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(54) **Title:** TAMPER EVIDENT PLASTIC FOOD CONTAINER

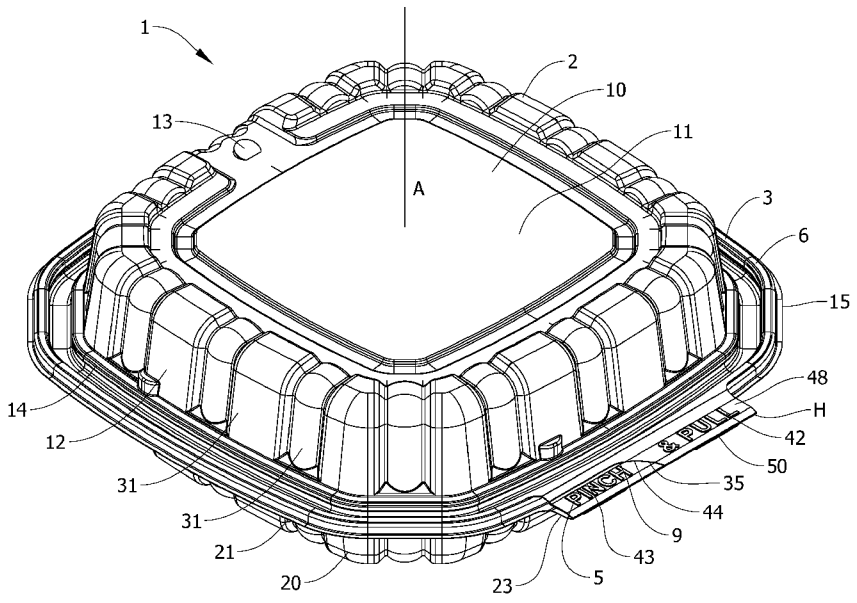


FIG. 1

(57) **Abstract:** A tamper evident container includes a base with a base rim adjoining a base hinge panel and a lid with a lid rim adjoining a lid hinge panel. A hinge connects the panels. A frangible line extends from an edge of the lid hinge panel to a first point on the panel and then, outwardly to the binge. The frangible line crosses the hinge and extends inwardly to a second point on the base hinge panel. From the second point the frangible line extends to an edge of the base hinge panel. When the container is initially sealed, the frangible line separates upon the application of an upwardly directed force to a first portion of the lid hinge panel while a second portion of the lid hinge panel is held in a fixed position or moved downwardly. The separation of the frangible line creates two grasping portions that can be used to pull the lid from the base.

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TAMPER EVIDENT PLASTIC FOOD CONTAINER

CROSS REFERENCE TO RELATED APPLICATION

[0001] Not applicable.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not applicable.

SEQUENCE LISTING, TABLE OR COMPUTER PROGRAM ON COMPACT DISC

[0003] Not applicable.

FIELD OF INVENTION

[0004] This invention relates generally to plastic food containers. The invention is more specifically related to re-closable plastic food containers having tamper evident sealing mechanisms.

BACKGROUND OF THE INVENTION

[0005] It is known to use plastic containers in the food preparation and restaurant industry to package prepared foods. The typical food container of the prior art consists of a clear or solid colored base and a clear lid. In order to maintain the quality of food contents and prevent tampering with the contents of a sealed container, it is desirable that the food container, once initially sealed, not be capable of being initially opened without visible indication of the container having been opened. To achieve this feature, container manufacturers have designed plastic containers having

integral tamper evident features. Typically, these containers consist of a lid that is hingedly attached to a base. The lid seals to the base by superposing the rim of the lid upon the rim of the base. These types of plastic containers are sold as one-piece containers and are often referred to as "clamshell" containers or packages.

[0006] In one type of hinged tamper evident container, the lid and base each have interlocking elements respectively located on or near the lid rim and base rim where the two rims meet when the container is sealed (i.e., at a non-hinged side or portion of the container). The interlocking element of the lid or base is conventionally located on a tab or flange extending from the rim of the lid or base. Either or both of the tabs are attached to their respective rims by a frangible section of plastic. When the lid and base are placed in initial sealing arrangement, the interlocking elements on or near the lid rim and base rim engage and lock together. In order to open the initially sealed container, the frangible section of one or both tabs must be ruptured so as to release the tab or tabs from the container. Because the interlocking sealing elements are located on the tabs, rupturing one or more tabs from the container disables the locking mechanism. The ruptured tab provides evidence of the container having been opened.

[0007] One shortcoming with the prior art food container described above is that the interlocked tabs can be cut from the container in clean fashion using scissors or another cutting implement so as to remove any indicia of the container having had a tamper evident mechanism. In view of the issues presented by incorporating a tamper evident mechanism in the meeting rims of the hinged container, some manufacturers have incorporated tamper evident features as part of the structure that forms or includes the hinge. In these containers, the container is designed to require a severance near the hinge in order to unseal (initially open) the container. This construct makes the hinge a single use hinge.

[0008] A variety of designs are known for tamper evident food containers that have, as an initial container opening mechanism, a frangible hinge structure. Virtually all of these designs rely on the container having a specific, noticeable structure (e.g., a tab) projecting outwardly from the container to serve as a grasping or pinching platform. That grasping or pinching platform exists for purposes of the user applying a tearing force to the container to either rupture a frangible (a/k/a "weakened" or "breakable") line or remove a strip of material from the container. In certain cases, the tab is built as a separate structure departing at a distinct angle from other structure of container. In other cases, the tab is a visibly oversized portion of existing structure of the container, typically a flange of the lid or base rim, that extends beyond an opposing similar structure on the lid or base rim to provide a dedicated grasping platform. Examples of these types of design can be seen in U.S. Patent Nos. 9,944,436, 9,676,527, 9,493,277, 9,365,331, 9,132,942 and 7,568,589. Tamper evident containers that eschew including visible tabs as grasping portions near the hinge area, generally have square-shaped or "boxy" hinge structures that require a significant vertical separation between the hinge structures emanating from the lid rim and those emanating from the base rim.

[0009] One problem with all of the foregoing designs is that a significant amount of additional material beyond a simple hinge structure is required to construct a reliably performing frangible hinge section that can be used to initially open the sealed container. In addition, many of the hinge structures or their frangible mechanisms are made using a complex arrangement of material folds and cutouts that are manufacturable only with complex tooling or forming machinery. There is thus a need in the art for a re-closable plastic food container that: is easy for end consumers to operate; combines reliable tamper evidence and defense against prying intrusion; and that uses a minimum of material to manufacture.

SUMMARY OF THE INVENTION

[0010] The present invention satisfies the needs in the art and provides an aesthetically appealing food container that is tamper resistant, tamper evident and easy to use. In this respect the present invention food container comprises a plastic food container that when viewed from the top, bottom, front, back, left side or right side, is tab-less in that it contains no visibly extraneous or extra structure to serve as a grasping portion. The container and its novel hinge area construct have a simple and clean appearance and other than the inclusion of a frangible line in the hinge panels, gives no indication of it having a tamper evident character. Thus, as opposed to the prior art containers with over-built hinge area structures, the container of the instant invention eliminates the obvious added tabs, complicated hinge area structures and a large vertical span at the hinge end.

[0011] There are several embodiments to the invention, which are broadly described in this summary section and more specifically described in the detailed description of the invention. The invention is directed to a tamper evident container having the novel hinge structure, the hinge structure, the frangible line and methods of forming the foregoing items.

[0012] In one embodiment the invention is directed to a tamper evident container comprising a base and a lid. The base includes a base rim and the lid includes a lid rim. The lid is mountable to the base for bringing the container to an initially sealed configuration. The initially sealed configuration is effected by engagement of the lid rim with the base rim. A base hinge panel joins to the base rim and extends outwardly therefrom. A lid hinge panel joins to the lid rim and extends outwardly therefrom. The base hinge panel and the lid hinge panel have respective first and second side edges.

[0013] The container includes a frangible line that extends: a) from the first side edge of the lid hinge panel and partially across the lid hinge panel to a first point on the lid hinge panel; b) from the first point outwardly to the hinge and then across the hinge and inwardly from the hinge to a second point on the base hinge panel; and c) from the second point partially across the base hinge panel to the second side edge of the base hinge panel. When the container is in the initially sealed configuration the frangible line separates upon the application of a first upwardly directed force to a first portion of the lid hinge panel, while a second portion of the lid hinge panel is held in a fixed position or moved downwardly. Notably, separating the frangible line creates a first grasping portion separated from a second grasping portion. The vertical displacement of the first grasping portion relative to the second grasping portion results in disengagement of the engaged rims.

[0014] Unlike most tamper evident containers, the inventive container when placed in the initially sealed configuration has no structures projecting outwardly of the engaged lid and base rims other than the lid hinge panel, the base hinge panel and the hinge. In fact, the construct of the frangible line operates so reliably and easily, the container can be made with no other frangible line on the lid hinge panel, the base hinge panel or the entire container. Unlike other tamper evident containers, separating the inventive frangible line does not create pieces of material detached from the container, such as tear strips, which often end up not being recycled with the rest of the container or which can serve as swallowing or choking hazards for small children and animals.

[0015] The invention is also directed to a method of thermoforming a tamper evident container comprising forming a lid from a portion of a single sheet of preferably at least partially transparent plastic material. The lid has a lid rim. A base is formed from a portion of the single sheet. The base includes a base rim defining a periphery of the base. A foldable section of the

container is formed from a portion of the single sheet. The foldable section joins the lid rim and the base rim and the foldable section includes a lid hinge panel extending from the lid rim to a hinge, a base hinge panel extending from the base rim and a hinge connecting the lid hinge panel to the base hinge panel.

[0016] The method includes forming a frangible line that extends: a) from an outside edge of the lid hinge panel and longitudinally across a portion of the lid hinge panel to a first point; b) from the first point transversely across the lid hinge panel to the hinge; c) across the hinge in a manner that transects the hinge and then transversely across the base hinge panel from the hinge to a second point on the base hinge panel; and d) from the second point longitudinally across a portion of the base hinge panel to an outside edge of the base hinge panel. In a preferred embodiment the method includes forming a first arcuate segment in the frangible line on the lid hinge panel near the first point to effect transition of the frangible line from extending longitudinally on the lid hinge panel to extending transversely on the lid hinge panel. Similarly, the method can include forming a second arcuate segment in the frangible line on the base hinge panel near the second point to effect transition of the frangible line from extending longitudinally on the base hinge panel to extending transversely on the base hinge panel.

[0017] The invention is also directed to a frangible line for a plastic food container and a method for forming same. The plastic food container has a lid hinge panel connected to a lid rim, a base hinge panel connected to a base rim and a hinge connecting the lid hinge panel to the base hinge panel. The frangible line comprises: a first length extending from a first side edge of the lid hinge panel to a first point partially across the lid hinge panel; a second length extending outwardly on the lid hinge panel from the first point to the hinge and then vertically transecting the hinge and then extending inwardly from the hinge to a second point on the base hinge panel; and a third

length extending from a second point on the base hinge panel to a second side edge on the base hinge panel. Rupture of the frangible line results in the creation of two adjacent grasping portions, one attached to the lid rim and one attached to the base rim. The grasping portions can be used to pull the lid off of the base. Other inventive concepts and aspects of the invention are described in detail *infra*.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] FIG. 1 is a rear perspective view of a preferred embodiment of a present invention plastic container in the initially sealed configuration.

[0019] FIG. 2 is a left elevation view of the preferred embodiment container in the initially sealed configuration.

[0020] FIG. 3 is a front elevation view of the preferred embodiment container in the initially sealed configuration.

[0021] FIG. 4 is a rear elevation view of the preferred embodiment container in the initially sealed configuration.

[0022] FIG. 5 is a top plan view of the preferred embodiment container in the initially sealed configuration.

[0023] FIG. 6 is a bottom plan view of the preferred embodiment container in the initially sealed configuration.

[0024] FIG. 7 is a front perspective view of a preferred embodiment of the present invention plastic container in the loading configuration.

[0025] FIG. 8 is a rear perspective view of a preferred embodiment container showing the hinge area structure having been separated into two visible grasping portions that allow the lid to

be separated from the base.

[0026] FIG. 9 is a right side elevation view of a preferred embodiment container showing the hinge area structure having been separated into two visible grasping portions that allow the lid to be separated from the base.

[0027] FIG. 10 is a left side elevation view of a preferred embodiment container showing the hinge area structure having been separated into two visible grasping portions that allow the lid to be separated from the base.

[0028] FIG. 11 is a rear elevation view of a preferred embodiment container showing the hinge area structure having been separated into two visible grasping portions that allow the lid to be separated from the base.

[0029] FIG. 12 is a front elevation view of a preferred embodiment container showing the front of the container when the hinge area structure in the rear of the container has been separated into two visible grasping portions that allow the lid to be separated from the base.

[0030] FIG. 13 is a top plan view of a preferred embodiment container showing the hinge area structure having been separated into two visible grasping portions that allow the lid to be separated from the base.

[0031] FIG. 14 is a bottom plan view of a preferred embodiment container showing the hinge area structure having been separated into two visible grasping portions that allow the lid to be separated from the base.

[0032] FIG. 15 is a perspective view showing the base of the preferred embodiment container in the opened configuration after the lid has been removed from the base by using the newly created grasping portions formed by rupture of the frangible line to peel the lid from the base.

[0033] FIG. 16 is a detailed, side elevation section view of the hinge area structure of an initially sealed container that includes the present invention container-opening mechanism, the container having an alternate embodiment rim structure and hinge area structure.

DETAILED DESCRIPTION

[0034] FIGS. 1-16 depict a preferred embodiment present invention tamper evident plastic container **1** along with its preferred features. As is seen in the figures, the inventive container **1** includes a lid **2** and a base **20** that are attached to each other through a hinge **50** located on one side of the container. Hinge **50** includes a hinge axis **H** about which lid **2** and base **20** pivot (rotate). Base **20** includes floor **28**. In practical use, the outer surface of floor **28** of base **20** will normally rest upon a surface (such as a table top) considered horizontal in reference to the user. Thus, the directional terms "vertical" and "horizontal" and the like are used to describe container **1** and its components with respect to the orientation and configuration illustrated in FIGS. 1-6 with the lid initially sealed upon the base and are employed merely for the purposes of clarity and illustration. For example, FIG. 1 shows container **1** from a rear perspective aspect when container **1** is in an initially sealed state. In the perspective and elevation aspects of FIGS. 1-4, lid **2** is "vertically" above base **20**. The directional terms "inner" and "inwardly" and the like are used herein with respect to the described container to refer to horizontal directions along the directional component toward the geometric center of the container identified by vertical axis **A** representatively shown in FIG. 1. With that vertical axis as a reference, the directional terms "outer," "peripherally" and the like are used herein with respect to the described container to refer to directions along the horizontal directional component away from the geometric center of the container. Additionally,

the terms "upward," "downward" and the like are used to describe spatial relationships among structure when lid **2** of container **1** is initially sealed upon the base **20**.

[0035] Lid **2** and base **20** respectively include lid rim **3** and a base rim **21**. As shown in FIG. 7, base **20** has an open upper end **30** defined by base rim **21**. Lid rim **3** preferably includes peripherally projecting lid rim flange **6**. Base rim **21** similarly preferably includes base rim flange **24**. Base **20** and lid **2** connect at hinge **50**.

[0036] As shown in the figures, preferred embodiment container **1** is capable of assuming a loading configuration (FIG. 7), an initially sealed configuration (FIGS. 1-6), a closed (unsealed) configuration (FIGS. 8-14) and an opened configuration (FIG. 15). In the loading configuration of FIG. 7, rim **3** of lid **2** and rim **21** of base **20** are not engaged in a friction fit about periphery **15** of container **1**. Container **1** is placed in the initially sealed configuration from the loading configuration by closing lid **2** upon base **20** until lid rim **3** is urged into a closing friction fit with base rim **21**. In the initially sealed configuration of FIGS. 1-6 lid rim **3** and base rim **21** are frictionally engaged and tamper-evidencing frangible line **34** (discussed *infra*) is intact. In the closed configuration shown in FIGS. 8-14, frangible line **34** has been ruptured but lid **2** is closed upon base **20** with lid rim **3** and base rim **21** frictionally engaged. In the opened configuration lid **2** is removed from base **20**. FIG. 15 depicts base **20** in the manner in which a user would deploy the base to consume a food product contained therein after the lid has been removed from the base.

[0037] As is more fully discussed below, container **1** transitions from the initially sealed configuration to the closed configuration by rupturing frangible line **34** on hinge panels **5**, **23**. The rupture of frangible line **34** allows lid **2** to be peeled from base **20** by pulling lid rim **3** from engagement with base rim **21**. Once frangible line is ruptured, lid **2** can be re-closed upon to base **20** and then re-opened without need to break frangible line **34**. Thus, container **1**, after being

opened from the initially sealed state can be re-closed by pressing lid rim 3 into engagement with base rim 21.

[0038] Lid 2 includes top portion 10. Top portion 10 includes exterior surface 11 upon which vent 13 is disposed. Container 1 may include lid sidewall 12 extending between top portion 10 and lid rim 3. Lid rim 3 circumferentially extends about the peripheral portion 4 of lid 2. Base rim 21 similarly extends about the periphery 22 of base 20. FIG. 16 depicts exemplary embodiment rim structural features that make the embodiment container not just tamper evident, but also tamper resistant. For purposes of carrying out the invention, a container need not have the exact rim structure shown in FIG. 16. Other rim structures can be employed, such as is shown in the other figures. According to the suggested embodiment of FIG. 16, rims 3, 21 engage into a sealed or closed configuration. In this respect, container 1 includes engaging rims 3, 21 that provide for a friction fit between them that tightly closes the container and that cannot be easily pulled apart without rupturing the frangible line 34 more fully described. From the aspect of FIG. 16 it is seen that in a preferred embodiment, lid rim 3 includes lid rim bead 53 that comprises a downwardly descending lid rim inner vertical wall 54, an upwardly extending lid rim outer wall 55 and a bead bottom segment 56. Bead bottom segment 56 extends from the bottom 57 of lid rim inner wall 54 and curves into the bottom 58 of the lid rim outer wall 55. Flange 6 preferably extends from outer wall 55 of lid rim 3 to lid hinge panel 5.

[0039] Base 20 includes base rim 21 circumferentially extending about the periphery 22 of base 20. Base sidewall 29 extends from floor 28 to rim 21. Base rim 21 includes base rim bead 61 that comprises downwardly extending inner vertical wall 62, upwardly extending outer wall 63 and bead bottom segment 64. Bead bottom segment 64 extends from bottom 65 of downwardly extending inner vertical wall 62 to bottom 66 of the upwardly extending outer wall 63. Flange 24

preferably extends from outer wall **63** of base rim **21** to base hinge panel **23**. Downwardly extending inner wall **62** and upwardly extending outer wall **63** each include a concave structure configured to respectively receive and frictionally engage convex surfaces of inner wall **54** and outer wall **55** of lid rim **3** when container **1** is in the sealed or closed arrangement.

[0040] In one embodiment the invention is directed to a tamper evident container comprising base **20** and lid **2**. Base **20** has base peripheral portion **22** including base rim **21**. Lid **2** includes lid peripheral portion **4** that includes lid rim **3**. Lid **2** is mountable to base **20** for bringing container **1** into a sealed configuration. The sealed configuration is achieved by engagement of lid rim **3** with base rim **21** with lid **2** overlying base **20**. The initially sealed container **1** has a periphery **15** defined by the engaged rims **3**, **21** and the folded area **48** encompassing hinge **50**.

[0041] Container **1** further includes base hinge panel **23** joined to base rim **21** and extending horizontally outwardly therefrom. Lid hinge panel **5** similarly joins to lid rim **3** and extends horizontally outwardly from lid rim **3**. Lid hinge panel **5** and base hinge panel **23** have respective first side edges **7**, **25** and second side edges **8**, **26**. Base hinge panel **23** and lid hinge panel **5** join together at hinge **50**. Hinge **50** can be formed by any known method of forming hinges and hinge regions in plastic containers including but not limited to scoring, thinning, coining or interrupted perforations. When container **1** is placed in the initially sealed configuration, lid hinge panel **5** overlies base hinge panel **23** as it extends from lid rim flange **6** to hinge **50**. Hinge **50** extends from respective first side edges **7**, **25** of lid hinge panel **5** and base hinge panel **23** to respective second side edges **8**, **26** of lid hinge panel **5** and base hinge panel **23**. When in the initially sealed formation, lid hinge panel **5**, base hinge panel **23** and hinge **50** collectively form a fold **48** (shown best in FIG. 16 as the circled area). When in the loading configuration, lid hinge panel **5**, base hinge panel **23** and hinge **50** collectively form foldable section **49** (shown in FIG. 7).

[0042] Embodiment container **1** includes frangible line (a/k/a breakable joint or line of weakness) **34** extending from first side edge **7** of lid hinge panel **5** partially across lid hinge panel **5** to first point **9** on lid hinge panel **5**. From first point **9** frangible line extends outwardly (frangible line portion **35**) to hinge **50** and then extends down and across hinge **50** and then inwardly (frangible line portion **36**) from hinge **50** to second point **27** on base hinge panel **23**. From second point **27** frangible line **34** extends partially across base hinge panel **23** to second side edge **26** of base hinge panel **23**. By virtue of its outwardly and inwardly directed components **35, 36** frangible line **34** divides fold **48** into adjacent first and second portions or sides **42, 43**. In the depicted embodiment and orientation shown in FIG. 5, first side **42** is on the right side of outwardly directed portion **35** of frangible line **34** on hinge panel **5**. This is merely exemplary. The attachment of lid hinge panel **5** of first side **42** of fold **48** to lid rim **3** is continuous and not divided from lid rim **3** by frangible line **34**. As shown in FIG. 6, base hinge panel **23** of second side **43** of fold **48** is similarly continuously attached to base rim **21** and not divided from base rim **21** by frangible line **34**.

[0043] Rupturing frangible line **34** is simple and requires no awkward manipulation or positioning of container **1**. To break frangible line **34** a user need only grasp with one hand first side **42** of fold **48** and second side **43** of fold **48** with the other hand. Frangible line **34** separates upon application of an upwardly directed force to first side **42** of fold **48** while holding second side **43** in place or directing it downward. Upon frangible line **34** breaking, fold **48** separates into first and second adjacent grasping portions **46, 47**. In other words, first side **42** of fold **48** becomes first grasping portion **46** and second side **43** of fold **48** becomes second grasping portion **47**. As shown in the figures, a portion of lid hinge panel **5** on first grasping portion **46** remains attached to lid rim **3**. Similarly, a portion of base hinge panel **23** on second grasping portion **47** remains attached to

base rim **21**. To remove lid **2** from base **20** a user need merely peel lid **2** from base **20** by pulling first grasping portion **46** and second grasping portion **47** vertically away from each other.

[0044] Further describing the invention, it can be seen that tamper evident container **1** comprises base **20** and lid **2**. Base **20** has a base peripheral portion **22** defining an open upper end **30** of base **20**. Base peripheral portion **22** includes base rim **21**. Lid **2** includes lid peripheral portion **4** that includes lid rim **3**. Lid **2** is mountable to base **20** with lid **2** overlying open upper end **30** of base **20** for bringing container **1** to an initially sealed configuration, the initially sealed configuration is effected by interlocking engagement of lid rim **3** with base rim **21** about an entire periphery **15** of container **1**. The interlocking engagement is releasable and re-engageable for opening and re-closing container **1**.

[0045] Base hinge panel **23** extends outwardly from base rim **21**. Lid hinge panel **5** extends outwardly from lid rim **2**. Lid hinge panel **5** and base hinge panel **23** have respective first side edges **7**, **25** and second side edges **8**, **26**. Hinge **50** pivotally connects base hinge panel **23** and lid hinge panel **5**. Base hinge panel **23** extends between base rim **21** and hinge **50**. Lid hinge panel **5** extends between lid rim **3** and hinge **50**. Hinge **50** extends from first side edges **7**, **25** of lid hinge panel **5** and base hinge panel **23** to second side edges **8**, **26** of lid hinge panel **5** and base hinge panel **23**.

[0046] Container **1** further includes frangible line **34** that extends from first side edge **7** of lid hinge panel **5** partially across lid hinge panel **5** to first point **9** on that panel. Frangible line **34** extends from first point **9** outwardly to hinge **50** and then extends across hinge **50** and inwardly from hinge **50** to second point **27** on base hinge panel **23**. From second point **27** frangible line extends partially across base hinge panel **23** to second side edge **26** of base hinge panel **23**. By virtue of this arrangement when the container is in the initially sealed configuration, only a portion

of the frangible line is situated on the lid hinge panel and only a portion of the frangible line is situated on the base hinge panel.

[0047] Frangible line **34** separates upon the application of an upwardly directed force to first side **42** of folded lid hinge and base hinge panels **5**, **23** (folded on hinge **50**) applied relative to second side **43** of the folded lid hinge and base hinge panels **5**, **23**. As shown in the figures, the severance of frangible line **34** creates first grasping portion **46** that is horizontally adjacent to, but separated from, second grasping portion **47**. First grasping portion **46** is attached to lid **2** and second grasping portion **47** is attached to base **20**. After rupturing of frangible line **34**, base rim **21** and lid rim **3** remain intact and engaged. By pulling first grasping portion **46** vertically away from second grasping portion **47**, lid **2** is removed from base **20**. Container **1** can be re-closed after frangible line **34** has been ruptured. By way of further description, container **1** in the sealed configuration requires a first separating force to rupture the frangible line. The rupture of frangible line **34** separates lid **2** and base **20** into two distinct pieces frictionally engaged at their peripheral rims **3**, **21**. After the rupture of line **34**, a second separating force is required to disengage the engaged peripheral rims of the lid and base.

[0048] Either or both of lid hinge panel **5** or base hinge panel **23** can have knurling, added texture or finger rests to provide the user with additional purchase when holding sides **42**, **43** or grasping portions **46**, **47**. In the depicted embodiment, base hinge panel **23** includes finger rests **70**. This is merely an optional feature. Leaving such finger rests off the hinge panels gives the container a cleaner look. Notably, in the initially sealed configuration container **1** has no structures projecting outwardly of the engaged lid and base rims other than the lid hinge panel, the base hinge panel and the hinge. This makes embodiment container appear as a normal container without manifest tamper evident features. Accordingly, container **1** represents a departure from the

multitude of tamper evident containers that have projections and complicated structures at the hinge area required for the severance of a frangible component. In addition, neither of hinge panels **5**, **23**, nor container **1**, has any frangible line other than line **34**, which characteristic provides for a simple opening mechanism and a minimum of unattractive surface markings and discontinuities. In addition, rupturing frangible line **34** does not create pieces of unattached material, such as strips, that must be disposed.

[0049] In the depicted preferred embodiment frangible line **34** includes first arcuate segment **44** located at first point **9** that softly redirects frangible line **34** from a line traveling longitudinally across hinge panel **5** to one that is directed outwardly and proceeds transversely across the long axis of hinge panel **5**. This arcuate section allows frangible line **34** to not just change direction, but to do so in smooth fashion so that lid hinge panel **5** does not include any internal corners that can provide any alternate tear points to circumvent the opening mechanism and to ensure that when first side **42** of fold **48** is separated from second side **43** of fold **48**, frangible line **34** ruptures smoothly. Further, frangible line **34** extends vertically down across and transects hinge **50**. Frangible line **34** preferably includes second arcuate segment **45** at second point **27** on base hinge panel **23** that provides the similar advantages and functionality as first arcuate segment **44**.

[0050] The invention is further directed to a frangible line for a plastic food container that has a lid hinge panel connected to a lid rim, a base hinge panel connected to a base rim and a hinge connecting the lid hinge panel to the base hinge panel. The inventive frangible line **34** extends from a first side edge **7** of the lid hinge panel to a first point **9** partially across the lid hinge panel. At the first point **9** the frangible line **34** extends outwardly to the hinge **50** and then vertically transects the hinge **50** and then extends inwardly from the hinge to a second point **27** on the base

hinge panel. The inventive frangible line extends from the second point to a second side edge on the base hinge panel. The rupture of the frangible line results in the creation of two adjacent grasping portions **46**, **47**, one attached to the lid rim and one attached to the base rim.

[0051] The invention is further directed to a method of thermoforming a tamper evident container. The method comprises forming a lid **2** from a portion of a single sheet of at least partially transparent plastic material. Lid **2** is formed with a lid rim **3** defining a periphery **4** of the lid **2**. The lid rim **2** is formed such that it connects with a lid hinge panel **5**. In the preferred embodiment method, lid rim **3** is formed with an outwardly projecting lid rim flange **6** from which lid hinge panel **5** extends. The method further includes forming a base **20** from a portion of the single sheet. The base **2** includes a base rim **21** defining a periphery **22** of the base **20**. Base rim **21** connects with base hinge panel **23**. The base rim **21** preferably includes an outwardly projecting base rim flange **24**. In the preferred embodiment method base rim **20** is formed with an outwardly projecting base rim flange **24** from which base hinge panel **23** extends. The method includes forming a hinge **50** from a portion of the single sheet, the hinge **50** joins lid hinge panel **5** to base hinge panel **23**. Foldable section **49** comprises hinge **50**, lid hinge panel **5** and base hinge panel **23**.

[0052] The embodiment method further includes forming a frangible line **34** that extends: a) from a first side edge **7** of lid hinge panel **5** partially across a portion of lid hinge panel **5** to a first point **9**; b) from first point **9** to hinge **50**; c) at hinge **50** across hinge **50** in a manner that transects hinge **50** and then from hinge **50** to a second point **27** on base hinge panel **23**; and e) from second point **27** partially across base hinge panel **23** to a second side edge **26** of base hinge panel **23**. Preferably the container is formed such that when the lid is closed upon the base the container has no structures projecting outwardly of the engaged lid and base rims other than the lid hinge

panel, the base hinge panel and the hinge. It is also preferable that the container is formed such that none of the lid hinge panel, the base hinge panel or the container have any other frangible line. It can further be seen from the figures, that frangible line **34**, other than the small segment of it vertically touching and transecting the hinge into two horizontal portions, is horizontally spaced entirely interiorly of the hinge or hinge axis.

[0053] A container constructed in accordance with the present invention can be manufactured in a variety of shapes and sizes, and is preferably formed of resins or plastic materials including, but not limited to, polystyrene, polyethylene, polypropylene, polyvinyl chloride or polyethylene terephthalate ("PET"). The container is preferably thermoformed, but can be blow-molded or injection molded. The container lid and base can be transparent or translucent, and may be colored in either instance. Further, the container is preferably polygonal, but can be of any shape.

[0054] Having described the invention in detail, those skilled in the art will appreciate that modifications may be made of the invention without departing from its spirit. Therefore, it is not intended that the scope of the invention be limited to the specific embodiment illustrated and described.

CLAIMS

What is claimed is:

1. A tamper evident container comprising:

a base including a base rim;

a lid including a lid rim;

the lid mountable to the base for bringing the container to an initially sealed configuration, the initially sealed configuration effected by engagement of the lid rim with the base rim;

a base hinge panel joined to the base rim and extending outwardly therefrom;

a lid hinge panel joined to the lid rim and extending outwardly therefrom;

the base hinge panel and lid hinge panel having respective first and second side edges;

a hinge joining the lid hinge panel to the base hinge panel;

a frangible line extending: from the first side edge of the lid hinge panel partially across the lid hinge panel to a first point on the lid hinge panel; from the first point outwardly to the hinge and then across the hinge and inwardly from the hinge to a second point on the base hinge panel; and from the second point partially across the base hinge panel to the second side edge of the base hinge panel; and

when the container is in the initially sealed configuration the frangible line separates upon the application of a first upwardly directed force to a first portion of the lid hinge panel while a second portion of the lid hinge panel is held in a fixed position or moved downwardly.

2. The container of Claim 1 wherein separating the frangible line creates a first grasping portion separated from a second grasping portion, the vertical displacement of the first grasping portion relative to the second grasping portion results in disengagement of the engaged rims.

3. The container of Claim 2 wherein the first grasping portion is horizontally adjacent the second grasping portion.

4. The container of Claim 2 wherein the first grasping portion is attached to the lid and the second grasping portion is attached to the base.

5. The container of Claim 1 wherein when the container is in the initially sealed configuration, the frangible line divides: only a portion of the lid hinge panel from the lid rim; and only a portion of the base hinge panel from the base rim.

6. The container of Claim 1 wherein in the initially sealed configuration the container has no structures projecting outwardly of the engaged lid and base rims other than than the lid hinge panel, the base hinge panel and the hinge.

7. The container of Claim 1 wherein the frangible line is the only frangible line on either the lid hinge panel or the base hinge panel.

8. The container of Claim 1 wherein the frangible line is the only frangible line on the container.

9. The container of Claim 1 wherein the frangible line includes an arcuate segment on the lid hinge panel proximate the first point that connects a longitudinally extending section of the frangible line to an outwardly extending section of the frangible line.

10. The container of Claim 1 wherein the frangible line includes an arcuate segment on the base hinge panel proximate the second point that connects a longitudinally extending section of the frangible line to an inwardly extending section of the frangible line.

11. The container of Claim 9 wherein the frangible line includes an arcuate segment on the base hinge panel proximate the second point that connects a longitudinally extending section of the frangible line to an inwardly extending section of the frangible line.

12. The container of Claim 1 wherein separating the frangible line does not create a piece of material detached from the container.

13. A tamper evident container comprising:

a base having a base peripheral portion defining an open upper end of the base, the base peripheral portion including a base rim;

a lid having a lid peripheral portion including a lid rim;

a base hinge panel extending outwardly from the base rim;

a lid hinge panel extending outwardly from the lid rim;

a hinge pivotally connecting the base hinge panel and the lid hinge panel;

the base hinge panel extending between the base peripheral portion and the hinge, and the lid hinge panel extending between the lid peripheral portion and the hinge;

the lid mountable to the base with the lid overlying the open upper end of the base for bringing the container to an initially sealed configuration, the initially sealed configuration defined by: a) interlocking engagement of the lid rim with the base rim about an entire periphery of the container, the interlocking engagement being releasable and re-engageable for opening and re-closing the container; and b) the lid hinge panel folded over the base hinge panel thereby creating a fold comprising the lid hinge panel, the base hinge panel and the hinge;

a frangible line dividing the fold into a first side and a second side;

the frangible line extending: partially across the lid hinge panel to a first point on the lid hinge panel; from the first point outwardly to the hinge and then extending across the hinge and inwardly from the hinge to a second point on the base hinge panel; and from the second point partially across the base hinge panel; and

the frangible line separating upon the application of an upwardly directed force to the first side of the fold while the second side of the fold is held in a fixed position or moved downwardly.

14. The container of Claim 13 wherein separating the frangible line creates a first grasping portion separated from a second grasping portion, the vertical displacement of the first grasping portion relative to the second grasping portion results in disengagement of the engaged rims.

15 The container of Claim 14 wherein the first grasping portion is horizontally adjacent the second grasping portion.

16. The container of Claim 14 wherein the first grasping portion is attached to the lid and the second grasping portion is attached to the base.

17. The container of Claim 13 wherein when the container is in the initially sealed configuration, only a portion of the frangible line is situated on the lid hinge panel and only a portion of the frangible line is situated on the base hinge panel.

18. The container of Claim 13 wherein in the initially sealed configuration the container has no structures projecting outwardly of the engaged lid and base rims other than than the lid hinge panel, the base hinge panel and the hinge.

19. The container of Claim 13 wherein the frangible line is the only frangible line on either the lid hinge panel or the base hinge panel.

20. The container of Claim 13 wherein the frangible line is the only frangible line on the container.

21. The container of Claim 13 wherein the frangible line includes an arcuate segment on the lid hinge panel proximate the first point that connects a longitudinally extending section of the frangible line to an outwardly extending section of the frangible line.

22. The container of Claim 13 wherein the frangible line includes an arcuate segment on the base hinge panel proximate the second point that connects a longitudinally extending section of the frangible line to an inwardly extending section of the frangible line.

23. The container of Claim 21 wherein the frangible line includes an arcuate segment on the base hinge panel proximate the second point that connects a longitudinally extending section of the frangible line to an inwardly extending section of the frangible line.

24. The container of Claim 13 wherein separating the frangible line does not create a piece of material detached from the container.

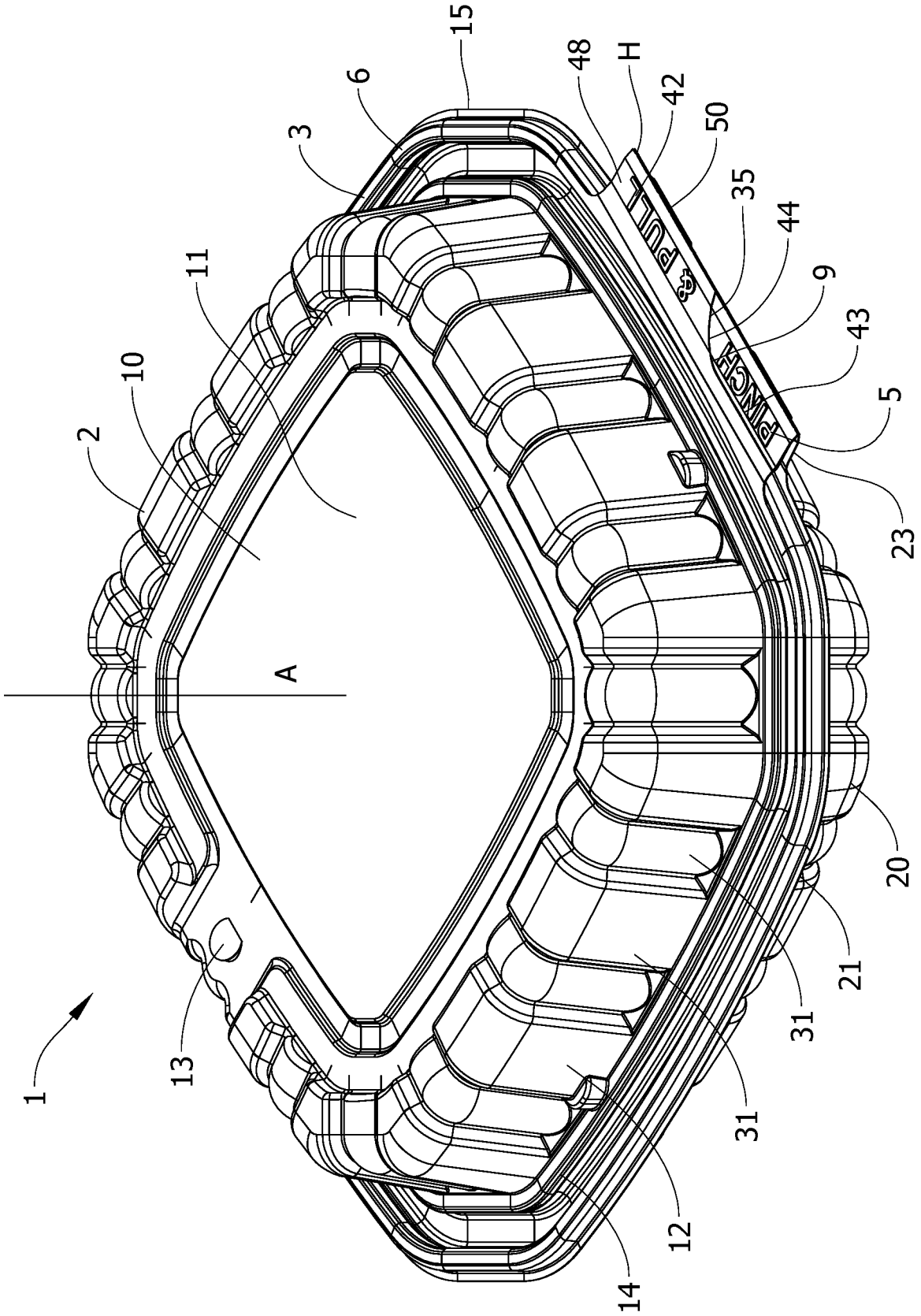


FIG. 1

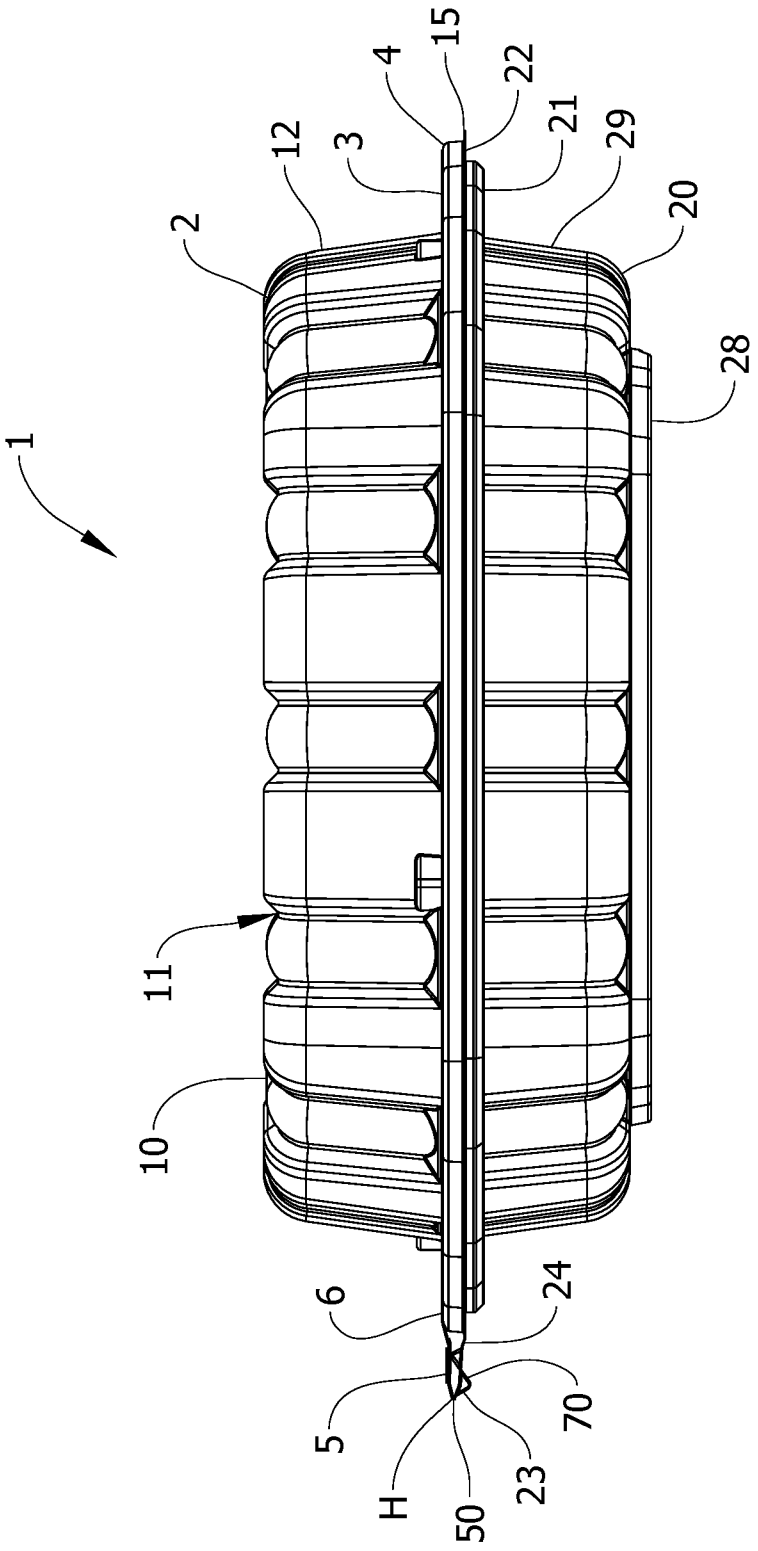


FIG. 2

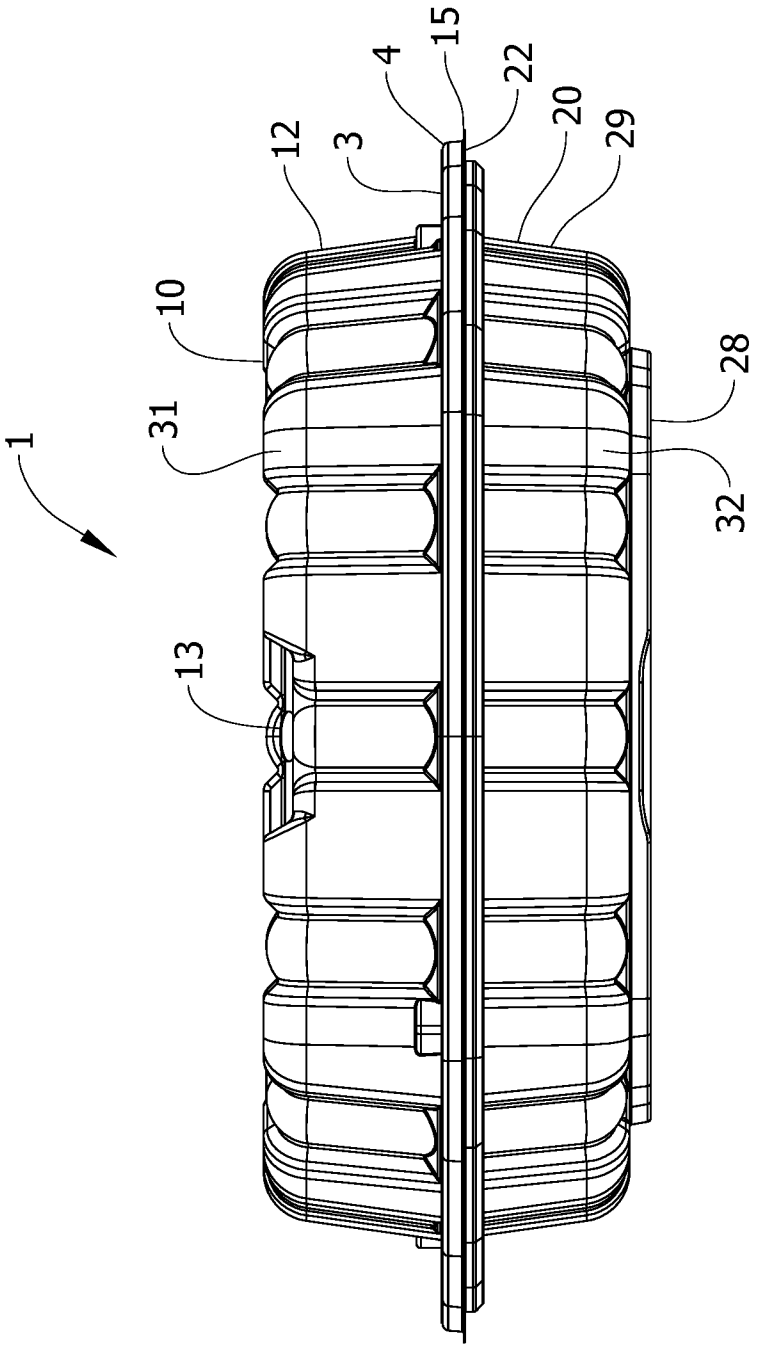


FIG. 3

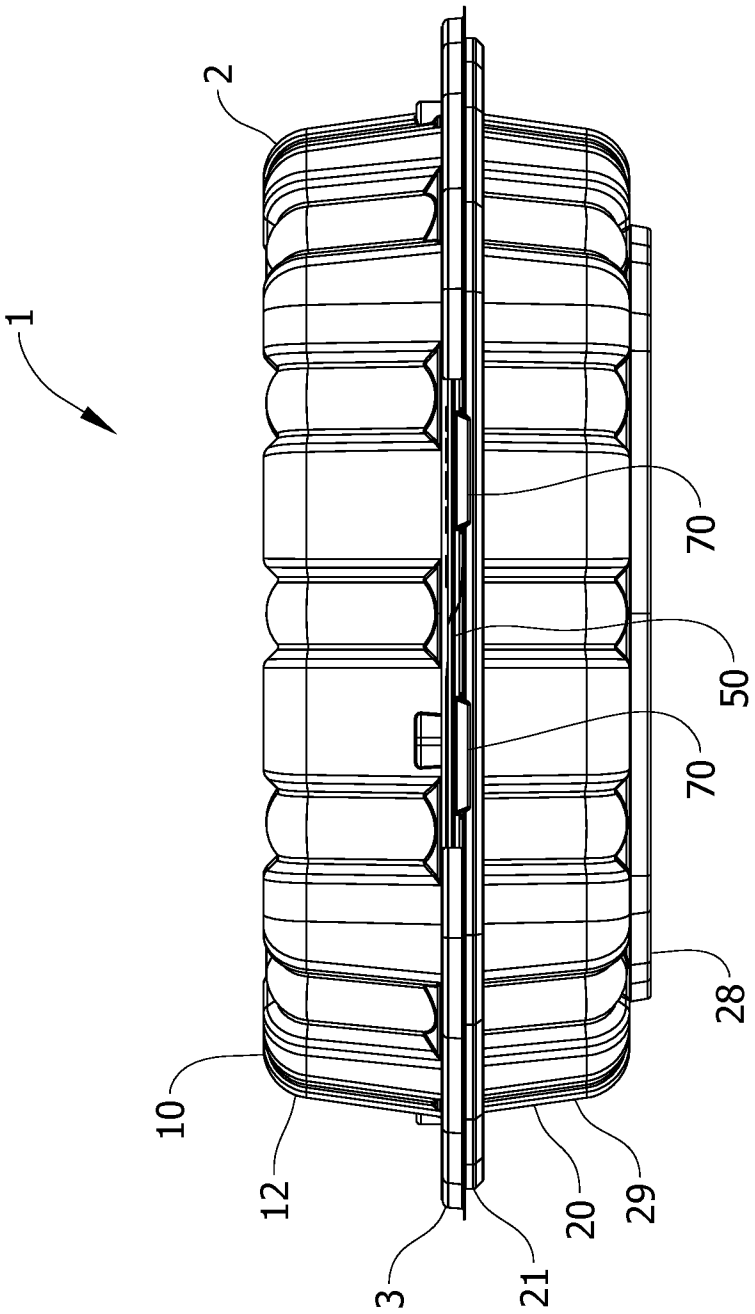


FIG. 4

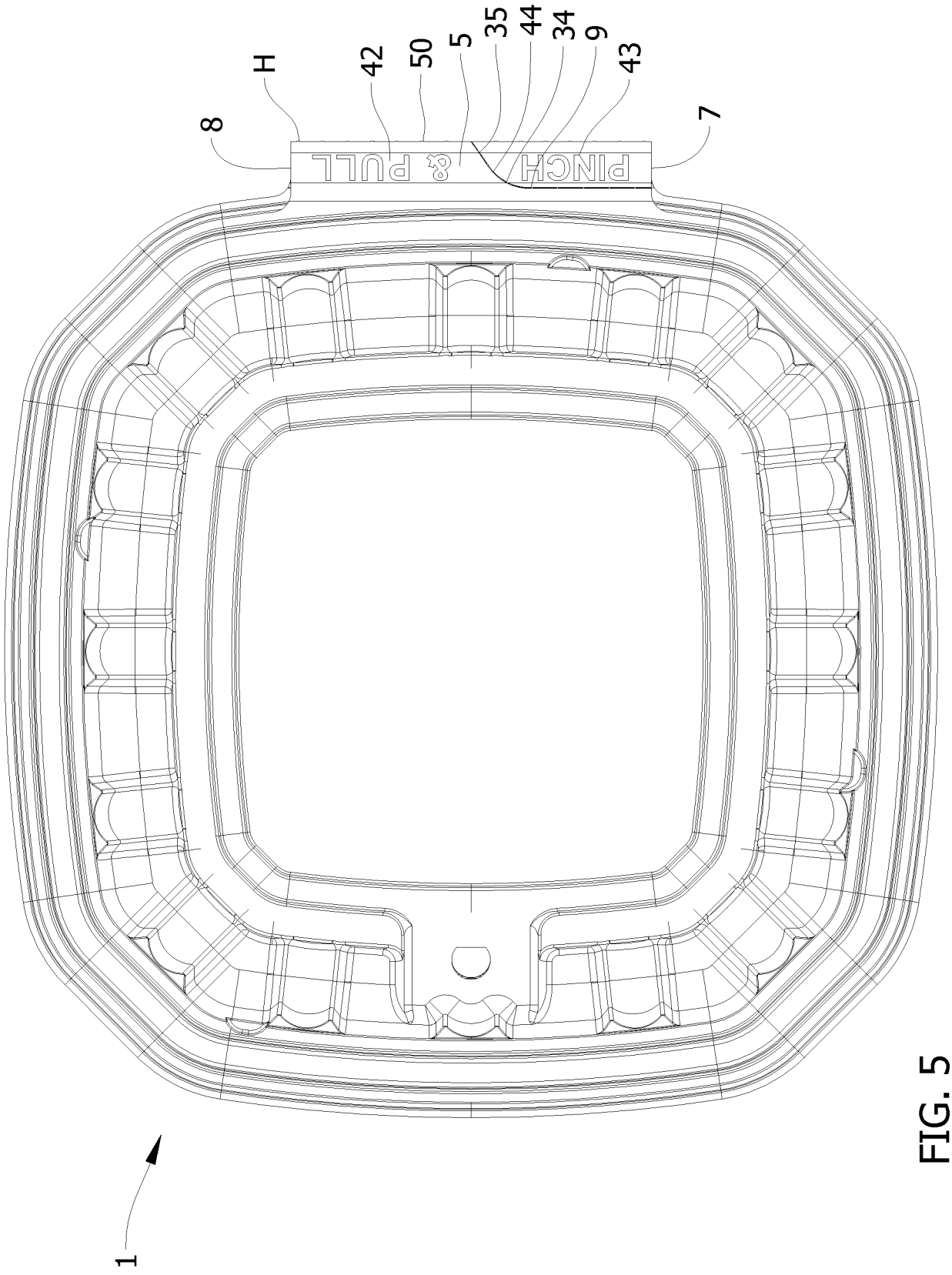


FIG. 5

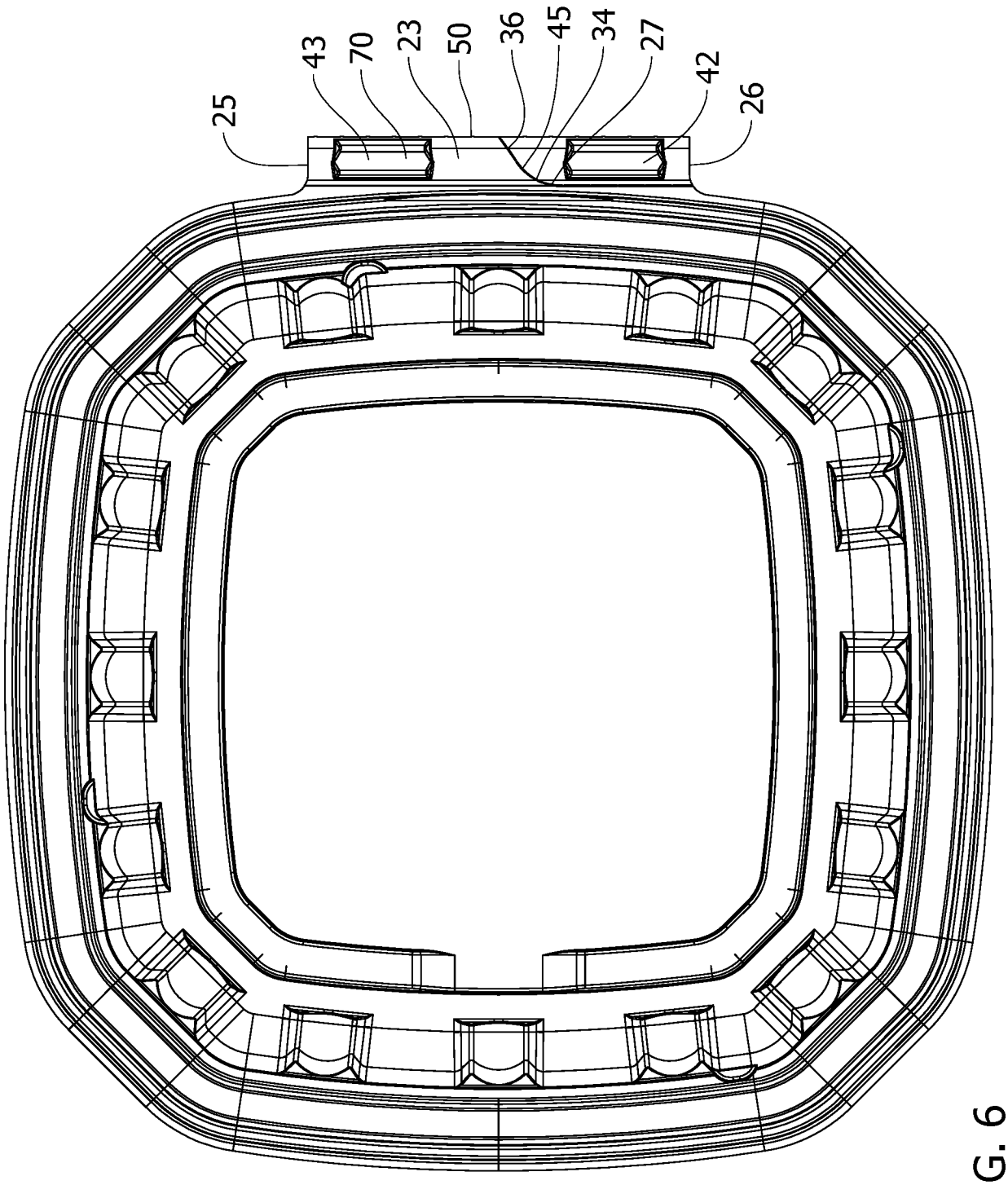


FIG. 6

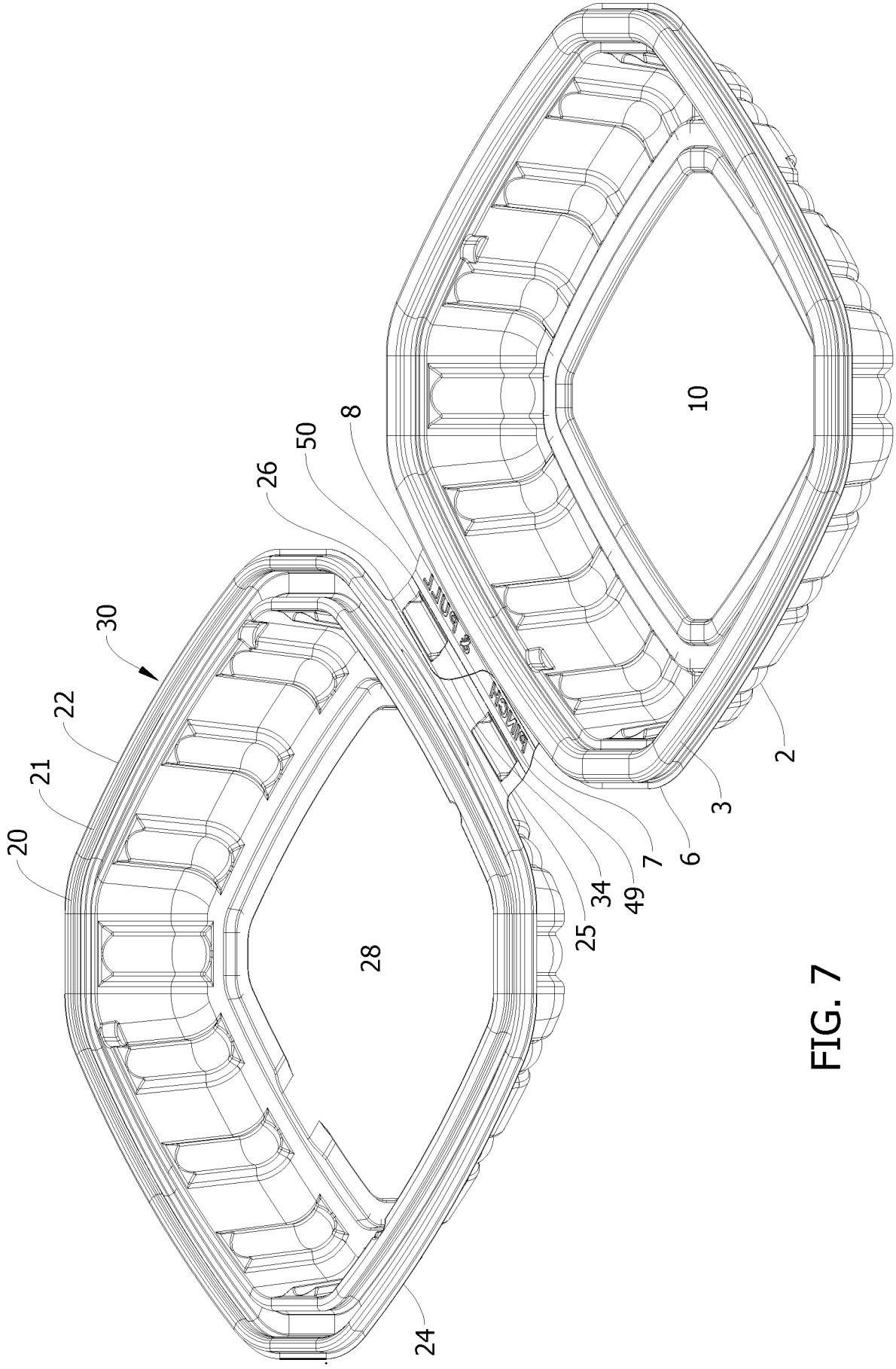


FIG. 7

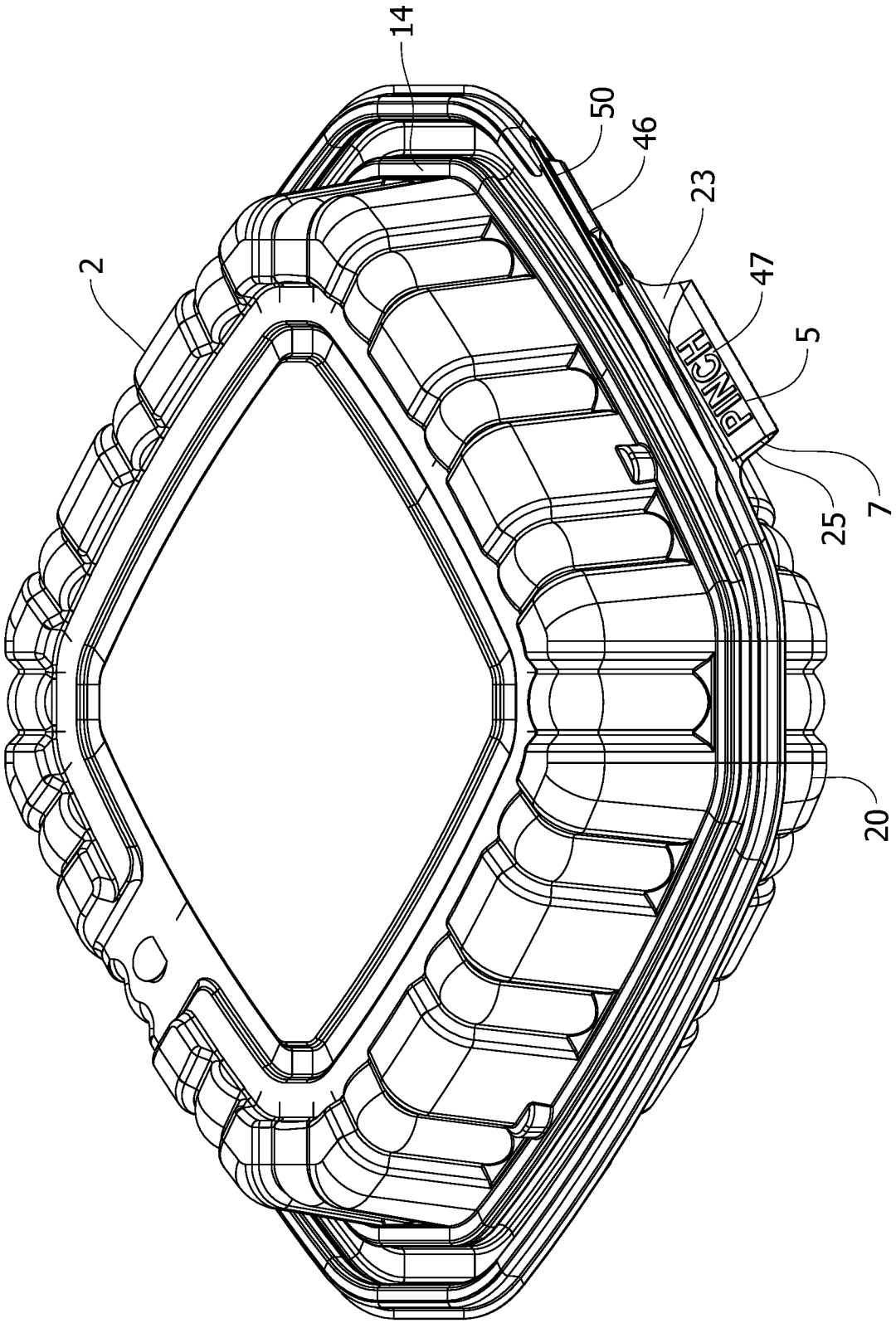


FIG. 8

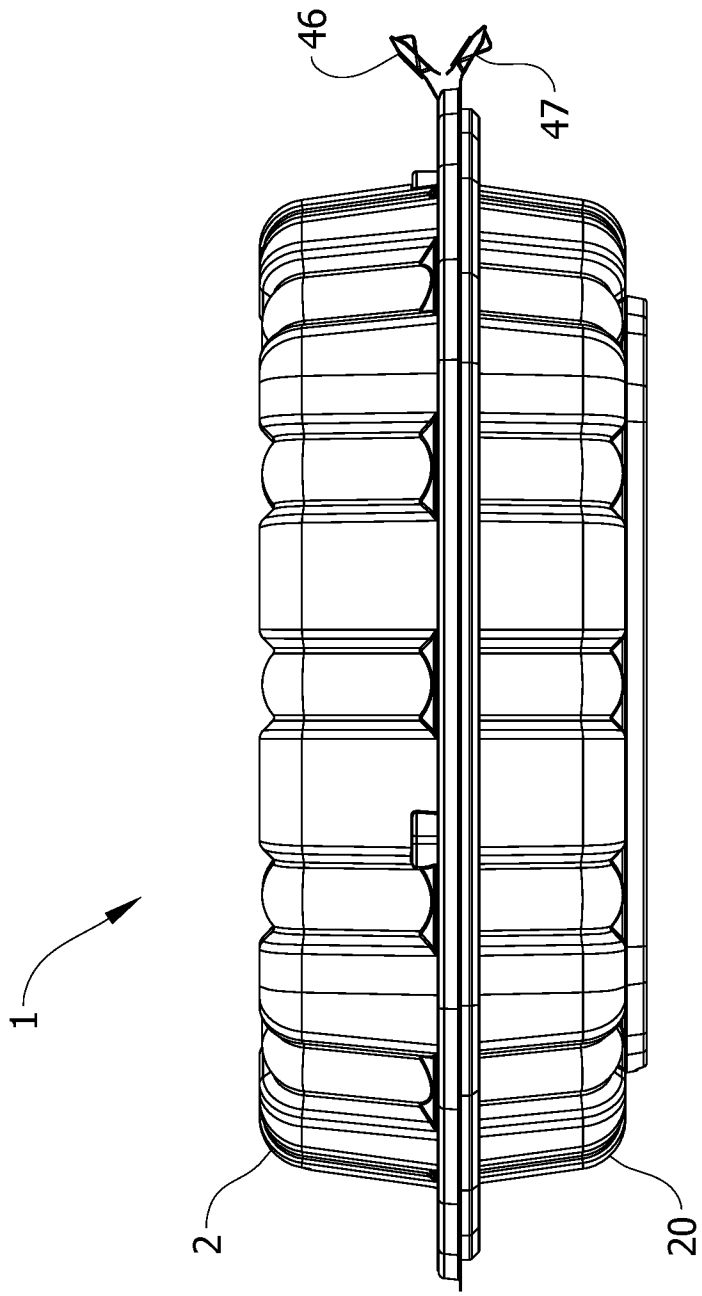


FIG. 9

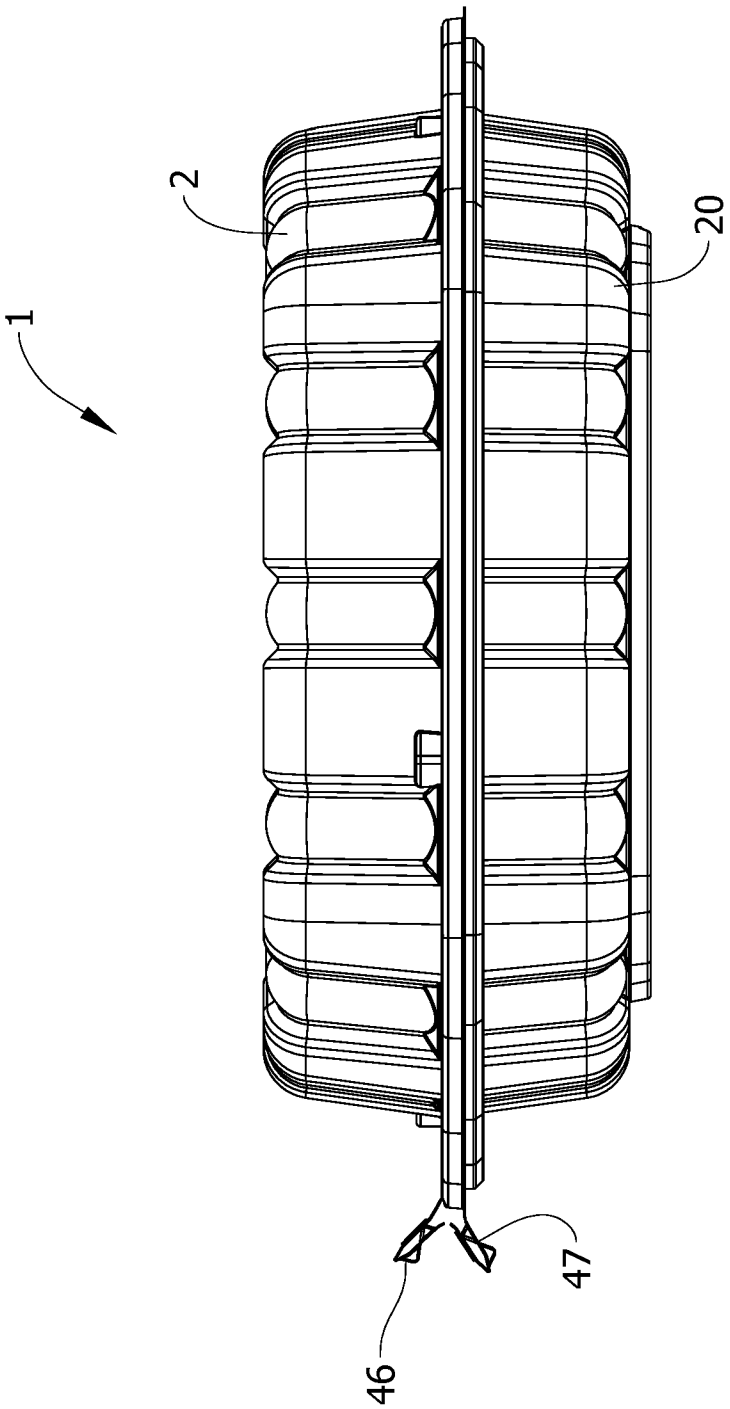


FIG. 10

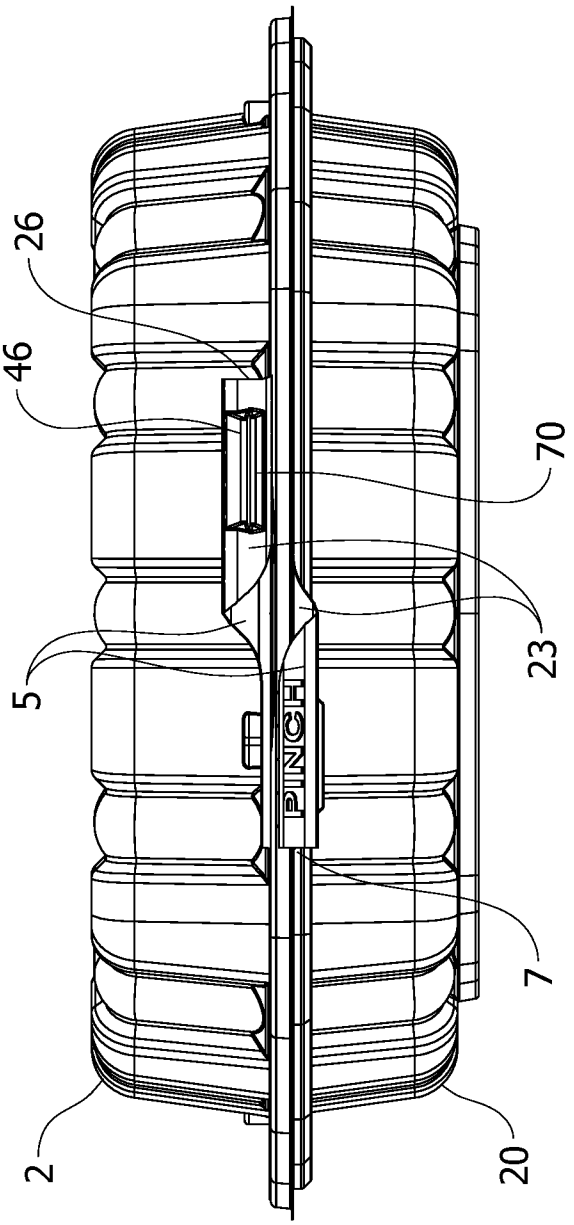


FIG. 11

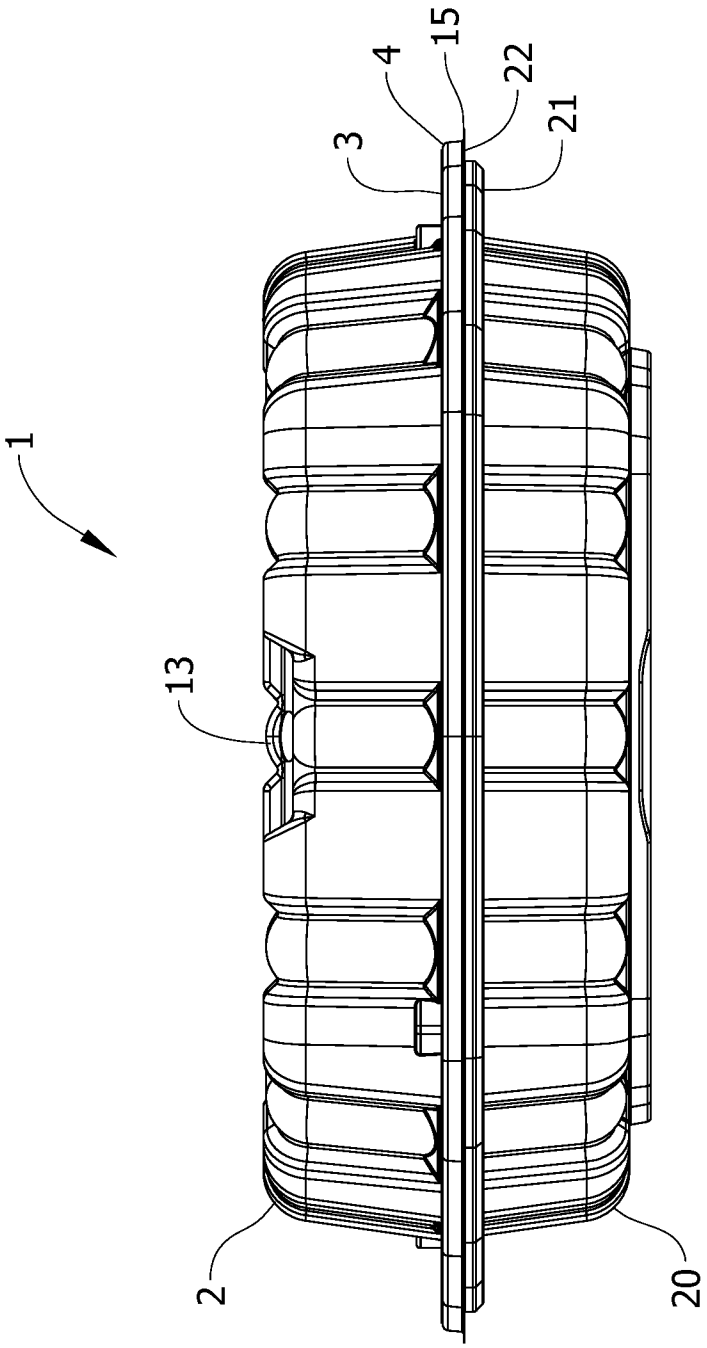


FIG. 12

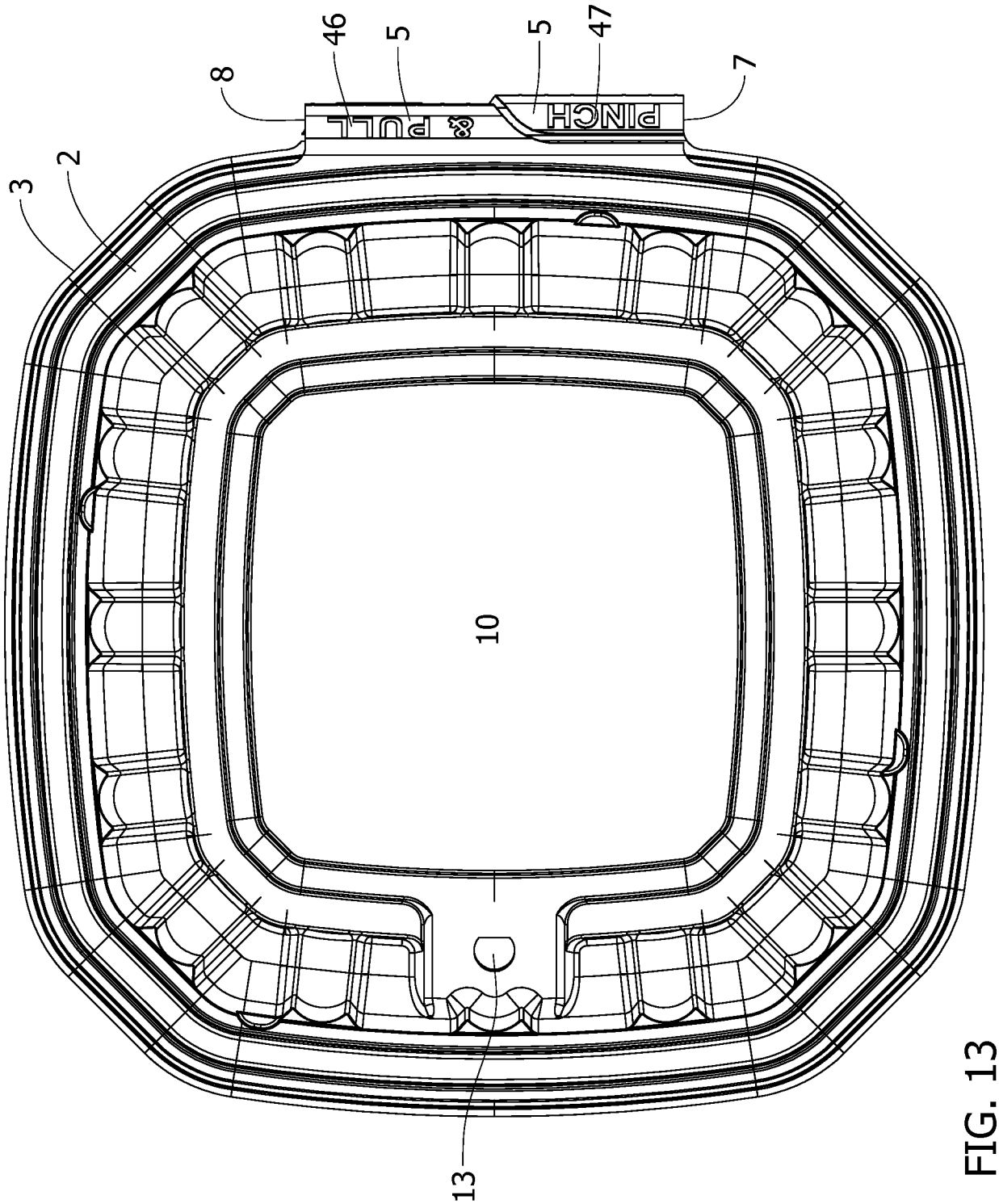


FIG. 13

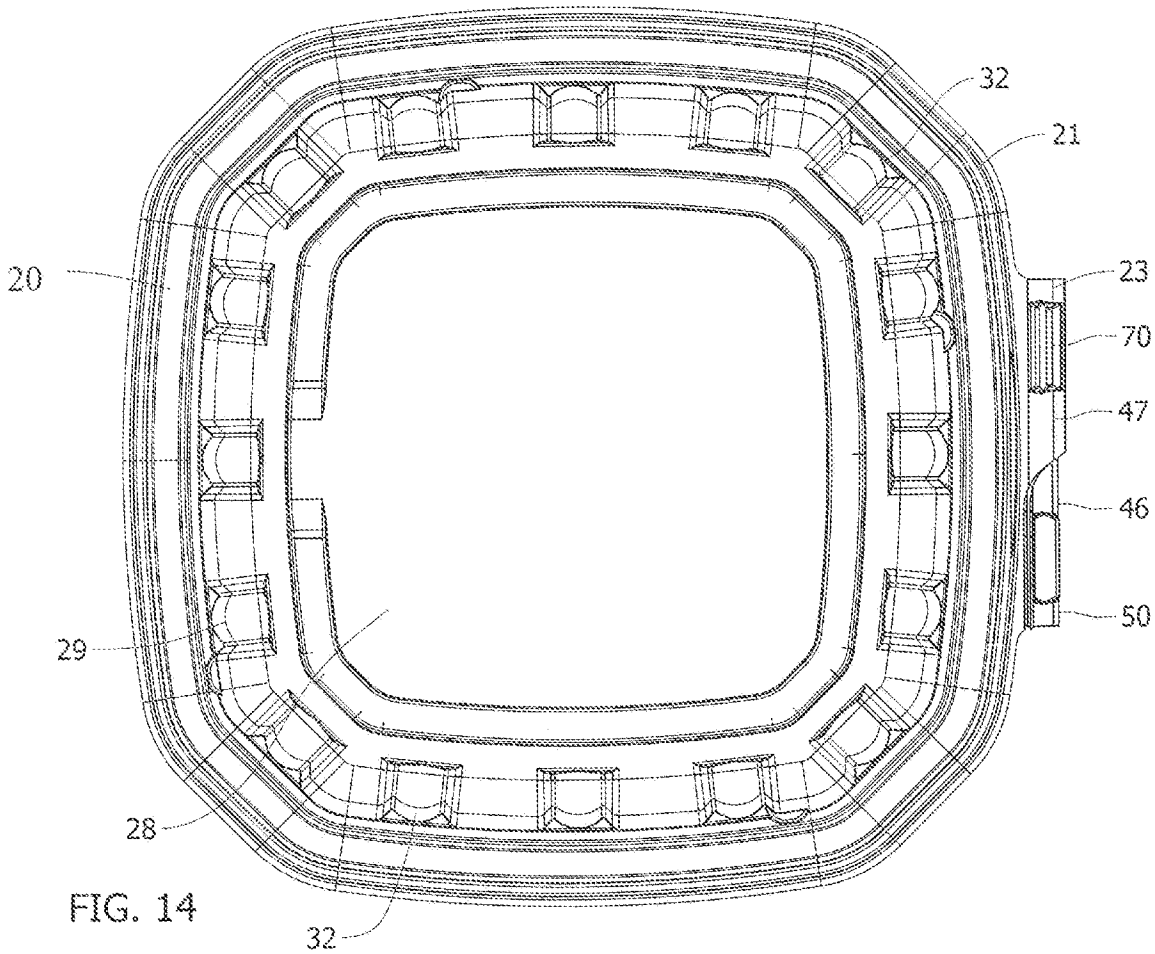


FIG. 14

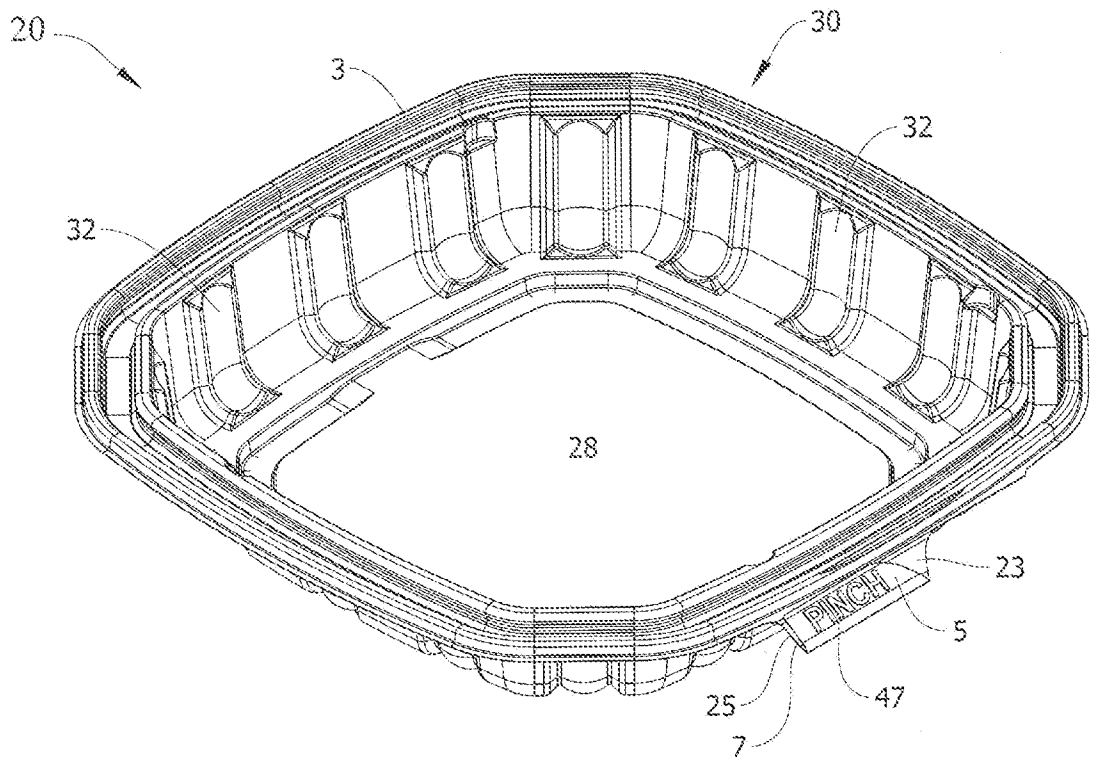


FIG. 15

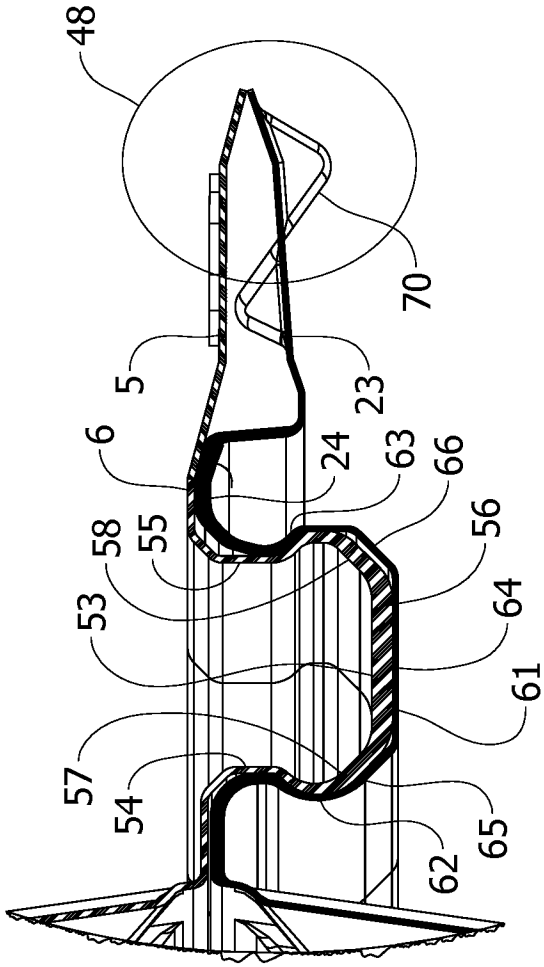


FIG. 16

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2021/033194

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - B65D 43/02; B65D 27/30; B65D 43/16; B65D 51/20; B65D 55/02 (2021.01)
CPC - B65D 43/0235; B65D 43/0237; B65D 2401/15; B65D 2401/20; B65D 2401/25; B65D 2401/60; B65D 2543/00296; B65D 2543/00685; B65D 2543/00796; B65D 2543/00842 (2021.05)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
see Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
see Search History document

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
see Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 7,568,589 B2 (VOVAN) 04 August 2009 (04.08.2009) entire document	1-24
A	US 9,580,219 B2 (ANCHOR PACKAGING, INC.) 28 February 2017 (28.02.2017) entire document	1-24
A	US 9,475,621 B1 (ANCHOR PACKAGING, INC.) 25 October 2016 (25.10.2016) entire document	1-24
A	US 9,016,503 B2 (BARBIER et al) 28 April 2015 (28.04.2015) entire document	1-24
A	US 9,493,277 B2 (POLARPAK INC.) 15 November 2016 (15.11.2016) entire document	1-24

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"D" document cited by the applicant in the international application
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
23 July 2021	AUG 23 2021
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, VA 22313-1450 Facsimile No. 571-273-8300	Authorized officer Harry Kim Telephone No. PCT Helpdesk: 571-272-4300