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R. B. TEETERS ET AL

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CLOSURE

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FIG. 1.

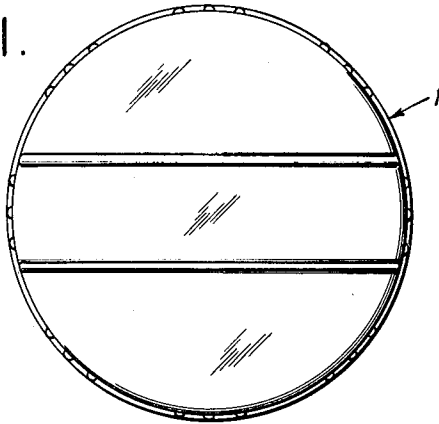


FIG. 2.

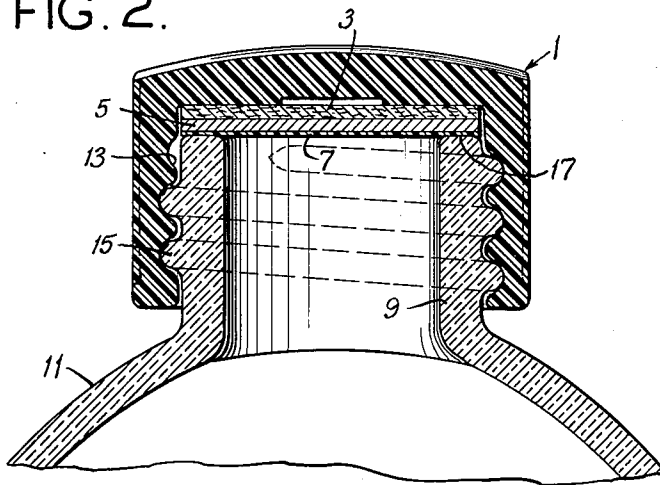
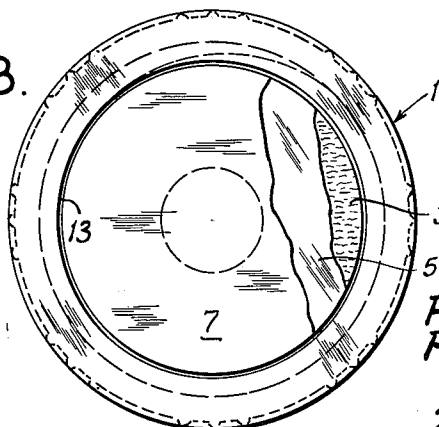


FIG. 3.



Robert B. Teeters,
Russell Marty,
Inventors.
Koenig and Pope,
Attorneys.

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CLOSURE

Robert B. Teeters, Rock Hill, and Russell Marty, Ferguson, Mo., assignors to Mallinckrodt Chemical Works, St. Louis, Mo., a corporation of Missouri

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7 Claims. (Cl. 215—40)

This invention relates to closures, and more particularly to a non-corrosive, leak-proof screw-cap type of closure for a bromine container.

Among the several objects of the invention may be noted the provision of a screw-cap type of closure, particularly for bromine bottles, which effectively prevents leakage of bromine, noting that bromine is both extremely volatile and extremely corrosive; the provision of a closure of the class described which is most effectively resistant to the corrosive effect of bromine liquid and vapor; the provision of a closure of the class described which may be easily tightened sufficiently to make a leak-proof seal without the use of any tools or special closing devices, and which may be readily loosened; the provision of a closure of the class described which is effective to maintain a tight seal despite handling and abuse and which is safe against accidental removal; and the provision of a closure of the class described which is economical to manufacture and adaptable to standard liquid containers, particularly glass bottles. Other objects will be in part apparent and in part pointed out hereinafter.

The invention accordingly comprises the elements and combinations of elements, features of construction, and arrangements of parts which will be exemplified in the structures hereinafter described, and the scope of which will be indicated in the following claims.

In the accompanying drawing, in which one of various possible embodiments of the invention is illustrated,

Fig. 1 is a plan of a closure of this invention;

Fig. 2 is a vertical cross section of the closure as applied to a bottle; and,

Fig. 3 is a bottom plan of the closure, with parts broken away.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawing.

Referring to the drawing, a closure made in accordance with our invention is shown to comprise a screw cap 1 in which is placed a packing comprising a backing 3, an intermediate liner 5 and an outer contact liner 7. The closure is illustrated in Fig. 2 as screwed in place on the neck 9 of a glass bromine bottle 11.

The cap 1 is made of a bromine-resistant material and is formed with an internal thread 13 mating with an external thread 15 on the neck of the bottle. The threads are such as to insure a firm gripping of the cap on the bottle. The cap preferably is molded of a standard phenolic resin, such as the resin sold under the trade designation Durez, or any other suitable bromine-resistant plastic.

The lip of the bottle is designated 17. The bottle must be made so that the lip presents a reasonably uniform smooth level surface. As a practical matter, however, account must be taken of irregularities in the conformation of lips of bottles, both as to alignment with the cap and as to slight irregularities in smoothness.

The backing 3 consists of a layer of a resilient bromine-resistant material which is adapted to be compressed so as to conform to irregularities in the conformation of the

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lip of a bottle when the cap is screwed in place, and to resume its original form when the cap is unscrewed. We have most successfully used a disk of asbestos for this backing layer, the diameter of the disk being slightly less than the internal diameter of the cap.

The intermediate liner 5 consists of a layer of a semi-rigid non-resilient bromine-resistant material providing a semi-rigid non-resilient base for the contact liner 7. We have most successfully used a disk of lead of approximately the same diameter as the disk 3 for this intermediate liner.

The contact liner 7 consists of a thin layer of a compressible material which is inert to bromine and which is adapted for compression between the semi-rigid liner 5 and the lip 17 of the bottle to conform to minute deformities in the lip of the bottle, thereby to effect a tight seal all around the lip. As shown in Fig. 2, this contact liner is much thinner than liner 5. We have most successfully used for the contact liner a disk cut from a thin sheet of polymeric tetrafluoroethylene, which may be obtained under the trade designation Teflon. This material is inert to bromine liquid and vapor, and is capable of the necessary compression to effect a tight seal.

The cap 1 with disks 3, 5 and 7 therein is screwed upon the neck 9 of a bottle sufficiently tightly to compress the resilient backing disk 3. Should there be any considerable irregularity of the lip of the bottle whereby the lip is out of line with respect to the inside of the top of the cap, this irregularity is taken care of by compression of the resilient backing 3 and lining up of the lead disk 5 with the lip of the bottle. As to any irregularities in the lip of the bottle which are too small to be compensated by compression of the backing layer, the contact liner 7 is compressed between the semi-rigid disk 5 and the lip 17 of the bottle to effect a tight seal. It will be observed that with a tight seal all around the lip of the bottle the only part of the cap which is exposed to bromine is the contact liner 7 and that this is formed of a material inert to bromine. When the closure is removed, parts 1, 3 and 5 may be exposed to bromine vapor, but since all these parts are bromine-resistant, little if any corrosion of these parts is occasioned.

In a typical physical embodiment of the invention, the cap has an internal diameter of approximately 1 inch, an overall height of about $\frac{7}{8}$ inch, disks 3 and 5 are each $\frac{1}{16}$ inch thick, and the contact liner 7 is .0005 inch thick.

It will be understood that while the invention is applicable particularly to bromine containers, it may be applicable to containers for other substances.

While the invention is herein disclosed as applied to a glass bottle, it will be understood that it may be applied to containers made of suitable material other than glass.

In the preceding specification and in the ensuing claims, "bromine-resistant" means that the material, while not necessarily absolutely inert to attack by bromine, is at most only slightly attacked by bromine, and "inert to bromine" means that the material is absolutely inert and not attacked in any degree by bromine. It will be recognized that the container and contact liner, being in direct and continuous contact with the bromine, must be made of materials inert to bromine, both to prevent attack of these parts and to prevent contamination of the bromine. On the other hand, the cap, backing and intermediate liner, which are not in direct and continuous contact with the bromine, need not be made of materials inert to bromine, but should be made of materials which are at least resistant to bromine to the degree mentioned.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above

description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

We claim:

1. A closure for a bromine container, such as a glass bottle having a screw-threaded neck, comprising a screw cap made of bromine-resistant material, and a packing in the cap for effecting a leak-proof seal when the cap is screwed tightly on the container, said packing comprising a backing, an intermediate liner and an outer contact liner, said backing consisting of a layer of resilient bromine-resistant material adapted to be compressed to conform to irregularities in the lip of the container when the cap is screwed in place and to resume its original form when the cap is unscrewed, said intermediate liner consisting of a layer of lead, this being bromine-resistant and providing a semi-rigid base for the outer contact liner, said outer contact liner consisting of a layer of polymeric tetrafluoroethylene, the latter being inert to bromine and adapted to conform to deformities in the lip of the container by compression between the lip and the lead layer.

2. A closure for a bromine container, such as a glass bottle having a screw-threaded neck, comprising a screw cap made of bromine-resistant material, and a packing in the cap for effecting a leak-proof seal when the cap is screwed tightly on the container, said packing comprising a backing, an intermediate liner and an outer contact liner, said backing consisting of a resilient layer of asbestos, this being bromine-resistant and adapted to be compressed to conform to irregularities in the lip of the container when the cap is screwed in place and to resume its original form when the cap is unscrewed, said intermediate liner consisting of a layer of lead, this being bromine-resistant and providing a semi-rigid base for the outer contact liner, said outer contact liner consisting of a layer of polymeric tetrafluoroethylene, the latter being inert to bromine and adapted to conform to deformities in the lip of the container by compression between the lip and the lead layer.

3. A closure for a bromine container, such as a glass bottle having a screw-threaded neck, comprising a screw cap made of bromine-resistant material, and a packing in the cap for effecting a leak-proof seal when the cap is screwed tightly on the container, said packing comprising a backing, an intermediate liner and an outer contact liner, said backing consisting of a resilient disk of asbestos, this being bromine-resistant and adapted to be compressed to conform to irregularities in the lip of the container when the cap is screwed in place and to resume its original form when the cap is unscrewed, said intermediate liner consisting of a disk of lead, this being bromine-resistant and providing a semi-rigid base for the outer contact liner, said outer contact liner consisting of a disk of polymeric tetrafluoroethylene, the latter being inert to bromine and adapted to conform to deformities in the lip of the container by compression between the lip and the lead disk.

4. A closure for a bromine container, such as a glass bottle having a screw-threaded neck, comprising a screw cap made of bromine-resistant material, and a packing in the cap for effecting a leak-proof seal when the cap is

screwed tightly on the container, said packing comprising a backing, an intermediate liner and an outer contact liner, said backing consisting of a resilient disk of asbestos, this being bromine-resistant and adapted to be compressed to conform to irregularities in the lip of the container when the cap is screwed in place and to resume its original form when the cap is unscrewed, said intermediate liner consisting of a disk of lead generally of the same thickness as the backing, the lead disk being bromine-resistant and providing a semi-rigid base for the outer contact liner, said outer contact liner consisting of a disk of sheet polymeric tetrafluoroethylene considerably thinner than the lead disk, the contact liner being inert to bromine and adapted to conform to deformities in the lip of the container by compression between the lip and the lead disk.

5. In combination, a closure cap and a packing in the cap comprising a resilient backing consisting of a layer of asbestos, an intermediate liner consisting of a layer of lead, and an outer contact liner consisting of a layer of polymeric tetrafluoroethylene.

6. In combination, a screw cap and a packing in the cap comprising a resilient backing consisting of a disk of asbestos, an intermediate liner consisting of a disk of lead, and an outer contact liner consisting of disk of sheet polymeric tetrafluoroethylene considerably thinner than the lead disk.

7. A closure for a bromine container, such as a glass bottle having a screw-threaded neck, comprising a screw cap made of bromine-resistant material, and a packing in the cap for effecting a leak-proof seal when the cap is screwed tightly on the container, said packing comprising a backing, an intermediate liner and an outer contact liner, said backing consisting of a layer of resilient bromine-resistant material adapted to be compressed to conform to irregularities in the lip of the container when the cap is screwed in place and to resume its original form when the cap is unscrewed, said intermediate liner consisting of a layer of lead, this being bromine-resistant and providing a semi-rigid base for the outer contact liner, said outer contact liner consisting of a layer of a fluorine-containing polymer which is inert to bromine and adapted to conform to deformities in the lip of the container by compression between the lip and the lead layer.

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