United States Patent [19]

Van Gordon et al.

[11] **3,814,276**

[45] **June 4, 1974**

[54] **CORROSION-PROOF CLOSURE ASSEMBLY**

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[22] Filed: **Aug. 14, 1972**

[21] Appl. No.: **280,344**

[52] **U.S. Cl.**..... **220/39 R**, 220/85 P, 138/96 T, 138/89 R

[51] **Int. Cl.**..... **B65d 41/04**

[58] **Field of Search**..... 220/39 R, 39 B, 85 P; 285/202; 138/89, 96 T

[56] **References Cited**

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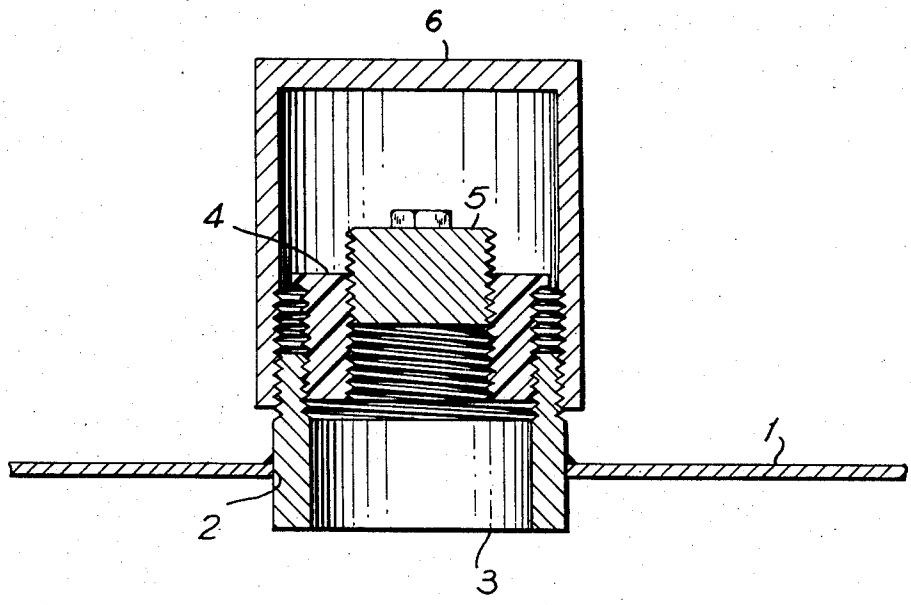
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[57] **ABSTRACT**

The tendency of threaded closures for metal containers employing metal caps or plugs to become inoperative as a result of corrosion or excessive wearing away of the threads is significantly reduced by employing a hollow, non-metallic member that is removably engaged with both the perimeter of the container aperture and the cap or plug. A metallic cover forms part of the closure assembly and conceals all non-metallic members, thereby conforming to the requirement for a container exhibiting a completely metallic exterior surface.

4 Claims, 2 Drawing Figures



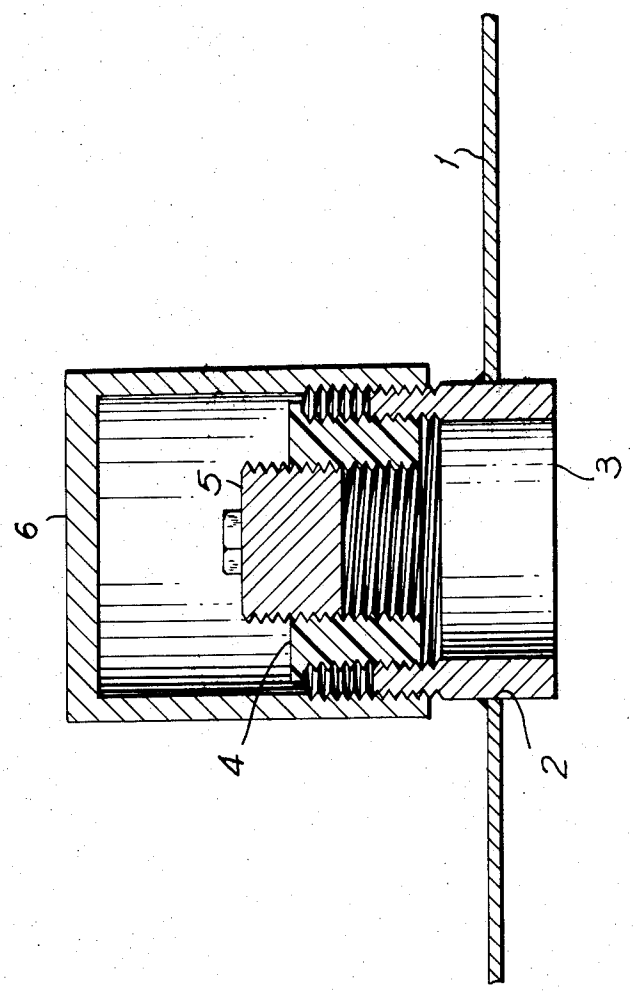


FIG.1

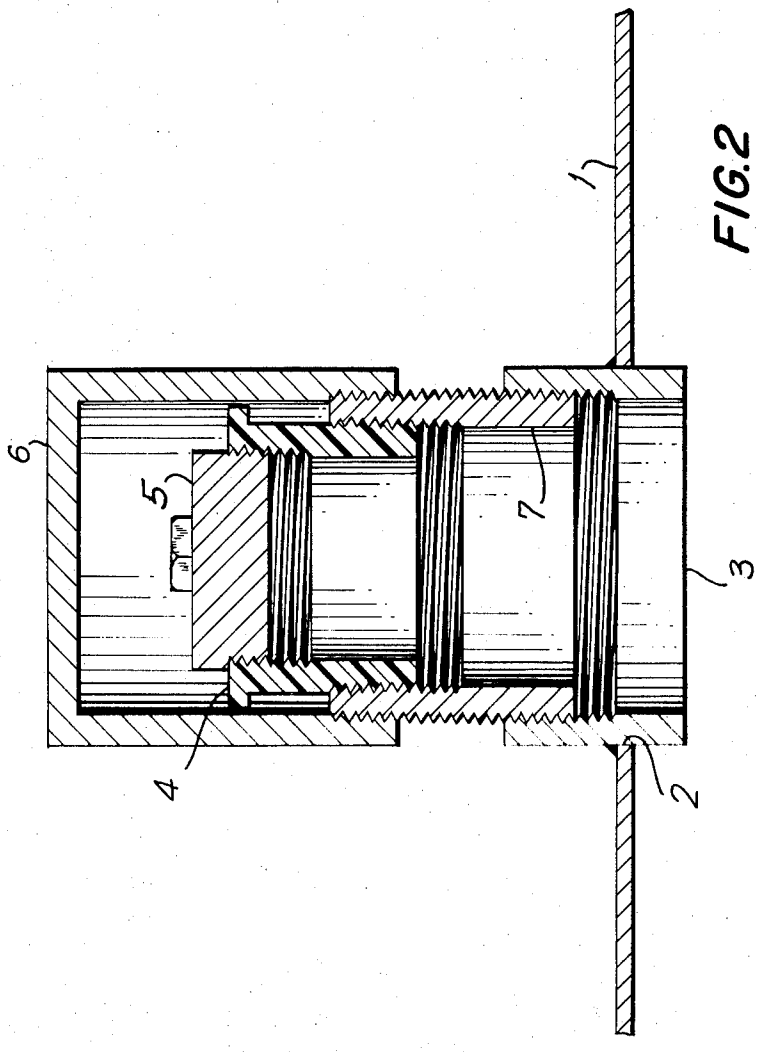


FIG.2

CORROSION-PROOF CLOSURE ASSEMBLY

This invention relates to an improved closure for metal containers. The invention further relates to a container closure which is not susceptible to being rendered inoperative as result of corrosion by the contents of the container, yet complies with the requirement that all exposed exterior surfaces of the sealed container be metallic.

Metal containers are commonly employed to store and transport solid or liquid materials. The apertures of these containers are in many instances sealed using a metal plug or cap which is secured in place by means of mating screw threads along the perimeters of the plug and the aperture. The metal plug or cap is used to conform to the requirement that all exposed surfaces of the container be metal.

This type of closure is less than desirable since the threads on the aperture and plug are subject to corrosion by the contents of the container. The corrosion may damage the threads to the extent that the plug can no longer be removed from the aperture by conventional methods, i.e., a wrench or other suitable tool. In addition, the threads often wear down as the plug is repeatedly inserted and withdrawn from the aperture. The end result of either corrosion or thread wear is that it is no longer possible to use the container. It is usually less costly to replace the entire container than to form new threads at the aperture.

One objective of this invention is to prolong the useful life of metal containers by providing a replaceable closure assembly which is not rendered inoperative by corrosion resulting from contact with corrosive materials stored within the container. A second objective is to provide a sealed container wherein all exposed surfaces are metallic.

The foregoing objectives are realized by 1) providing a hollow, non-metallic member between the metal plug and the wall of the container aperture, said non-metallic member being removably engaged with respect to both the plug and the container wall and 2) providing a metal cover which conceals all non-metallic elements of the sealed container.

Additional objectives and advantages of this invention will be evident from the accompanying drawings.

FIG. 1 represents a sectional view of one embodiment of a closure assembly.

FIG. 2 represents a sectional view of a second embodiment of this invention and provides an alternative means for securing a hollow metal cap over the closure assembly.

Referring to FIG. 1, the wall 1 of a metal container exhibits at least one aperture 2 communicating with the interior of the container for the purpose of transferring materials into or out of the container. The outer wall of a metal tube 3 is secured to the perimeter of the aperture by suitable means, e.g., welding, and extends outwardly from the wall of the container. The inner wall of the metal tube is removably engaged by means of a threaded connection with at least a portion of the outer wall adjacent to one end of a non-metallic tube 4. At least a portion of the inner wall adjacent to the opposite end of the non-metallic tube is threaded to receive a plug 5 which is formed from either a metal or a non-metallic material. The inner walls of tubes 3 and 4 form a passage that communicates between the interior and exterior of the container. The outer end of the passage is sealed by means of the plug 5.

A hollow metal cap 6 is removably engaged against the outer wall of the metal tube 3 by means of a threaded connection so as to conceal the plug and non-metallic portion of the closure assembly. With the cover in place, the entire exposed surface of the container is metal.

Referring now to FIG. 2, the hollow cover 6 is secured in place using the threaded outer wall of a metal bushing 7, the outer wall of which is also removably engaged with the inner wall of the metal tube 3. Should the threads of the bushing show signs of corrosion or wear, the bushing can readily be removed and replaced. The outer wall of the non-metallic tube 4 is removably engaged against the threaded inner wall of the bushing.

The metallic components of the container closure are preferably formed from steel to obtain maximum strength and corrosion protection at a reasonable cost. The hollow cap 6 should be formed from steel to conform with Governmental shipping regulations requiring steel for all exposed container surfaces.

The non-metallic tube 4 may be formed from any material which is substantially inert to many chemicals, particularly materials to be stored in the container. The non-metallic material should be sufficiently hard and rigid to avoid premature wearing of the threads formed on the inner and outer walls of the tube. Among the suitable non-metallic materials are plastics such as polyamide resins, vinyl resins, particularly poly(vinyl chloride), polyolefins, including fluorocarbons, polycarbonates, epoxide and phenyl-aldehyde resins and acrylic polymers, to name only a few; and hard rubber of both the natural and synthetic type. Other suitable non-metallic materials include ceramics, i.e., baked clays, and glass.

The diameter of the container aperture will be determined by several factors, including the size of the container and the material to be stored therein. The size of the aperture will, in turn, determine the diameter of the plug and other components of the closure assembly. For the sake of conveience, it is preferable to employ standard pipe diameters for each of the components, which in the United States are ⅛, ¼, ⅜, ½, ¾, and 1 inch, 1¼, 1½, and 2 inches, the latter being the largest diameter that will usually be employed in conventional closure assemblies. Larger sizes may be preferred for certain applications.

The sealed container can be filled or emptied by removing the hollow metal cover 6 and the metal plug 5. If the threads along the inner wall of the non-metallic tube become worn, the tube can readily be replaced. Use of the non-metallic tube eliminates metal-to-metal contact on moving surfaces and the potential for immobilization of the plug due to corrosion by the contents of the container. The difference in outside diameter between the plug and the non-metallic tube makes it unlikely that the latter will be removed when torque is applied to the plug by means of a wrench or other suitable tool.

What is claimed is:

1. An improved container closure assembly wherein all exterior surfaces of the container are metallic and wherein no two moveably engaged surfaces exposed to the contents of the container are both metallic, said closure assembly being comprised of:

1. a substantially circular passage through the wall of the container and communicating between the interior and exterior of the container, the passage being defined by:
   a. a metallic tube secured at the perimeter of an aperture in the wall of the container, and
   b. a non-metallic tube wherein at least a portion of the outer wall adjacent to one end of the non-metallic tube is removably engaged with at least a portion of the inner wall of the metallic tube
2. a plug removably engaged with at least a portion of the inner wall adjacent to one end of the non-metallic tube, thereby sealing said substantially circular passage and preventing communication between the interior and exterior of the container
3. a hollow metallic cap removably engaged with the outer wall of the metallic tube, thereby enclosing all non-metallic elements of the container closure, such that all exposed exterior surfaces of the container are metallic.

2. The improved container closure assembly of claim **1** wherein the container and all metallic elements of the closure assembly are steel.

3. The improved container closure assembly of claim **1** wherein the material of the non-metallic tube is selected from the group consisting of polyamides, vinyl polymers, polyolefins, polycarbonates, epoxide and phenol-aldehyde polymers, natural and synthetic hard rubber, ceramics and glass.

4. The improved container closure assembly of claim **1** wherein the metal tube is removably engaged with the hollow metal cap and the non-metallic tube by means of a metal bushing.

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