

Jan. 5, 1965

D. M. KITTERMAN ETAL

3,164,306

BOTTLE CLOSURE

Filed Jan. 17, 1963

2 Sheets-Sheet 1

Fig. 1.

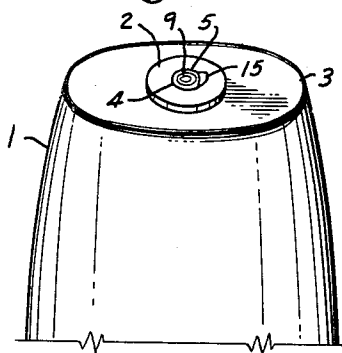


Fig. 2.

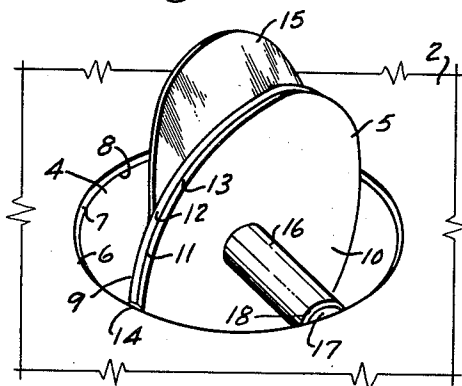


Fig. 3.

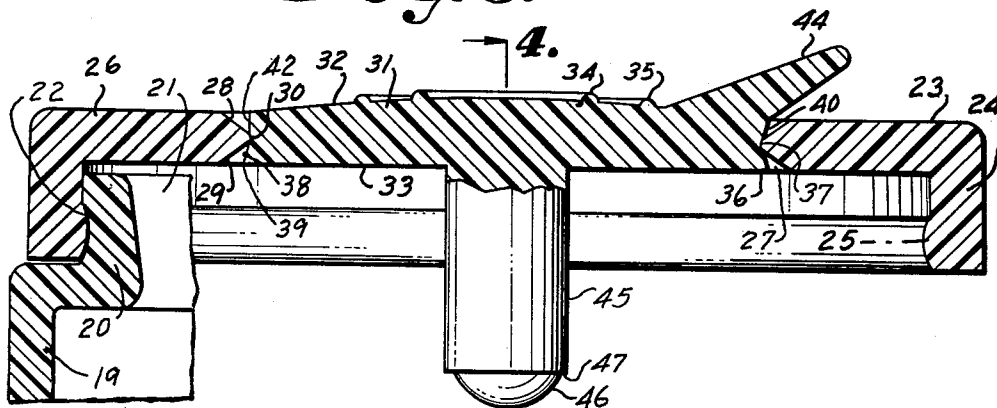
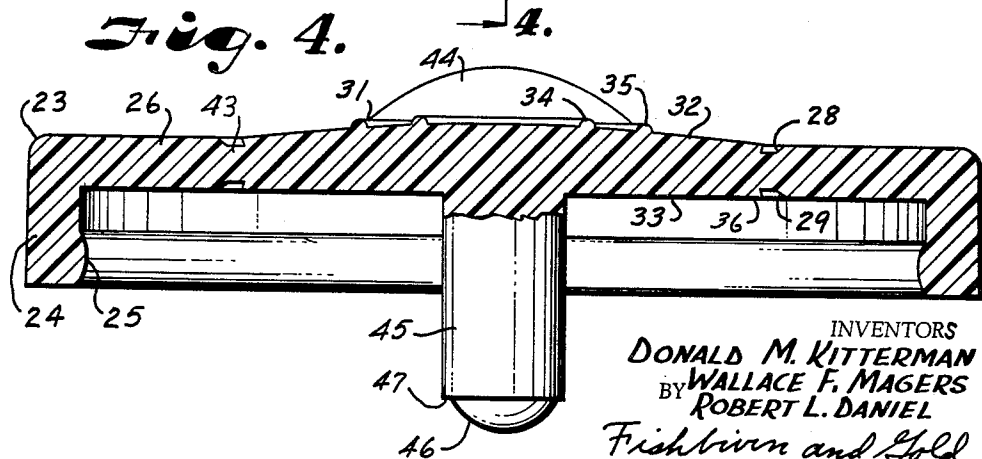


Fig. 4.



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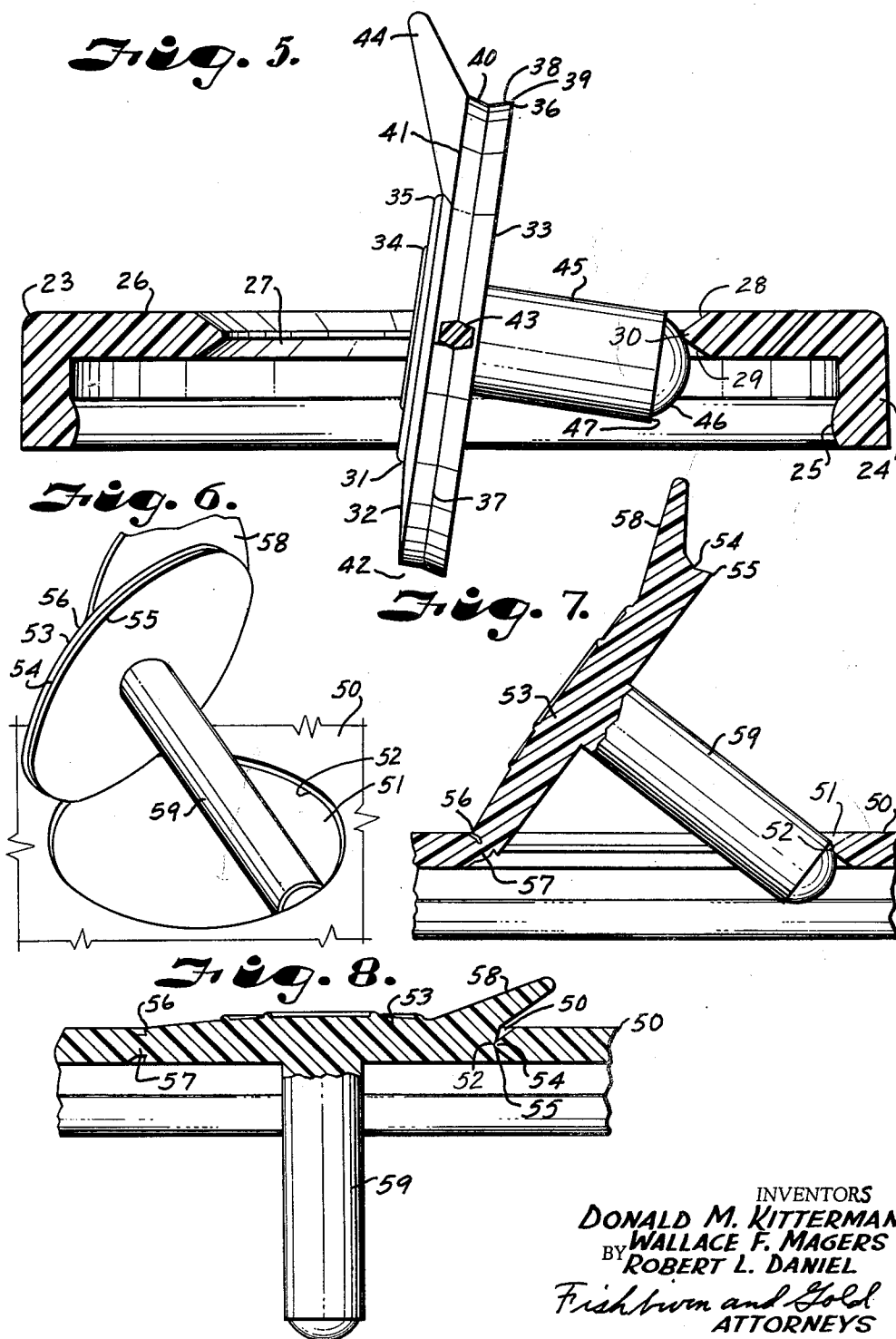
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2 Sheets-Sheet 2



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3,164,306

BOTTLE CLOSURE

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14 Claims. (Cl. 222-498)

This invention relates to containers for flowable material such as fluids, powders and the like, and more particularly to dispensing closures for a mouth of a container such as bottle and the like with a movable valve member for controlling the dispensing of the contents.

The principal objects of the present invention are to provide a container with a dispensing closure structure having a valve member swingably mounted to open and close a dispensing opening; to provide a dispensing valve structure with a body member and a valve structure with integrally connected portions forming a hinging connection whereby the valve member is swingable to open and close a dispensing opening in said body; to provide a container closure and valve formed of moldable resilient material as suitable synthetic resins, for example polyvinylchloride, polyethylene, polypropylene and other flexible plastics having the character of being capable of being deformed under pressure and upon removal of said pressure returning to original shape; to provide such a structure wherein the valve element is a disc-like member having opposed faces with a peripheral portion therebetween for sealing engagement with an edge of the body member defining the dispensing opening with the valve element having outwardly extending peripheral lips that permit swinging the valve element to open position with the lips resisting swinging movement of the valve element when in closed position; to provide a dispensing closure structure having a valve element that is a part of the structure defining the dispensing opening which the valve element is adapted to close and that is formed during the manufacture thereof as by molding with mold portions arranged to define substantially opposed grooves at the valve element periphery with inner edges in close proximity whereby the molding material at said edges leaves a line of separation between the valve element and the portion defining the edge of the dispensing opening; to provide such a structure wherein the mold has a connecting opening between the valve element cavity and the cavity of the portions surrounding the dispensing opening whereby the molding material can flow from one to the other and in the product the material remaining in the opening between the cavities forms flexible hinge connections about which the valve element may be swung; to provide such a structure with a projection from the valve element adapted to engage the edge defining the dispensing opening when the valve element is in open position to limit the swinging movement of said valve element; to provide a dispensing closure for containers wherein a body portion has a dispensing opening with marginal portions therearound converging inwardly to an edge defining said opening and the valve element is integral with said body and is a disc-like member with a peripheral groove whereby in closed position the edge of the opening resiliently engages the bottom of said peripheral groove, the valve element being connected to the body member by a flexible hinge connection at a point on the periphery with a projection from the valve element spaced from the hinge connection whereby said valve element may be lifted and swung from closed to open position; and to provide a dispensing valve structure that is economical to manufacture, easily applied and is simple yet positive and efficient in operation.

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Other objects and advantages of this invention will become apparent from the following description taken in connection with the accompanying drawings wherein are set forth by way of illustration and example certain embodiments of this invention.

FIG. 1 is a partial perspective view of a container having a closure embodying the features of the present invention.

FIG. 2 is an enlarged partial perspective view of a container closure with the valve element in open or dispensing position.

FIG. 3 is a greatly magnified transverse sectional view through a container closure structure.

FIG. 4 is a transverse sectional view through the closure taken on the line 4-4, FIG. 3.

FIG. 5 is a transverse sectional view through the closure with the valve element being shown in elevation and open or dispensing position, and the hinge element thereof in section.

FIG. 6 is a partial perspective view of a modified form of closure with the valve element in open position.

FIG. 7 is a partial sectional view through the form of closure illustrated in FIG. 6 in open position.

FIG. 8 is a transverse sectional view through the closure shown in FIG. 6 with the valve element in closed position.

Referring more in detail to the drawings:

This invention contemplates a structure wherein a dispensing valve is arranged to control discharge of flowable materials from a container wherein a valve element is positioned in a dispensing opening and the portion or wall defining said opening serves as one end of the container. The invention further contemplates such a structure wherein the valve structure includes a body member with a dispensing opening in which a valve element is swingably mounted wherein the body member and valve element are molded of flexible resilient material such as suitable synthetic resin, for example polyvinylchloride, polyethylene, polypropylene and other flexible plastics with a resilient engagement between the peripheral portion of the valve element and the edge of the body member defining said opening providing a seal when the valve element is in closed position. This invention further contemplates a dispensing valve structure wherein the valve element is swingably mounted on a body member for movement to open and close a dispensing opening and the body member removably connected to a container at the mouth thereof, said body member and valve element preferably being of a material that it may be constructed by molding, as for example, injection molding.

The reference numeral 1 designates a container with a valve body member 2 at one end 3. The body member 2 has a dispensing opening 4 with a valve element 5 swingably mounted thereon to open and close said dispensing opening. The marginal portions 6 adjacent the opening 4 are preferably beveled as at 7 to provide inwardly converging surfaces terminating in an inner edge 8 that defines the opening 4. The valve element 5 is preferably a disc-like member with opposed faces 9 and 10 and a peripheral portion 11 intermediate said faces adapted to be engaged by the edge 8 to form a seal when the valve element is in closed position. The valve element also has outwardly extending portions 12 and 13 adjacent said surfaces 9 and 10 to form peripheral lips that extend outwardly beyond the portion 11.

The valve element is connected to the body member by trunnions or hinge members 14 at the periphery of said valve element whereby the valve element may be swung about said trunnions or flexible hinge members 14. It is preferred that the trunnions 14 be at diametrically opposed points and integral with the valve element and body member whereby the valve element swings about an

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axis through said trunnions. The valve element is provided with a projecting portion or tab 15 or suitable structure adapted to be grasped to swing the valve element about the axis of the trunnions 14. In the structure illustrated, the tab 15 extends upwardly and outwardly at a side of the valve element in spaced relation to the axis of swinging movement to facilitate pulling said side upwardly with the lips 12 and 13 and the edge 8 yielding at said side to permit swinging movement of the valve element 5. The swinging movement of the valve element 5 is limited by a projection 16 thereon adapted to engage the body member adjacent the opening 4. In the structure illustrated, the projection 16 is in the form of a depending cylindrical rod-like member with a rounded lower end 17 forming a shoulder 18 arranged whereby when the valve element is swung to open position the rounded portion 17 will engage the edge 8 beyond the shoulder 18 and said shoulder will provide resistance tending to hold the valve element in open position. It is to be understood that the body member 2 may be integral with the container or may be separable therefrom.

In the structure illustrated in FIGS. 3 to 5 inclusive, there is a container 19 that has an upstanding wall 20 defining a mouth 21 communicating with the interior of the container. The wall 20 preferably is inclined outwardly to form a groove or recessed periphery as at 22. The closure member includes a body member 23 adapted to be suitably secured on the container at the mouth thereof and, in the structure illustrated, the body member includes a depending wall 24 with an inwardly extending bead 25 adapted to engage under or in the groove defined by the peripheral shape of the wall 20. This particular arrangement allows the body member 23 to be snapped onto the container in resilient tight engagement thereon. In the structure illustrated, the body member 23 has a top wall 26 with a dispensing opening 27 centrally located therein. The marginal portions adjacent said opening have inwardly converging surfaces 28 and 29 that terminate in an inner edge 30 that defines the opening 27.

A valve element 31 is positioned in the opening 27, said valve element being a disc-like member having an upper or outer face 32 and a lower or inner face 33. In the illustrated structure, the upper face 32 is crowned and there are spaced concentric ribs 34 and 35 that are both decorative and add some strength. It is preferred that the valve element 31 at its periphery 36 have a thickness substantially corresponding to the thickness of the wall 26 of the body 23. The valve element has a mid-portion 37 that extends substantially around the periphery or circumferentially and has resilient engagement with the edge 30 of the body member when the valve element is in closed position as illustrated in FIG. 3. From the peripheral portion 37, the periphery is inclined outwardly toward the inner face 33, providing an inclined peripheral face 38 on an angle whereby said face is spaced from the surface 29 of the body member, the face 38 and the inner face 33 cooperating to define a peripheral lip 39 slightly larger than the portion 37. From the peripheral portion 37, the periphery for one-half of the circumference slopes outwardly, having a face 40 to form an outwardly extending lip 41 that substantially corresponds to the lip 39. While the face 40 and lip 41 may extend for the entire periphery of the valve element, it is preferred that for slightly less than one-half of the periphery from the portion 37 to the outer face 32 the surface is generally cylindrical as at 42 to reduce the resistance of swinging movement of the valve element to open position, as later described.

The valve element 31 is connected to the body 23 at diametrically opposed points by hinge members or trunnions 43. These hinge members are centrally located between the inner and outer faces of the valve element whereby the axis of swinging movement of the valve element is substantially in a plane defined by the circle of the portion 37 of the periphery of the valve element 31.

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The valve element also preferably has a tab or suitable member 44 extending outwardly whereby it can be grasped to swing the adjacent side of the valve element upwardly into open position, as illustrated in FIG. 5. The hinge members 43 are preferably adjacent the terminus of the cylindrical portion 42 and the tapered upper portion having the face 40 of said valve element with the tab 44 on a side opposite from the cylindrical portion 42.

The valve element has a depending member 45 with a rounded end 46 forming a shoulder 47 so that when the valve element is swung to open position the rounded portion will engage the edge 30 of the body member and, as the valve element tends to swing back to closed position, the shoulder 47 will engage said edge to retain the valve element in open position until it is forcibly moved to cause the shoulder 47 to pass the edge 30. As the valve element returns to closed position, the lip 39 on the side having the tab 44 engages the adjacent portion of the edge 30 to resist full closing movement. By pressing on the tab side of the valve element, the lip 39 and edge 30 yield whereby they can pass to position the valve element in closed position as illustrated in FIG. 3. In this position, the inclined face 40 cooperates with the face 38 to resist movement until pressure is applied in lifting of the tab 44 to cause yielding of the lip 39 and edge 30 sufficiently for the resistance to be overcome and the valve element moved to open position.

In making a closure structure such as illustrated and described, as by molding from a flexible resilient material, mold members are closed to define a cavity corresponding to the shapes of both the body member 23 and valve element 31. Portions of the mold members also define the spaces between the faces 28, 40 and 42, and the faces 29 and 38, with the inner edges of said mold portions slightly spaced. Those mold portions also are arranged to leave a cavity corresponding to the hinge members 43. The material is then injected into the cavities, as for example into the body portion of the cavity, and said material will flow through the cavity and fill same but will not pass through the space between the mold portions defining the spaces between the periphery of the valve element and the edge of the body member. The material, however, will flow through the cavity forming the hinge members 43 and thereby fill the cavity for the valve element but that material in the valve element cavity will not pass through the space at the peripheral edge so that in the product there is engagement of the edge 30 and the peripheral portion 37 but no membrane connecting same, the only connection being the integral hinge members 43.

When it is desired to use the structure, the body member 23 is applied to a container at the mouth thereof with the opening 27 closed by the valve element. With it is desired to dispense some of the contents of the container, the tab 44 is grasped and lifted, swinging the valve element on the hinge members 43 to a position such as shown in FIG. 5, whereby the contents may be dispensed through the opening 27. When the dispensing is completed, the valve element is swung to closed position, as illustrated in FIGS. 3 and 4. While there is a twisting in the hinge members 43, it is found that such members continue to function for many, many hinging operations and thereby will last for more than the normal use in dispensing of contents from the container.

In the form of the invention illustrated in FIGS. 6 to 8 inclusive, the body member 50 has an opening 51 defined by an edge 52 of substantially the same structure as shown and described relative to the structure shown in FIGS. 3 to 5 inclusive. The valve element 53 is also preferably of the same structure as the valve element 31 as shown in FIGS. 3 to 5 inclusive, and has a peripheral portion 54 adapted to be resiliently engaged by the edge 52. Also the peripheral portion of the valve element has spaced lips 55 and 56 that cooperate in substantially the same manner to resist movement or swinging of the valve member from open to closed position.

In the structure shown in FIGS. 6 to 8 inclusive, the valve element 53 is swingably mounted on a single hinge member 57 that connects the periphery of the valve element 53 with the edge 52 of the body member. The hinge member is substantially the same as one of the hinge members 43 as shown in FIG. 5, but is oppositely disposed relative to a tab 58 on the valve element. The depending projection 59 on the valve element is longer whereby it can engage the edge portion 52 oppositely from the hinge member 57 when the valve element is in open position, as illustrated in FIG. 7. Except for the bodily swinging of the valve element about a single hinge member 57, the operation of the structures shown in FIGS. 6 to 8 inclusive is substantially the same as shown and described relative to the structure in FIGS. 3 to 5 inclusive.

It is to be understood that while we have illustrated and described certain forms of our invention, it is not to be limited to the specific forms or arrangements of parts herein described and shown except insofar as such limitations are included in the claims.

What we claim and desire to secure by Letters Patent is:

1. A dispensing closure for a mouth of a container adapted to contain flowable materials comprising,
 - (a) a closure body of resilient material for connection to said container at the mouth thereof,
 - (b) said closure body having an end portion with an opening arranged substantially centrally thereof and communicating with the interior of the mouth of said container with marginal portions around said opening converging inwardly to an edge defining said opening,
 - (c) a dispensing valve element mounted for swinging movement at said end portion, said valve element embodying a disc-like member having opposed faces with a peripheral portion therebetween for sealing engagement with said edge defining said opening, said valve element having outwardly extending peripheral lips for resisting swinging movement of said valve element,
 - (d) a flexible hinge member of relatively small cross-section connecting the valve element periphery with said end portion edge at a point thereof,
 - (e) means on said valve element adjacent a side thereof spaced from the hinge member for lifting said side of the valve element to swing same on said hinge member to open position;
 - (f) and means depending from said valve element for engaging said edge in response to swinging of said valve element to open position to limit said opening swinging movement.
2. A dispensing closure as set forth in claim 1 wherein:
 - (a) the hinge member is integral with said end portion and valve element and the lips of the valve element are slightly larger than the opening defined by said end portion edge and said edge and lips are thin whereby the resiliency of said end portion edge and valve element permits deformation of said edge and lips as they pass in swinging movement of the valve element to open and closed positions.
3. A dispensing closure for a mouth of a container adapted to contain flowable materials comprising,
 - (a) a closure body made of resilient material for connection to said container at the mouth thereof,
 - (b) said closure body having an end portion with an opening arranged substantially centrally thereof and communicating with the interior of the mouth of said container with marginal portions around said opening being beveled inwardly to an edge defining said opening,
 - (c) a dispensing valve element mounted for swinging movement at said end portion, said valve element embodying a disc-like member having opposed faces and a peripheral portion for sealing engagement with

- said edge defining said opening and peripheral surfaces extending outwardly from said peripheral portion to said opposed faces to form spaced lips on said valve element,
- (d) a flexible hinge member of relatively small cross-section connecting the valve element periphery with said end portion edge at a point thereof,
 - (e) means on said valve element adjacent a side thereof spaced from the hinge member for lifting said side of the valve element to swing same on said hinge member to open position,
 - (f) and means depending from the valve element for engaging said edge when said valve element is in open position to limit said opening swinging movement.
4. A dispensing closure for a mouth of a container adapted to contain flowable materials comprising,
 - (a) a cap made of resilient material and including a top wall for connection to said container in mouth-closing position,
 - (b) said top wall having an opening arranged substantially centrally thereof and communicating with the interior of the mouth of said container with marginal portions around said opening having converging surfaces at an acute angle forming an edge defining said opening,
 - (c) a dispensing valve element mounted for swinging movement on said top wall, said valve element embodying a disc-like member having a peripheral groove defining a mid-portion for sealing engagement with the top wall edge defining said opening,
 - (d) a flexible hinge member of relatively small cross-section connecting the valve element periphery with the top wall edge at a point thereof,
 - (e) a tab extending outwardly of the valve element adjacent a side thereof spaced from the hinge member for lifting said side of the valve element to swing same on said hinge member to open position,
 - (f) and means depending from the valve element for engaging said edge when said valve element is in open position to limit said opening swinging movement.
5. A dispensing closure as set forth in claim 4 wherein:
 - (a) the hinge member is integral with the top wall and valve element and the periphery of the valve element at the outer edges of said groove therein is slightly larger than the opening defined by the top wall edge and said edges are thin whereby the resiliency of the top wall and valve element permits deformation of said edges as they pass in swinging movement of the valve element to open and closed positions.
6. A dispensing closure for a mouth of a container adapted to contain flowable materials comprising,
 - (a) a cap made of resilient material and including a top wall for connection to said container in mouth-closing position,
 - (b) said top wall having an opening arranged substantially centrally thereof and communicating with the interior of the mouth of said container with marginal portions of said top wall around said opening being beveled to form a narrow inwardly extending edge defining said opening,
 - (c) a dispensing valve element mounted for swinging movement on said top wall, said valve element embodying a disc-like member having a peripheral portion for sealing engagement with the top wall edge defining said opening and peripheral surfaces outwardly inclined from said peripheral portion to define a peripheral groove around said valve element,
 - (d) a flexible hinge member of relatively small cross-section connecting the valve element periphery with the top wall edge at a point thereof,
 - (e) a tab extending outwardly of the valve element adjacent a side thereof spaced from the hinge member for lifting said side of the valve element to swing same on said hinge member to open position,

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(f) and a depending projection on the valve element for engaging said top wall edge in response to swinging of said valve element to open position to limit said opening swinging movement.

7. A dispensing closure for a mouth of a container adapted to contain flowable materials comprising,

(a) a closure body made of resilient material for connection to said container at the mouth thereof,

(b) said closure body having an end portion with an opening arranged substantially centrally thereof and communicating with the interior of the mouth of said container with marginal portions around said opening converging inwardly to an edge defining said opening,

(c) a dispensing valve element mounted for swinging movement at said end portion, said valve element embodying a disc-like member having opposed faces with a peripheral portion therebetween for sealing engagement with said edge defining said opening, said valve element having outwardly extending peripheral lips for resisting swinging movement of said valve element,

(d) flexible hinge members of relatively small cross-section connecting the valve element peripheral portion with said end portion edge at diametrically opposed points whereby said hinge members define an axis of swinging movement of said valve element,

(e) means on said valve element adjacent a side thereof laterally of the axis of the hinge members for lifting said side of the valve element to swing same on said hinge members to open position,

(f) and means depending from said valve element for engaging said edge in response to swinging of said valve element to open position to limit said opening swinging movement.

8. A dispensing closure as set forth in claim 7 wherein:

(a) the hinge members are integral with said end portion and valve element and the lips of the valve element are slightly larger than the opening defined by said end portion edge and said edge and lips are thin whereby the resiliency of said edge and valve element permits deformation of said edge and lips as they pass in swinging movement of the valve element to open and closed positions.

9. A dispensing closure for a mouth of a container adapted to contain flowable materials comprising,

(a) a cap made of resilient material and including a top wall for connection to said container in mouth-closing position,

(b) said top wall having an opening arranged substantially centrally thereof and communicating with the interior of the mouth of said container with marginal portions of said top wall around said opening converging to an edge defining said opening,

(c) a dispensing valve element mounted for swinging movement on said top wall, said valve element embodying a disc-like member having opposed faces with a peripheral portion therebetween for sealing engagement with the top wall edge defining said opening, said valve element having outwardly extending peripheral lips defining a peripheral groove around said valve element,

(d) flexible hinge members of relatively small cross-section connecting the valve element periphery with the top wall edge at diametrically opposed points whereby said hinge members define an axis of swinging movement of said valve element,

(e) means on the valve element adjacent a side thereof laterally of the axis of the hinge members for lifting said side of the valve element to swing same on said hinge members to open position,

(f) and means depending from the valve element for engaging said top wall edge when said valve element is in open position to limit said opening swinging movement.

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10. A dispensing closure as set forth in claim 9 wherein:

(a) the hinge members are integral with the top wall and valve element and the periphery of the valve element at the lips is slightly larger than the opening defined by the top wall edge and said edge and lips are thin whereby the resiliency of the top wall and valve element permits deformation of said edge and lips as they pass in swinging movement of the valve element to open and closed positions.

11. A dispensing closure for a mouth of a container adapted to contain flowable materials comprising,

(a) a cap made of resilient material and including a top wall for connection to said container in mouth-closing position,

(b) said top wall having an opening arranged substantially centrally thereof and communicating with the interior of the mouth of said container with marginal portions of said top wall around said opening being beveled to form a narrow inwardly extending edge defining said opening,

(c) a dispensing valve element mounted for swinging movement on said top wall, said valve element embodying a disc-like member having a peripheral portion for sealing engagement with the top wall edge defining said opening and peripheral surfaces outwardly inclined from said peripheral portion to define a peripheral groove around said valve element,

(d) flexible hinge members of relatively small cross-section connecting the valve element periphery with the top wall edge at diametrically opposed points whereby said hinge members define an axis of swinging movement of said valve element,

(e) a tab extending outwardly of the valve element adjacent a side thereof laterally of the axis of the hinge members for lifting said side of the valve element to swing same on said hinge members to open position,

(f) and a depending projection on the valve element for engaging said top wall edge in response to swinging of said valve element to open position to limit said opening swinging movement.

12. A dispensing closure for attachment to a container adapted to contain flowable materials comprising,

(a) a cap made of resilient material and including a top wall,

(b) said top wall having an opening arranged substantially centrally thereof and communicating with the interior of a mouth of said container with marginal portions of said top wall around said opening being beveled to form a narrow inwardly extending edge defining said opening,

(c) a dispensing valve element mounted for swinging movement on said top wall, said valve element embodying a disc-like member having a peripheral portion for sealing engagement with the top wall edge defining said opening and peripheral surfaces outwardly inclined from said peripheral portions to define a peripheral groove around said valve element, the included angle between said peripheral surfaces being greater than the included angle in the beveled marginal portions of said top wall at said inwardly extending edge defining said opening whereby in closed position only said peripheral portion of the valve element engages said edge of the top wall,

(d) a flexible hinge member of relatively small cross-section connecting the valve element periphery with the top wall edge at a point thereof,

(e) means of the valve element adjacent a side thereof spaced from said hinge member for lifting said side of the valve element to swing same on said hinge member to open position,

(f) and means depending from said valve element for engaging said edge in response to swinging of said

valve element to open position to limit said opening swinging movement.

13. A dispensing closure for attachment to a container adapted to contain flowable materials comprising,

- (a) a cap made of resilient material and including a top wall, 5
 - (b) said top wall having an opening arranged substantially centrally thereof and communicating with the interior of a mouth of said container with marginal portions of said top wall around said opening being beveled to form a narrow inwardly extending edge defining said opening, 10
 - (c) a dispensing valve element mounted for swinging movement on said top wall, said valve element embodying a disc-like member having a peripheral portion for sealing engagement with the top wall edge defining said opening and peripheral surfaces outwardly inclined from said peripheral portions to define a peripheral groove around said valve element, the included angle between said peripheral surfaces being greater than the included angle in the beveled marginal portions of said top wall at said inwardly extending edge defining said opening whereby in closed position only said peripheral portion of the valve element engages said edge of the top wall, 15 20 25
 - (d) flexible hinge members of relatively small cross-section connecting the valve element periphery with the top wall edge at diametrically opposed points whereby said hinge members define an axis of swinging movement of said valve elements, 30
 - (e) means on the valve element adjacent a side thereof laterally of the axis of the hinge members for lifting said side of the valve element to swing same on said hinge members to open position,
 - (f) and means depending from said valve element for engaging said edge in response to swinging of said valve element to open position to limit said opening swinging movement. 35
14. A dispensing closure for attachment to the lip of an open mouth of a container adapted to contain flowable materials comprising, 40
- (a) a cap made of resilient material and including a substantially flat top wall and a circumferential wall depending therefrom so as to form a chamber for reception therein of said lip, 45
 - (b) said top wall having an opening arranged substantially centrally thereof and communicating with the

interior of the mouth of said container with marginal portions of said top wall around said opening being beveled to form a narrow inwardly extending edge defining said opening,

- (c) a dispensing valve element mounted for swinging movement on said top wall, said valve element embodying a disc-like member having a peripheral portion for sealing engagement with the top wall edge defining said opening and peripheral surfaces outwardly inclined from said peripheral portions to define a peripheral groove around said valve element, the included angle between said peripheral surfaces being greater than the included angle in the beveled marginal portions of said top wall at said inwardly extending edge defining said opening whereby in closed position only said peripheral portion of the valve element engages said edge of the top wall,
- (d) flexible hinge members of relatively small cross-section connecting the valve element periphery with the top wall edge at diametrically opposed points whereby said hinge members define an axis of swinging movement of said valve element,
- (e) a tab extending outwardly of the valve element adjacent a side thereof laterally of the axis of the hinge members for lifting said side of the valve element to swing same on said hinge members to open position,
- (f) and a depending projection on the valve element for engaging said top wall edge in response to swinging of said valve element to open position to limit said opening swinging movement.

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