Nov. 5, 1957 R. W. BEALL, JR 2,812,120

VENTED CLOSURE

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FIG. 1.

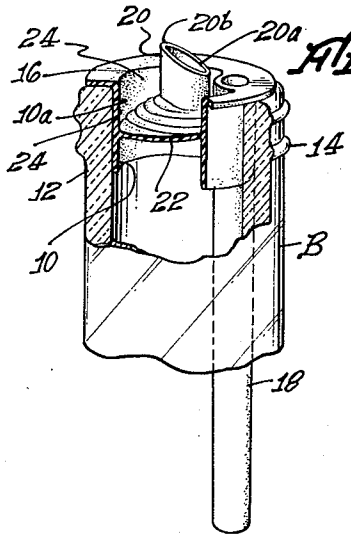


FIG. 2.

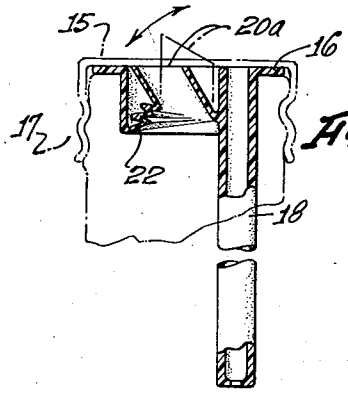


FIG. 3.

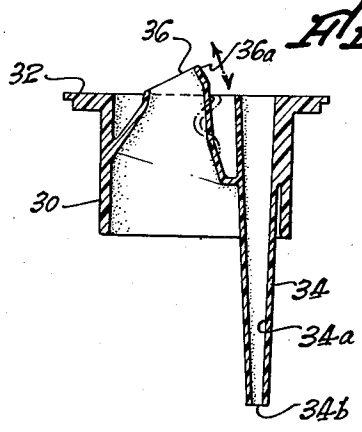


FIG. 4.

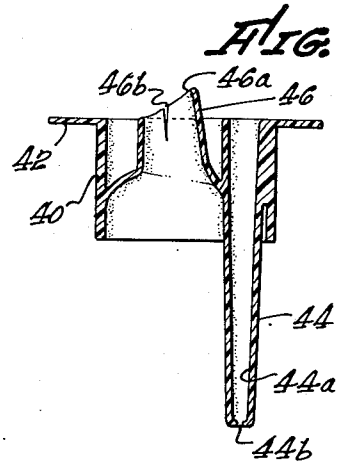
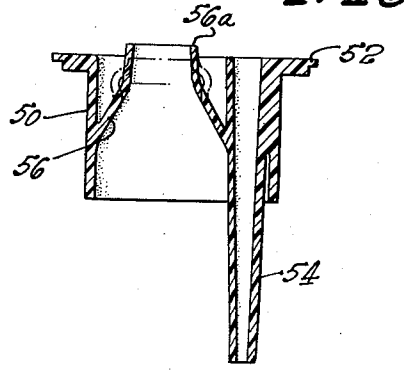


FIG. 5.



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VENTED CLOSURE

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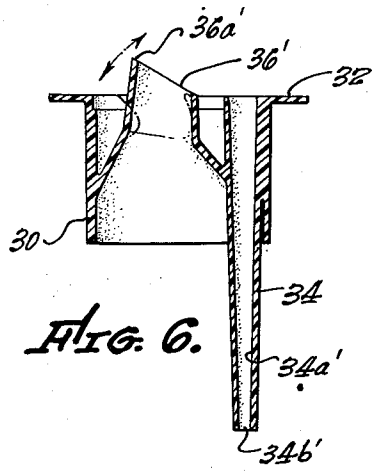


FIG. 6.

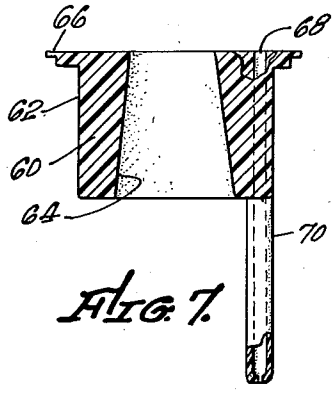


FIG. 7.

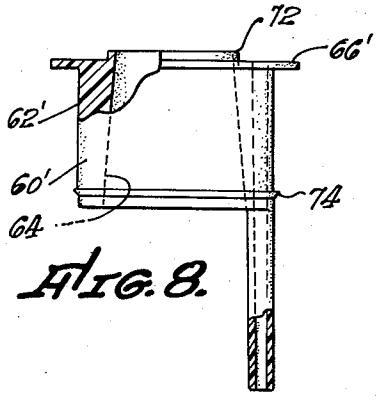


FIG. 8.

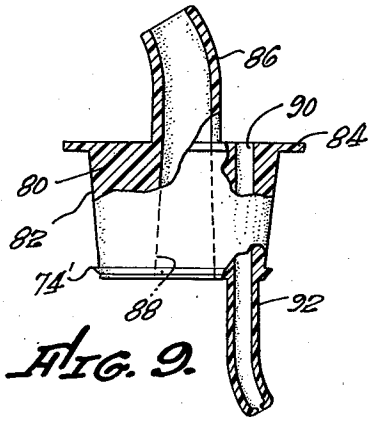


FIG. 9.

FIG. 10.

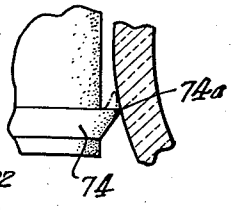


FIG. 11.

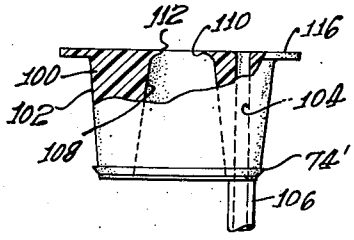
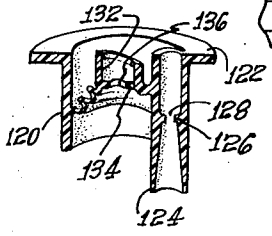


FIG. 12.



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VENTED CLOSURE

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Application May 2, 1955, Serial No. 505,140

11 Claims. (Cl. 222—481.5)

The present invention relates generally to the field of closures, and more particularly to a vented closure that can be removably or permanently mounted in the mouth of a bottle or other fluid containers.

Although numerous closures embodying pouring spouts and air vents both independently and in combination have been devised and marketed in the past, these devices are of such a design that they preclude the use of a conventional screw type cap to seal the mouth of the bottle or container in which they are mounted. Thus, while the previously available vented closures permitted fluid discharge from the containers with which they were associated, their use would require the adoption of a completely new cap to close the bottles or containers during shipment thereof. The adoption of such a new cap would not be economically feasible as the present day screw type cap is inexpensive, remains in position when placed on the mouth of a bottle or container, and is as satisfactory a fluid-sealing device as has yet been developed.

The major object of the present invention is to provide a vented closure that can be removably mounted or permanently affixed to the mouth portion of a bottle or container, which mouth portion has threads formed on the exterior surface thereof, and the invention of such structure and design as to permit a conventional threaded cap to be removably placed on the mouth portion of the bottle for sealing purposes.

Another object of the invention is to supply a vented closure that is provided with a spout that extends upwardly a sufficient distance above the balance of the invention to permit fluid to be discharged from the spout without it dripping down from the sides thereof, and the spout being so constructed that it may be retracted within the confines of the mouth portion of the bottle or container cap when the cap is screwed thereon.

A still further object of the invention is to provide a vented closure of such design that liquid will not flow through the air vent during a pouring operation, and the spout being of such design that liquid is discharged therefrom in a solid stream free of turbulence, as well as the gurgling which normally occurs when fluid is discharged from a bottle or container.

Another object of the invention is to provide a vented closure of such design and construction as to permit its fabrication as a one-piece unit from the numerous commercially available polymerized resins such as polyethylene or the like.

A still further obpect of the invention is to supply a vented closure that is easy to clean, is attractive in appearance, and one due to the material from which it is fabricated and the method employed in effecting same can be sold at a sufficiently low cost as to encourage its widespread use in the bottling industry.

Yet another object of the invention is to supply a vented closure from which liquid discharges as a succession of drops when the container in which it is mounted is held in an inverted position.

These and other objects and advantages of the invention will become apparent from the following description of a preferred and certain alternate forms thereof, taken in conjunction with the accompanying drawings in which:

Figure 1 is a perspective view of the preferred form of the invention, with portions thereof cut away to show the interior construction of the air vent and pouring spout;

Figure 2 is a vertical cross-sectional view of the device shown in Figure 1 illustrating the manner whereby the pouring spout and bellows type sealing member associated therewith may be retracted into the confines of the invention;

Figure 3 is a vertical cross-sectional view of a first alternate form of the invention, the portion of the pouring spout when in a retracted position being shown by phantom line;

Figure 4 is a vertical cross-sectional view of a second alternate form of the invention in which the spout is provided with flutes to facilitate the retraction thereof;

Figure 5 is a third alternate form of the invention in which the spout can be retracted by inward longitudinal movement thereof, with the retracted position of the pouring spout being indicated by phantom line;

Figure 6 is a vertical cross-sectional view of a form of closure that is substantially identical to that shown in Figure 3, but showing the spout in reverse position;

Figure 7 is a vertical cross-sectional view of a fourth alternate form of the invention in which both the air and fluid passages are tapered;

Figure 8 is a vertical cross-sectional view of a vented closure similar to that shown in Figure 7 but embodying an upwardly disposed pouring lip;

Figure 9 is a vertical cross-sectional view of a form of closure in which the spout is non-retractable;

Figure 10 is a fragmentary view of the sealing bead utilized in those forms of the invention illustrated in Figures 8, 9 and 11;

Figure 11 is a vertical cross-sectional view of a vented closure of such structure as to prevent dripping of fluid after completion of a pouring operation; and,

Figure 12 is a perspective view of a form of the invention from which liquid is discharged as a succession of drops when the container on which it is mounted is held in an inverted position.

Referring now to Figure 1 for the general arrangement of the preferred form of the invention, it will be seen to include a cylindrical side wall member **10** of such external diameter as to fit snugly within confines of the mouth portion **12** of a bottle B. The mouth portion **12** is provided with threads **14** on the exterior surface thereof which are adapted to be engaged by a cap (not shown) of conventional design. Side wall **10** terminates on the upper edge thereof in a flat, outwardly extending ring-shaped flange **16**, the lower surface of which flange is adapted to seat against the upper extremity of the mouth portion **12**. A tubular air vent **18** is provided, and extends longitudinally down within the confines of side wall **10** into the interior of bottle B. A tubular pouring spout **20** is also provided, the lower edge portion of which develops into a resilient sealing member **22** of a bellows-like construction (Figures 1 and 2), and the periphery of this member in fluid-sealing engagement with the interior surface of side wall **10**.

In the preferred form of the invention, the periphery of the sealing member **22** engages the interior surface of the side wall **10** at a position above the bottom edge thereof as shown in Figure 1. However, in Figure 2 it will be seen that the same construction may be employed, but with the sealing member being connected to the side wall **10** at the lower edge thereof. Each of the two forms of the invention as shown in Figures 1 and 2 operate in the same manner, and the position at which the sealing

member **22** is connected to the side wall member **10** merely being a matter of choice. The construction of the cap C shown in phantom line in Figure 2 normally employed in sealing the mouth of the bottle or like container, embodies a flat metal plate **15** from which a cylindrical threaded side wall **17** extends downwardly to engage threads **14**.

In Figure 1 it will be noted that spout **20** extends upwardly above flange **16** and has an angular upper edge **20***a*. When the device is employed in pouring liquid from the bottle B, the bottle is so tilted that the liquid flows over the upwardly extending extremity **20***b* of the spout. When the bottle is returned towards an upright position a sharp cut-off of the liquid is effected by the spout extremity **20***b*. Should any liquid adhere to the spout **20** upon the termination of the pouring operation, it will drip downwardly on the exterior surface of the spout into a cavity **24** defined by the upper surface of the sealing member **22** and the interior surface **10***a* of the side wall **10**. Thus, if there is any drippage of liquid from the pouring spout **20** at the cessation of the pouring operation, it does not flow down over the exterior surface of the neck portion of the bottle B but rather is confined in the cavity **24**. Of course, upon the next pouring operation being initiated the fluid that has dripped into the cavity **24** flows outwardly therefrom over the flange **16** into the container in which the fluid is being dispensed. Flange **16** as may be seen in Figure 1 is provided with sharp edges on both the inner and outer peripheries thereof, and these edges serve to sever liquid flowing over the flange from portions adhering thereto, with the result that there is a minimum of drippage down the side of the mouth portion **12** of the bottle B. Flange **16** seats against the upper extreme face of the mouth portion **12**, and precludes the possibility of liquid escaping between the exterior surface of the side wall **10** and interior surface of the mouth portion **12**.

When the cap **15** is screwed onto the bottle, the spout **20** is initially in substantially the upwardly projection position shown in phantom line in Figure 2, but as the cap is brought into closer proximity with the upper surface of the flange **16**, the edge **20***a* of the spout moves from the angularly disposed position shown in phantom line in Figure 2 to a position in which it is in the same horizontal plane as the upper surface of the flange **16**. Thus, the spout **20** may be easily retracted into the position shown in the solid line in Figure 2, by simply screwing the cap **15** onto the bottle in the normal manner. The sealing member **22** is of a bellows-like construction and is formed of a resilient material. As a result of this construction the member can be deformed from the position shown in Figure 1 to that shown in Figure 2 without in any way minimizing its sealing qualities. Due to the resiliency of the sealing member **22**, the spout **20** is immediately advanced from the position shown in the solid line in Figure 2 to substantially that shown in phantom line in the same figure, and is then in a position to permit pouring of fluid from the bottle B without the fluid coming in contact with the upper extremity of the mouth portion, or dripping down the sides of the mouth portion after the pouring operation has been completed.

The flange **16** in addition to serving the functions previously mentioned also serves as a sealing medium. The flange is preferably formed of a resilient material and when the cap **15** is screwed tightly on the bottle B, the flange is compressed between the interior face of the cap and the upper surface of neck portion **12**.

A first alternate form of the invention is shown in Figure 2 in which it will be noted that the device includes a cylindrically shaped side wall member **30** that has a flange **32** formed on the upper edge thereof that serves the same function as flange **16** in Figure 1. A tubular air vent **34** is provided on the interior surface of side wall member **30** and extends downwardly within the confines of the side wall to a position substantially below the lower edge of the sidewall. A conically shaped pouring spout **36** is provided that terminates at the top in an angularly disposed edge **36** and on the bottom in a lower edge that is connected to the interior surface of the side wall **30**, as well as a portion of the exterior surface of the air vent **34**. The pouring spout **36** is formed of a resilient material, and upon a cap, such as the cap **15**, being screwed onto a bottle in which the first alternate form of the invention is disposed, the interior surface of the top of the cap engages the upper extremity **36***a* of the pouring spout and causes the pouring spout to be forced downwardly to assume the position shown in phantom line in Figure 3. When the pouring spout has been so deformed, the angularly disposed upper edge thereof is in the same horizontal plane as the upper surface of the flange **32**. However, when the cap is removed from the bottle in which this form of the invention is disposed, the resiliency of the material forming the pouring spout causes the spout to assume substantially the position shown in solid line in Figure 3. It will of course be realized that the memory of no plastic material is perfect, and that after deformation the material returns to substantially but not the exact position it occupied before such deformation.

A second alternate form of the invention is shown in Figure 4 in which a cylindrical side wall member **40** is provided that has a ring-shaped flange **42** extending outwardly from the upper edge portion thereof, but with this flange portion being considerably thinner than the similar flange **32** shown in Figure 3. In the third alternate form of the invention a tubular air vent **44** is provided that extends downwardly from the upper portion of the closure to a distance considerably below the lower edge thereof. The second alternate form of the invention is also provided with a pouring spout **44** that increases in the internal cross-section as the pouring spout extends upwardly relative to the side wall member **40**. The pouring spout **44** terminates in an angularly disposed circumferential edge portion **46***a*, with this edge portion having two oppositely disposed flutes **46***b* formed therein that extend downwardly therefrom. The purpose of the flutes **46***b* is to permit the resilient material forming the spout to more easily assume a retracted position, in which all of the spout is disposed within the confines of the cylindrical side wall member **40** when a cap, such as the cap **15**, is screwed onto the mouth portion of the bottle in which the invention is disposed. The flanges shown in the preferred form and the first and second alternate forms of the invention not only serve to regulate the depth to which the inventions may be inserted within the confines of the mouth portions of the bottle, but also due to the resiliency of the material from which the flanges are formed serve as liquid sealing members. Due to the resiliency of the spout shown in the preferred and first and second alternate forms of the invention, and the fact that the upper edge of the spout is angularly disposed, the spout when deformed urges this upper edge into forceful contact with the interior surface of the cap **15** and to a degree that the upper edge of the spout effects a fluid tight seal therewith.

It will be particularly noted in the second and third alternate forms of the invention that the interior bores **34***a* and **44***a* respectively, of the air vent taper inwardly, with the transverse cross-section of the bores being a minimum at the lower extremities of the vent. The purpose of this tapering is to increase the velocity of the flow of air into the confines of the bottle B as the pouring operation takes place, and the velocity being sufficient to prevent fluid entering the lower extremities **34***b* and **44***b* of the air vents when fluid is being discharged from the pouring spout of the invention. The pouring spouts of the second and third alternate forms of the invention are of minimum transverse area at the upper extremities thereof, and this design being effected to assure that a full stream of fluid is discharged from the spouts.

The fourth form of the invention shown in Figure 5

includes a cylindrically shaped side wall **50** that terminates on its upper edge in a ring-shape flange **52**. The side wall **50** has a tubular air vent **54** extending downwardly within the confines thereof from the upper portion of the side wall to a position below the lower edge thereof. A tubular pouring spout **56** is provided that terminates in a horizontally disposed upper edge **56***a*, and the lower edge of the spout being connected to the interior surface of the side wall **50** and a portion of the exterior surface of the air vent **54**. The device operates in substantially the same manner as the form of the invention shown in Figure 3, other than the upper portion of the pouring spout **56** is deformed downwardly instead of angularly when a cap is placed on the mouth portion of the bottle in which this form of the invention is disposed. When a cap is so placed on the bottle, the spout deforms into the position shown in phantom line in Figure 5, in which deformed position the upper edge **56***a* of the spout is in the same horizontal plane as the upper surface of the flange **52**. The upper edge **56***a* of the spout is at all times urged upwardly due to the resiliency of the material from which the spout is formed, and in consequence is forced into fluid sealing contact with the interior surface of the cap that holds it in the deformed position.

The form of the invention shown in Figure 6 is identical to that shown in Figure 3, other than the position of the upper portion of the pouring spout is reversed. The same numerals used in identifying the component parts in Figure 3 are used in Figure 6, but with a prime affixed thereto.

The various forms of the invention shown in Figures 1 to 6 can be fabricated as one piece units by molding operations, and from such materials as the numerous synthetic resins that are available for this purpose. Should it be desired, the various forms of the invention can be formed from separate pieces, and bonded together by means that are normally employed for such purposes.

In Figure 7, another form of the invention is shown in which the closure is formed from a cylindrically shaped member **60** having an exterior surface **62** that is adapted to be slidably inserted within the confines of the mouth portion of a bottle. The member **60** has a tapered bore **64** formed therein, which bore has its smallest transverse cross-sectional area at the portion thereof adjacent a ring-shaped flange **66** that extends outwardly from the upper portion of the member. The form of the invention shown in Figure 7 has a bore **68** extending longitudinally through one side portion thereof, and this bore being in communication with a tubular air vent **70** that extends downwardly from the lower edge of the member **60**. In this form of the invention the tapered bore **64** permits discharge of fluid from the interior of a bottle or container in which the invention is mounted in the same manner as in the previously described forms of the invention.

Another form of the invention is illustrated in Figure 8, which is identical to the form shown in Figure 7, with the exception that an annular ring **72** is formed with sharp circumferential edges that serve to cut off the flow of fluid from the invention when a pouring operation is terminated, and without drops of the fluid flowing over the flange **66'** to dribble down the exterior surface of the neck portion of the bottle in which the invention is mounted. The same numerals used in Figure 7 to identify the component parts of that form of the invention are used in Figure 8, but with primes added thereto. In addition to the ring **72**, a circumferentially extending rib **74** is formed on the lower exterior surface of the member **60'**. The rib **74** is of triangular shaped transverse cross-section as may be seen in Figure 10, and includes an apex portion **74***a* that slidably engages the interior surface of the bottle portion **12** to effect a fluid tight seal therewith, as well as preventing the invention inadvertently being displaced from the bottle.

Another form of the invention is shown in Figure 9

in which a resilient member **80** is provided that has a downwardly and inwardly tapering exterior surface **82** that slidably engages the interior surface of the mouth portion of a bottle, and is also provided with a rib **74'** on the lower portion thereof, which rib performs the same function as the rib **74** shown and described in connection with the form of invention shown in Figure 8. The member **80** is formed with a flange **84** on the upper edge portion thereof, and this flange serves the same function as the various flanges previously described in connection with the invention. A pouring spout **86** projects upwardly from the member **80** and is in fluid communication with a tapered bore **88** formed in the member. A longitudinally extending bore **90** is also formed in the member and is in fluid communication with an air vent **94** that extends downwardly from the lower portion of the member **80**. The form of the invention shown in Figure 9 operates in substantially the same manner as the forms of the invention shown in Figures 7 and 8, other than the fluid is dispensed from the projecting spout **86**, and is accordingly less liable to drip down the mouth portion of the bottle or come in contact with the exterior surface of the flange **84**.

Another form of the invention is shown in Figure 11 in which a cylindrically shaped resilient member **100** is provided that has a downwardly and inwardly tapering surface **102**. A downwardly extending bore **104** is formed in one side portion of the member **100** and is in communication with a tubular air vent **106** that depends from the lower portion of the member **100**. The member **100** is provided with a rib **74'** that is identical with rib **74** shown in Figure 10 and serves the same function. A centrally disposed upward and inwardly tapering bore **108** is formed in the member, with the bore at its upper extremity terminating in an annular opening **110** through which fluid is discharged, and this opening being defined by an inwardly extending annular lip **112**. The upper surface of the member **100** and the lip **112** intersect to define a sharp peripherial edge portion **114** that serves to cut off the fluid sharply at the cessation of the pouring operation, and thus prevent the fluid flowing over the upper surface of the member **100**, as well as down the exterior surface of the mouth portion of the bottle in which the invention is exposed. The member **100** is provided on the upper portion thereof with an outwardly extending annular flange **116** that seats on the upper extremity of the mouth portion of the bottle in the same manner as the flange **16** shown in Figure 1. The form of the invention shown in Figure 3 assures a smooth even flow of fluid through the bore **108**, and this fluid flow being cut off sharply by the lip **112** when the pouring operation is completed and the bottle in which the invention is disposed returned to an upright position.

The various forms of the invention shown in Figures 7 to 11 are adapted to be fabricated as one piece units, and the material used for this purpose may be rubber, or one of the numerous synthetic plastic materials available for this purpose.

A form of the invention is shown in Figure 12 that is particularly adapted for use in the pharmaceutical industry, particularly in those applications in which the liquid contents of a bottle are to be dispensed therefrom drop by drop. The device is formed from a resilient material such as one of the synthetic plastics available for such purposes, and includes a cylindrically shaped side wall **120** that has a ring shaped flange **122** projecting outwardly from the upper edge thereof. A tubular air vent **124** extends downwardly within the confines of the side wall from a position on the upper edge thereof to a position below the lower edge of the side wall. The interior of air vent **124** tapers upwardly, with the center of the vent being provided with a restriction **126** in whch an orifice **128** is formed. A bellows-like sealing member **130** extends upwardly from the interior surface of side wall **120** to terminate in a

pouring spout **132**. A restriction **134** is provided at the entrance to spout **132**, which restriction has an orifice **136** formed therein. The two orifices **128** and **136** limit the rates of flow of air into and liquid out of the bottle, and as a result liquid is discharged drop by drop from a bottle in which this form of the invention is disposed when the bottle is placed in an inverted position.

Although the inventions herein shown and disclosed are fully capable of achieving the objects and providing the advantages hereinbefore mentioned, it is to be understood that they are merely illustratve of the presently preferred embodiment of the devices, and that there is no intention to limit the invention to the details of construction herein shown and described, other than as defined in the appended claims.

The invention claimed is:

1. A retractable vented pouring spout closure capable of being substantially completely disposed within the confines of the straight cylindrical mouth portion of a fluid holding container when a cap is affixed to said portion that includes: a resilient cylindrically shaped side wall capable of snugly and completely engaging the interior surface of said mouth portion; an annular flange that extends outwardly from the upper edge of said side wall and seats against the upper extremity of said mouth portion; a tubular air vent disposed longtiudinally within the confines of said side wall; a pouring spout that extends upwardly within the confines of said side wall to a position above said flange and laterally separated from said vent; and a transversely disposed deformable member in fluid sealing contact with the interior surface of said side wall, said member formed with a first opening in communication with said air vent, and a second opening that leads to the interior of said spout, and said member sufficiently deformable that said pouring spout can be moved downwardly to be completely disposed within said side wall when a cap is mounted on said mouth portion.

2. A closure as defined in claim 1 in which said deformable member is of a bellows like construction.

3. A closure as defined in claim 1 in which said deformable member is formed with a plurality of spaced folds therein.

4. A closure as defined in claim 1 in which said pouring spout is formed with an angularly disposed upper edge to minimize the tendency of fluid to adhere thereto.

5. A closure as defined in claim 1 in which said deformable member is of a generally conical shape.

6. A closure as defined in claim 1 in which said air vent extends downwardly below the lower edge of said side wall.

7. A closure as defined in claim 1 in which the bore in said air vent increases in cross sectional area in proportion to the distance of said area from the outer extremity of said vent.

8. A disposable vented pouring spout that can be removably mounted in the straight cylindrical mouth portion of a bottle, including: resilient cylindrical side wall member capable of snugly and completely engaging the interior surface of said mouth portion of said bottle; a flange extending outwardly from the upper portion of said side wall and abutting against the upper extremity of said mouth portion when said side wall member is completely disposed therein; air vent passage forming means affixed to said side wall member and extending from a first point on the upper portion thereof to a second point of lower elevation that is in communication with the interior of said bottle; and a tubular pouring spout laterally separated from said air vent passage, the lower edge portion of which spout forms a fluid-tight junction with the interior surface of said side wall member at a position below the upper edge thereof, with the interior surface of said side wall member and the exterior surface of said spout cooperatively defining an annulus-shaped cavity in which liquid adhering to the spout exterior can drip after cessation of the pouring operation.

9. A pouring spout as defined in claim 8 in which said flange is ring-shaped and formed with sharp inner and outer circumferential edges to provide a sharp liquid cut-off after completion of a pouring operation to minimize the quantity of liquid flowing to said cavity.

10. A pouring spout as defined in claim 8 in which at least a portion of said spout is formed of a resilient material to permit retraction of said spout into said cavity when not in use.

11. A disposable vented pouring spout adapted to be removably mounted in the straight cylindrical mouth portion of a bottle, which portion has threads formed on the exterior thereof that are removably engaged by a rigid cover, including: a resilient cylindrical side wall member capable of completely and snugly engaging the interior surface of said mouth portion of said bottle; a flange extending outwardly from the upper portion of said side wall and abutting against the upper extremity of said mouth portion when said side wall member is mounted therein; air vent passage forming means affixed to said side wall member and extending from a first point on the upper portion thereof to a second point of lower elevation that is in communication with the interior of said bottle; a tubular pouring spout laterally separated from said vent passage, the lower edge portion of which spout forms a fluid-tight junction with the interior surface of said side wall member at a position below the upper edge thereof, with the interior surface of said side wall member and the exterior surface of said spout cooperatively defining an annulus shaped cavity in which liquid adhering to the spout exterior can drip after cessation of the pouring operation, which spout is formed of a resilient material that permits retraction of said spout into said cavity yet due to the resiliency of said material said spout is at all times urged upwardly with sufficient force to maintain the upper edge of said spout in fluid-tight contact with the interior surface of said cover.

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