap.

4. The closure as recited in claim 3 in which said spacer means are a plurality of ribs formed integrally with the ring of said sealing member.

5. The closure as recited in claim 3 in which said spacer means are a plurality of ribs formed integrally with the cap.

6. A screw top closure for a liquid container having a neck terminating in an end encircling the mouth in a plane transverse to the axis of the opening of the container mouth, said closure comprising in combination a cap, at least one orifice in said cap, said orifice being oriented over the end of said neck, a cylindrical portion with threads therein on said cap for tightening the same upon the neck of the container, and an imperforate sealing member of resilient material within said cap, said sealing member having an end section in contact with said cap around the circumference of said cap, said sealing member flaring inwardly in frusto-conical form from said ring section to the central portion of the sealing member, whereupon said frusto-conical section fits within the mouth of said container, and said end section contacts the mouth of said container and spacer means cooperating with said end section to create a differential degree of compression of said sealing member when the cap is closed on the mouth of a bottle.

7. A device in accordance with claim 6 wherein said spacers are integral with said sealing means.

8. A device in accordance with claim 6 wherein the spacers are integral with said cap.

9. A closure for a container having a mouth defined by a container wall portion terminating in an end encircling the mouth in a plane transverse to the axis of the opening of the container mouth, said closure comprising a cap having at least one orifice therein, said orifice being oriented over the end of the wall defining the mouth of the container and extending over the mouth of the container, a cylindrical portion on said cap with means for tightening the same upon a container, an imperforate sealing member of resilient material fitted within said cylindrical portion against said cap, said sealing member being frusto-conical and flaring outwardly from a central portion of the sealing member to fit upon the mouth of the container, the outer edge of the outwardly flaring portion of said sealing member terminating under said orifice intermediate the radial ends thereof and over the end of the wall portion defining the mouth of the container, whereby said outer edge is resiliently differentially compressed between said cap and said end.

References Cited in the file of this patent

UNITED STATES PATENTS

1,509,419	Colgate et al.	Sept. 23, 1924
2,514,124	Eisen	July 4, 1950
2,734,651	Lindstrom	Feb. 14, 1956