

Nov. 26, 1940.

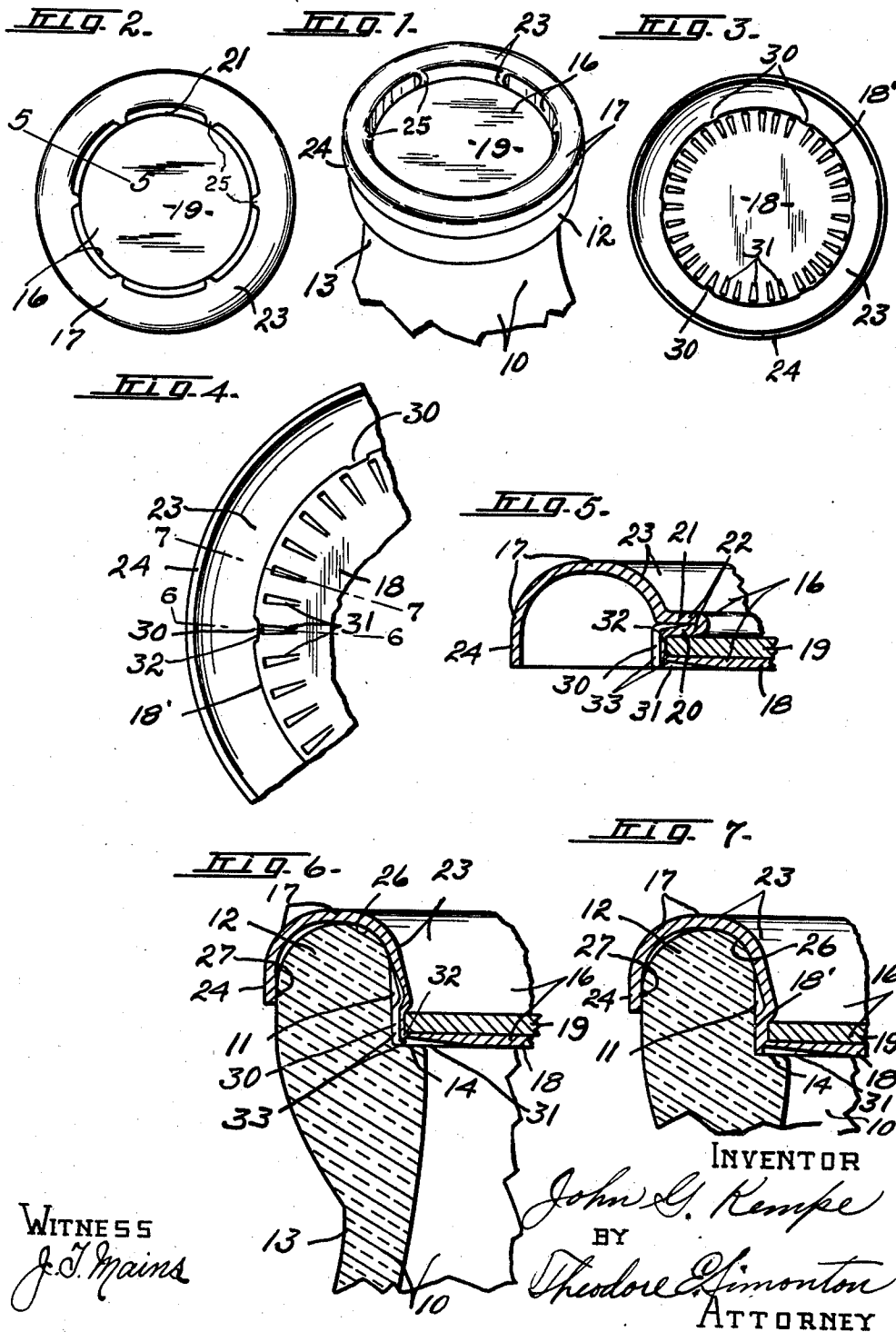
J. G. KEMPE

2,223,321

BOTTLE CAP AND MEANS FOR MAKING THE SAME

Filed April 15, 1935

2 Sheets-Sheet 1



Nov. 26, 1940.

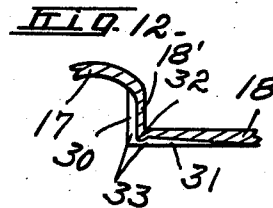
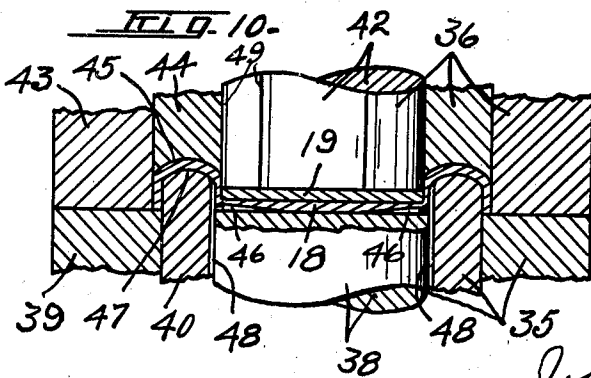
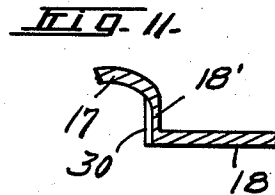
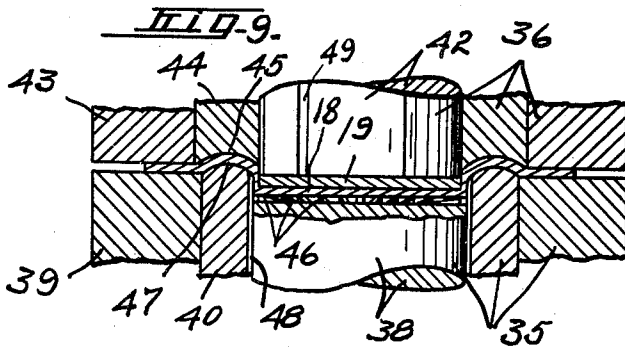
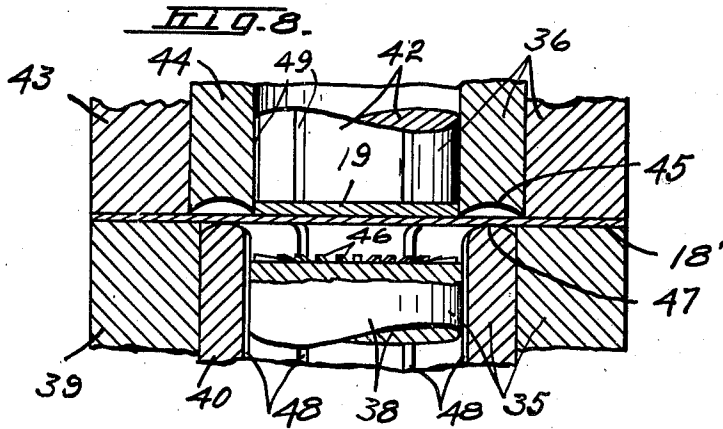
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BOTTLE CAP AND MEANS FOR MAKING THE SAME

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2 Sheets-Sheet 2



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2,223,321

BOTTLE CAP AND MEANS FOR MAKING
THE SAMEJohn G. Kempe, Oneida, N. Y., assignor to Smith-
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Application April 15, 1935, Serial No. 16,316

10 Claims. (Cl. 215—38)

This invention relates to an improved bottle cap. The cap of this invention is adapted more particularly for use in connection with a conventionally constructed milk bottle or the like and is of the hood or semi-hood type embodying a bottle seat or plug portion adapted to seat upon the usual shoulder provided in the mouth recess and to have a sealing engagement with the wall of said recess and a lip covering portion adapted to over-lie the bead or pouring lip that surrounds the bottle mouth.

In bottle caps of the above mentioned type, the mouth of the bottle is so thoroughly and completely sealed that air or gases are unable to escape from the bottle during the expansion of the contents of the bottle with the result that the cap is either lifted from its sealing position on the bottle or the bottom of the central or plug portion of the cap is forced or warped out of its original shape so as to bulge outwardly and thereby draw the marginal edge of the plug portion of the cap out of pressure contact with the wall of the mouth recess sufficiently to permanently destroy the effective seal originally produced by the cap.

The main object of this invention is to provide a cap or closure for milk bottles or the like which will efficaciously seal the bottle and at the same time permit the passage of air or gas from the interior of the bottle when an abnormal plus pressure, that is, a pressure above atmosphere, is developed within the bottle as by the expansion of the contents thereof, without destroying the normal effective sealing properties of the cap.

In carrying out the above mentioned object, I provide the cap with one or more minute vent passages in the surface thereof adapted to communicate with the interior of the bottle and with the bottle mouth recess exteriorly of the plug portion of the cap.

Another object of the invention is to provide simple and efficient means for forming the vent passage or passages simultaneously with the forming of the cap and thereby produce such caps at no appreciable addition in cost over the cost of conventionally constructed caps.

Other objects and advantages will appear from the following description taken in connection with the accompanying drawings in which:

Figure 1 is a perspective view of a cap embodying the various features of this invention as applied to a milk bottle.

Figure 2 is a top plan view of the cap illus-

trated in Figure 1 prior to the applying of said cap to the bottle.

Figure 3 is an inverted plan view of the cap shown in Figure 2.

Figure 4 is a fragmentary inverted plan view of the cap shown in Figure 1 illustrating the same on an enlarged scale.

Figure 5 is an enlarged vertical sectional view taken substantially in the plane of the line 5—5, Figure 2.

Figure 6 is an enlarged vertical sectional view showing the cap applied to a bottle and taken substantially in the plane of the line 6—6, Figure 4.

Figure 7 is an enlarged vertical sectional view showing the cap applied to a bottle and taken substantially in the plane of the line 7—7, Figure 4.

Figure 8 is a detail transverse sectional view of a pair of disks from which my novel cap is formed, together with adjacent end portions of cooperating die members for effecting the formation of the cap, said die members being shown in cooperative relation just prior to operatively engaging the cap disks.

Figure 9 is a sectional view similar to Figure 8 illustrating the die members in an intermediate position.

Figure 10 is a view similar to Figure 8 illustrating the die members in position for producing a further step in the method of forming the cap.

Figure 11 is a detail transverse sectional view of a portion of the cap as formed by the dies when in the position shown in Figure 9.

Figure 12 is a view similar to Figure 11 illustrating a portion of the cap as formed when the dies are in the position illustrated in Figure 10.

The bottle as 10 is of the conventional construction for containing milk, cream or the like and comprises a circular bore or recess 11 at the upper end defining the mouth of the bottle, an outwardly extending bead or pouring lip 12 contiguous said recess and a contracted or reduced neck portion 13 below the bead. The recess or bore 11 is provided with the usual inwardly extending shoulder 14 spaced some distance from the upper or outer end surface of the bead 12 and which is adapted to provide a seat for the central or plug portion of the cap to limit the inward axial movement of the cap and also to cooperate with said cap portion to effectively seal the bottle.

The bottle cap of this invention, as perhaps more clearly illustrated in Figures 1 and 5, com-

prises a central substantially cup-shaped or plug portion 16 and a marginal flange or lip covering portion 17. The central or plug portion 16 of the cap includes a body member 18 in the form of a substantially circular disk on which rests a reinforcing disk 19. The edge of the body portion 18 is folded inwardly to form an annular flange 20 overlying the edge of the disk 19 and is then return bent or folded outwardly upon itself to form the flange 21, thus providing what may be termed an annular bellows-fold 22 overlying the reinforcing disk 19 and maintaining it in its position with respect to the body portion 18.

The lip covering portion 17 comprises an annular extension 23 made integral with the fold 21 and which may be molded along arcuate or curved lines so as to fit tightly over and upon the upper surface of the bottle bead 12. The distance between the lower surface of the extension 23 and the body portion 18 in the formed cap is substantially less than the distance between the shoulder 14 and the upper surface of the bead 12. The extension 23 is provided with an annular flange 24 extending substantially axially with respect to the body portion 18 and spaced from the edge thereof a distance slightly less than the thickness of the bottle bead 12. The inner vertical wall of the cup-shaped portion 16 is provided with a plurality of, in this instance, six ribs or beads 25, which extend from near the upper surface of the reinforcing disk 19 upwardly along said inner wall toward the lip covering portion 17.

In the application of this cap to a bottle as 10 it will be apparent that the inner surface of the extension 23 will engage the upper surface of the bead 12 before the body portion 18 seats on the shoulder 14. However, tight contact of the body portion 18 with the shoulder 14 is permitted by pressing the body portion 18 downwardly with the extension 23 in contact with the upper edge of the bead 12 thereby opening the bellows fold 22 sufficiently to permit tight seating of the body portion 18 with the wall of the recess 11 and upon the shoulder 14.

It will thus be understood that by forcing the body portion 18 downwardly until it seats upon the shoulder 14 the extension 23 remains at all times in contact with the upper surface of the bead 12 as illustrated at 26, Figures 6 and 7, and the fold 22 is opened just sufficiently to permit seating of the body portion 18 on the shoulder 14 so as to maintain tight contact between the lower and peripheral edge surfaces of the body 18 and the shoulder 14 and adjacent wall of the recess 11 respectively. In other words, the use of the bellows fold 22 permits the bottle to act as a measuring factor in determining the extent of opening of the bellows fold, while said bellows fold functions to maintain the extension 23 in tight contact with the upper surface of the bead 12 at all times.

In the finished cap as illustrated in Figure 5, the axial flange 24 terminates at its lower edge in substantially the plane of the body 18 so that when the cap is applied to a bottle head said flange will closely contact with the outer peripheral surface of the bead 12 as at 27, Figures 6 and 7.

The cap is preferably molded from paper board of proper moisture content which has been passed through a molten paraffin bath, the molding being of such a nature that the marginal flange portion 17 is of substantially uniform

thickness throughout and has smooth and continuous interior and exterior surfaces.

The cap thus far described is of the general construction illustrated in my Patent No. 2,195,379 issued March 26, 1940. It will be apparent that, inasmuch as the diameter of the body portion 18 is substantially equal to the diameter of the recess 11, when the cap is applied to the bottle and the body portion 18 brought into contact with the shoulder 14 the marginal edge of the body portion will tightly engage the adjacent portion of the peripheral wall of the recess 11 and thereby not only securely maintain the cap in its operative position on the bottle but also provide a fluid-tight seal for preventing the passage between said body portion and the bottle of either liquid or air. In addition to the sealing action of the body 18 thus mentioned, it will be noted that the extension 17 by tightly engaging the surface of the bead 12 at the points 26 and 27 provides further means by which air or liquid is prevented from escaping from the interior of the bottle.

It will thus be seen that the cap structure thus far described not only effectively covers the mouth of the bottle and prevents contamination of the mouth of the bottle and the entry of any foreign substance into the bottle, but also provides a proportionately large amount of smooth gripping surfaces on the cap for tight frictional engagement with the bottle when the cap is applied thereto so that the mouth of the bottle is so thoroughly sealed, and the cap is so securely connected to the bottle that when an abnormal pressure is produced within the bottle as by the expansion of the contents thereof, the cap is either lifted bodily from its closure position on the bottle or the flat central or body portion 18 of the cap will be warped or bulged out of normal position by the excessive pressure before the seal between the cap and bottle is sufficiently broken to release said pressure by the passage of air between the cap and bottle.

Such flexing of the cap body 18 permanently destroys the effective sealing qualities of the cap due to the body after having once been deflected not returning to or remaining in its normal position and in order to overcome this defect in caps of the above described structure the cap is provided with simple effective means comprising this invention whereby the cap will function to effectively produce a liquid-tight seal and at the same time permit sufficient passage of air or gas from the interior of the bottle to automatically release any excessive or unusual pressure within the bottle which may be produced by expansion of the contents thereof without destroying the effective liquid-tight sealing properties of the cap.

The novel improvement in bottle cap structure comprising this invention consists as shown more clearly in Figures 4, 5 and 6, in providing the outer vertical edge 18' of the body portion 18 with a plurality of, in this instance, six axially disposed indentations or recesses 30 arranged in substantially uniform circumferential spaced relation. These indentations or recesses 30 extend from the bottom surface of the body 18 upwardly to at least the upper surface of the marginal edge 18' and are very minute in size, being only a few thousandths of an inch in depth.

The body 18 is also provided with a multiplicity of radially disposed indentations or recesses 31 which have the outer ends thereof terminating in slightly spaced relation to the peripheral edge 18' of the body portion and also of the axially

disposed recesses 30 which produce in a manner presently described at the junction of registering vertical and radial recesses axially disposed pendant ribs or beads 32 of less depth than the recesses 31. These indentations or recesses 31 are arranged in substantially uniform circumferential spaced relation about the disk or body 18 and are so spaced apart in relation to the spacing of the axially disposed recesses 30 that when they are formed as by die pressure in the lower surface of the body 18 one or more of the radial indentations and axial indentations will be in registration with each other as shown in Figures 3 and 4. These radially disposed recesses or indentations 31 extend inwardly from the marginal edge of the body 18 a distance sufficient that when the cap is applied to the bottle, the inner end portions of the recesses will extend beyond the shoulder 14 into communication with the interior of the bottle.

It will thus be noted that when the cap is applied to the bottle those radial recesses 31 in registration with the axial recesses 30 will cooperate with said axial recesses in forming a continuous vent passage as 33, Figure 6, from the interior of the bottle to the recess 11 above the body 18. Each of these vent passages is so restricted by the beads or ribs 32 that while a liquid will be prevented from passing therethrough, air or gas above atmospheric pressure within the bottle may escape into the recess 11 and will then be forced outwardly between the marginal flange portion 17 of the cap and the bead 12 and thereby relieve the excess pressure in the bottle and at the same time the liquid contained in the bottle will be preserved and foreign matter will be prevented from passing inwardly through the vents 33 owing to the relatively small area of these vents and to the engagement of the marginal flange 17 with the bead 12 as at points 26 and 27.

In other words, although there are a multiplicity of radially disposed recesses or indentations 31 provided in the bottom surface of the body 18, all of these recesses terminate in slightly spaced relation to the marginal flange 18' of the body 18 as clearly illustrated in Figures 4 and 7 so that said recesses are not in direct communication with the recess 11 of the bottle and only those recesses 31 in communication with the axially disposed recesses 30 cooperate with said axially disposed recesses to provide minute vent passages 33 from the interior of the bottle around said body portion 18 to the recess 11 and although the cap of this construction permits air or gas to escape from the bottle under pressure, it does provide an effective liquid-tight seal which prevents the passage of liquid from the bottle except when an excessive pressure is produced in the bottle as from over-expansion of the liquid contents thereof, owing to the relatively greater degree of viscosity of the liquid.

The manner of constructing my improved cap above described is very much the same as that described in Weeks and Pease Patent No. 575,300, issued March 2, 1926, and comprises lower and upper sectional die members 35 and 36 respectively. The lower die member 35 is composed of a centrally disposed plunger 38, an outer tubular member or sleeve 39 and a second tubular member or sleeve 40 positioned intermediate the sleeve 39 and plunger 38. The upper die member 36 is composed of a centrally disposed plunger 42, an outer sleeve or tubular member 43 and an intermediate sleeve or tubular member 44 arranged in co-axial relation with the correspond-

ing elements 38, 39 and 40 of the lower die member 35. These die members 35 and 36 are normally spaced apart for receiving therebetween suitable cap blanks or disks as 18' and 19 from which the cap is formed and which may be arranged in co-axial relation with said die members by hand or automatically by any suitable mechanism not shown, and these members may be moved relatively toward and from each other to effect the formation of the cap by any suitable means not believed necessary to illustrate or further describe in connection with the instant application inasmuch as it forms no part of the invention thereof.

The plunger 38 of the lower die member 35 is, as shown in this instance, a cylindrical member having a smooth peripheral surface and is of slightly less diameter than the body portion 18 of the cap. The upper end surface of the plunger 38 is provided with a multiplicity of radially disposed circumferentially spaced ribs or corrugations 46 corresponding in number to the radially disposed recesses or indentations 31 formed in the lower face of the body portion 18 of the cap. These ribs or corrugations 46 extend from within a short distance of the peripheral edge of the plunger inwardly and are tapered from the outer ends thereof, which are only a few thousandths of an inch in height, to the inner end where they blend with the adjacent surface of the plunger.

The intermediate die section or sleeve 40 has an exterior diameter substantially equal to the interior diameter of the axial flange 24 of the cap, while the interior diameter of said sleeve is slightly greater than that of the plunger 38 and equal to the exterior diameter of the body portion or disk 18 of the cap. The upper end 47 of the sleeve 40 is convex in cross section to correspond with the curvature of the interior of the extension 17 of the cap. The inner wall of the sleeve 40 is provided with a plurality of, in this instance, six axially disposed ribs or corrugations 48. These ribs are arranged in circumferential spaced relation to conform with the arrangement of the indentations or recesses 30 in the cap and extend axially of the sleeve from the upper curved end 47 thereof downwardly intermediate the sleeve and the plunger 38. The outer die section 39 has a close sliding fit on the intermediate section 40, while the exterior diameter thereof is substantially equal to the diameter of the larger disk 18'.

In operation these die sections 38, 39 and 40 are slidably mounted one upon the other so as to have the necessary relative axial movement to effect the desired formation of the cap blank.

The upper die member 36 has the central plunger 42 thereof arranged co-axially with the plunger 38 and said plunger is of substantially the same exterior diameter as the cap disk 18, while the lower end thereof is substantially flat and smooth and arranged at substantially right angles to the axis thereof. The central plunger 42 is provided with six vertical grooves 49 equally spaced around its periphery.

The intermediate die section or sleeve 44 has a close sliding fit on the plunger 42 and the exterior diameter of this member is slightly greater than that of the companion die section 40 in the lower die member and substantially equal to the exterior diameter of the flange 24 of the cap. The lower end 45 of this die section 44 is concave in cross section to correspond to the curvature of the extension 17 of the cap. The outer sleeve or die section 43 has a close sliding fit

on the intermediate section 44 while the exterior diameter thereof is substantially equal to that of the companion die section 39 and of the large disk 18". Insofar as the outer die sections 39 and 43 pertain to this invention, their adjacent end surfaces may be smooth and continuous or may be provided with corrugations or teeth sections for effecting a similar corrugation of the peripheral or marginal edge portion of the larger cap disk 18".

In operation it will be observed that when the disks 18" and 19 are arranged between the die members 35 and 36 in co-axial relation therewith as illustrated in Figure 8, that by producing a slight relative movement of the die sections 43 and 44 toward the companion die sections 39 and 40 to the position shown in Figure 9, said die sections will cooperate with the companion die sections 39 and 40 for maintaining the marginal edge of the larger cap disk 18" against being distorted during the relative axial movement of the central portion of said cap blank to form the central cup-shaped portion 16 of the cap. This central cup-shaped portion of the cap is then formed by moving the upper die section or plunger 42 downwardly toward the lower die section 38 to the position illustrated in Figure 9. While the cup-shaped portion 16 is thus being formed, part of the material of its vertical wall flows into the vertical groove 49, thereby forming the ribs or beads 25 illustrated in Figures 1 and 2.

As the plunger 42 is thus moved downwardly, it will be observed that the marginal wall 18' of the cup portion will be pressed into engagement with the axially disposed beads or ribs 48 in the lower die section 40 simultaneously with the forming of the cup-shaped portion of the cap and thereby produce the axially disposed indentations or recesses 30 in the outer peripheral surface of said cup-shaped portion. As the upper die plunger 42 approaches the position illustrated in Figure 9 where the bottom surface of the body portion 18 of the cap is in close proximity to the radially disposed ribs 46 in the lower plunger 38, additional pressure is applied to the upper die sections whereby the intermediate section 44 is brought into tight gripping contact with the adjacent transverse portion of the cap for firmly holding the same upon the lower intermediate die section 40 while the outer die section 43 and the lower die section 39 are moved downwardly relatively to the intermediate sections 44 and 40 for wrapping the marginal portion of the larger cap blank 18" about the outer surface of the die section 40 to form the flange 24 of the cap as illustrated in Figure 10. During this relative axial movement of the sleeve sections of the die members, the upper plunger section 42 is forced toward the lower plunger section 38 for firmly pressing the body portion 18 of the cap against said lower plunger 38 and the ribs formed thereon to thereby produce the radially disposed recesses or indentations 31 of the cap as illustrated in Figure 10.

It will thus be seen that while the groups of recesses or indentations 30 and 31 are successively formed, they are at the same time formed simultaneously with the forming of the cap and without any appreciable additional cost or labor. Further, it will be noted that inasmuch as the outer ends of the radially disposed ribs 46 are spaced inwardly a slight distance beyond the inner edge of the axially disposed ribs 48, the radially disposed recesses or indentations will be spaced inwardly a corresponding distance from

the axially disposed recesses or indentations 30. However, inasmuch as the axially disposed indentations are formed first and the spacing of the radially disposed ribs 46 from the axially disposed ribs 48 is very slight, the cap material positioned intermediate the aligned ribs 46 and 48 will be drawn inwardly as the radially disposed ribs 46 are pressed into the surface of the cap blank and thereby produce the rib 32 at the junction of the radially and axially disposed aligned recesses, and inasmuch as these rib portions are not engaged directly by the radially disposed ribs 46, it is obvious that these ribs will be spaced a less distance from the lower surface of the body portion 18 than the bottom of the recesses 31 and hereby produce pendant ribs which restrict the passage formed by the aligned axially and radially disposed recesses, and thus produce minute vent passages leading from the central portion of the body 18 outwardly and along the peripheral edge 18' thereof.

Although the construction and operation of the cap shown and described are particularly simple, practical and efficient, it is evident that certain changes may be made in the detailed construction thereof and the manner of producing the same without departing from the spirit of the invention.

I claim:

1. A bottle closure comprising a body portion adapted to tightly fit the recess in a bottle mouth to form a liquid-tight seal, said body portion being provided with a minute vent in the exterior surface thereof in communication with the interior of the bottle adapted to permit the passage therethrough of a less viscous fluid than the liquid when an abnormal pressure is present within the bottle.

2. A closure for a bottle having a mouth recess and a shoulder in said recess, comprising a paper disk having a body portion adapted to tightly fit the recess when seated on said shoulder to form a liquid-tight seal, said disk being provided with a minute vent in the exterior surface thereof contiguous said shoulder and the wall of the recess in communication with the interior of the bottle adapted to permit the passage therethrough of a less viscous fluid than the liquid when an abnormal pressure is present within the bottle.

3. A bottle closure comprising a paper disk having a body portion adapted to tightly fit the recess in a bottle mouth to form a fluid-tight seal and an annular flange portion integral with the body portion adapted to contact with the upper edge of the bottle, and to cooperate with the body portion to maintain said fluid-tight seal when a normal pressure is present in the bottle, said disk being provided with a minute vent in the exterior surface of said body portion only for connecting the interior of the bottle with the mouth recess adjacent the flange portion of the cap to permit the passage of air therethrough when an abnormal pressure is present within the bottle.

4. A closure for a bottle having a mouth recess and a shoulder in said recess, comprising a circular paper body portion adapted to tightly fit the recess when seated on said shoulder to form a fluid-tight seal, said body portion having an axial indentation in the peripheral edge thereof and a radial indentation in the bottom surface thereof in communication with said axial indentation and extending beyond said shoulder to form a minute vent adapted to permit the pas-

sage of air therethrough when an abnormal pressure is present within the bottle.

5. A closure for a bottle having a mouth recess and a shoulder in said recess comprising a circular body portion adapted to tightly fit the recess when seated on said shoulder to form a fluid-tight seal, said body portion having a plurality of axially disposed indentations in the peripheral edge thereof and a multiplicity of radially disposed indentations in the bottom surface thereof extending inwardly from slightly spaced relation with the marginal edge of the body to a position beyond the bottle shoulder, said axial and radial indentations being so spaced circumferentially relative to each other that at least one of the axial and one of the radial indentations will be in communication with each other to form a continuous vent passage from the bottom across the marginal edge of said body.

6. A closure for a bottle having a mouth recess and a shoulder in said recess comprising a body portion adapted to tightly fit the recess when seated on said shoulder to form a liquid-tight seal, said body portion having an axially disposed channel in the surface thereof adjacent the wall of the bottle recess and a radially disposed channel adjacent the shoulder in said bottle recess arranged in substantial alignment with the vertically disposed channel, said channels having their adjacent ends slightly spaced from each other and a relatively shallow indentation connecting said ends of the channels to form an air vent between said body portion of the cap and adjacent surface of the bottle, and restricting means in said vent for determining the size thereof.

7. A bottle closure comprising a body portion adapted to tightly fit the recess in a bottle mouth to form a liquid-tight seal, said body portion being provided with an air passage in the surface thereof contiguous the adjacent portion of the bottle mouth, composed of two spaced relatively deep portions connected by a relatively shallow portion, said latter portion forming a restricting means in said passage for determining the size thereof.

8. A relatively rigid preformed bottle cap comprising a discoidal portion, a cylindrical wall portion extending upwardly from the periphery of said discoidal portion and terminating in an outwardly flaring flange overlying and encircling the

top portion of the bottle, said vertical wall portion being adapted to snugly engage the bore of the bottle mouth to retain the cap on the bottle, and being provided with a passage to permit the escape of liquid between the periphery of said wall portion and the bore of the bottle mouth without affecting retention of the cap on the bottle, said outwardly flaring flange normally engaging the top portion of the bottle in leak-proof relationship and being yieldable to permit the escape of liquid under pressure from said passage.

9. A relatively rigid preformed bottle cap comprising a discoidal portion, a cylindrical wall portion extending from the periphery of said discoidal portion and terminating in an outwardly flaring flange, said vertical wall portion being adapted to be pressed into the bore of the bottle mouth and to snugly engage the same to retain the cap on the bottle, said wall being provided with a plurality of grooves arranged in circumferentially spaced apart relationship and extending lengthwise of said wall to permit the escape of liquid between the periphery of said wall portion and the bore of the bottle mouth without affecting retention of the cap on the bottle, said outwardly flaring flange portion extending over the top portion of the bottle and engaging the same in leak-proof relationship and being yieldable to permit the escape of liquid under pressure from said passage.

10. A relatively rigid preformed bottle cap comprising a discoidal portion, a cylindrical wall portion extending upwardly from the periphery of the discoidal portion and forming the inner wall of a flange substantially U-shaped in cross section, said flange being adapted to overlie the top edge of the bottle with the outer wall of the flange encircling and yieldingly engaging the top portion of the bottle, said inner cylindrical wall portion being adapted to snugly engage the bore of the bottle mouth to retain the cap on the bottle and being formed with a plurality of grooves extending lengthwise in the outer surface thereof adjacent the bore of the bottle mouth, said flange engaging the bottle top in leak-proof relationship and being operable to permit the escape of liquid, when under pressure, through said grooves without affecting said leak-proof relationship.

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