

[54] **EASY-OPENING CONTAINER CLOSURE  
HAVING A SLIDING TAB**

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[22] Filed: **Aug. 30, 1972**

[21] Appl. No.: **285,000**

[52] U.S. Cl. .... **222/80, 222/541**

[51] Int. Cl. .... **B65d 47/10**

[58] Field of Search ..... 222/541, 80, 85, 484;  
220/47, 43, 41, 44, 46

[56] **References Cited**

**UNITED STATES PATENTS**

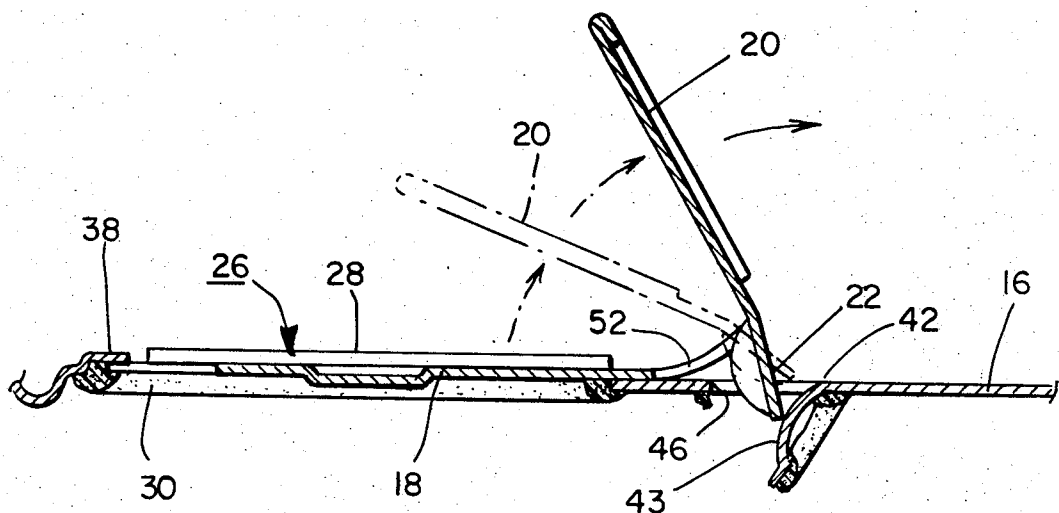
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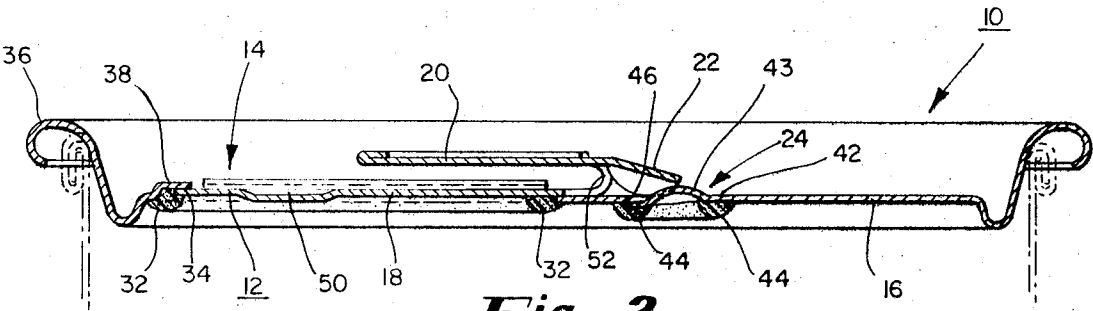
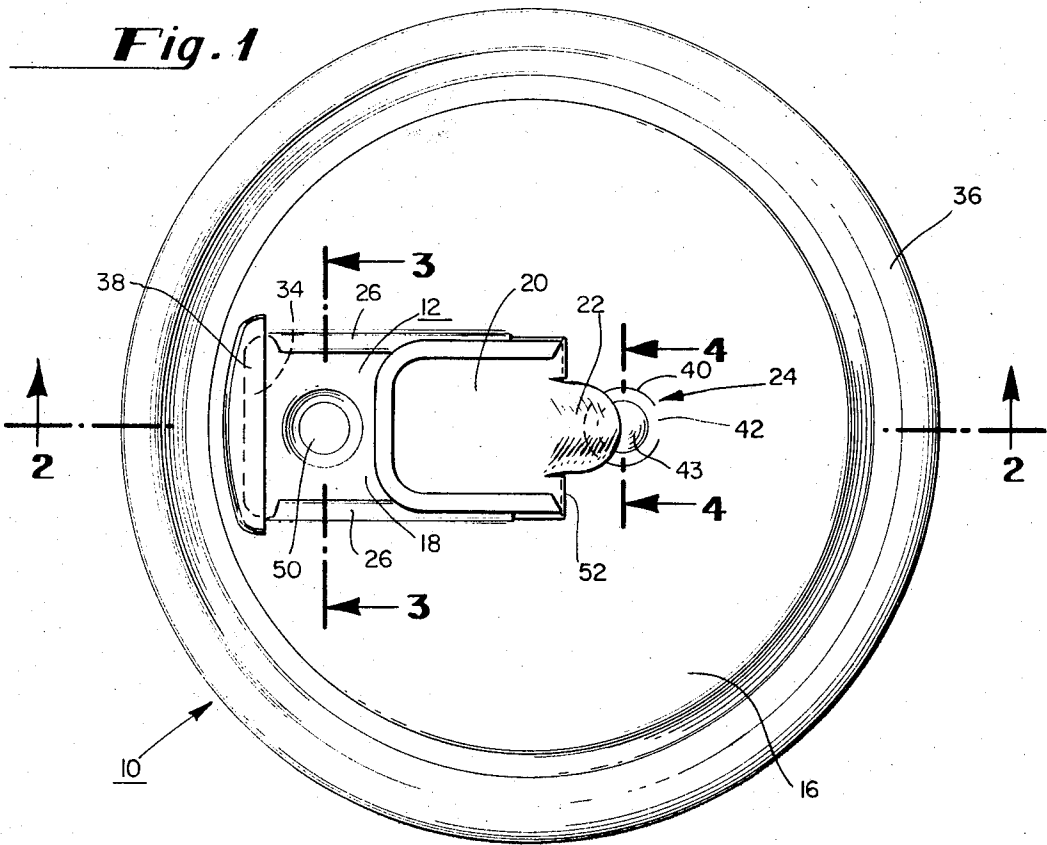
[57] **ABSTRACT**

A can end of the easy opening type includes an end panel having a dispensing aperture and a partially pre-formed vent hole. An easy opening tab including a portion adapted to slide between closed and opened positions over the dispensing aperture includes a flip-over finger engageable portion which is double-backed over the sliding portion when the tab is in the closed position. A closure panel puncturing projection extends from the flip-over portion of the tab so as to engage the partially pre-formed vent hole when the flip-over portion is pivoted to a substantially upright position. The continued pivoting of the flip-over tab to a flattened position on the end panel opposite the dispensing aperture and the interaction of the puncturing projection of the vent hole opening, slides the sliding portion of the tab to a position opening the dispensing aperture.

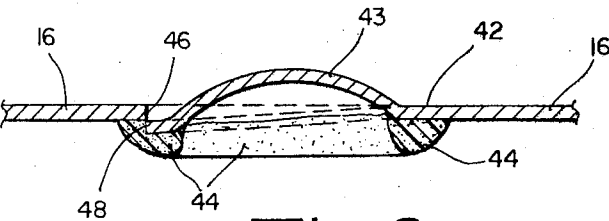
**15 Claims, 10 Drawing Figures**



**Fig. 1**

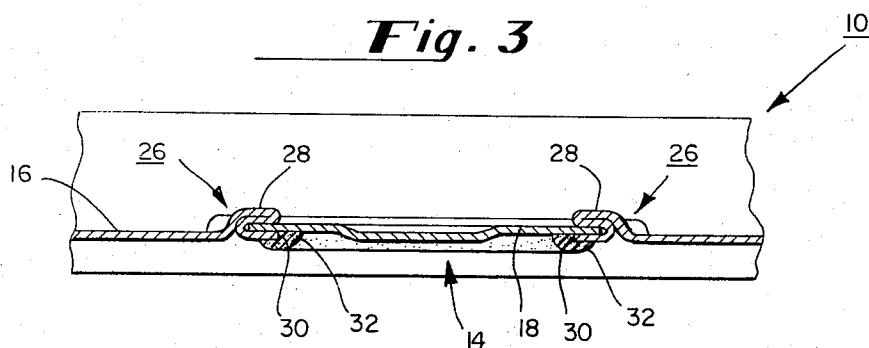


**Fig. 2**

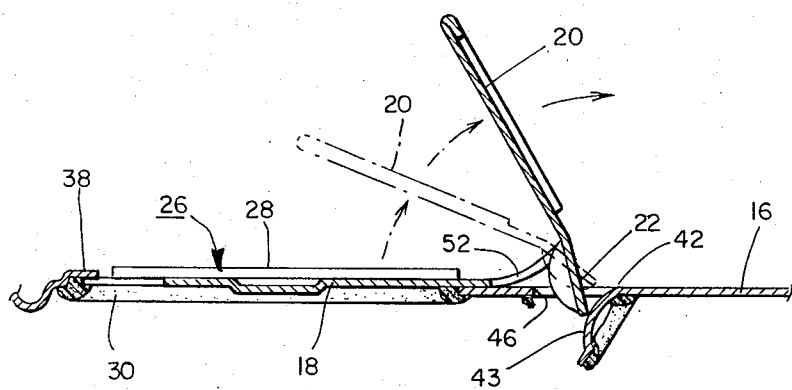
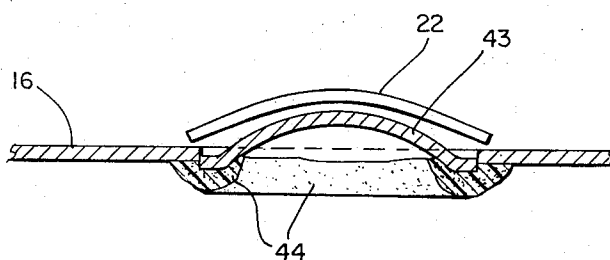


**Fig. 2a**

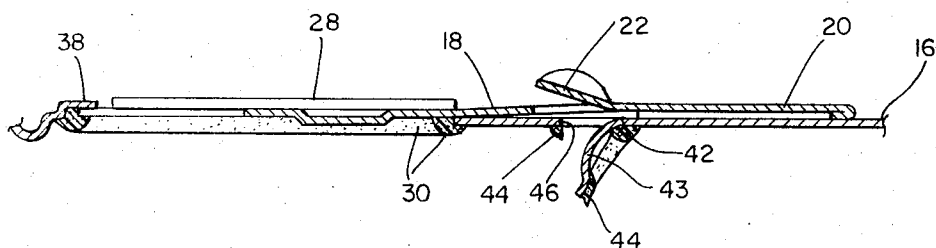
**Fig. 3**



**Fig. 4**

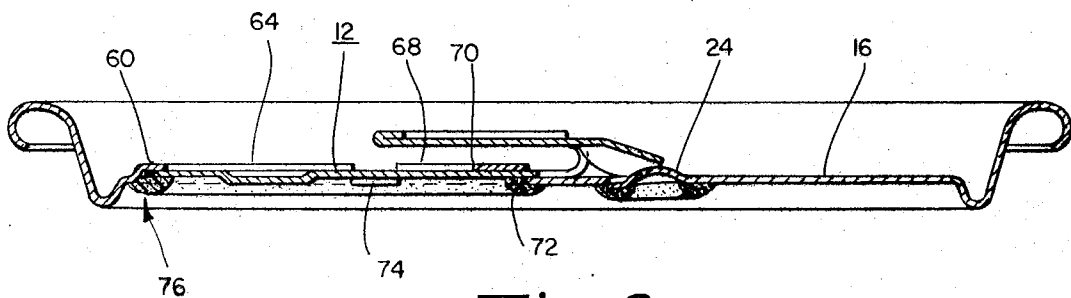
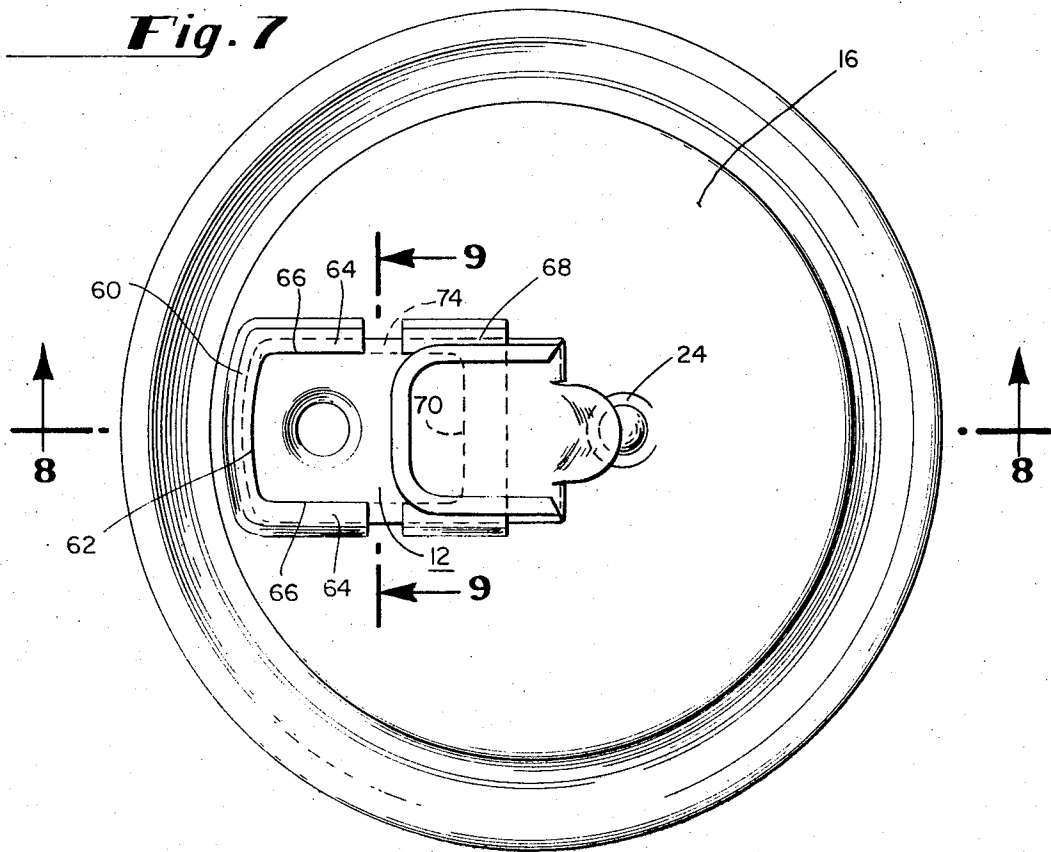


**Fig. 5**

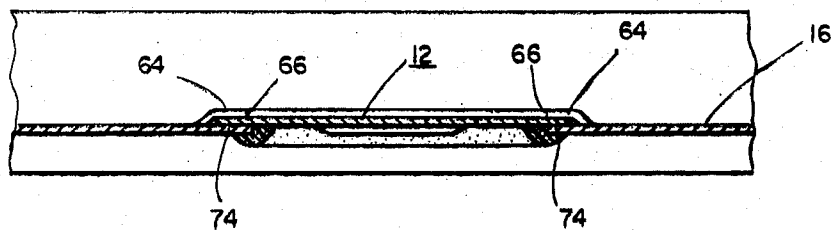


**Fig. 6**

**Fig. 7**



**Fig. 8**



**Fig. 9**

## EASY-OPENING CONTAINER CLOSURE HAVING A SLIDING TAB

### BACKGROUND OF THE INVENTION

#### Field of the Invention

This invention relates to easy opening containers including easy opening cans having finger engageable tabs for use in opening cans.

The most commercially successful easy opening can of the tab-type has utilized a tab which is formed by scoring a can end panel and removed by grasping a ring attached thereto with the resulting ripping of the tab from the end panel along the score lines. Aluminum is usually utilized for ring-tab ends of this type because of its soft and malleable qualities which allow the use of substantial residual scoring depths while still permitting removal of the tabs by hand.

However, aluminum can ends of this type do present a number of problems. First, aluminum is expensive and, due to its low strength relative to steel, large quantities of aluminum must be utilized in providing can ends of sufficient gauge to withstand the internal pressures generated within the cans. Since aluminum is also expensive relative to steel, the conventional can comprises a steel can body with only the end or ends comprising aluminum. This in itself is undesirable since an electrochemical reaction may be set up within a can due to its metallic nature thereby creating the risk that the contents within a container may become contaminated.

Aluminum can ends of the ring-tab type are also undesirable from an ecological standpoint. Aluminum, unlike steel, is not readily degradable. Furthermore, the removable nature of the aluminum tabs results in littering which is extremely undesirable from an ecological standpoint. Of course, where the tabs are disposed of on a beach or other location where they may come in contact with bare feet, they present a substantial safety hazard.

Finally, aluminum can ends of the ring-tab type are not particularly easy to open. In general, more than one hand is required for opening. Furthermore, there is some risk in cutting one's hand when removing the sharp-edged tab.

Due to the drawbacks of aluminum ring-tab ends, the container industry has considered the use of steel in easy opening can ends. Unfortunately, the hardness of steel makes its use in otherwise conventional ring-tab ends impractical for a number of reasons. First, the residual scoring thicknesses of a steel can end of this type must be small and must be maintained within very close tolerances to assure a line of weakness which will permit removal of the tabs from the can end. Second, the hardness of steel makes for a rather short tool life for the punches and dies which are utilized in scoring the steel.

Because of the foregoing difficulties in utilizing steel in a ring-tab can end, other types of easy opening steel can ends have been considered by the container industry. One prior art suggestion involves the use of a small steel tab which is riveted to the can end panel. A portion of the tab slides under a raised rim of a dispensing aperture in the steel end panel. In order to provide a seal, a sealing material such as plastisol may be utilized on the underside of the end panel in contact with the tab in the area surrounding the opening. This arrangement virtually necessitates the complete separation of

the tab from the end panel upon opening. Although it is possible to slide the tab under the raised rim again to effect reclosing, separation of the tab from the end panel usually results in the loss or contamination of the tab. Another problem resulting from this arrangement is the cost of riveting the ring to the tab.

Another easy opening steel can end is disclosed in pending application Ser. No. 150,351 filed June 7, 1971 in the name of this inventor. As disclosed in that application, the sliding tab is moved through a track which retains the tab at all times. While this particular construction solves many of the prior art problems, it is still difficult to open a sliding tab of this kind due to the rather substantial internal pressures which bear upon the tab thereby creating substantial friction between the tab and the edges of the dispensing aperture. The required opening force is increased further by the use of a plastic sealant such as plastisol which forms a hermetic, pressure resistant seal between the tab and the can end panel at the dispensing aperture. As a result, it is difficult to open a can end of this type where, as in the case of a beverage or beer can, the contents of the can are under substantial internal pressure of the order of 115 p.s.i.

### SUMMARY OF THE INVENTION

It is an object of this invention to provide an improved easy opening closure which may be opened with substantial ease.

It is a further object of this invention to provide a low cost easy opening closure.

It is a still further object of this invention to provide an easy opening closure which is ecologically desirable.

It is a still further object of this invention to provide an easy opening closure which may comprise steel.

In accordance with these and other objects of the invention, a preferred embodiment of the invention comprises a closure panel having a dispensing aperture therein and an at least partially pre-formed vent hole with an easy opening tab including a sliding portion closing the dispensing aperture, a flip-over portion having a hinged connection with the sliding portion and a vent hole puncturing portion extending from the flip-over portion. Prior to opening the closure, the flip-over portion is double-backed over the sliding portion with the vent hole puncturing means extending away from the closure panel. When the flip-over portion is pivoted about the hinged connection to a position extending outwardly away from the closure panel, the puncturing portion engages the closure panel in the vicinity of the partially pre-formed vent hole. In accordance with one important aspect of the invention, the flip-over tab acts as a lever having a fulcrum at a hinge connection so as to provide a mechanical advantage enabling the puncturing portion to open the vent hole. In accordance with another important aspect of the invention, the flip-over portion continues to pivot about the hinge connection while cooperating with the panel adjacent the vent hole opening to slide the sliding portion of the tab to a position opening the dispensing aperture.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view for a can end embodying the invention;

FIG. 2 is a sectional view of the can end of FIG. 1 taken along section line 2—2;

FIG. 2a is an enlarged sectional view of the can end vent hole taken along section line 2—2;

FIG. 3 is a sectional view of the can end of FIG. 1 taken along section line 3—3;

FIG. 4 is an enlarged sectional view of the vent hole and puncturing projection taken along section line 4—4;

FIGS. 5 and 6 are sectional views of the can end of FIG. 1 taken along section line 2—2 representing two different phases of the can opening process;

FIG. 7 is a plan view of another can end embodying the invention;

FIG. 8 is a sectional view of the can end of FIG. 7 taken along section line 8—8; and

FIG. 9 is a sectional view of the can end of FIG. 8 taken along section line 9—9.

#### DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

In FIGS. 1 and 2, a steel can end 10 carries a flip-over tab 12 which closes a dispensing aperture 14 in a central end panel 16. The tab 12 includes a sliding portion 18 which covers the dispensing aperture 14, a flip-over portion 20 which is adapted to be engaged by the fingers of the consumer, and a projection 22 which is adapted to puncture a partially pre-formed vent hole 24 located in the central end panel 16.

As best shown in Fig. 3, the sliding portion 18 is held in place within a track 26 formed by triple-folding the edges 28 along opposite sides of the dispensing aperture 14. Specifically, the sides 28 are double-folded over the exterior of the sliding portion 18 with the single fold along the raw edge 30 of the end panel 16 being located on the interior side of the sliding portion 18. The dispensing aperture is sealed closed by providing a plastic sealant material 32, e.g., plastisol, along the raw edge 30.

As best shown in FIGS. 1 and 2, the end 34 of the sliding portion 18 which is located adjacent the chuck wall 36 of the end 10 is received beneath the raised lip 38 of the end panel 16 along the edge of the dispensing aperture 14. The plastisol 32 also extends along the end 34 of the sliding portion 18 so as to form a seal with the end panel 16. Similarly, the plastisol 32 forms a seal between the sliding portion 18 and the end of the dispensing aperture adjacent the vent hole 24.

As shown in FIGS. 1, 2, and 2a, the vent hole 24 is partially pre-formed by lancing the end panel 16 along a 300° arc 40 with a bridging connection 42 to the remainder of the end panel being located on the side opposite the dispensing aperture 14. This bridging connection 42 is particularly important since it prevents the cover 43 which extends over the vent hole 24 from falling into the cans at the time the can is opened.

The vent hole 24 is maintained in the closed condition by a plastisol sealant 44 which extends along the 300° arc 40 between the vent hole cover and the remainder of the central panel along the edge 46 of the partially pre-formed vent hole. Even though the pressure within the can may reach rather substantial levels, e.g., 115 p.s.i., the vent hole construction is capable of preventing the premature venting of the can. In this connection, it should be appreciated that the lancing of the end panel 16 to form the partially pre-formed vent hole would produce a friction fit between the edge 46 of the vent hole along the arc 40 and an edge 48 of the vent hole cover 43. This construction prevents the vent

hole cover 43 from being blown out of the can. Of course, the plastisol 44 prevents any leakage between the cover and the end panel at the edges 46 and 48. Furthermore, this particular lanced configuration is, from the manufacturing standpoint, easy to achieve. Finally, the vent hole cover 43 is domed or bubbled so as to achieve the optimum cooperation between the puncturing projection 22 which is arcuate in cross-section as shown in FIG. 4 and the cover 43 which will now be described with reference to FIGS. 2, 5 and 6.

In FIG. 2, which represents the closed position, the flip-over portion 20 of the tab 12 extends back over the sliding portion 18 and the dispensing aperture 14. While the puncturing portion 22 of the tab 12 extends over the cover 43 of the vent hole 24, the cans may be stacked end-on-end without danger of damaging the tab or producing premature opening. Then, by inserting a finger under the flip-over portion 20 which is facilitated by a depression 50 in the sliding portion 18, the flip-over portion 20 may be flipped up to a substantially upright position as shown in FIG. 5. In this position, the projection 22 has pushed the vent hole cover 43 down into the interior of the can. Note however, that the bridge 42 remains intact so as to prevent the cover 43 from falling into the container.

In accordance with one important aspect of the invention, the flip-over portion 20 acts as a lever arm pivoting at the hinge connection 52 between the flip-over portion 20 and the sliding portion 18. The puncturing portion 22 serves as a much shorter lever arm between the hinge connection 52 and the vent hole to be punctured. Thus a substantial mechanical advantage is provided to assist in the opening of the vent hole 24 in the steel end 10 since the tab itself acts as a tool in opening the partially preformed vent hole 24. The same result would be achieved if the vent hole were scored into the steel end since the mechanical advantage afforded by the tab would permit puncturing of the can end 10 at the vent hole 24 even if the residual scoring depth tolerances should vary substantially.

In accordance with another important aspect of the invention, the projection 22 cooperates with the edge 46 of the vent hole 24 so as to slide the portion 18 to an open position once the pressure on the sliding tab has been reduced through venting of the can and the flip-over portion 20 has been laid against the central end panel 16 in a position opposite the dispensing aperture 14 as shown in FIG. 6. Thus a single motion of the flip-over tab from the position shown in FIG. 2 to the position shown in FIG. 6 accomplishes venting of the can which in turn permits the sliding portion 18 to move with ease to the position shown in FIG. 6 through the cooperation of the puncturing projection 22 and the vent hole 24. Actually, the simple opening procedure may be accomplished with one hand by placing the thumb beneath the double-backed flip-over portion 20 and moving the tab through an arcuate motion of 180° about the hinge connection 52. Note that the tab 12 remains with the can end 10 after opening which is extremely advantageous from an ecological and safety standpoint.

In the embodiment of FIGS. 7-9, the sliding tab 12 is substantially identical to that shown in FIGS. 1-6, but the track which receives the sliding tab 12 has a somewhat different configuration. In particular, a raised lip 60 extends along the end 62 of the dispensing aperture

14 as well as along a substantial portion of the sides 64 with the raw edges 66 of the end panel 16 being located on the exterior of the can. Similarly, a raised lip 68 extends along the opposite end portions of the sides of the aperture 14. The sliding portion 18 of the tab extends through a slit 72 located at the end of the lip 68 between the aperture 14 and the partially pre-formed vent hole 24. In order to support the interior side of the tab sliding portion 18, ears or nibs 74 which are located between the raised lip 60 and the raised lip 68 extend beneath the sliding portion 18. Plastisol sealant 76 extends along the slit 72 and around the dispensing aperture 14 so as to provide a seal for the contents within the can before opening the can end in the manner shown in FIGS. 1-6.

Since the tab construction serves as a tool offering a mechanical advantage in the opening of a can end and steel does have certain ecological advantages, the preferred embodiments have been described as steel can ends. However, another metal such as aluminum might be utilized but is by no means necessary in practicing the invention due to the mechanical advantage inherent in this tab construction.

In the foregoing specification, the flip-over tab has been described in terms of a can end adapted to be double-seamed to the can body as shown in dotted lines in FIG. 2. However, the flip-over tab of this type could be embodied in a number of different types of closures for containers including a crown closure for a bottle. In essence, this would involve a tab-crown closure configuration of the general type shown in the aforesaid co-pending application Ser. No. 150,351.

Although specific embodiments of the invention have been shown and described in detail, it will be understood that the invention may be embodied in other forms which will fall within the spirit of the invention and the scope of the appended claims.

What is claimed is:

1. A closure of the easy opening type comprising:  
a closure panel having a dispensing aperture therein and an at least partially pre-formed vent hole spaced therefrom;

an easy opening tab including a sliding portion closing said dispensing aperture, a flip-over portion having a hinged connection with said sliding portion, and a vent hole puncturing portion extending from said flip-over portion, said flip-over portion being double-backed over said sliding portion when said tab is in the closed position with said vent hole puncturing portion extending away from said closure panel, said vent hole puncturing portion contacting said partially pre-formed vent hole when said flip-over portion is pivoted about said hinged connection to a position extending outwardly away from said sliding portion, said flip-over portion forming a lever having a fulcrum at said hinged connection, the overall length of the lever arm of said flip-over portion being longer than the distance from the point of contact between said partially pre-formed vent hole and said hinged connection so as to provide a substantial mechanical advantage in puncturing said end panel at said partially pre-formed vent hole.

2. The closure of claim 1 wherein said vent hole puncturing portion cooperates with said panel adjacent said vent hole after puncturing so as to slide said sliding portion to open said dispensing aperture as said flip-over portion is moved toward said vent hole.

3. The closure of claim 2 wherein said vent hole puncturing portion pushes against an edge of said vent hole as said flip-over portion moves toward said vent hole thereby inducing a sliding motion of said sliding portion.

4. The closure of claim 3 wherein said vent hole puncturing portion is substantially arcuate in cross-section in a plane parallel to said hinged connection.

5. The closure of claim 4 wherein a substantial portion of said edge of said vent hole is substantially arcuate.

6. The closure of claim 1 wherein said panel and said tab comprise steel.

7. The closure of claim 1 further comprising a plastic sealant forming a seal between said tab and said closure at said dispensing aperture before opening.

8. The closure of claim 1 wherein said end panel is lanced in a partially closed configuration so as to form said partially pre-formed vent hole and said closure further includes a plastic sealant material for forming a seal between lanced edges of said panel at said vent hole before said puncturing.

9. The closure of claim 1 wherein said vent hole is spaced from said dispensing aperture and said hinge connection is located between said dispensing aperture and said vent hole.

10. The closure of claim 2 wherein said dispensing aperture is formed by a double-folded layer of said closure panel extending over said tab with a raw edge of said closure panel extending beneath said tab on opposing sides of said opposing aperture so as to form a sliding track for said tab, said closure further comprising a plastic sealant material forming a seal between said raw edge of said panel and the sliding tab.

11. The closure of claim 2 wherein the edge of said dispensing aperture is formed by a portion of the raw edge of said closure panel extending over said tab and another portion extending beneath said tab along opposing sides of said dispensing aperture, said closure further comprising a plastic sealant for forming a seal between said tab and said closure panel at said dispensing aperture.

12. The closure of claim 2 wherein said sliding portion is recessed adjacent said the edge of said flip-over portion to permit insertion of the end of a finger under said flip-over portion.

13. The closure of claim 2 wherein said closure panel is domed upwardly toward said puncturing portion of said tab before opening.

14. A closure of the easy-opening type comprising:  
an end panel to be attached to a container body, said end panel having a dispensing aperture therein and an at least partially pre-formed vent hole spaced from said dispensing aperture; and

an easy opening tab including a sliding portion in communication with the contents of the container body when said sliding portion closes said dispensing aperture and a finger engageable lever portion connected with said sliding portion, said lever portion including vent hole opening means adapted to initially open said vent hole as said lever portion is pivoted about the connection with said sliding portion so as to release pressure on the sliding portion, said lever portion subsequently cooperating with said panel adjacent said vent hole for sliding said sliding portion to an open position as said lever portion is further pivoted about said connection.

15. The closure of claim 14 wherein said vent hole opening means engages said panel at an edge of said vent hole as said lever portion is further pivoted about said connection thereby sliding said sliding portion to said open position.

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