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(54) SHAPED BREACHING BUBBLE WITH INWARD INCURSION BREACHING FOCUS

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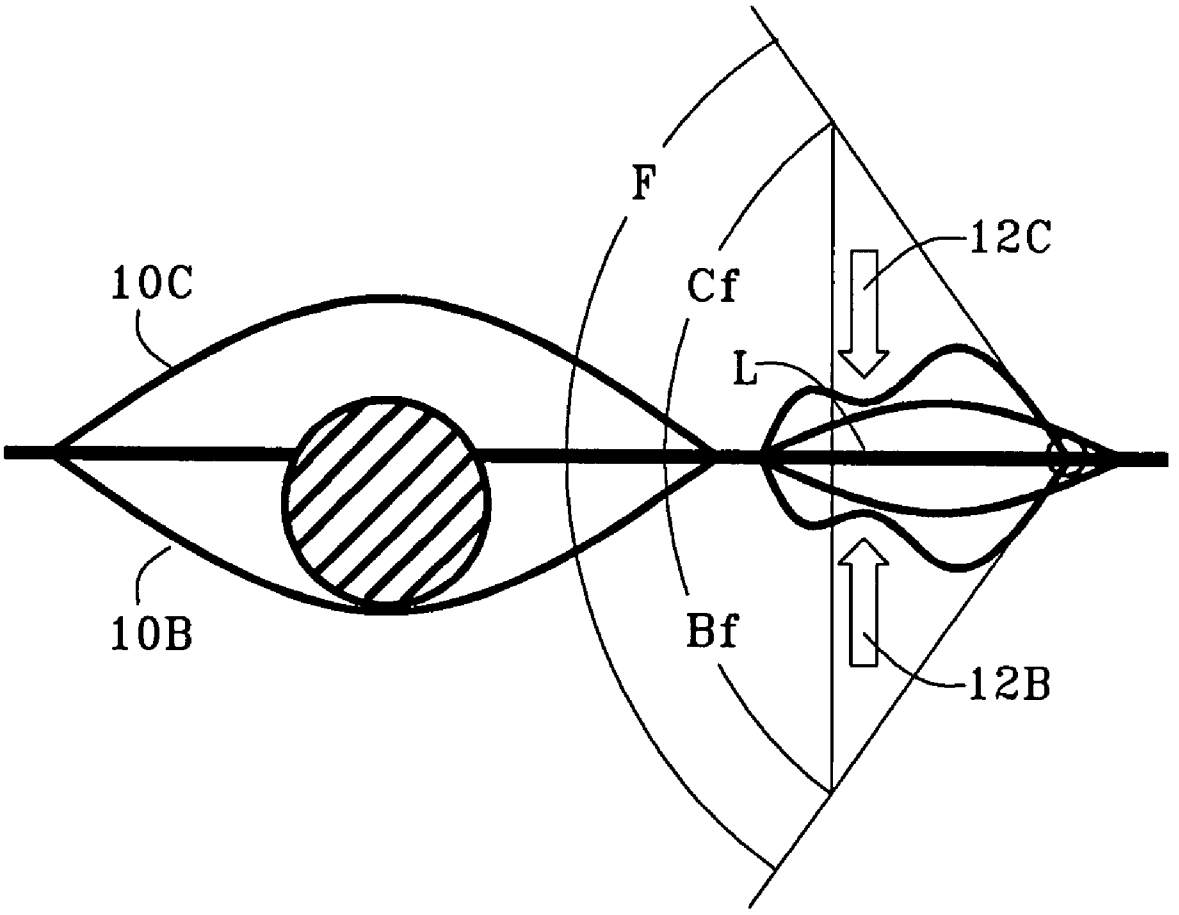
(57) **ABSTRACT**

Merchandise container (**10**) has location specific breaching at breaching focus (**12**F) when shaped breaching bubble (**12**S) is in compression. Base lamina (**10**B) and opposed cover lamina (**10**C) are selectively pressed together into a double convex receptacle (see FIG. **1**B). Product chamber (**12**P) and the breaching bubble are included within a perimeter seal (**14**P). Inner seal (**14**I) extends across the container, isolating the product chamber from the breaching bubble. Bubble incursion zone (**12**Z) shifts the perimeter seal inward toward the breaching bubble. Breaching focus (**12**F) initiates the breach at the inward most point or location of the incursion zone. Breaching flanks (**14**K) adjacent to the breaching focus form the breaching edge. The breaching bubble is compressed under external pressure applied by the end user, indicated by arrows (**12**C) and (**12**B) in FIG. **1**B, causing the opposed laminae to separate. Opposed peel flaps, cover peel flap (**14**C) and base peel flap (**14**B) (see FIG. **1**C) are provided by the separated opposed laminae proximate the incursion zone after the location specific breach at the breaching focus.



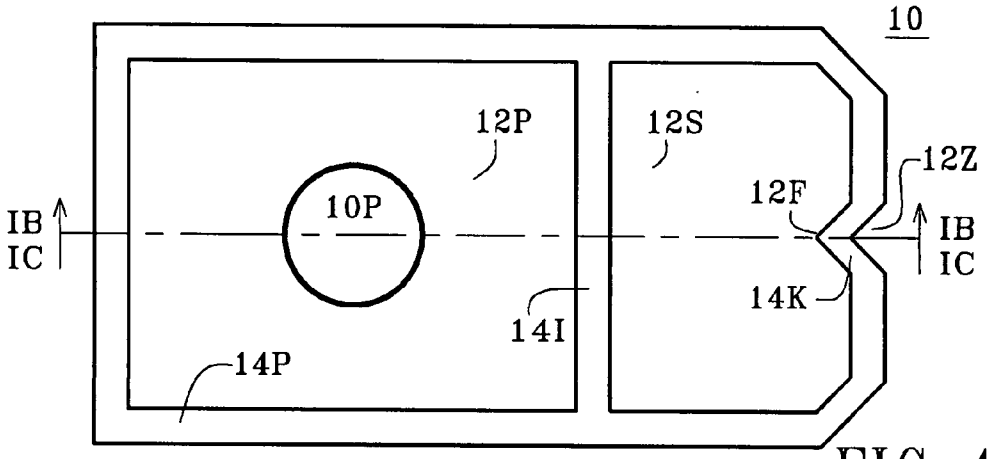


FIG 1A

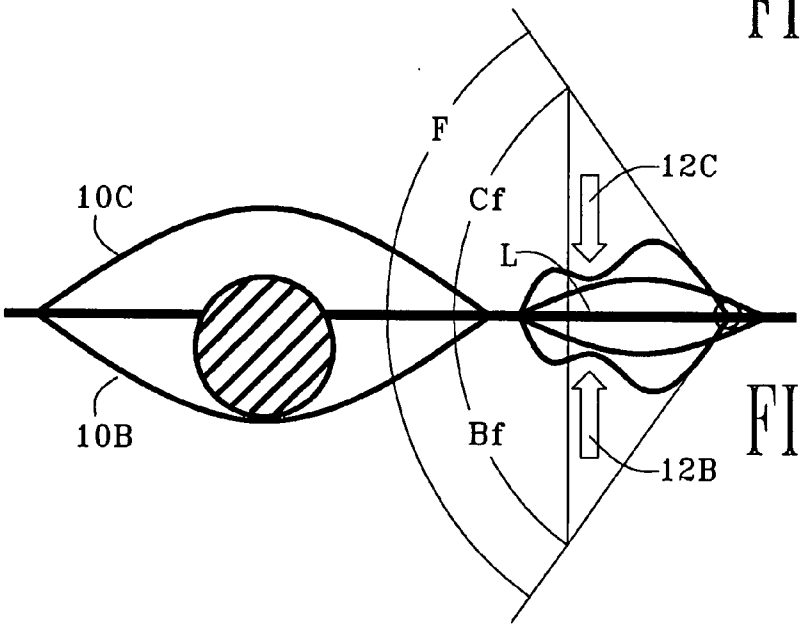


FIG 1B

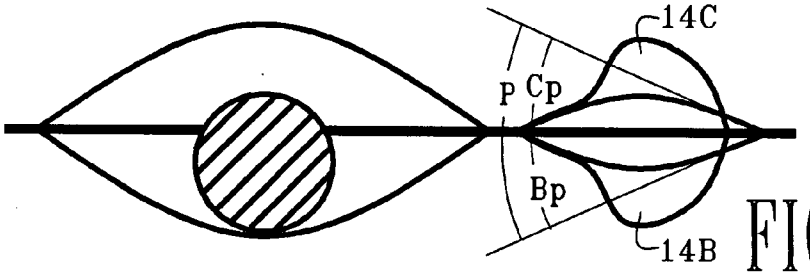


FIG 1C

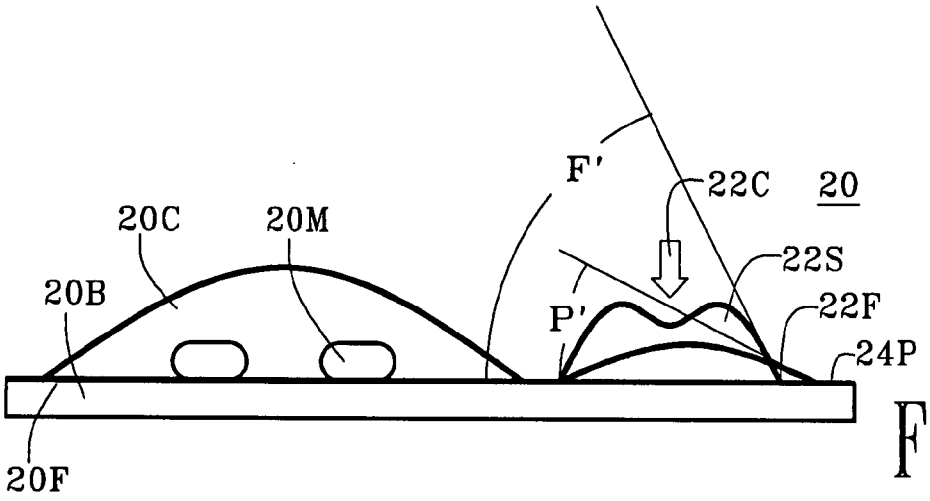


FIG 2

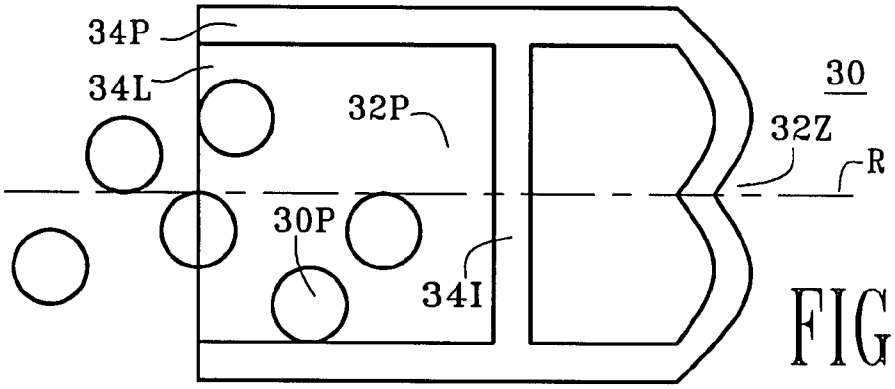


FIG 3

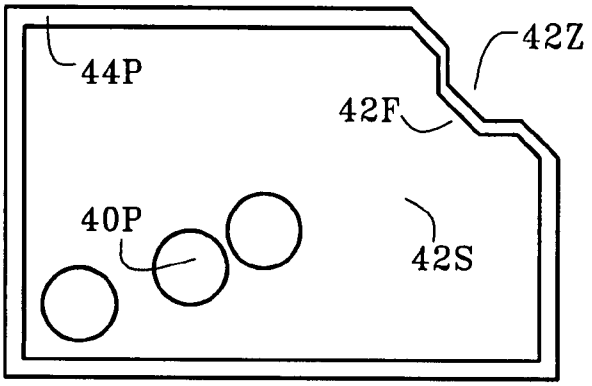


FIG 4

SHAPED BREACHING BUBBLE WITH INWARD INCURSION BREACHING FOCUS

[0001] This application claims the benefit of provisional application Ser. No. 60/790,481, filed Apr. 10, 2006.

TECHNICAL FIELD

[0002] This invention relates to a shaped breaching bubble, and more particularly to such bubble with an incursion zone which sponsors a breach to provide peel flaps.

BACKGROUND

[0003] U.S. Pat. No. 6,726,364 issued on Apr. 27, 2004 to the present inventor teaches a breaching bubble with opposed peel flaps along the breaching edge. The peel flaps are pulled back by the end user to open a chamber and present a stored product. However, this earlier bubble does not have a breach sponsoring incursion zone.

SUMMARY

[0004] It is therefore an object of this invention to provide a merchandise container with a shaped breaching bubble which may be easily opened without using a sharp instrument or other tool. The end user compresses the bubble causing an edge breach in a perimeter seal.

[0005] It is another object of this invention to provide such a container in which the edge breach is location specific. The site where the edge breach will occur is known to both the designer and user of the container. This known breach orientation is a benefit in the designing and the manufacturing and later in the utilization. The breach occurs at a breaching focus, and not randomly along the perimeter seal.

[0006] It is a further object of this invention to provide such a bubble device having opposed peel tabs by which the end user can open the breaching bubble for access to a product.

[0007] It is a further object of this invention to provide such a container formed by a single pressing step. Opposed laminae are selectively pressed together to make the container. All of the pressed laminae unions may be formed at the same temperature and under the same pressure and for the same duration.

[0008] It is a further object of this invention to provide such a bubble device which emits an audible sound upon edge breaching. The compression within the bubble produces a rush of escaping air. The nature of the sound of the rushing air is affected by the shape and dimensions of the breach.

[0009] Briefly, these and other objects of the present invention are accomplished by providing a breaching bubble apparatus with location specific breaching when in a state of compression. A base lamina and an opposed cover lamina are selectively pressed together, forming a perimeter seal and a shaped breaching bubble included within the perimeter seal. A bubble incursion zone along the perimeter seal shifts the perimeter seal inward toward the breaching bubble. A breaching focus forms part of the perimeter seal at the inward most location of the incursion zone. When the breaching bubble is in compression, a focus separation angle F develops between the opposed laminae at the breaching focus. A similar perimeter separation angle P develops between the opposed laminae along the perimeter seal. The focus separation angle F is greater than the perimeter separation angle P. The angle difference promotes greater separation of the opposed laminae at the breaching focus then opposed laminae separation along the perimeter seal. Location specific breaching of the shaped breaching bubble occurs at the breaching focus.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] Further objects and advantages of the shaped breaching bubble the operation of the breaching focus will become apparent from the following detailed description and drawings (not drawn to scale) in which:

[0011] FIG. **1**A is a plan view of merchandise container **10** showing product chamber **12**P and shaped breaching bubble **12**S with incursion zone **12**Z;

[0012] FIG. **1**B is a cross-sectional view of container **10** of FIG. **1**A taken generally along reference line **1**B thereof, during compression showing focus separation Angle F;

[0013] FIG. **1**C is a cross-sectional view of container **10** of FIG. **1**A taken generally along reference line **1**C thereof, showing perimeter separation Angle P, and opposed peel flaps **14**C and **14**B at the moment of breaching;

[0014] FIG. **2** is a side view of merchandise container **20** with coplaner flat base **20**B;

[0015] FIG. **3** is a plan view of merchandise container **30** showing curved incursion zone **32**Z and product loading port **34**L; and

[0016] FIG. **4** is a plan view of breaching bubble apparatus **40** with product **40**P and corner incursion zone **42**Z.

[0017] The first digit of each reference numeral in the above figures indicates the figure in which an element or feature is most prominently shown. The second digit indicates related elements or features, and a final letter (when used) indicates a sub-portion of an element or feature.

REFERENCE NUMERALS IN DRAWINGS

[0018] The table below lists the reference numerals employed in the figures, and identifies the element designated by each numeral.

[0019] Merchandise Container **10**
- **[0020]** Base Lamina **10**B
- **[0021]** Cover Lamina **10**C
- **[0022]** Product **10**P
- **[0023]** Arrow **12**C
- **[0024]** Arrow **12**B
- **[0025]** Breaching Focus **12**F
- **[0026]** Product Chamber **12**P
- **[0027]** Shaped Breaching Bubble **12**S
- **[0028]** Incursion Zone **12**Z
- **[0029]** Base Peel Flap **14**B
- **[0030]** Cover Peel Flap **14**C
- **[0031]** Breaching Flanks **14**K
- **[0032]** Inner Seal **14**I
- **[0033]** Perimeter Seal **14**P

[0034] Container **20**
- **[0035]** Coplanar Flat Base **20**B
- **[0036]** Cover Lamina **20**C
- **[0037]** Medications **20**M
- **[0038]** Flat Laminae Plane **20**F
- **[0039]** Arrow **22**C
- **[0040]** Breaching Focus **22**F
- **[0041]** Shaped Breaching Bubble **22**S
- **[0042]** Perimeter Seal **24**P

[0043] Container **30**
[0044] Product **30**P
[0045] Product Chamber **32**P
[0046] Curved Incursion Zone **32**Z
[0047] Product Loading Port **34**L
[0048] Inner Seal **34**I
[0049] Perimeter Seal **34**P
[0050] Breaching Bubble Apparatus **40**
[0051] Product **40**P
[0052] Shaped Breaching Bubble **42**S
[0053] Breaching Bubble **42**S
[0054] Corner Incursion Zone **42**Z.
[0055] Perimeter Seal **44**P

General Embodiment (FIG. **1** ABC)

[0056] Merchandise container **10** has location specific breaching at breaching focus **12**F when shaped breaching bubble **12**S is in a state of compression. The container is formed by base lamina **10**B and opposed cover lamina **10**C selectively pressed together into a double convex receptacle (see FIG. **1**B). Perimeter seal **14**P around the container is also formed by the selective pressing. Product chamber **12**P and shaped breaching bubble **12**S are included within the perimeter seal between the selectively pressed opposed laminae. Inner seal **14**I formed by the selective pressing extends across the container, isolating the product chamber from the shaped breaching bubble. Bubble incursion zone **12**Z along the perimeter seal shifts the perimeter seal inward toward the breaching bubble.

[0057] Breaching focus **12**F forms part of the perimeter seal at the inward most point or location of the incursion zone. Breaching flanks **14**K form part of the perimeter seal adjacent to the breaching focus. A breaching flank extends from each side of the breaching focus. The incursion zone may be any suitable shape such as a V-shaped notch (as shown in FIG. **1**A) having an apex at the breaching focus with straight breaching flanks extending from the apex.

[0058] The breaching bubble is compressed under external pressure applied by the end user (indicated by arrows **12**C and **12**B in FIG. **1**B) causing the opposed laminae to separate. The laminae separation advances outward, starting at the breaching focus, and resulting in an edge breach along the breaching flanks into the ambient. Opposed peel flaps, cover peel flap **14**C and base peel flap **14**B (see FIG. **1**C) are provided by the separated opposed laminae proximate the incursion zone after the location specific breach at the breaching focus. The peel flaps may be easily gripped by the end user and pulled apart, causing detachment of the inner seal. With the perimeter seal breached at the incursion zone and the inner seal detached, the end user has access to product **10**P within product chamber **12**P. The end user may be the actual consumer who ingests or utilizes or operates the product. The end user may involve a facilitator or parent of the actual consumer.

[0059] The opposed laminae may have multiple layers to provide properties such as waterproofing, UV protection, increased bulk, and strength. The opposed laminae may be any suitable enclosing material such as plastic, paper fabric, cellophane, or bio-degradable matter. Thin mylar plastic is a flexible film with hermetic properties, and may be employed as a container material. The perimeter of the container has a breaching seal along the breaching flanks for product access, and a non-breaching seal along the remaining perimeter. The breaching seal may be a frangible laminae union and the non-breaching seal may be a destructive laminae union. The frangible breaching seal may be formed at a lower lamina-to-lamina pressure and a lower temperature for a shorter time than the destructive non-breaching seal. The frangible seal is weaker than the destructive seal, and breaches at a lower separation force and requires less compressive pressure applied by the end user.

[0060] Additional details of a suitable merchandise container are disclosed in U.S. Pat. No. 6,726,364 issued on 27 Apr. 2004 to Perell et al, the subject matter of which is hereby incorporated by reference in its entirety into this disclosure.

Separation Angles (FIG. **1**B)

[0061] Laminae separation occurs along the inner edge of the breaching flank seals because tension in the laminae pulls the laminae apart. The tension is due to internal compression within the breaching bubble caused by the loss of volume resulting from the external pressure. The compression forces the lamina material into a "plump" or maximum volume configuration. The opposed laminae move apart wherever the pressure is not applied, expanding the volume between them. In the double convex embodiment of FIG. **1**, cover lamina **10**C expands upward and base lamina **10**B expands downward creating a steeper angle between the laminae at breaching focus **12**F.

[0062] Angle F is the focus separation angle (see FIG. **1**B) between the tangents to the opposed laminae at breaching focus **12**F when shaped breaching bubble **12**S is in compression.

[0063] Angle P is the perimeter separation angle (see FIG. **1**C) between the tangents to the opposed laminae along perimeter seal **14**P when breaching bubble **12**S is in compression.

[0064] Angle F is greater than Angle P, because of the inward incursion zone allows the laminae proximate breaching focus **12**F to assume a steeper configuration. The steeper focus separation Angle F promotes greater separation of the opposed laminae at the breaching focus, then separation of the opposed laminae along the perimeter seal. The pulling apart effect of the laminae tension is more effective at the steeper angle. The greater angle and easier separation causes location specific breaching of the breaching bubble at the breaching focus. That is, the edge breaching occurs along the breaching flanks before breaching can occur anyplace along the remainder of the perimeter seal.

Coplanar Embodiment (FIG. **2**)

[0065] Base lamina **20**B may be level and rigid, defining flat laminae plane **20**F for container **20**. Flat containers are convenient for many products such as medication **20**M. The flat base may be manufactured from suitable easy-to-work, inexpensive material such as cardboard.

[0066] Angle F' is the focus separation angle between the tangent to cover lamina **20**C and laminae plane **20**F at breaching focus **22**F when shaped breaching bubble **22**S is in compression.

[0067] Angle P' is the perimeter separation angle between the tangent to cover lamina **20**C and laminae plane **20**F along the perimeter seal **24**P when breaching bubble **22**S is in compression.

[0068] In the coplanar embodiment, the angle between the flat base lamina and the laminae plane is zero. The angles of

the coplanar embodiment of FIG. **2** are about one-half the corresponding angles of the double convex embodiment of FIG. **1**.

[0069] The applied external pressure (indicated by arrow **22**C) establishes compression within breaching bubble **22**S, generating a separation force Jf at separation focus **22**F and a lessor separation force Jp along perimeter seal **24**P.

[0070] Force Jf', the force of separation at the separation focus, is:

Force $Jf'=T(\text{Sine Angle } F')$

[0071] where T is the tangential tension

[0072] in the opposed laminae caused

[0073] by the breaching bubble compression.

[0074] Force Jp', the force of separation along the perimeter, is:

Force $Jp'=T(\text{Sine Angle } P')$

[0075] where T is the tangential tension

[0076] in the opposed laminae caused

[0077] by the breaching bubble compression.

[0078] As Angle F' and Angle P' are increased (or decreased) the separation forces increase (or decrease) according to the Sine function. The separation forces are maximum at the theoretical maximum separation angle of 90 degrees. The perimeter seal (or a portion thereof) may be coplanar, defining the laminae plane.

Double Angle (FIG. **1** BC)

[0079] The general embodiment of FIG. **1** has a double convex receptacle with similar tensions and separation forces as the flat base embodiment of FIG. **2**.

[0080] Angle F, the focus separation angle, is the sum of cover separation Angle Cf and base separation Angle Bf.

[0081] Angle Cf is the angle between cover lamina **10**C at breaching focus **12**F and adjacent leg L of the right triangle which includes cover separation Angle Cf.

[0082] Angle Bf is the angle between base lamina **10**B at breaching focus **12**F and adjacent leg L of the right triangle which includes base separation Angle Bf.

[0083] Angle P, the perimeter separation angle, is the sum of cover separation Angle Cp and base separation Angle Bp;

[0084] Angle Cp is the angle between cover lamina **10**C along perimeter seal **14**P and adjacent leg L of the right triangle which includes cover separation Angle Cp.

[0085] Angle Bp is the angle between base lamina **10**B along perimeter seal **14**P and adjacent leg L of the right triangle which includes base separation Angle Bp.

[0086] The force of separation, Force Sf, at the breaching focus is:

Force $Sf=T(\text{Sine Angle } Cf+\text{Sine Angle } Bf)$

[0087] where T is the tangential tension

[0088] in the opposed laminae caused

[0089] by the breaching bubble compression.

[0090] The force of separation, Force Sp, along the perimeter seal is:

Force $Sp=T(\text{Sine Angle } Cp+\text{Sine Angle } Bp)$

[0091] where T is the tangential tension

[0092] in the opposed laminae caused

[0093] by the breaching bubble compression.

[0094] Force Sf is greater than Force Sp.

[0095] The breaching focus has a threshold separation Force Tsf. As the applied pressure increases, the internal compression and lamina tension increase. Also the focus separation angle increases as the bubble "plumps", yielding an increased Sine function. Eventually the separation Force Sf at breaching focus **12**F exceeds the threshold separation Force Tsf, and the pressed laminae union fails. The perimeter seal has a similar threshold separation Force Tsp. The threshold separation Force Tsf of the breaching focus is lower than the threshold separation Force Tsp of the perimeter seal. The breaching focus separates and the perimeter seal does not separate under a range of breaching bubble compressions which create a range of threshold separation forces which are:

[0096] greater than the threshold separation Force Tsf of the breaching focus, but

[0097] less than the threshold separation Force Tsp of the perimeter seal.

[0098] Within this critical range of thresholds, the separation at the flanking seals advances, while the perimeter seal remains intact.

Product Port Embodiment (FIG. **3**)

[0099] Container **30** has product loading port **34**L where perimeter seal **34**P has not yet been pressed. The port receives product **30**P as product chamber **32**P is loaded. During the initial pressing in which perimeter seal **34**P and inner seal **34**I are formed, the loading port is left unsealed. The loading port is sealed closed during a final pressing, after the product has been loaded. Incursion zone **32**Z may be inwardly concave at the breaching focus with curved breaching flanks extending from the breaching focus. The incursion zone and the container may be symmetrical about the breaching focus with symmetrical breaching flanks extending from the breaching focus. The general embodiment of FIG. **1**A is symmetrical about reference line IB, and the port embodiment of FIG. **3** is symmetrical about reference line R. Alternatively, the container may lack symmetrical (as shown in FIG. **4**). The breaching focus maybe a point forming the origin of the breaching flanks extending therefrom as shown in FIG. **1**A. Alternatively, the breaching focus may occupy a width along the perimeter seal between the breaching flanks extending therefrom as shown in FIG. **4**. The configuration of the breaching focus and the strength of the breaching flanks, affect the nature of the sound generated by the breaching bubble. The breaching sound may be loud or soft, high pitched or low pitched, or long or short, as required by the application.

Product Bubble Embodiment (FIG. **4**)

[0100] In the general embodiment, the product was in a product chamber (see FIG. **1**). In the bubble embodiment of FIG. **4**, the product is in the breaching bubble. The product chamber and inner seal have been eliminated. Shaped breaching bubble **42**S has perimeter seal **44**P formed by selective pressing. Bubble incursion zone **42**Z and breaching focus **42**F and breaching flanks **44**K are located at a corner of container **40**. The breaching seal at the breaching focus and along the breaching flanks may be narrower than the wider perimeter seal. The narrow breaching seal requires less bubble enlargement to force an edge breach, and breaches before the perimeter seal can breach. In addition, the breaching seal separates at a faster rate than the perimeter seal because of the steeper focus separation angle presented by the shaped breaching bubble. To further

enhance breaching, the breaching flanks at the breaching focus may be weaker than the remainder of the perimeter seal due to manufacturing constraints of duration and temperature and pressure.

INDUSTRIAL APPLICABILITY

[0101] It will be apparent to those skilled in the art that the objects of this invention have been achieved as described hereinbefore by providing a merchandise container with a shaped breaching bubble which may be easily opened without the use of a tool. Further, the site where the edge breach is location specific, and occurs at a breaching focus, and not randomly along the perimeter seal. The breached bubble has opposed peel tabs which assist the end user in opening the shaped bubble. The container formed by a single pressing step, in which opposed laminae are selectively pressed together. All of the pressed laminae unions are formed at the same temperature, pressure and duration. The bubble device produces a rush of escaping air upon edge breaching which emits an audible sound.

[0102] Various changes may be made in the structure and embodiments shown herein without departing from the concept of the invention. Further, features of embodiments shown in various figures may be employed in combination with embodiments shown in other figures. Therefore, the scope of the invention is to be determined by the terminology of the following claims and the legal equivalents thereof.

I claim as my invention:

1) A breaching bubble apparatus with location specific breaching when in a state of compression, comprising:

a base lamina and an opposed cover lamina selectively pressed together;

a perimeter seal formed by the selective pressing;

a shaped breaching bubble included within the perimeter seal between the selectively pressed opposed laminae;

bubble incursion zone along the perimeter seal and shifting the perimeter seal inward toward the breaching bubble;

breaching focus forming part of the perimeter seal at the inward most location of the incursion zone;

focus separation angle F between the opposed laminae at the breaching focus when the breaching bubble is in compression;

perimeter separation angle P between the opposed laminae along the perimeter seal when the breaching bubble is in compression;

which the focus separation angle F is greater than the perimeter separation angle P promoting greater separation of the opposed laminae at the breaching focus then opposed laminae separation along the perimeter seal,

causing location specific breaching of the shaped breaching bubble at the breaching focus.

2) The apparatus of claim **1**, further comprising opposed peel flaps provided by the separated opposed laminae proximate the incursion zone after the location specific breach at the breaching focus.

3) The apparatus of claim **2**, further comprising a product in the shaped breaching bubble.

4) The apparatus of claim **1**, further comprising breaching flanks forming part of the perimeter seal adjacent to the breaching focus, and extending from each side of the breaching focus.

5) The apparatus of claim **4**, wherein the breaching flanks separate at a faster rate than the perimeter seal when the breaching bubble is in compression.

6) The apparatus of claim **4**, wherein the perimeter seal along the breaching flanks is weaker than the remainder of the perimeter seal.

7) The apparatus of claim **4**, wherein the perimeter seal along the breaching flanks is narrower than the remainder of the perimeter seal.

8) The apparatus of claim **4**, wherein the incursion zone is a V-shaped notch having an apex at the breaching focus with straight breaching flanks extending from the apex.

9) The apparatus of claim **4**, wherein the breaching flanks extending from the breaching focus are curved.

10) The apparatus of claim **4**, wherein the incursion zone is symmetrical about the breaching focus with symmetrical breaching flanks extending from the breaching focus.

11) The apparatus of claim **4**, wherein the breaching focus is a point forming the origin of the breaching flanks extending therefrom.

12) The apparatus of claim **4**, wherein the breaching focus has a width along the perimeter seal between the breaching flanks extending therefrom.

13) The apparatus of claim **1**, wherein at least a portion of the perimeter seal is coplanar defining a laminae plane.

14) The apparatus of claim **13**, wherein:

the base lamina is flat and rigid defining the laminae plane;

the focus separation angle F' is the angle between the cover lamina at the breaching focus and the laminae plane; and

the force of separation Force Jf' is

$$Jf'=T(\text{Sine } C)$$

where T is the tangential tension in the opposed laminae caused by the breaching bubble compression.

15) The apparatus of claim **1**, wherein:

the focus separation angle F is the sum of a cover separation angle Cf and a base separation angle Bf;

cover separation angle Cf is the angle between the cover lamina at the breaching focus and the adjacent leg of the right triangle which includes the cover separation angle Cf;

base separation angle Bf is the angle between the base lamina at the breaching focus and the adjacent leg of the right triangle which includes the base separation angle Bf;

the perimeter separation angle P is the sum of a cover separation angle Cp and a base separation angle Bp;

cover separation angle Cp is the angle between the cover lamina along the perimeter seal and the adjacent leg of the right triangle which includes the cover separation angle Cp;

base separation angle Bp is the angle between the base lamina along the perimeter seal and the adjacent leg of the right triangle which includes the base separation angle Bp;

the force of separation Force Sf at the breaching focus is

$$Sf=T(\text{Sine } Cf+\text{Sine } Bf)$$

where T is the tangential tension in the opposed laminae caused by the breaching bubble compression;

the force of separation Force Sp along the perimeter seal is

$$Sp=T(\text{Sine } Cp+\text{Sine } Bp)$$

where T is the tangential tension
in the opposed laminae caused
by the breaching bubble compression; and

Force Sf is greater than Force Sp.

16) The apparatus of claim **1**, wherein:

the breaching focus has a threshold separation Force Tsf;

the perimeter seal has a threshold separation Force Tpf; and

the threshold separation Force Tsf of the breaching focus is lower than the threshold separation Force Tpf of the perimeter seal.

17) The apparatus of claim **16**, wherein the breaching focus separates and the perimeter seal does not separate under a range of breaching bubble compressions which create a range of threshold separation forces greater than the threshold separation Force Tsf of the breaching focus but less than the threshold separation Force Tpf of the perimeter seal.

18) The apparatus of claim **1**, further comprising:

a product chamber included within the perimeter seal between the selectively pressed opposed laminae;

an inner seal formed by the selective pressing isolating the product chamber from the breaching bubble;

breaching flanks forming part of the perimeter seal adjacent to the breaching focus, and extending from each side of the breaching focus; and

opposed peel flaps provided by the separated opposed laminae proximate the incursion zone after the location specific breach at the breaching focus, which permit detachment of the inner seal and access to the product chamber.

19) The container of claim **18**, further comprising a product loading port through the perimeter seal for receiving a product into the product chamber.

20) The container of claim **18**, further comprising a product in the product chamber.

* * * * *