

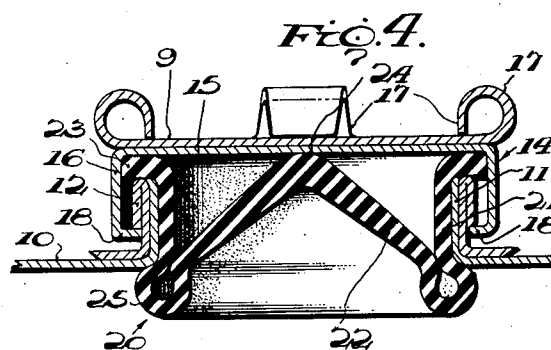
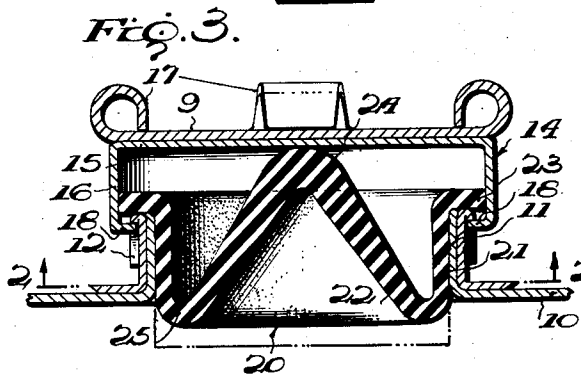
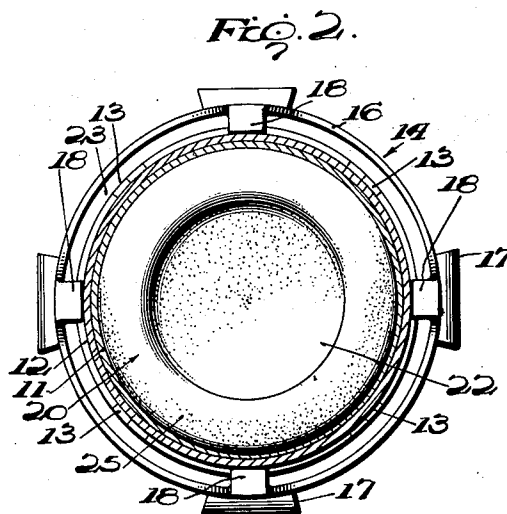
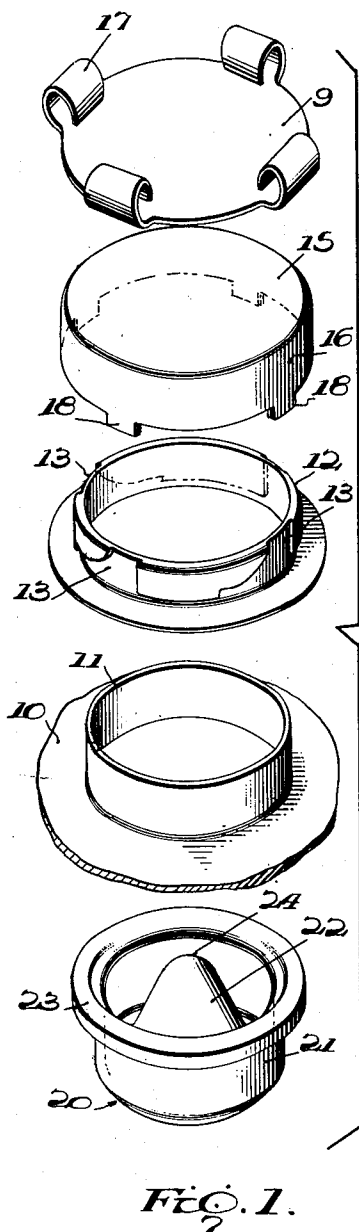
Feb. 26, 1957

C. W. HURLEY

2,782,958

MECHANICALLY EXPANSIBLE CLOSURE PLUG

Filed Nov. 16, 1954



INVENTOR

Charles Warren Hurley.

BY

W. Eccleston.

ATTORNEY

1

2,782,958

MECHANICALLY EXPANSIBLE CLOSURE PLUG

Charles Warren Hurley, Gaithersburg, Md., assignor to the United States of America as represented by the Secretary of the Army

Application November 16, 1954, Serial No. 469,326

5 Claims. (Cl. 220—24.5)

My invention relates to closure plugs for openings in container walls and relates more particularly to a plug formed of extensible material which is expanded into sealing engagement with the walls of the opening. Most plugs of this type are either oversize and are mechanically stretched to reduce them to a size smaller than the opening and thereafter allowed to expand into sealing engagement or are of the type which are normally smaller than the opening and which are mechanically expanded to form the seal. It is to this latter type that my invention relates. Such types in the past have required a cam lever or the like for actuating the plug to its expanded condition. Obviously, the requirement for a separate lever adds to the complexity of the closure, to the cost of the same as well as to the size.

With the foregoing in view, it is an object of the invention to provide an improved expansible closure plug of the class described.

A further object is to provide such an improved expansible plug which is operative without the use of levers, cams or the like.

A further object is to provide an improved expansible closure plug in combination with a closure cap which is operative by the action of the cap as the same is seated on the container to expand the plug automatically and seal the opening.

Other objects and advantages reside in the particular structure of the invention, the structure of the several elements thereof, combinations and subcombinations of such elements, all of which will be readily apparent to those skilled in the art upon reference to the attached drawing in connection with the following specification wherein the invention is shown, described and claimed.

In the drawing:

Fig. 1 is an exploded perspective view of a closure according to the invention;

Fig. 2 is a horizontal section view taken substantially on the planes of the line 2—2 of Fig. 3;

Fig. 3 is a transverse sectional view of the closure showing the same in unseated relation to a container opening and taken substantially on the plane of the line 3—3 of Fig. 2; and

Fig. 4 is a sectional view like Fig. 3 but showing the closure in the seated position.

Referring specifically to the drawing, wherein like reference characters are used in all views to designate like parts, 10 designates the wall of any suitable container such as a metal drum. The wall 10 has an opening therein which is defined by a flange or embossment 11 which mounts any suitable flange or sput 12. In the form illustrated the sput is formed with a plurality of bayonet slots 13 but obviously could be screw-threaded if desired.

The closure according to the invention comprises a closure cap generally indicated at 14 which includes a top wall 15 and a depending annular flange 16. The top wall 15 is preferably provided with any suitable tool-engaging means such as the spaced lugs 17. In the structure illustrated, the lugs 17 are formed on the edge of a

2

reinforcing plate 9 which overlies the top wall 15 and is fixedly secured thereto in any suitable manner (not shown) such as by welding. Likewise, the flange 16 is formed with any suitable inwardly directed drive means 18 for engagement with the screw threads or bayonet slots 13 of the sput 12. For a purpose to be apparent later, it is preferred that the inwardly directed drive means 18 of the cap wall 16 be downwardly spaced from the inner surface of the top wall 15. In the embodiment illustrated, such inwardly directed drive means comprise a plurality of radially inwardly directed lugs 18 on the lower edge of the cap wall 16. The number of lugs 18, of course, correspond to the number of bayonet slots 13 on the sput 12. In addition to comprising drive means for moving the cap 14 into and out of a seated position on the sput 12, the lugs 18 have the additional function of securing the expansible plug to the cap 14.

The expansible plug 20 preferably is of hollow cup-shaped configuration and includes a cylindrical side wall 21 and a conical floor in the form of an upright hollow cone 22. The side wall 21 is formed with suitable means for overlying the lugs or the like 18 of the cap 14 so as to provide a lost motion connection between the cap and plug. In the embodiment illustrated, such means comprise a radially outwardly directed flange 23 on the upper edge of the side wall 21. Such flange 23 overlies the lugs 18 to permit relative movement of the plug and cap in both axial and rotary directions. The conical floor 22 includes an apex 24 which is preferably disposed axially of the floor. In the embodiment illustrated, the apex 24 extends upwardly of the flange 23 inside the cap 14 so as to rest against the undersurface of the top wall 15, Fig. 3. Obviously, the apex could be disposed on a much lower plane and be engaged by a downward projection of the wall 15 or otherwise actuated as will be apparent hereinafter.

In operation, and with the parts in the position of Fig. 3, the plug 20 is readily inserted in the opening until the lugs 18 engage the bayonet slots 13 and flange 23 rests atop the sput 12. By the usual rotary action, the cap is moved to the seated position shown in Fig. 4 and by so doing moves relative to the sput 12 and plug 20 so that the cone 22 is partially flattened. This action moves the marginal portions 25 of the cone 22 radially outwardly and causes the lower portions of the side wall 21 to be moved into sealing engagement with the container wall. In effect, this action is that of a toggle and where, as shown, the lower portions of the wall 21 are inside the container, they are rolled about the inside corner of the embossment 11. This toggle action is insured by forming the walls of the cone 22 of thicker cross section than the side wall 21 so that it is the side walls which are extended under the toggle action of the floor instead of the floor collapsing. In the embodiment illustrated, the walls of the cone 22 vary in thickness from a relatively thick cross section at the apex 24 to a relatively thin cross section at the marginal portions 25. Preferably, this variance in wall thicknesses is in the form of a uniform taper outwardly from the apex 24 to the marginal portions 25 where the thicknesses of the cone wall is substantially the same as that of the side wall 21.

It is apparent from the foregoing, that the device shown and described hereinabove eliminates the need for a cam lever or the like for expanding the plug while at the same time forms a resilient seal of great strength. Preferably, the plug 20 is formed of a resilient as well as an extensible material so that it will tend to return automatically to the released position of Fig. 3 as the cap is unscrewed.

While I have shown and described what is now thought to be a preferred embodiment of the invention, it is to be understood that the same is susceptible of other forms and expressions. Consequently, I do not limit myself to

3

the precise structure shown and described hereinabove except as hereinafter claimed.

I claim:

1. In an expansible closure, the combination with a container having an annular wall flange defining an opening in a container wall, a closure cap having a top wall and depending annular cap flange telescopically engaging said wall flange, and interengaging means on said flanges for moving said cap into and out of a seated position on said wall flange; of an expansible closure plug, said plug normally having a free fit in said wall flange, means mounting said plug in said cap flange for movement relative thereto, stop means on said plug and engageable with said wall flange for limiting the entrance of said plug into said opening, said plug comprising a hollow cup-shaped member having a cylindrical side wall, said member having a floor comprising a hollow upright cone having a tip normally projecting above said wall flange within said cap, said tip being engaged by said cap top wall and moved inwardly thereby as said cap is moved relative to said wall flange and plug to said seated position, said side wall having a lower edge normally disposed below said wall flange, said floor being relatively thicker than said side wall, and said floor having a toggle action as said cap is moved to said seated position so as to roll said lower edge of said side wall radially outwardly below said wall flange and in tight engagement therewith to form a seal.

2. The structure of claim 1 and said plug being formed of substantially resilient material tending to become unsealed as said cap is unsealed.

3. In an expansible closure, the combination with a container having an annular wall flange defining an opening in a container wall, a closure cap having a top wall and a depending annular cap flange telescopically engaging said wall flange, and interengaging means on said flanges for moving said cap into and out of a seated position on said wall flange; of an expansible closure plug, said plug normally having a free fit in said wall flange, means mounting said plug in said cap flange for movement relative thereto, stop means operatively associated with said plug and wall flange for limiting the entrance of said plug into said opening, said plug comprising a cylindrical side wall and a floor comprising an upright hollow cone having an apex providing actuating means, said floor being relatively thicker than said side wall, said plug side wall having a lower edge disposed below said wall flange, means on said

4

cap engaging said apex of said cone and moving the same inwardly as said cap moves relative to said plug to said seated position, and said floor having a toggle action as said cap is moved to said seated position so as to roll said lower edge of said side wall radially outwardly below said wall flange and into tight engagement therewith to form a seal.

4. The structure of claim 3, wherein said floor tapers in thickness radially outwardly from a relatively thick section at said apex to a thinner marginal portion.

5. In an expansible-type closure, the combination with a neck of a sput surrounding an opening in a container wall; of a closure cap having a top wall and a depending cylindrical cap flange, interengaging drive means on said neck and flange for moving said cap into and out of a seated position on said neck, an expansible closure plug including connecting means, means on said cap flange cooperating with said connecting means on said plug to provide a lost motion connection between said cap and plug, said plug comprising a floor and a cylindrical side wall normally having a free fit in said neck, stop means limiting axial movement of said plug into said neck, said side wall having a lower portion disposed axially inwardly of said neck, said floor comprising a hollow upright cone having an apex, said cap having means engaging said apex and partially flattening said cone as said cap moves axially relative to said sput and plug to said seated position, and said lower portion of said side wall being moved radially outwardly of said neck into sealing engagement with said wall of said container inwardly thereof by said partial flattening of said cone.

References Cited in the file of this patent

UNITED STATES PATENTS

1,199,166	Ennes	Sept. 26, 1916
2,156,585	Enkur	May 2, 1939
2,444,779	Krasberg	July 6, 1948
2,471,172	Stoller	May 24, 1949
2,582,489	Krueger	Jan. 15, 1952
2,661,128	Rieke	Dec. 1, 1953
2,696,318	Kihm	Dec. 7, 1954
2,716,504	Martin	Aug. 30, 1955

FOREIGN PATENTS

505,504	Belgium	Sept. 15, 1951
---------	---------	----------------