Oct. 18, 1938. W. F. KAUFMAN 2,133,298

CLOSURE AND METHOD OF MAKING CLOSURES

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Fig. 1

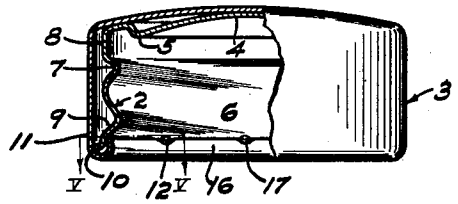


Fig. 3

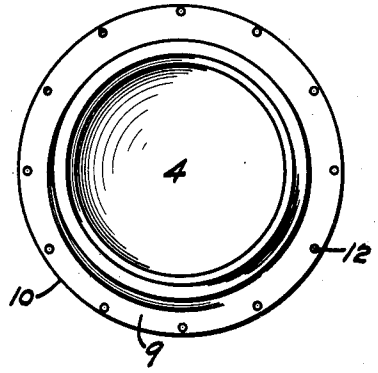


Fig. 2

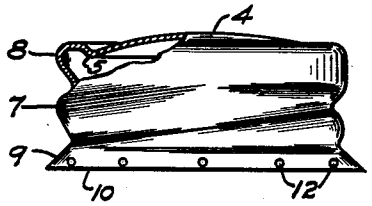


Fig. 4

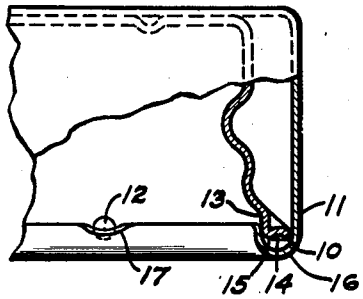
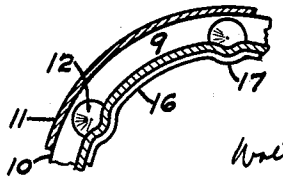


Fig. 5



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Fig. 6

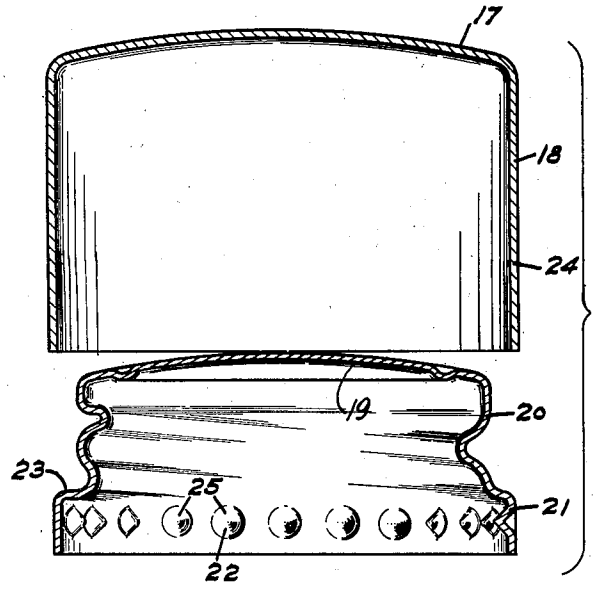
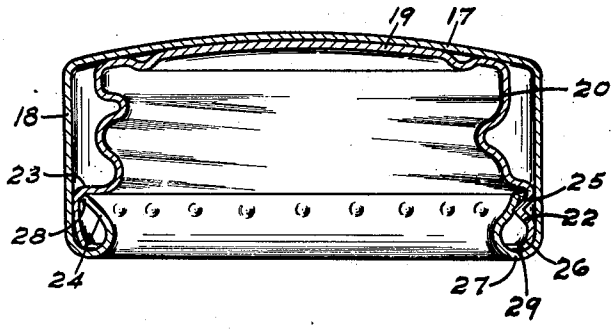


Fig. 7



Inventor

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UNITED STATES PATENT OFFICE

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CLOSURE AND METHOD OF MAKING CLOSURES

Walter F. Kaufman, Lancaster, Pa., assignor to Armstrong Cork Company, Lancaster, Pa., a corporation of Pennsylvania

Application July 14, 1936, Serial No. 90,479

19 Claims. (Cl. 113—121)

This application is a continuation in part of my copending application Serial No. 755,131, filed November 28, 1934.

My invention relates to metallic closures for receptacles and more particularly to closures of the type having an inner cap provided with means for attaching the closure to a receptacle and an outer shell telescoped over the inner cap and secured thereto and concealing the cap portion from view when the closure is in sealing position. Closures of this type are generally designated "double shell" closures. My invention also relates to a new method of making such closures whereby collapse of the receptacle engaging means on the inner cap, such as screw thread formations, is prevented.

One of the problems incident to the manufacture of double shell closures is to provide a closure unit in which relative rotation between the parts is prevented, and (since the inner section is generally formed of light weight sheet metal) to prevent destructive deformation of the receptacle engaging means formed therein upon assembly of the two sections into locking engagement. This latter problem is particularly prevalent in the assembly of closures including a screw threaded inner cap, for pressure applied to the skirt of the cap tends to collapse the threads to such extent that the completed closure will not properly engage the receptacle to be sealed.

An object of this invention is to provide a simple, effective union of the inner cap and outer shell whereby relative rotation of the parts is prevented and an effective union is obtained which, even though temporarily broken, will possess considerable resistance against relative rotation of the parts. A further object is to provide a novel inner cap construction and method of manufacture which prevents any harmful deformation of the attaching means formed on the cap during assembly of the cap with the outer shell; substantially all of the force exerted upon the inner cap in assembly thereof with the outer shell being radial.

This invention contemplates an inner metallic cap provided with receptacle engaging means such as screw threads formed on the downwardly extending skirt thereof, a flange formed on the exposed edge of the skirt, and preferably terminating in a cut surface, a plurality of pips formed on the flange, an outer metallic shell telescoped over the inner cap and having the exposed edge thereof turned inwardly and upwardly, and if desired outwardly, into engagement with and deformed about pips on the flange of the inner cap. In one embodiment, the flange is disposed outwardly and downwardly and the pips are so formed as to lie with one surface thereof substantially parallel to the axis of the cap and, if the pips be conical, with another surface lying substantially normal to the axis of the cap. In another form, the flange is directed axially of the cap and the pips are disposed substantially radially inwardly thereof. In this embodiment the exposed edge of the outer shell is turned inwardly, upwardly and outwardly so that the edge thereof engages the pips in a direction substantially normal to the axis of the cap.

This invention also contemplates a method of making double shell closures, which, in the preferred practice, includes forming an inner shell having a flange on the skirt thereof, terminating in a cut surface; forming a plurality of pips on the flange; telescoping the cap within the outer shell; and deforming a portion of the skirt of the outer shell over the pips on the flange, the pips being so shaped and positioned that the force required to deform the skirt of the outer shell will be exerted substantially radially of the cap, thus preventing collapse of the skirt of the cap due to the application of force axially thereof.

In order that my invention may be more readily understood, I will describe the same in conjunction with the attached drawings, in which,

Figure 1 is a view partly in elevation and partly in vertical section showing a preferred construction;

Figure 2 is a similar view illustrating the inner cap;

Figure 3 is a bottom plan view of the cap of Figure 2;

Figure 4 is a detail sectional view illustrating the interlocking of the component parts;

Figure 5 is a detail sectional view taken along the line V—V of Figure 1;

Figure 6 is an exploded sectional view of a modified form of closure prior to assembly; and

Figure 7 is a sectional view showing the closure after the assembly operation is completed.

The closure illustrated in Figures 1 to 5 comprises an inner cap 2 and an outer shell 3. The inner cap includes a top 4, which may be provided with a liner forcing annulus 5, and a depending skirt portion 6. The skirt is provided with suitable receptacle engaging means which are illustrated in the present embodiment as screw thread formations 7, although any other suitable means, such as lug formations, may be provided for securing the closure to a receptacle

to be sealed. A liner holding recess 8 may be provided if desired.

The skirt 6 terminates in an outwardly and downwardly extending flange 9, which preferably has a cut surface 10 for engagement with the inner surface of a skirt 11 of the outer shell 3 as will be more fully hereinafter described. The flange 9 is preferably disposed at an angle to a line drawn normal to the axis of the cap and, in the illustrated embodiment, the flange is disposed at a 45° angle thereto. The angle may be greater or lesser, but should not be greater than 90° with respect to such line and should preferably be not less than 30° or more than 60° in order to provide the utmost in locking engagement with the least deformation with the particular formation shown in Figures 1 to 5 wherein the pips have a surface lying substantially parallel to the axis of the cap.

A plurality of "pips" 12 are formed on the flange 9 and extend inwardly therefrom. In the preferred embodiment, these pips are of conical shape and, as illustrated in Figure 4, when severed along a median line, present a surface 13 extending substantially parallel to the axis of the cap and another surface 14 extending substantially normal to the axis of the cap, with the apices 15 of the pips 12 extending generally inwardly and toward the axis of the cap to a point exterior thereof. If the angle of the flange with respect to a line drawn normal to the axis of the cap be changed, then the angularity of the pips should also be changed if it be desired to have a surface of the pips lie parallel to the axis of the cap as shown in Figure 4.

As pointed out above, the pips are preferably of generally conical shape, but other shapes may be employed. By the terms "pip" and "pips" as used herein, it is intended to include protuberances, deformations, nodosities or the like of a generally conical or pyramidal shape. The pips are preferably spaced about the flange with the distance between the pips greater than the width of the pips. In a 28 mm. cap, for example, twelve pips spaced equidistantly about the flange have been found satisfactory. It is desirable to space the pips a distance from each other sufficient to permit the outer shell to be deformed thereabout by the forces developed during the beading operation.

The inner cap is preferably drawn, threaded, flanged and the flange trimmed to provide a cut surface on the edge thereof and then the pips formed thereon. The pips are preferably spaced close to the edge of the flange in order to insure that the bead will be satisfactorily deformed thereabout. The outer diameter of the flange 9 is preferably slightly greater than the inner diameter of the skirt 11 of the outer shell 3; a few thousandths of an inch being sufficient in the smaller sized caps. For example, in a 28 mm. cap two thousandths of an inch is satisfactory.

The inner cap is telescoped within the outer shell and since the inner cap has a greater diameter than the inner diameter of the shell, there is some slight deformation of the flange of the inner cap, which, when urged into position within the outer shell, firmly engages the skirt thereof. The skirt 11 of the outer shell is somewhat longer than the skirt of the cap and the extending portion thereof is formed into an inwardly and upwardly extending bead 16 (Figures 1 and 4).

The bead 16 is, as shown in Figure 4, preferably turned inwardly and then upwardly. The leading end of the skirt, during the locking or beading operation, first contacts with the surface 13 of the pips 12. It will be understood by those skilled in the art that considerable force is exerted upon the pips during the deformation of the skirt of the outer shell thereabout. This deformation is desirable since it aids in preventing relative movement between the cap and shell. Since the surface 13 lies parallel to the axis of the cap, substantially all force exerted on the cap during such deformation is radial of the cap rather than axial thereof and any material deformation of the screw thread formations 7 is thus obviated. The bead 16 clamps the flange at the cut surface 10 and at the surface 13 of the pips 12. It will be observed that any compression of the flange 9 axially of the cap will tend to urge the flange outwardly (Figure 1), the flange being expansible radially, thereby increasing the outer diameter thereof and more firmly embedding the cut surface 10 into the skirt 11 of the outer shell.

In my preferred embodiment, the bead extends inwardly and thence upwardly toward the top of the cap and is deformed about the pips. If desired, the bead may then be urged outwardly so that the edge of the metal will be concealed. The deformation of the bead 16 about the pips 12 is shown at 17 (Figures 1 and 4).

In the embodiment illustrated in Figures 6 and 7, the outer shell 17 is of generally the same form as that shown in the other figures. The length of the skirt 18, however, is preferably somewhat longer than that of the other views. The inner cap is also similar to the cap 2 and comprises a top 19, a screw threaded skirt 20 and an axially extending flange 21 provided with a plurality of pips 22. The flange is preferably formed with a shoulder portion 23 which is directed outwardly from the skirt of the cap. This provides a ledge to receive the edge of the skirt of the outer shell upon final assembly, thereby concealing the cut edge of the skirt and insuring proper deformation of the skirt about the pips 22.

In assembling closures of this type, the assembly punch is so shaped that the edge 24 of the skirt 18 of the outer shell 17 is urged into engagement first with the inner surfaces 25 of the pips 22, as contrasted with the formation shown in the other views wherein the edge of the skirt of the outer shell first engages the surfaces 13 of the pips which are so disposed as to lie substantially parallel to the axis of the cap. Upon engagement of the edge 24 with the surfaces 25 of the pips 22, there results a deformation of the skirt of the outer shell, which deformation is enhanced by the fact that movement of the edge induced by the assembly punch is arrested by the shoulder 23 and considerable pressure is thereby applied to the metal of the skirt in the region of the pips. By forming the bead so that it engages the surfaces 25, substantially all axial pressure on the skirt of the inner cap is avoided. By providing pips which terminate in points, the best possible deformation of the skirt of the outer shell is obtained and the pips are not easily flattened or otherwise deformed so as to lessen their effective gripping action.

In these closures, as in the closures above described, deformation of the threads on the inner cap is at a minimum since substantially all force applied in the assembly operation is radial of the cap rather than axial. As shown in Figure 7, there may be a slight curling of the edge 26 of the inner cap to conform with the bead 27 of the outer shell formed by the curling punch.

Since the curling punch first engages the exposed edge 24 of the skirt, that portion will have engaged the pips 22 prior to any material curling of the edge 26 of the inner cap. The cut edge 28 of the outer shell preferably lies in engagement with the flange of the inner cap and the cut surface 29 of the inner cap in engagement with the beaded portion 27 of the skirt of the outer shell to increase the interlocking grip.

In both embodiments, the locking engagement which prevents relative movement of the parts is believed to result from the engagement of the cut surface of the skirt of the inner cap with the surface of the skirt of the outer shell and from deformation of the beaded portion of the outer shell by the pips disposed on the flange of the inner cap. In the embodiment illustrated in Figures 1 to 5, additional locking probably results from the fact that the flange 9 is directed outwardly and downwardly and any movement of the flange tends to increase its overall diameter, thus causing the cut edge 10 thereof to pierce the metal of the skirt of the outer shell.

The combined locking is such that relative movement of the parts is incapable of accomplishment in unscrewing the assembled closures from bottles or receptacles to which they have been applied, assuming, of course, that the unscrewing force is applied digitally. It has been found in test work that even though the interlock be broken by the application of rotative force to the outer shell while holding the inner shell stationary, the pips continue to pierce the metal of the outer shell, and that while relative rotation may be accomplished by the application of approximately 65 pound inches of torque, there is still retained sufficient frictional grip between the component elements that, ordinarily, the cap may be satisfactorily unscrewed by the application of digital force. In other words, the cap maintains a frictional grip equivalent at least to the torque which is capable of being applied by the average person with his fingers and which should, generally, be sufficient to remove a closure from a receptacle to which it is applied. For example, a test cap in which relative rotation will occur at 85 pound inches will, thereafter, require about 24 pound inches for continued rotation. This should be contrasted with double shell closures heretofore made of the type including ribs, for in such structures there is no piercing or cutting action, and once the lock is broken the parts move freely relative to each other. It is often impossible to remove such closures from the receptacles to which they are applied because, upon application of rotative force, the outer shell turns about the inner cap which frictionally engages the receptacle more firmly than the inner cap and outer shell engage each other. This is important in those instances where the closure is applied by machinery and sufficient turning torque may be accidentally applied to break the initial interlocking. In closures of the type herein disclosed embodying pips, the secondary interlocking permits ready removal. In addition, closures made in accordance with my invention are as securely locked, initially, as those heretofore utilized and require at least as great an amount of turning torque before any relative rotation occurs.

The flange 9 (Figure 4) is illustrated as terminating in a cut surface. This requires a trimming operation because the shell cannot be conveniently drawn to have a true circumference terminating in a cut surface. To avoid a trimming operation, the cap may be formed with a downwardly extending portion integral with the flange 9, but care should be taken to insure that such portion does not interfere with the formation of a bead which does not collapse the threads, as might be the case if the bead, during its formation, engaged such downwardly extending portion on the flange prior to its contact with the pips. For that reason, it is preferred to form the cap with an outwardly and downwardly extending flange terminating in a cut surface formed by trimming, rather than permitting the irregularly shaped excess metal to remain on the skirt as an axially extending flange which, if engaged by the bead in the assembly operation, might cause the application of undesired pressure to the cap axially thereof.

While I have described and illustrated the preferred embodiment of my invention, it will be understood that the invention is not so limited but may be otherwise embodied within the scope of the following claims:

I claim:

1. A closure comprising an inner cap having a downwardly extending skirt, a flange on the skirt, a plurality of preformed pips of generally conical or pyramidal shape on the flange terminating in points disposed inwardly of the flange, an outer shell having a downwardly extending skirt covering the skirt of the inner cap and a bead formed on the skirt of the outer shell engaging said preformed pips and deformed thereabout with the points of the pips piercing the metal of the outer shell.

2. A closure according to claim 1 in which the flange on the skirt of the inner cap extends outwardly and downwardly.

3. A closure comprising an inner cap having a downwardly extending skirt, an outwardly and downwardly extending flange on the skirt terminating in a cut surface, a plurality of pips on the flange and extending inwardly therefrom, an outer shell having a downwardly extending skirt telescoped over said cap with the cut surface of the flange in engagement with the inner surface of the skirt of the outer shell, and a bead formed on the skirt of the outer shell engaging said pips and deformed thereabout, said bead clamping said flange at the cut surface and at the pips formed thereon.

4. A double shell closure comprising an inner screw threaded cap, a flange on the inner member, a plurality of preformed pips of generally conical or pyramidal shape on the flange extending inwardly thereof, an outer shell telescoped over the inner cap, the edge of the skirt of the outer shell being turned into a bead having portions thereof disposed about the preformed pips in deformed condition.

5. A double shell closure comprising an inner screw threaded cap having an outwardly and downwardly extending flange terminating in a cut surface, a plurality of pips of generally conical shape on the flange and extending inwardly therefrom, an outer shell telescoped over the inner cap, the edge of the skirt of the outer shell being turned into a bead engaging the flange and deformed about the pips thereon.

6. A double shell closure comprising an inner screw threaded cap having an outwardly and downwardly extending flange terminating in a cut surface, a plurality of pips on the flange extending inwardly therefrom, at least some of said pips presenting a surface lying substantially parallel to the axis of the cap, an outer shell having a top and a depending skirt telescoped over

the inner cap, an inwardly and upwardly extending bead formed on the edge of the skirt and urging the cut surface of the cap into firm engagement with the inner surface of the skirt of the outer shell.

7. A double shell closure comprising a screw threaded inner member, an expansible flange on the inner member terminating in a cut edge, a plurality of pips on the flange extending inwardly thereof, the distance between pips being greater than the width of the pips, an outer member having a top and a skirt, the edge of the skirt being turned inwardly and upwardly into a bead engaging said pips on the flange, with the cut edge of said flange penetrating the material of the skirt.

8. As an intermediate product of manufacture, an inner screw threaded cap having an outwardly and downwardly extending flange terminating in a cut surface, a plurality of pips on the flange extending inwardly thereof and an outer shell having a top and a depending skirt telescoped over the inner cap, the cut surface of the inner cap penetrating the inner surface of the skirt of the outer shell, the skirt of the shell extending below the flange a distance sufficient to permit the formation of a locking bead.

9. A double shell closure comprising an inner metallic cap having a top and a depending screw threaded skirt, a flange on the skirt having an outwardly and downwardly extending surface, said flange terminating in a cut surface, a plurality of pips of generally conical shape on said surface and extending inwardly of the cap, at least some of said pips presenting a surface lying substantially parallel to the axis of the cap and another surface lying substantially normal to the axis of the cap, the distance between pips being greater than the width of the pips, an outer shell having a top and a depending skirt telescoped over the inner cap and with the top thereof engaging the top of the inner cap and the cut surface of the flange firmly engaging the inner surface of the skirt of the outer shell, and an inwardly and upwardly extending bead on the lower edge of the skirt of the outer shell engaging the outwardly and downwardly extending surface of the flange and deformed about the pips thereon.

10. A double shell closure comprising an inner cap having a top and a depending skirt, receptacle engaging means on the skirt, a flange integral with the skirt and presenting an outwardly and downwardly extending surface, a plurality of pointed pips on said surface projecting inwardly of the flange with their lowermost points extending substantially in the plane defined by the edge of the flange, an outer shell having a top and a depending skirt, a bead formed on the edge of the skirt of the outer shell engaging the pips and deformed thereabout.

11. In the method of making double shell closures, the steps consisting in forming an inner cap having a depending skirt with an outwardly and downwardly extending flange provided with a plurality of inwardly extending pips of generally conical or pyramidal shape thereon, one surface of said pips lying parallel to the axis of the cap, telescoping the cap within an outer shell and forming a bead on the outer shell by turning the exposed edge thereof inwardly and upwardly into engagement with said surfaces.

12. In the method of making double shell closures, the steps consisting in assembling an inner cap having a top and a depending screw threaded skirt terminating in an outwardly and downwardly extending flange within an outer shell and locking the cap and shell against relative rotation by turning the edge of the skirt of the outer shell into engagement with a plurality of deforming surfaces on the flange lying substantially parallel to the axis of the cap and urging the edge of the flange into cutting engagement with the outer shell.

13. In the method of making double shell closures, the steps consisting in forming an inner cap having a shoulder and an axially extending flange, there being pips provided on the flange having one surface thereof upwardly inclined, telescoping an outer shell over the inner cap, turning the exposed edge of the skirt of said shell into an inwardly, upwardly and outwardly directed bead, urging the terminal edge of the skirt into engagement with said shoulder and continuing turning of the skirt until the same is deformed about the inclined surface of the pips.

14. A double shell closure comprising an inner member provided with receptacle engaging means, a flange on the inner member, a plurality of preformed pips of generally conical or pyramidal shape on the flange, and an outer member having a top and a skirt covering the inner member, the terminal edge of the skirt of the outer member being turned inwardly and upwardly into engagement with the flange on the inner member and being deformed about the preformed pips thereon.

15. A double shell closure comprising an inner screw threaded cap, a flange on the cap extending substantially axially thereof, a plurality of preformed pips of generally conical or pyramidal shape on the flange and extending inwardly of the cap with one surface thereof upwardly inclined, and an outer shell having a top and a skirt covering the inner cap, the terminal edge of the skirt of the outer shell being turned inwardly and upwardly into engagement with the upwardly inclined surfaces of the preformed pips and being deformed thereabout.

16. A double shell closure comprising an inner member provided with receptacle engaging means, a flange on the inner member having an outwardly directed portion and a downwardly directed portion, a plurality of preformed pips of generally conical or pyramidal shape on the downwardly directed portion extending inwardly thereof and having one surface thereof upwardly inclined, and an outer member having a top and a skirt covering the inner member, the edge of the skirt of the outer member being turned into a bead with the terminal edge thereof lying in engagement with said outwardly directed portion and the upwardly inclined surfaces of the said pips engaging those portions of the bead which are deformed thereabout.

17. In the method of making double shell closures, the steps consisting in forming an inner cap having a plurality of inwardly extending pips of generally conical or pyramidal shape thereon with one surface thereof upwardly and outwardly inclined with respect to the axis of the cap, telescoping an outer shell over the inner cap, turning the exposed edge of the skirt thereof into engagement with the inclined surfaces of said pips without engagement with the diametrically opposed surfaces thereof and deforming the edge of said skirt about the pips.

18. A double shell closure comprising an inner cap having a top and a depending, screw thread-

ed skirt; a flange on the skirt having an outwardly and downwardly extending surface, a plurality of pips of generally conical shape on said surface and extending inwardly of the cap, an outer shell having a top and a depending skirt, the skirt engaging said flange, and an inwardly and upwardly extending bead on the skirt of the outer shell engaging the outwardly and downwardly extending surface of the flange and deformed about the pips thereon.

19. A closure comprising an inner cap having a downwardly extending skirt, an outwardly and downwardly extending flange on the skirt, a plurality of pips of a generally conical or pyramidal shape formed in the flange and terminating in points disposed inwardly of the flange, an outer shell having a downwardly extending skirt covering the skirt of the inner cap and a bead formed on the skirt of the outer shell engaging said pips and deformed thereabout.

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