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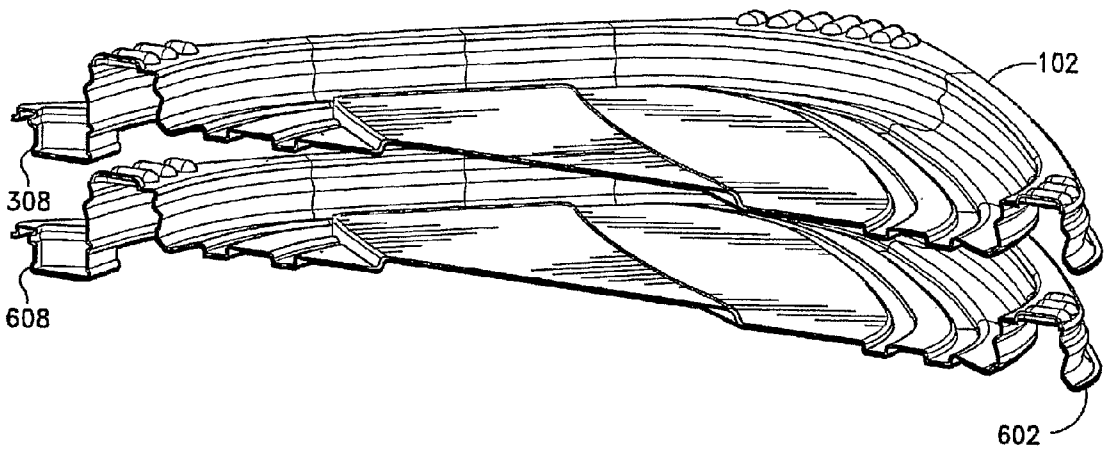
(54) **Title:** CONTAINERS WITH INTERLOCKING COVERS



(57) **Abstract:** A container (100) includes a cover (102) and a base (104). The cover (102) of the container (100) includes a first closure portion (310), an engagement portion (308), and an alignment portion. The base (104) includes a second closure portion (212). The first closure portion (310) of the cover (102) is sealingly engageable with the second closure portion (212) of the base (104) to define a sealed storage area. Multiple covers (102) stack together in two different ways. First, the covers (102) may be stacked into an "aligned" stack. Second, the covers (102) may be stacked into a locked stack. The alignment portion of the cover (102) is engageable with the alignment portion of a second cover to form an aligned cover stack. The engagement portion (310) of the cover (102) is receivingly engageable by the engagement portion (308) of a second cover (602) to form a locked cover stack (728).

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CONTAINERS WITH INTERLOCKING COVERS

FIELD OF THE INVENTION

[0001] The present invention relates generally to containers, and, more particularly, to containers whose covers align together when stacked in a first position and which may be locked together in a second position.

BACKGROUND OF THE INVENTION

[0002] Rigid, thermoplastic food containers are generally known. Users often accumulate a large number of these containers in different sizes and shapes. When not in use, the containers are often stored haphazardly into drawers. In this case, the unused containers take up a great deal of room, and finding a matching base and cover, which make up a container, in a disarranged drawer may be difficult. To avoid this, some users stack the containers in cabinets. While the bases of the containers usually nest and therefore take up less room than in a disorganized drawer, it may still be difficult to match a base with a cover. In addition, the covers may not stack and the covers may tend to topple down. When the containers are in use to store food, the containers are often stacked one on top of another in cabinets or in a refrigerator. These stacks may be precarious, and their fall may cause food to spill from the containers. Many users would find it desirable if the containers, whether empty or in use, could be stored in a manner space efficient, less precarious, and more structurally rigid.

[0003] During large-scale manufacturing, the covers may be transported in bulk before being separated out for individual packaging. During bulk handling, manufacturers would find it desirable if the covers would form a stack stable enough to resist the vertical and lateral movements caused by forces typically encountered during manufacturing operations.

[0004] The present invention has as a general aim to provide containers that satisfy both users and manufacturers.

SUMMARY OF THE INVENTION

[0005] Embodiments according to the principles of the present invention provide containers whose covers may be stacked together in two different ways. First, the covers may be nested and stacked and configured into an "aligned" stack. The aligned stack provides enough structural rigidity for bulk handling during manufacturing. Second, the covers may be stacked, interlocked one to another, and configured into a "locked" stack. The locked stack provides even more structural rigidity than does the aligned stack and is useful when storing unused covers. Finally, once the stack of covers is locked, the top cover of the stack may be easily released from the locked stack and removed.

[0006] In some embodiments, the cover includes a first closure portion, an engagement portion, and an alignment portion. The base of the container includes a second closure portion that is sealingly engageable with the first closure portion of the cover to define a substantially sealed, leak-proof, and re-sealable storage area for items such as food. It is well known to those of ordinary skill in the art, that the cover may be sealingly engaged with its base.

[0007] The alignment portion of the cover is engageable with the alignment portion of a second cover to form an aligned cover stack. The engagement portion of the cover is engageable with a second cover to form a system of covers in a locked cover stack.

[0008] In one embodiment, once engaged to form a locked stack of covers, the engagement portion of the top cover of the locked stack is disengageable from the cover immediately below the top cover in the cover stack. The top cover is removable from the locked stack by a simple lifting action supplied by the thumb or forefinger of a user on a gripping tab coupled to the cover.

[0009] In one embodiment, the engagement portion of the cover is positioned on a gripping tab of the cover. The engagement portion is configured as a downwardly directed protrusion on the top of the cover of the container. A male cap component of the engagement portion, cooperates with a female well component of the engagement portion of a second cover aligned immediately below the cover to lock the two covers

together in a stack. The male cap component may be nearly vertical and fits with minimal clearance inside the female well component so that cover stacking is provided when the cover stack is not kept in a vertical orientation. In one embodiment, the male cap component of a cover physically contacts the female well component of a second cover and provides a friction fit that locks the covers stacked together. The male cap component may have a shape similar to an opened topped hollow tub having a wedge-shaped outer surface wall. The male cap component may further include at least one undercut and at least one lead-in. The lead-in of the cover cooperates with the undercut of a second cover to provide a "snap" fit, well known to those of ordinary skill in the art, to lock the cover with the second cover. Thus, The covers may either nest by sitting on top of each other in a stack that may be shear de-nested, or the male cap component may abuttingly engage into the female well component to lock the covers into one unit for convenient storage.

[0010] In another embodiment, the cover includes a first closure portion at the outer peripheral edge of the bottom of the cover. The first closure portion of the cover cooperates with a second closure portion on the top perimeter rim edge of the base of the container to form a seal. The container uses a rim or perimeter design that includes both inside and outside seals. Containers may be embodied with a variety of closure portion designs including outer closures and/or inner closures. The engagement portion is in a position spanning between an inner sealing wall and an outer sealing wall at the top of the first closure portion. The engagement portion of the cover is configured as a locking lug integral with the first closure portion.

[0011] The covers and bases of container may be economically constructed from relatively thin-gauge plastic so that the user may either wash them after use or dispose of them with the view that their purchase price allows them to be used as a consumable good. The container may be readily manufactured, for example, with conventional thermoforming equipment or thin-walled injection molding. The cover may be made from a semi-transparent material to ensure satisfactory visibility of the container's contents. The container may be suitable for refrigerator, freezer, microwave, and machine dishwasher use.

[0012] The features of the present invention will become apparent to one of ordinary skill in the art upon reading the detailed description, in conjunction with the accompanying drawings, provided herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] Reference will now be made to the drawings wherein like numerals refer to like parts throughout, and wherein:

Figure 1 is an isometric view of a container with a cover and a base according to an embodiment of the present invention;

Figure 2 is an isometric view of the base of Figure 1;

Figure 3A is an isometric top view of the cover of Figure 1;

Figure 3B is an isometric bottom view of the cover of Figure 1;

Figure 4A is top plan view of the cover of Figure 1 showing the engagement portion of the cover;

Figure 4B is close-up view of the engagement portion of the cover of Figure 4A as indicated in dotted line;

Figure 4C is front view of the cover of Figure 4A showing the engagement portion of the cover;

Figure 5A is an isometric view of a cross- section of the cover of Figure 3A taken along a first midline of the cover;

Figure 5B is a close-up view of the engagement portion of the cover of Figure 5A;

Figure 6A is an isometric view similar to Figure 5A showing a cross-section of the cover and a second aligned with the cover;

Figure 6B is a close-up view similar to Figure 5B showing of the engagement portion of the cover locked with the engagement portion of a second cover;

Figure 6C is a close-up view of a the engagement portion of the cover in a locked configuration with the engagement portion of a second cover;

Figure 7 is an isometric view similar to Figures 5A and 6A showing a cross-section of a stack of five covers in a locked configuration;

Figure 8 is an isometric view of a container with a cover and a base according to another embodiment of the present invention;

Figure 9 is an isometric view of the base of Figure 8;

Figure 10A is an isometric top view of the cover of Figure 8;

Figure 10B is an isometric bottom view of the cover of Figure 8;

Figure 11A, is a partial side cross-section view of the container of Figure 8;

Figure 11B is an outline view of the cross-section profile of Figure 11A schematically depicting the seal formed by the cover and the base;

Figure 12A is a partial side cross-section view similar to the view of Figure 11A showing the cover of Figure 8 and a second cover aligned below but not locked to the cover;

Figure 12B is a partial side cross-section view similar to the view of Figure 11A showing the cover of Figure 8 lockingly engaged with the second cover;

Figure 12C is an outline view of the cross-section profile of Figure 12B schematically depicting the locking engagement of the cover and the second cover;

Figure 13A is a partial side cross-section view similar to Figure 11A of the container of Figure 8 having a second cover locked to the cover; and

Figure 13B is an outline view of the cross-section profile of Figure 13A schematically depicting the seal formed by the cover and the base and the locking engagement of the cover and the second cover.

DETAILED DESCRIPTION OF THE INVENTION

[0014] An embodiment according to the principles of the present invention is illustrated in Figures 1-7. As seen in Figure 1, a container 100 includes a flexible cover 102 sealingly engaged to a base 104. The cover 102 includes at least one gripping tab 106 to facilitate removal of the cover 102 from the base 104. In some embodiments, the gripping tab 106 includes one or more cross-ribs or a textured surface to improve a user's grip and lift on the tab 106. The container 100 is depicted as substantially square with rounded corners. In other embodiments of the present invention, the container 100 has other shapes such as square, circular, or elliptical.

[0015] As seen in Figure 3A and 3B, and as described and illustrated more fully below, the cover 102, and more particularly the gripping tab 106, includes an engagement portion 308. Engagement portion 308 allows the cover 102 to engage with the engagement portion of a second cover.

[0016] The cover 102 further includes a first closure portion 310 at the outer peripheral edge of the bottom of cover 102. In Figure 2, the base 104 includes a second closure portion 212 at the top edge of the base 104. It is well known to those of ordinary skill in the art, that the cover 102 may be sealingly engaged with the base 104. Thus, the first closure portion 310 of the cover 102 is sealingly engageable with the second closure portion 212 of the base 104 to define the substantially sealed, leak-proof, and re-sealable storage area for items such as food. The container 100 uses a rim or perimeter design that includes both inside and outside seals. Containers may be embodied with a variety of closure portion designs including outer closures and/or inner closures with a variety of undercuts and lead-ins that may affect seal integrity

[0017] The first 310 and second 212 closure portions may be configured to be slightly different in size to form an interference fit therebetween. The interference between the closure portions may provide the sealing engagement between the closure portions. As a result, when the two pieces are engaged, a positive seal may be formed between sealing surfaces around the perimeters of the base 104 and of the cover 102. The engagement of the first 310 and second 212 closure portions may be

accompanied by an audible "snap" indicating that the container 100 is securely closed. .

[0018] As described and illustrated above with reference to Figure 3A and 3B, the cover 102, and more particularly the gripping tab 106, includes an engagement portion 308 that allows the cover 102 to lockingly engage with the engagement portion of a second cover. The engagement portion of the second cover may engage with the engagement portion of yet a third cover, and so on, to form a locked stack of any number of covers. This locking feature makes the resultant stack of covers more structurally rigid. Thus, the locked stack of covers is less precarious than a traditional, non-interlocked, stack of covers. Further, as described and illustrated in more detail below, the cover 102 accommodates the disengagement of the engagement portion 308 of the cover 102 from the engagement portion of a second cover to release the cover 102 from its locked configuration in the stack of covers.

[0019] Figures 4A-7 show the utility of an embodiment of the invention when the container covers are locked in storage. In one embodiment, the engagement portion 308 of the cover 102 illustrated in Figures 4A-4C is centered within the gripping tab 106 at the top surface of the cover 102. As best seen in Figure 4C, the engagement portion 308 is depicted as a projection that is directed downwardly from the top of the cover 102.

[0020] As shown in Figures 5A and 5B, the projection is in the form of a hollow, cup-like, nested structure. Engagement portion 308 is open at the top and has a wedge-shaped outer surface wall defining a male cap component 514 (Figure 5B). The inner surface wall of the engagement portion 308 defines a female well component 516 (Figure 5B) adapted to receive the male cap component of another cover. The male cap component 514 of the engagement portion 308 of the cover 102 has a shape complimentary to the female well component 516. In the embodiment of Figures 4A-7, the walls of the engagement portions taper from top to bottom, being designed with a draft angle, to accommodate nesting. Thus, the male cap component 514 of cover 102 may be receivingly engaged by the female well component of a cover below, locking the covers into one unit for convenient storage. Engagement portions of

different covers may vary in depth to allow locking engagement compatibility across a container product family.

[0021] In other embodiments, more than one engagement portion 308 may be located on the top surface of the cover 102 to accommodate locking engagement of multiple container covers at more than one position on the top surface of the cover 102. In some embodiments, a standard shape and configuration of the engagement portion 308 is used with covers 102 of various shapes and sizes. This enhances storage flexibility by allowing different types of covers 102 to be stored together in a locked stack. A standard shaped and configured engagement portion 308 may be used with, for example, circular, square, rectangular, and elliptical shaped covers or with similarly shaped covers but differently sized covers.

[0022] The engagement portion 308 may also be chosen to have a shape or otherwise include alignment portion elements that provide rotational alignment of a stack of covers 102. Rotation is defined about an axis normal to the plane formed by orthogonal midlines, i.e., first midline 318 and second midline 320, of the cover 102 (Figure 3A). The origin of the rotational axis is at the center point 322 where the orthogonal midlines 318 and 320 intersect. For instance, shapes that inherently require alignment prior to engagement or that may be self-aligning during the process of connecting engagement portions would be shapes with linear or curvilinear sides, vertices or lobes such as triangular, square, rectangular, or multi-petal shapes. The engagement portion 308 depicted in Figures 4-6, which has a wedge-shaped outer surface defining the male cap component 514 of the cover 102, is an engagement portion shape that inherently requires rotational alignment before locking with engagement portions of other covers. Alternately, cover 102 may have elements that self-aligning during the process of locking connection of the engagement portions.

[0023] Referring again to Figure 5B, the male cap component 514 includes an undercut 524 configured as a lengthwise bead along at least a part of the bottom edge of the male cap component 514. In the embodiment of Figures 4A-7, undercut 524 is positioned around the entire outer surface wall of the engagement portion 308 making

up the male cap component 514. The undercut 524 projects outwardly from the engagement portion 308 of the cover 102.

[0024] The female well component 516 of the engagement portion 308 of the cover 102 includes a lead-in 526. Lead-in 526 is configured as a groove or indentation along at least a portion of the top edge of the female well component 516. In this embodiment, lead-in 526 is indented around the entire inner surface wall of the engagement portion 308 making up the female well component 516.

[0025] Referring to Figures 6A-6C, to lock a second cover 602 to the cover 102 the cover 102 is first rotationally aligned with the second cover 602. As noted above, the cover 102 inherently requires rotational alignment with the second cover 602 before locking. To align the cover 102 with the second cover 602, the cover 102 is rotated about its center point 322 (Figure 3A) until the engagement portion 308 of the cover 102 is directly above an engagement portion 608 of the second cover 602.

[0026] The engagement portion 608 of a second cover 602 is configured as described above for the cover 102. More particularly, the engagement portion 608 of the second cover 602 includes a male cap component 614. The male cap component 614 of the second cover 602 includes an undercut 624 configured as a lengthwise bead along the entire bottom edge of the male cap component 614 of the second cover 602. Further, in this embodiment, the engagement portion 608 of the second cover 602 includes a female well component 616 defined by the inner surface wall of the engagement portion 608. The female well component 616 of the engagement portion 608 of the second cover 602 includes a lead-in 626. Lead-in 626 of the second cover 602 is configured as a groove or indentation along at least a portion of the top edge of the female well component 616 of the engagement portion 626 of the second cover 602. In this embodiment, lead-in 626 is indented around the entire inner surface wall of the engagement portion 608 making up the female well component 616 of the second cover 602.

[0027] As best seen in Figure 6C, when in a locked configuration, the outer surface wall of the engagement portion 308 defining the male cap component 514 of the cover

102 engages and interacts with a female well component 616 defined by the inner surface wall of the engagement portion 608 of the second cover 602 stacked immediately below the cover 102. More particularly, the undercut 524 of the cover 102 is adapted to engage and cooperate with the lead-in 626 of the engagement portion 608 of the second cover 602 to form a locked relationship between cover 102 and second cover 602.

[0028] In locking the second cover 602 with the cover 102, engagement portion 308 of the cover 102 is rotationally aligned above the engagement portion 608 of the second cover 602 (Figure 6A). As shown in Figure 6B, the cover 102 is next pressed down onto and contacted with the second cover 602 such that male cap component 514 of the cover 102 is receivingly engaged by the female well component 616 of the second cover 602, to form a locking relationship between cover 102 and second cover 602. More particularly, when the cover 102 is pressed down on the second cover 602, the undercut 524 of the engagement portion 308 of the cover 102 forms a snap or friction fit with lead-in 626 of the engagement portion 608 of the second cover 602, which locks the cover 102 and the second cover 602 together into one unit for convenient storage.

[0029] Referring to Figure 7, similarly, in this embodiment, a third cover 702A, includes an engagement portion 708A. The engagement portion 708A of the third cover 702A is configured as described above for the cover 102 and the second cover 602. The engagement portion 708A of the third cover 702A may be locked with the engagement portion 608 of the second cover 602 in a manner similar to that described above for locking the cover 102 with the second cover 602. Likewise, an engagement portion 708B of a fourth cover 702B may be locked with the engagement portion 708A of the third cover 702A and an engagement portion 708C of a fifth cover 702C may be locked with the engagement portion 708B of the fourth cover 702B to form a locked stack 728 of five covers as shown in Figure 7.

[0030] A stack of locked covers, each with at least one undercut on the male cap component of its engagement portion and at least one cooperating lead-in on the female well component, may be unlocked by pulling upwardly on the tab of the top

cover while holding the stack of locked covers below the top cover and so on until the entire stack of covers is unlocked. The unlock covers may nest on top of each other in a stack that may be shear de-nested as is well know to those of ordinary skill in the art. Advantageously, in this embodiment, the engagement portions may be nearly vertical and accordingly the male cap components of the engagement portions fit with minimal clearance inside the cooperating female well components. Cover locking is provided without excessively increasing the height of a stack of locked covers over the height of a stack of unlocked covers that have no engagement portions.

[0031] As with the shape of the container 100 itself, the engagement portions of the covers may assume a variety of shapes, locations, and matingly engageable surface configurations. Another embodiment in accordance with he principles of the present, for example, is described and illustrated more fully below with reference to Figures 8-13B. Referring to Figure 8, a container 800 includes a flexible cover 802 sealingly engaged to a base 804. As seen in Figure 10B, 11A and 11B, the cover 802 further includes a first closure portion 1010 at the outer peripheral edge of the bottom of cover 802. The cover 802 includes at least one gripping tab 806 to facilitate removal of the cover 802 from the base 804. The container 800 is depicted as substantially square with rounded corners. In other embodiments of the present invention, the container 800 has other shapes such as square, circular, or elliptical.

[0032] In Figure 9, 11A, and 11B, the base 804 includes a second closure portion 912 at the top perimeter edge of the sidewall 911 of the base 804 that is integral with the bottom 909 of the base 804. It is well known to those of ordinary skill in the art, that the cover 802 may be sealingly engaged with the base 804 to define the substantially sealed, leak-proof, and re-sealable storage area for items such as food shown in Figure 8. The container 800 uses a rim or perimeter design that includes both inside and outside seals. Containers may be embodied with a variety of closure portion designs including outer closures and/or inner closures.

[0033] Referring to Figures 10A-11B, the cover 802 includes an engagement portion 1008. As best seen in Figure 11B, engagement portion 1008 is integrally formed with the first closure portion 1010 of the cover 802 and is not formed at the tab 806 as in

the embodiment described above with reference to Figures 1-7. As described and illustrated more fully below with reference to Figures 12A and 12B, the engagement portion 1008 allows the cover 802 to lockingly engage with the first closure portion of a second cover.

[0034] Figure 11A, is a partial side cross-section view of the container 800 of Figure 8. Figure 11B is an outline view of the cross-section profile of Figure 11A schematically depicting the seal formed by the first closure portion 1010 of the cover 802 and the second closure portion 912 of the base 804. The first closure portion 1010 of the cover 802 cooperates with the second closure portion 912 of the base 804 to define a sealed storage compartment. Referring to Figures 11A and 11B together, the first closure portion 1010 includes an inner sealing wall 1130 and an outer sealing wall 1132. The inner sealing wall 1130 defines a first sealing surface and the outer sealing wall 1132 defines a second sealing surface, both of which are part of the lower surface of the cover 802 (See also Figure 10B). In the embodiment shown, the inner sealing wall 1130 includes a first inner lead-in 1133A at the bottom of the first sealing portion 1010 where it joins the top of the cover 802. Likewise, the outer sealing wall 1132 includes a first outer lead-in 1133B at the bottom of the first sealing portion 1010. Further, in this embodiment, the inner sealing wall 1130 includes a second inner lead-in 1134A at the top of the first sealing portion 1010 of the cover 802. Likewise, the outer sealing wall 1132 includes a second outer lead-in 1134B at the top of the first sealing portion 1010 of the cover 802. In other embodiments, first sealing portion 1010 may contain more than one inner and outer lead-ins of the cover 802.

[0035] As described and illustrated more fully below with reference to Figures 12A and 12B, integral with first closure portion 1010 at the second inner lead-in 1134A and second outer lead-in 1134B lead-ins is the engagement portion 1008 of the cover 802. The engagement portion 1008 is configured as a locking lug spanning between the second inner 1134A and second outer 1134B lead-ins of the first closure portion 1010.

[0036] The second closure portion 912 of the base 804 is a raised ring that extends from an upper edge of the sidewall 911 of the base 804 (See also Figure 9). The

second closure portion 912 includes an inner sealing wall 1138, an outer sealing wall 1140 and a retention bead 1141 integral with and spanning between the inner sealing wall 1138 and outer sealing wall 1140 of the second closure portion 912 of the base 804. The inner sealing wall 1138 defines a third sealing surface and the outer sealing wall 1140 defines a fourth sealing surface. The second closure portion 912 may include one or more lead-ins. In the embodiment shown, the inner sealing wall 1138 of the second closure portion 912 includes an inner lead-in 1142A. The outer sealing wall 1140 of the second closure portion 912 includes an outer lead-in 1142B.

[0037] The first closure portion 1010 and the second closure portion 912 may be configured to be slightly different in size to form an interference fit therebetween. The interference fit between the first closure portions 1010 and the second closure portion 912 may provide a sealing engagement between the closure portions. More particularly, the first sealing surface of the inner sealing wall 1130 of the first closure portion 1010 abuttingly contacts the third sealing surface of the inner sealing wall 1138 of the second closure portion 912 to provide an inner sealing engagement; and the second sealing surface of the outer sealing wall 1132 of the first closure portion 1010 abuttingly contacts the fourth sealing surface of the outer sealing wall 1140 of the second closure portion 912 to provide an outer sealing engagement.

[0038] The second inner lead-in 1134A of the first closure portion 1010 cooperates with the inner lead-in 1142A of the second closure portion 912 to enhance and maintain the inner sealing engagement between the cover 802 and the base 804. In a similar manner, the second outer lead-in 1134B of the first closure portion 1010 cooperates with the outer lead-in 1142B of the second closure portion 912 to enhance and maintain the outer sealing engagement between the cover 802 and the base 804. As a result, when the cover 102 and the base 104 are abuttingly engaged, a compound positive seal is formed between the sealing surfaces around the perimeters of the cover 802 and the base 804.

[0039] The abutting engagement of the first closure portion 1010 and second closure portion 912 may be accompanied by an audible "snap" indicating that the container is securely closed and sealed. To facilitate sealing engagement of the cover 802 with its

base 804, a user applies a downward force on the cover 802, or, more conveniently, only to the top of the engagement portion 1008 of the cover 802, while the first closure portion 1010 of the cover 802 is aligned with the second closure portion 912 of the base 804.

[0040] Figure 12A is a partial side cross-section view similar to the view of Figure 11A showing the cover 802 of Figure 8 and a second cover 1202 aligned below but not locked to the cover 802. Figure 12B is a partial side cross-section view similar to the view of Figure 11A showing the cover 802 of Figure 8 lockingly engaged with the second cover 1202. Figure 12C is an outline view of the cross-section profile of Figure 12B schematically depicting the locking engagement of the cover 802 and the second cover 1202. As best seen in Figure 12C, integral with the first closure portion 1010 of the cover 802 is the engagement portion 1008 spanning between the second inner lead-in 1134A and the second outer lead-in 1134B of the first closure portion 1010. The engagement portion 1008 of the cover 802 is configured as a locking lug integral with the first closure portion 1010.

[0041] The engagement portion 1208 of the second cover 1202 includes an inner undercut portion 1244A above and integral with an inner lead-in 1234A of the engagement portion 1208 of the second cover 1202. Likewise, the engagement portion 1208 of the second cover 1202 includes an outer undercut portion 1244B above and integral with an outer lead-in1234B at the engagement portion 1208 of the second cover 1202. A retention bead 1241 of the engagement portion 1208 of the second cover 1204 is integral with and spans between the inner lead-in1234A and the outer lead-in 1234B of the engagement portion 1208 of the second cover 1204.

[0042] The engagement portion 1208 of the second cover 1202 is adapted to cooperate with the first closure portion 1010 of the cover 802 to lockingly engage the second cover 1202 with the cover 802. Thus, the configuration of the engagement portion 1208 of the second cover 1202 mimics a part of the second closure portion 912 of the base 804 (Figure 11C). More particularly, the inner undercut portion 1244A and outer undercut portion 1244B of the engagement portion 1208 of the second cover 1202 correspond to inner sealing wall 1130, and outer sealing wall

1132, respectively, of the second closure portion 912 of the base 804 (see Figures 11B and 11C).

[0043] To lockingly engage the second cover 1202 with the cover 802, the first sealing portion 1010 of the cover 802 is aligned above the engagement portion 1208 of the second cover 1202 as shown in Figure 12A. In a manner similar to that described above for the first and second closure portions, a user applies a downward force on the first cover 802 while the first closure portion of the cover 102 is aligned above the engagement portion 1208 of the second cover 1202. The first closure portion 1010 of the cover 802 abuttingly engages the engagement portion 1208 of the second cover 1202 to lock the second cover 1202 to the cover 802 as shown in Figure 12B and 12C. More particularly, when lockingly engaged, inner sealing wall 1130 and first inner lead-in 1133A of the cover 802 engages, respectively, with inner lead-in 1234A and inner undercut portion 1244A of the second cover 1202; and outer sealing wall 1132 and first outer lead-in 1133B of the cover 802 engages, respectively, with outer lead-in 1234B and outer undercut portion 1244B of the second cover 1202 to lock the cover 802 with the second cover 1202.

[0044] In a similar manner, a third cover may be locked to the second cover 1202, a fourth cover may be locked to the third cover and so on to form a stack of locked covers. In this embodiment, the stack of locked covers, each with a first closure portion and a cooperating engagement portion as described above, may be unlocked by pulling upwardly on the tab of the top cover while holding the stack of locked covers below the top cover and so on until the entire stack of covers is unlocked. The unlock covers may nest on top of each other in a stack that may be shear de-nested as described in related U.S. Provisional Patent Application # 60/655830.

[0045] Figure 13A is a partial side cross-section view similar to Figure 11A of the container 800 of Figure 8 having a second cover 1302 locked to the cover 802 of the base 804 of the container 800. Figure 13B is an outline view of the cross-section profile of Figure 13A schematically depicting the seal formed by the cover and the base and the locking engagement of the cover and the second cover. As shown in the Figures container 800 may be sealed by engaging cover 802 to the base 804 as

described above with reference to Figures 11A and 11B while at the same time a second cover 1302 is locking engaged with the cover 802 as described above with reference to Figures 12A-12C. The engagement portion of the second cover 1302 may engage with the engagement portion of yet a third cover, and so on, to form a locked stack of any number of covers above the base 804 of the container 800.

[0046] In the embodiment shown in Figures 8-13B, the engagement portion of the cover is formed above the first closure portion the cover around the entire perimeter edge of the cover. In other embodiments, the engagement portion of the cover is formed as one of more discrete segments above the first closure portion of the cover that cooperate with the first closure portion of a second cover.

[0047] The covers described above may be constructed with a wall thickness thinner than that of its base. The covers may be made from any suitable plastic and may be integrally made by any suitable technique, such as thermoforming. In one embodiment, the covers may be formed from polypropylene. Due to the thermoforming process, the wall thickness of the covers may vary. Thinner covers reduce material costs and increase flexibility to more easily accommodate their removal from, and engagement with, their bases. The covers may maintain adequate flexibility for proper sealing even during typical freezer temperatures.

[0048] The covers may be sufficiently flexible to allow a user to create a vacuum in containers upon sealing. In order to create a vacuum, the user could for example depress a cover during the closing of the container. A return force imparted upon the cover by the resiliency of the material of the cover will urge the cover to return to its normal position, thereby creating a vacuum.

[0049] The base may be integrally made from any suitable plastic with sufficient thickness to withstand without deforming the heat of microwave cooking and of top-shelf dishwashing. It should also remain sturdy during lifting while laden with hot food. The base may be made from any suitable plastic and may be made by any suitable technique, such as co-extrusion, lamination, injection molding, thermoforming, or overmolding. As is well known in the art, the same forming

process is typically used to form both the base and the cover of the container. In one embodiment, the base is formed from polypropylene. The wall thickness of the base may vary due to the manufacturing process.

[0050] Other embodiments of the engagement portion may include one or more of the following features to enable locking engagement: convex portions or ribs, concave portions or ribs, linear or curvilinear undercuts, discrete snap elements or buttons, interference fits, textured surfaces, or elements that modify surface friction or tackiness at or around the points of engagement.

[0051] In some embodiments, the force required to connect the covers may differ substantially from the force required to disengage the covers. For instance, it may be beneficial during manufacturing that the force needed to connect the covers is less than the force required to separate the covers. As a result, the covers are relatively easy to connect during manufacturing, yet they will lock securely and not undesirably separate during the manufacturing process. To accomplish this, the protrusions on the engagement portion may be designed where, for a given protrusion, the upper protrusion edge comprises a gradual taper whereas the lower protrusion edge comprises a more abrupt shape. For example, in one embodiment, the shape of the protrusion may be similar to a barbed hook with gradual taper on the upper edge of the barb that would impart little resistance during engagement and with an abrupt shape on the lower edge of the barb that would impart relatively high resistance during disengagement. Conversely, it may be beneficial to design the engagement portion so that the force that needs to be applied to connect the covers is more than the force required to separate the covers, since the user may perceive that a high connecting force equates to satisfactory locking integrity, whereas a weak connecting force may lead the user to perceive that the cover stack lacks the integrity required to insure the expected organizational benefit. Thus, the high connecting force provides the perceived benefit, yet a lower disengagement force does not require that the user untowardly struggle during separation of covers. To accomplish this, the protrusions on the engagement portion may be designed where, for a given protrusion, the upper protrusion edge comprises an abrupt shape whereas the lower protrusion edge comprises a more gradual taper. For example, in one embodiment, the shape of the

protrusion may be a reversed barb with an abrupt shape on the upper edge of the barb that would impart relatively high resistance during engagement and with a gradual taper on the lower edge of the barb that would impart little resistance during disengagement. Furthermore, during the process where the user applies force to aligned covers in a direction normal to the general cover plane so as to lock the covers together, the engagement portion may provide tactile or audible feedback upon locking. In this way, the user would sense that the covers are connected and that no further force need be applied.

[0052] In accordance with embodiments of the present invention, the container may be reusable, but it may also be constructed cheaply enough that consumers see it as a disposable item, with replacement covers and bases available separately for retail sale. The base and the cover may be fabricated by thermoforming a plastic such as clarified polypropylene homopolymer material. In another embodiment, the container may be fabricated by thermoforming a clarified random copolymer polypropylene material. Other plastic materials that would be suitable for fabricating the container by thermoforming include opposing PS (polystyrene), CPET (crystalline polyethylene terephthalate), APET (amorphous polyethylene terephthalate), HDPE (high density polyethylene), PVC (polyvinyl chloride), PC (polycarbonate), and foamed polypropylene. The material used may be generally transparent to allow a user to view the contents of the container.

[0053] The container may include a visual indication of closure between the cover and the base. The visual indication may be a color change in the area where the cover engages the base. In one embodiment, the first closure portion on the cover may be a first color and the second closure portion on the base may be a second color. When the closure portions are sealingly engaged, the first and second colors produce a third color which is visible to the user to indicate that the container is sealed.

[0054] The container may include a rough exterior surface to reduce slipping and to improve grasping by the user, especially if the user's hands are wet or greasy. In addition, the pinching bar may all have a rough exterior to aid in application of the pinching force supplied by a user to disengage locked covers.

[0055] The container may include a self-venting feature. The pressure in the sealed container may increase when the sealed container and contents are heated in a microwave oven. Thus, the cover may include a self-venting mechanism that opens when the pressure in the container exceeds a predetermined value.

[0056] The container may be divided to separate foods in the container. A divider may be integral with the container or may be a separate component. Either the base only may include a divider or both the base and the cover may each include a divider. The divider located in the cover may only partially engage the divider in the base so as to provide splash protection, or it may fully engage the divider in the base to provide varying degrees of inter-compartmental leak resistance.

[0057] The container may include a strip indicating the temperature of the container and its contents.

[0058] The gripping tab may include a relieved portion that provides less interference contact with the base during the removal or engagement of the cover while still providing an adequate first closure portion to maintain proper sealing of the container. The relieved portions of the gripping tab permit venting by allowing a portion of the cover to be unsealed from the base while still maintaining a seal around the remaining perimeter of the container. This feature is useful in microwave cooking where the cover prevents food from splattering onto the inside surface of the microwave while still allowing the container to vent. By using the gripping tab, less force is required to remove the cover from the base. This lower opening force also reduces the possibility of container failure from stress and fatigue. The lower opening force may improve the ability of the user to maintain control over the container components while removing the cover from the base and thus to reduce the possibility of spilling the contents stored in the container.

[0059] The use of the terms "a," "an," "the," and similar referents in the context of describing the invention (especially in the context of the following claims) are to be construed to cover both the singular and the plural, unless otherwise indicated herein or clearly contradicted by context. Recitation of ranges of values herein are merely

intended to serve as a shorthand method of referring individually to each separate value falling within the range, unless otherwise indicated herein, and each separate value is incorporated into the specification as if it were individually recited herein. All methods described herein may be performed in any suitable order unless otherwise indicated herein or otherwise clearly contradicted by context. The use of any and all examples, or exemplary language (e.g., "such as") provided herein, is intended merely to better illuminate the invention and does not pose a limitation on the scope of the invention unless otherwise indicated.

[0060] While the invention is described herein in connection with certain preferred embodiments, there is no intent to limit the present invention to those embodiments. On the contrary, it is recognized that various changes and modifications to the described embodiments will be apparent to those skilled in the art upon reading the foregoing description, and that such changes and modifications may be made without departing from the spirit and scope of the present invention. Skilled artisans may employ such variations as appropriate, and the invention may be practiced otherwise than as specifically described herein. Accordingly, the intent is to cover all alternatives, modifications, and equivalents included within the spirit and scope of the invention. Moreover, any combination of the above described elements in all possible variations thereof is encompassed by the invention unless otherwise indicated herein or otherwise clearly contradicted by context.

CLAIMS

1. A plastic container comprising:

a cover including a first closure portion at the outer peripheral edge of the cover and an engagement portion;

a base including a second closure portion;

wherein said first closure portion of said cover is sealingly engageable with said second closure portion of said base so that when said first closure portion and said second closure portion are sealingly engaged with each other, said cover and said base define a substantially sealed storage area, and;

wherein said engagement portion of said cover is lockingly engageable with a second cover.

2. The plastic container of claim 1 wherein said cover defines a gripping tab.

3. The plastic container of claim 2 wherein said gripping tab of said cover defines said engagement portion of said cover.

4. The plastic container of claim 1 wherein said engagement portion of said cover is a projection downwardly directed from the top of said cover, and;

wherein said projection is in the form of a hollow cup-like structure.

5. The plastic container of claim 4 wherein said projection comprises:

a male cap component, and;

a female well component.

6. The plastic container of claim 5 wherein said male cap component includes at least one undercut configured as a lengthwise bead along at least a part of the bottom edge of said male cap component.

7. The plastic container of claim 5 wherein said female well component includes at least one lead-in configured as an indentation along at least a portion of the top edge of said female well component.

8. The plastic container of claim 1 wherein said plastic container comprises at least one additional engagement portion.

9. The plastic container of claim 1 wherein said plastic container comprises thermoformed plastic material.

10. The plastic container of claim 9 wherein said plastic material is selected from the group consisting of PS (polystyrene), CPET (crystalline polyethylene terephthalate), APET (amorphous polyethylene terephthalate), HDPE (high density polyethylene), PVC (polyvinyl chloride), PC (polycarbonate), polypropylene, and foamed polypropylene.

11. The plastic container of claim 1 wherein said engagement portion of said cover is integral with said first closure portion of said cover.

12. The plastic container of claim 11 wherein said engagement portion of said cover is configured as a locking lug.

13. The plastic container of claim 11 wherein said engagement portion is formed around the entire perimeter edge of the cover.

14. The plastic container of claim 11 wherein said engagement portion is formed in discrete segments around the perimeter edge of the cover.

15. A cover for a plastic container comprising:

a first closure portion at the outer peripheral edge of said cover, wherein said first closure portion of said cover is sealingly engageable with a second closure portion of a base so that when said first closure portion and said second closure

portion are sealingly engaged with each other, said cover and said base define a substantially sealed storage area, and

an engagement portion wherein said engagement portion of said cover is lockingly engageable with a second cover.

16. The cover of claim 15 wherein said cover defines a gripping tab.

17. The cover of claim 16 wherein said gripping tab of said cover defines said engagement portion of said cover.

18. The cover of claim 15 wherein said engagement portion of said cover is a projection downwardly directed from the top of said cover, and;

wherein said projection is in the form of a hollow cup-like structure.

19. The cover of claim 15 wherein said engagement portion of said cover is integral with said first closure portion of said cover.

20. The cover of claim 15 comprising thermoformed plastic material selected from the group consisting of PS (polystyrene), CPET (crystalline polyethylene terephthalate), APET (amorphous polyethylene terephthalate), HDPE (high density polyethylene), PVC (polyvinyl chloride), PC (polycarbonate), polypropylene, and foamed polypropylene.

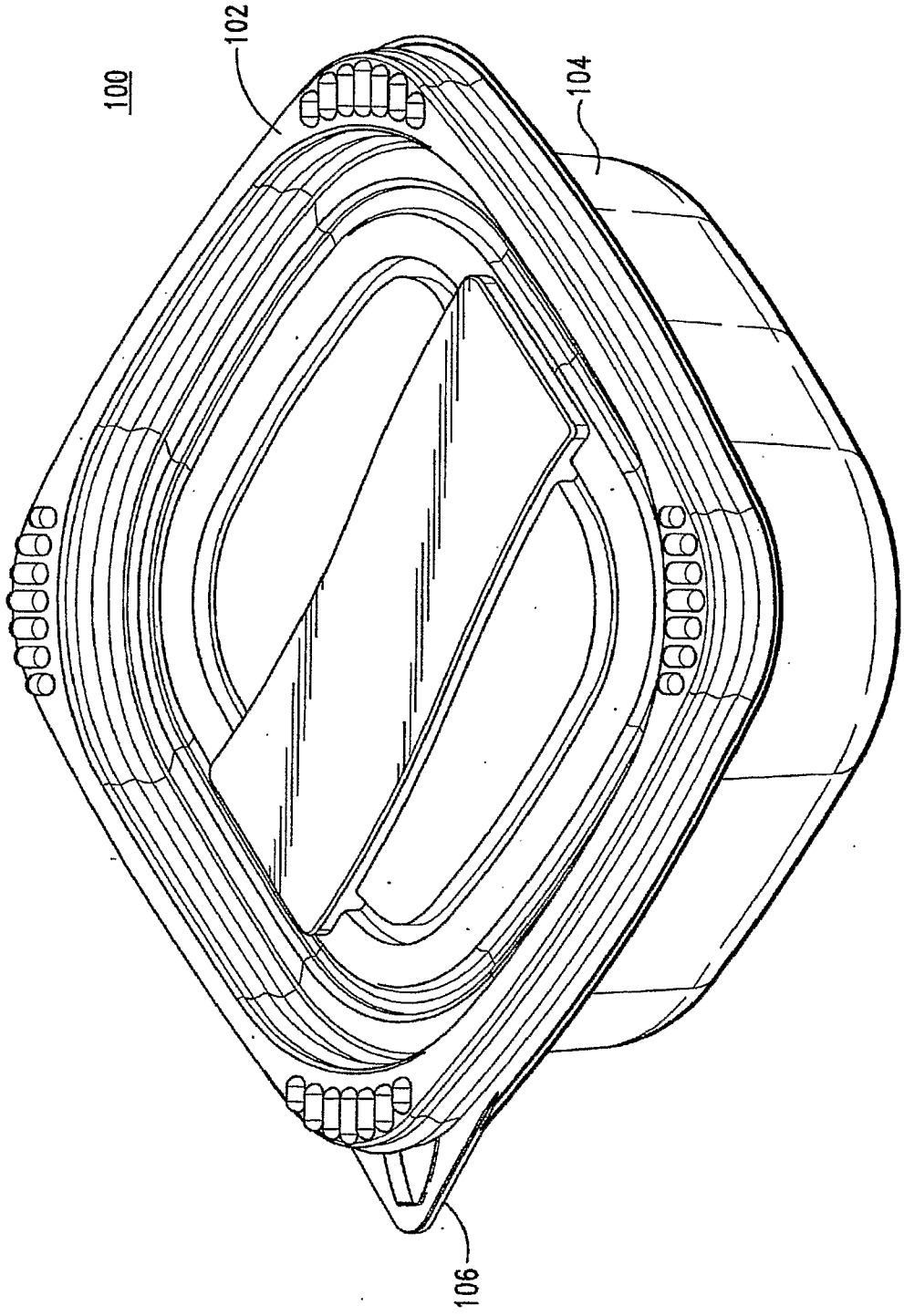

FIG. – 1

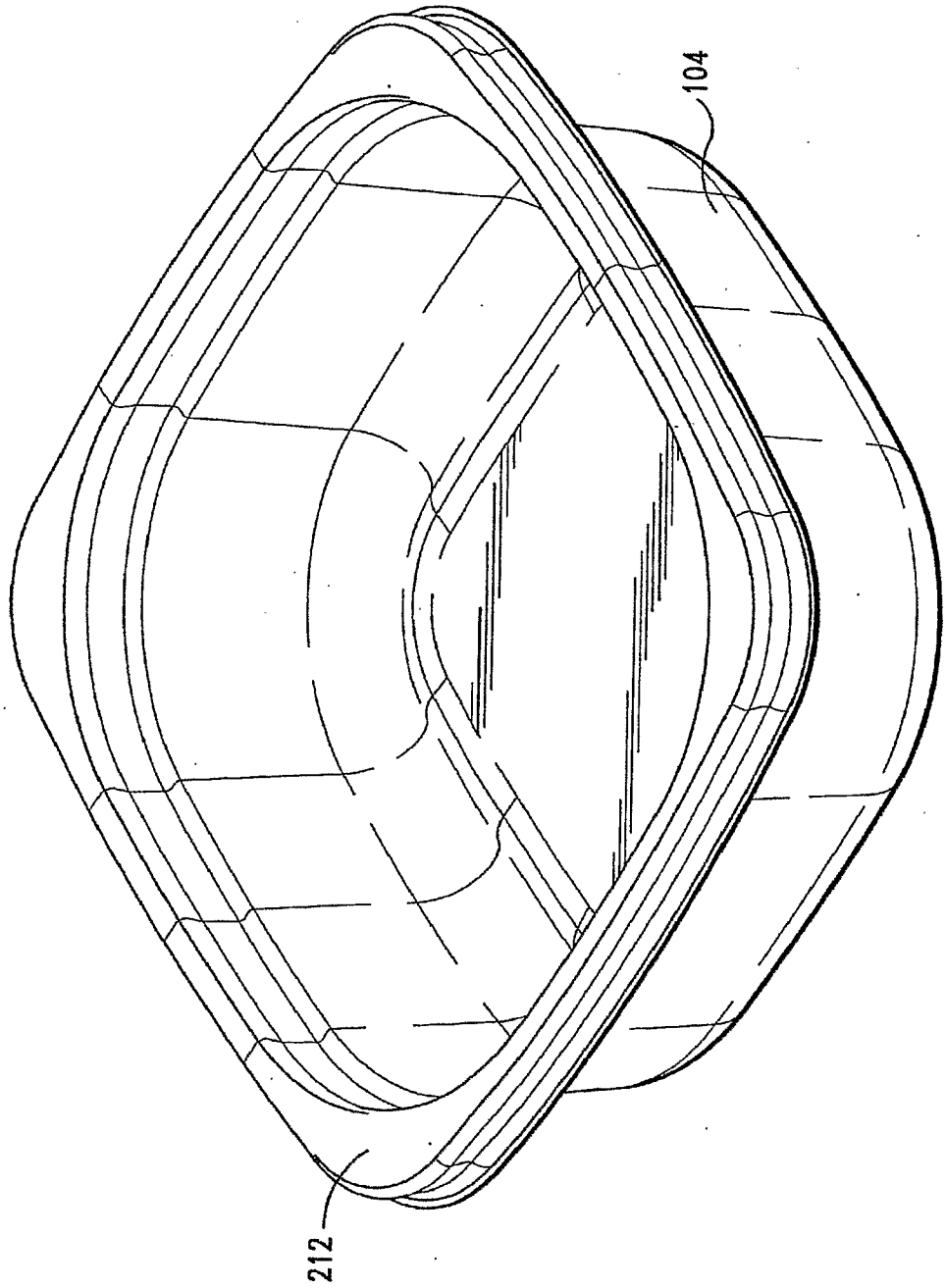

FIG.-2

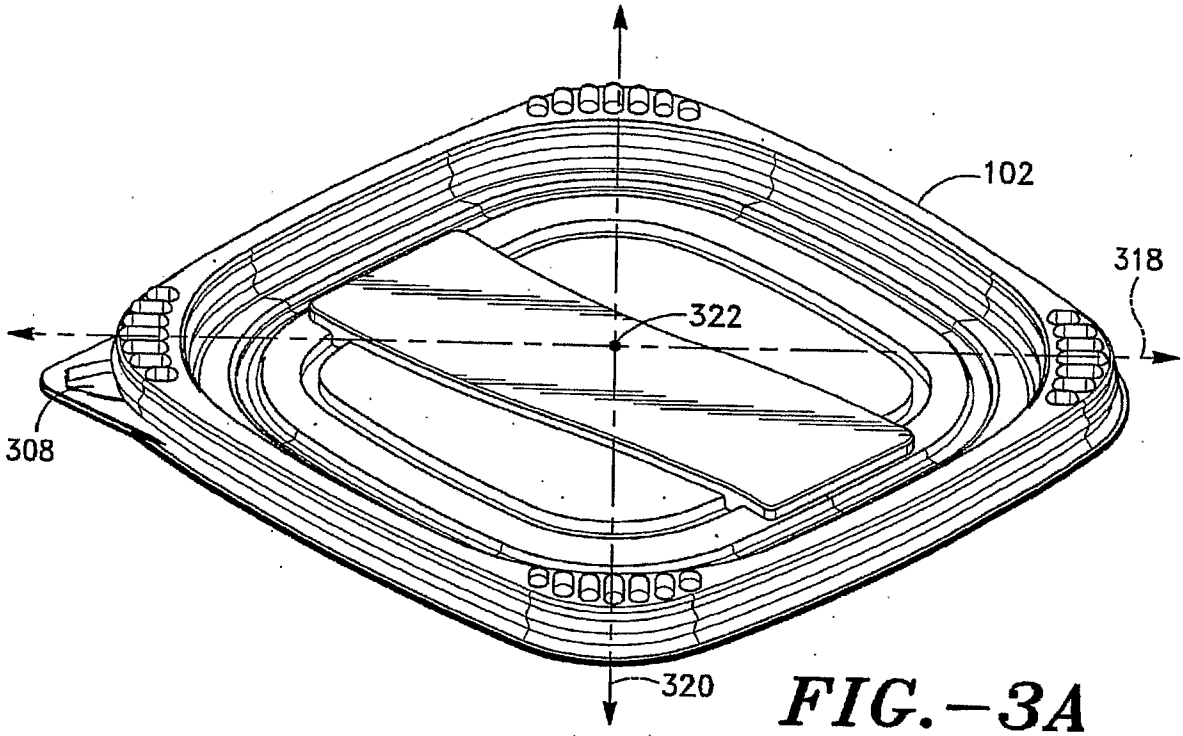

FIG.–3A

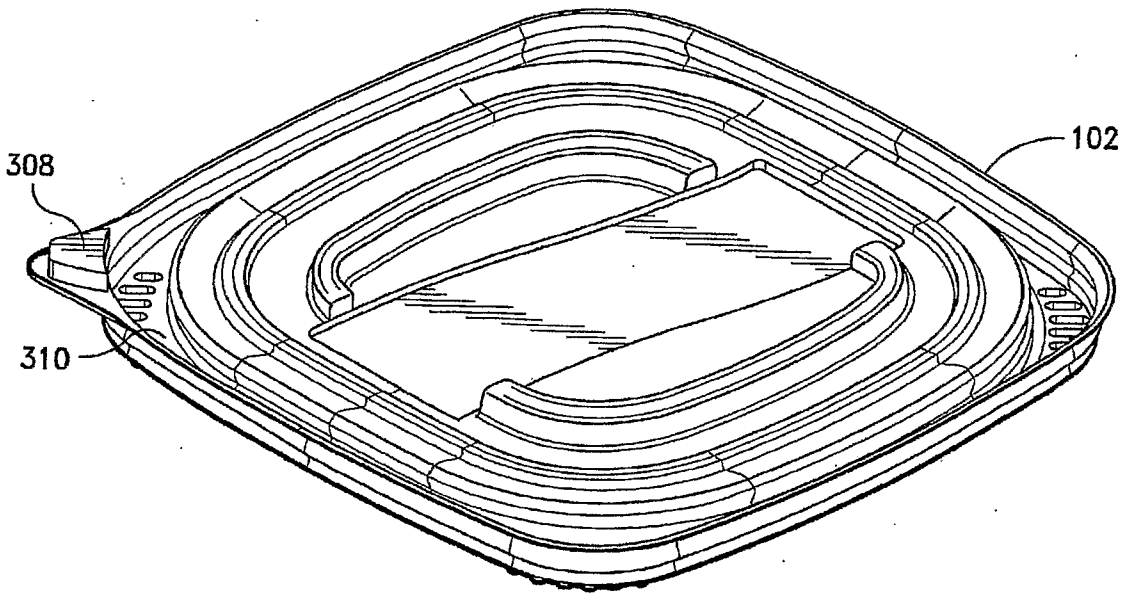

FIG.–3B

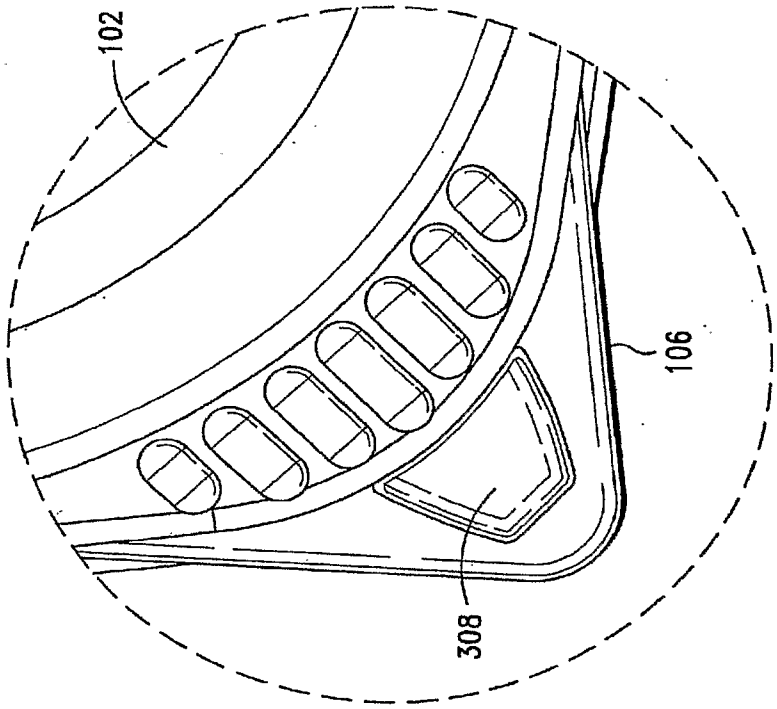

FIG.-4B

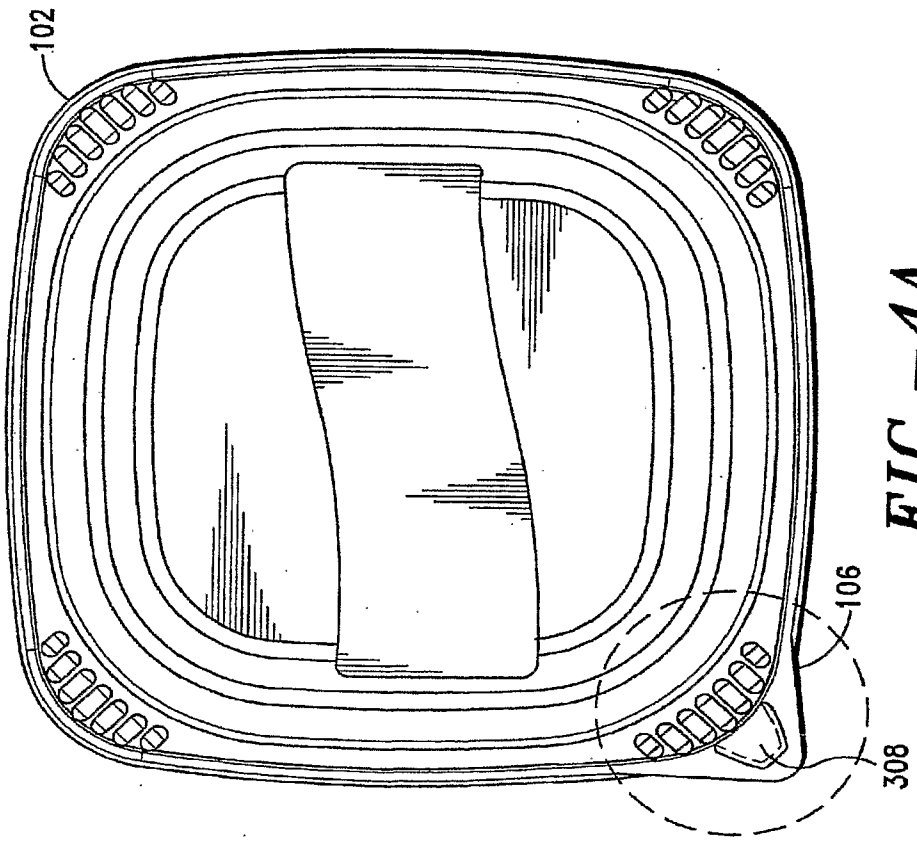

FIG.-4A

FIG.-4C

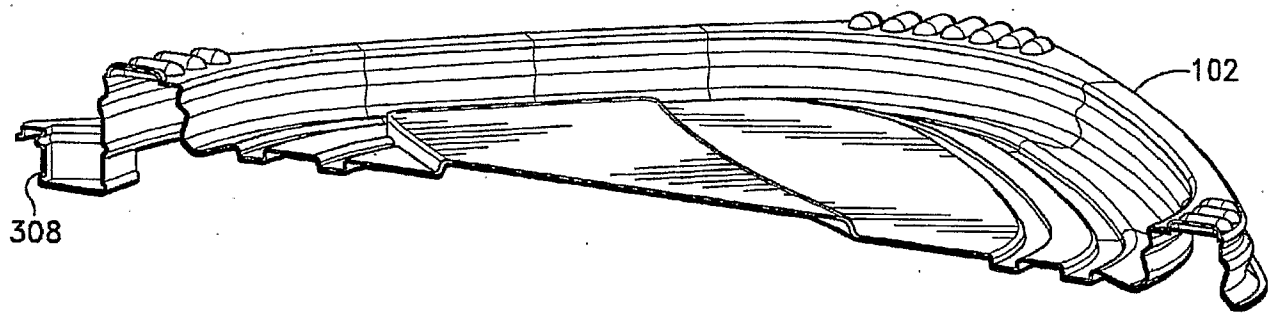

FIG.–5A

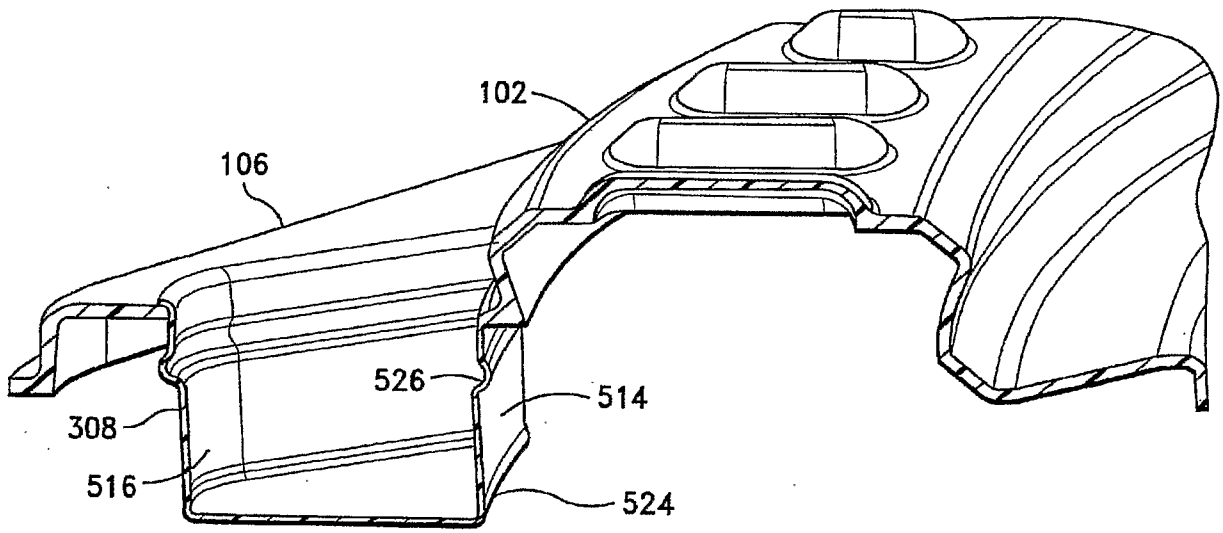

FIG.–5B

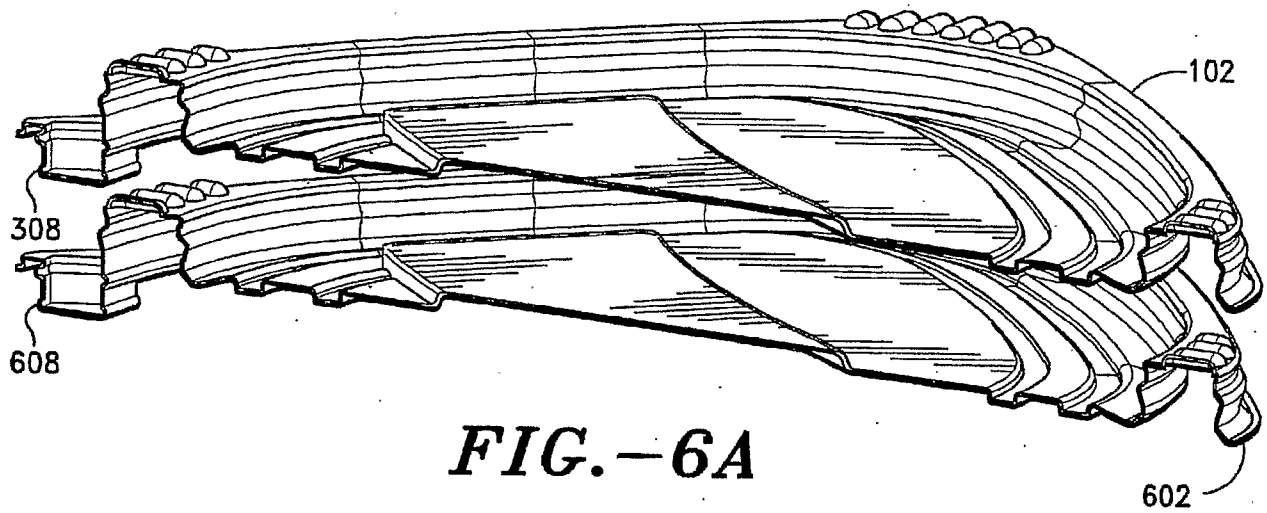

FIG.–6A

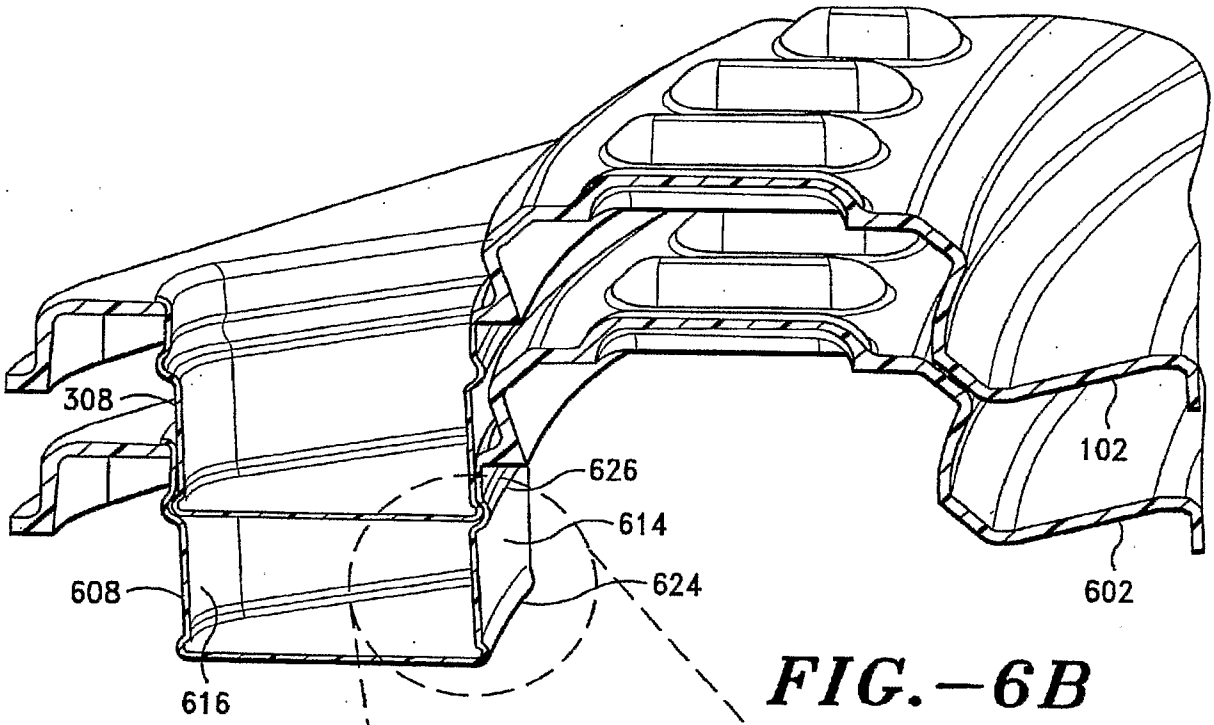

FIG.–6B

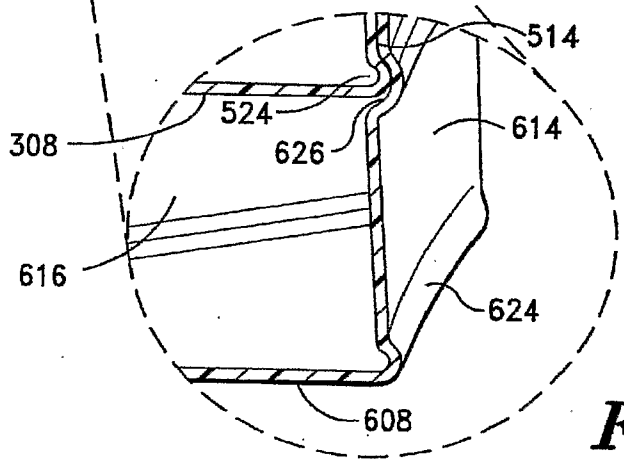

FIG.–6C

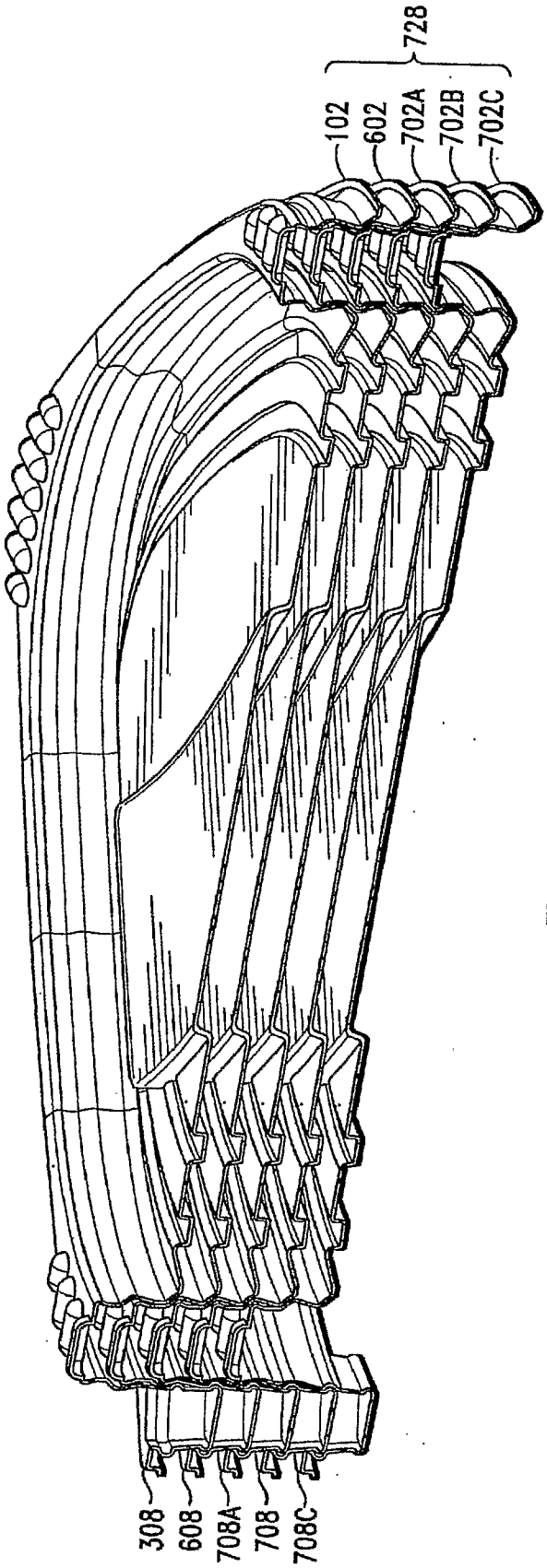

FIG.-7

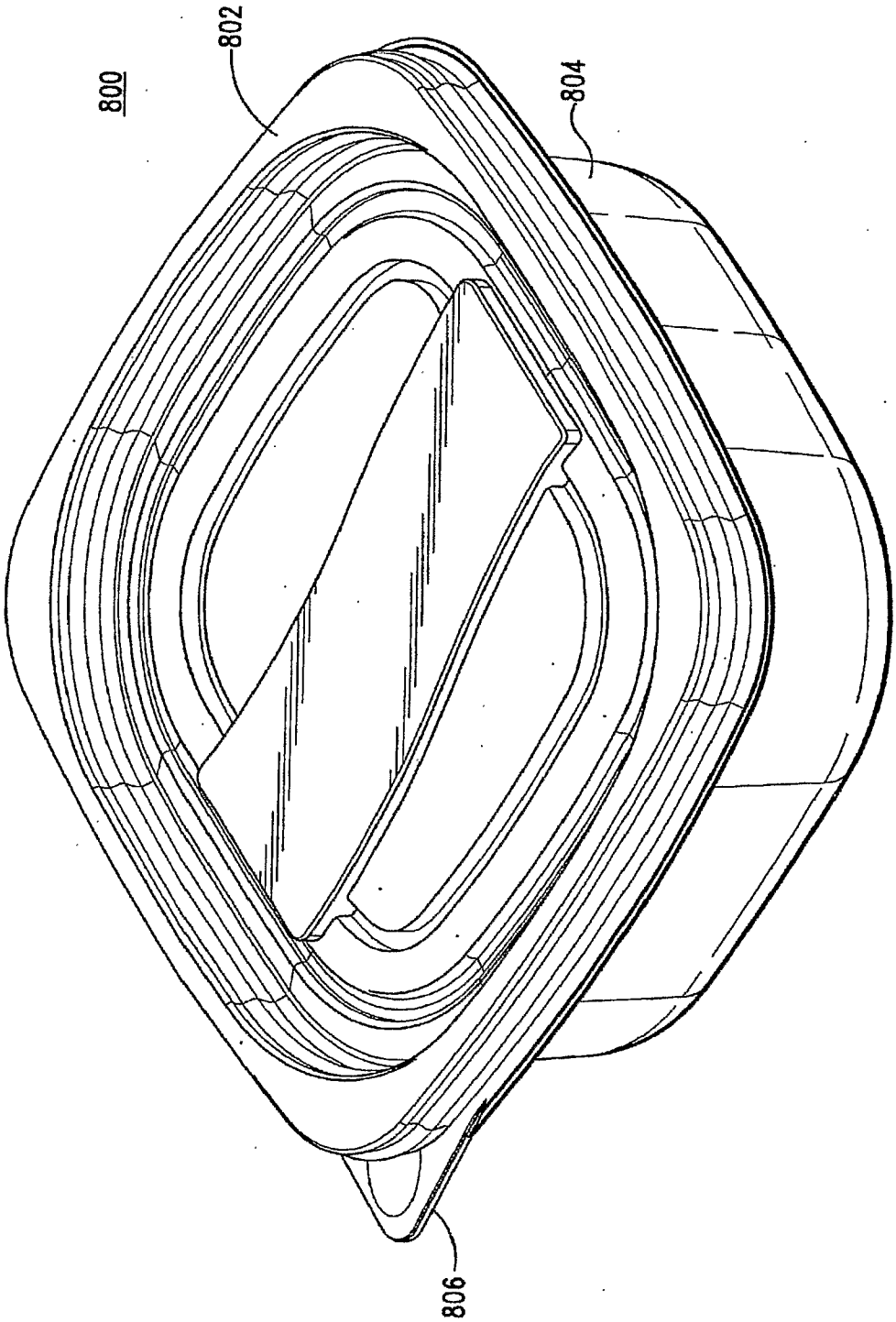

FIG.-8

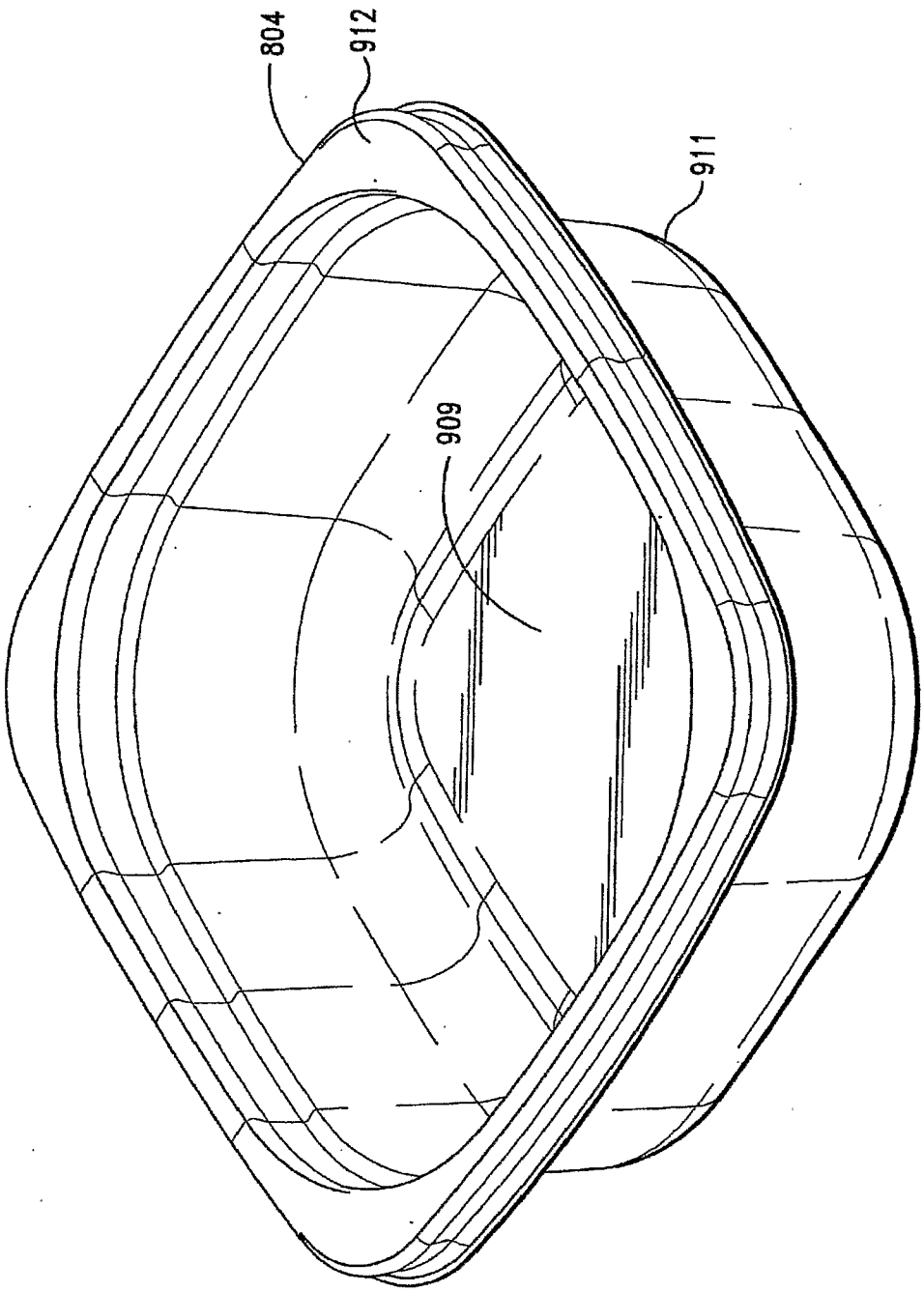

FIG.—9

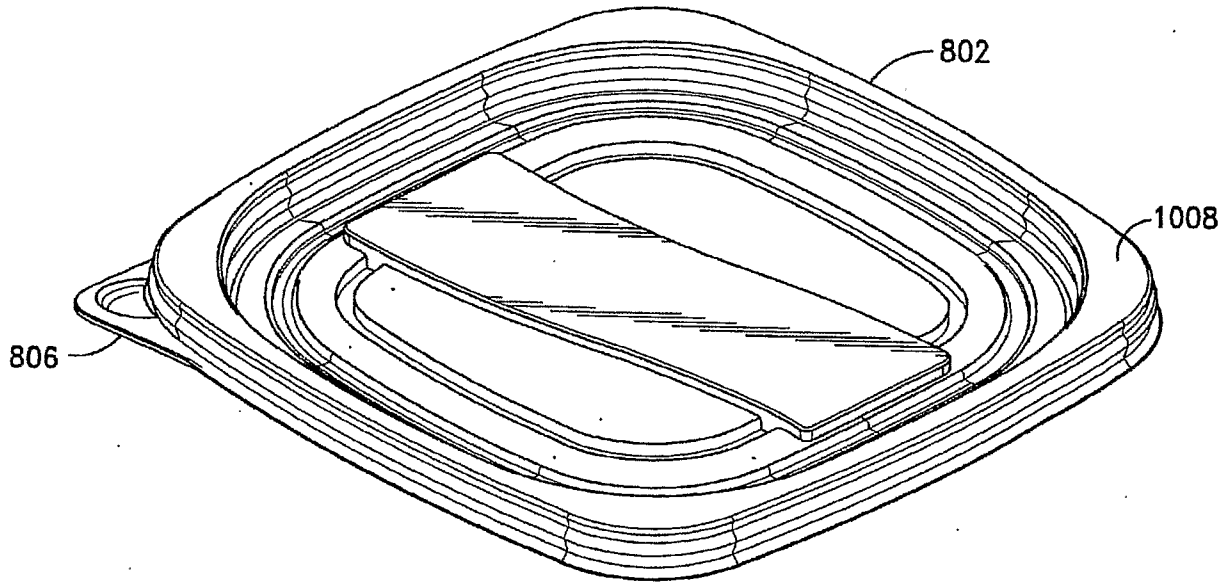

FIG.–10A

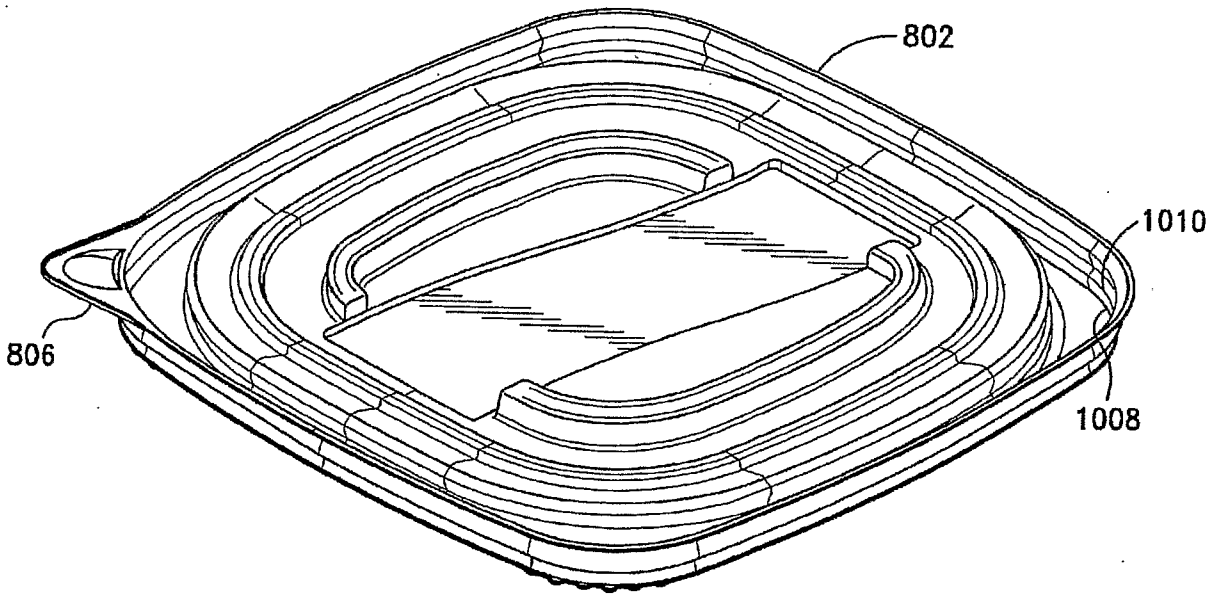

FIG.–10B

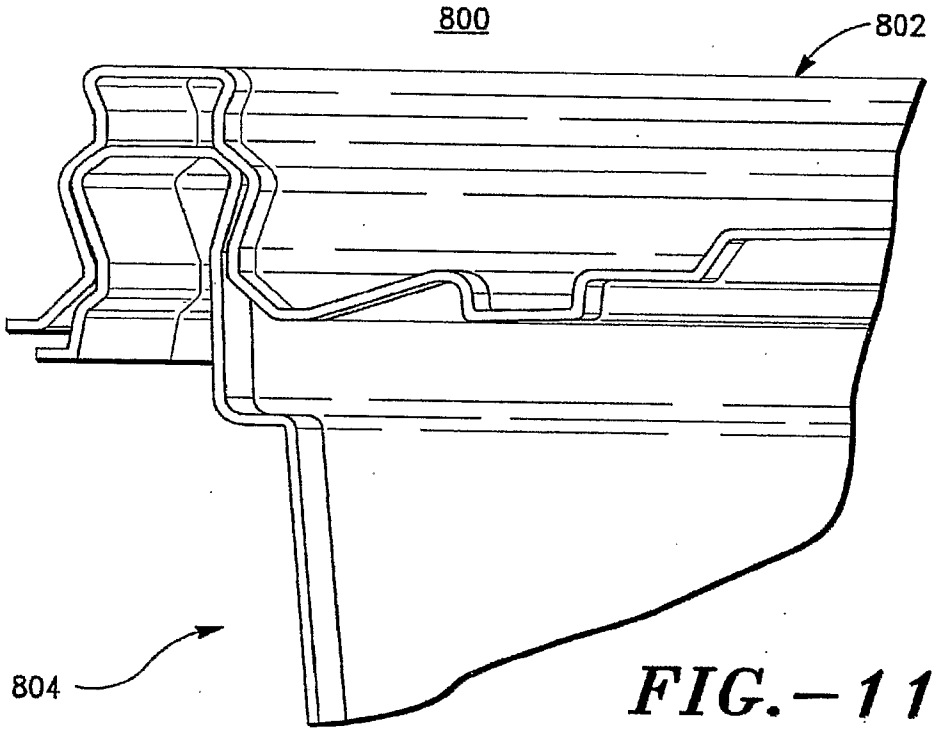

FIG.–11A

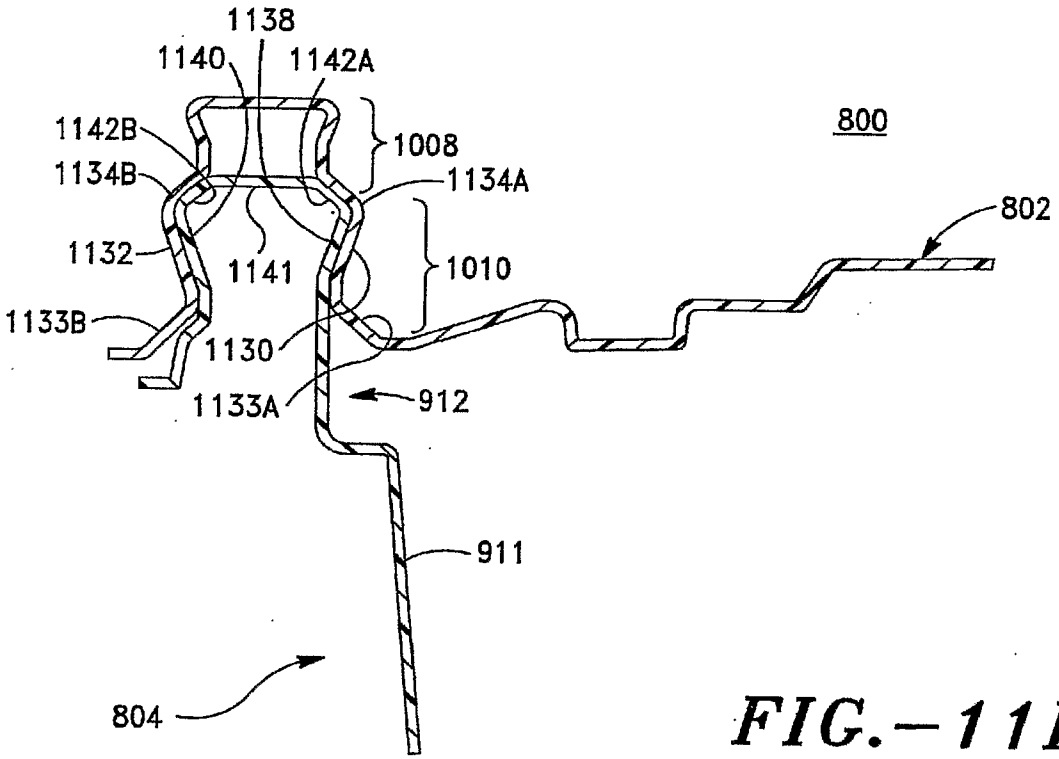

FIG.–11B

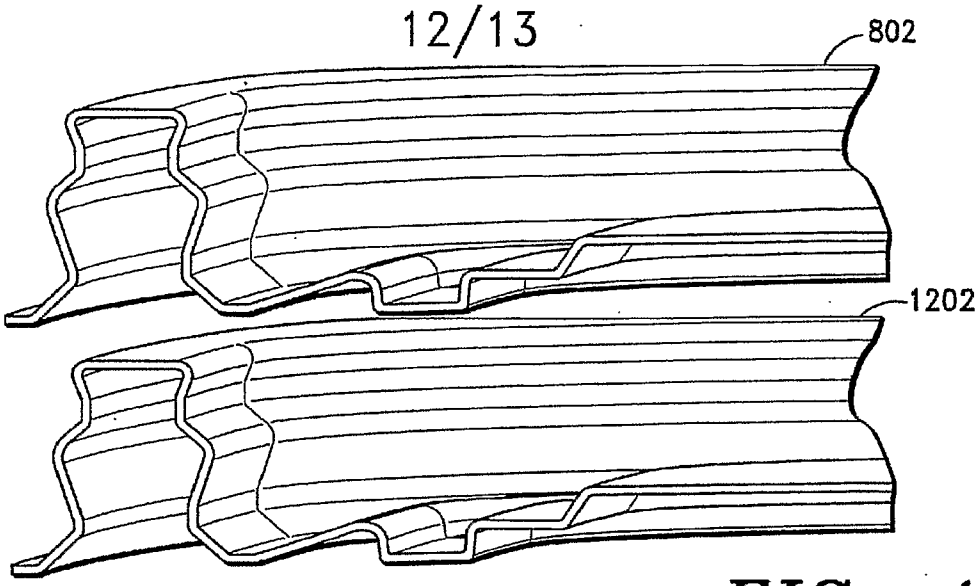

FIG.—12A

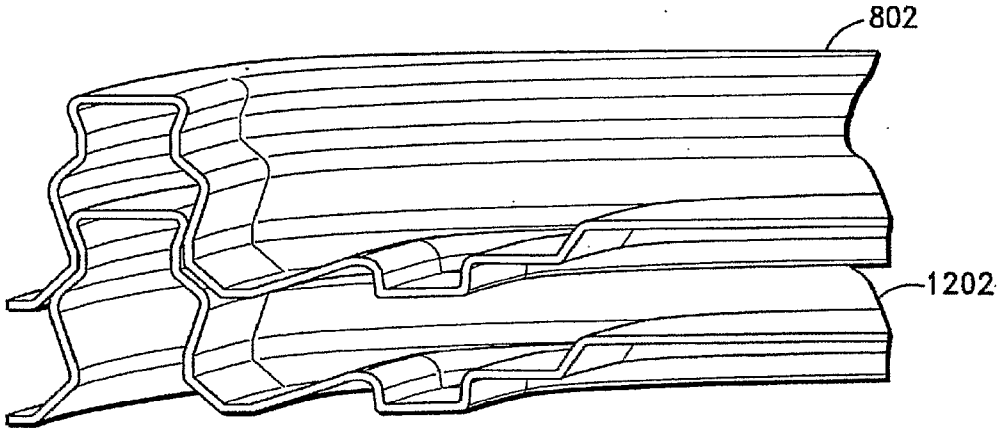

FIG.—12B

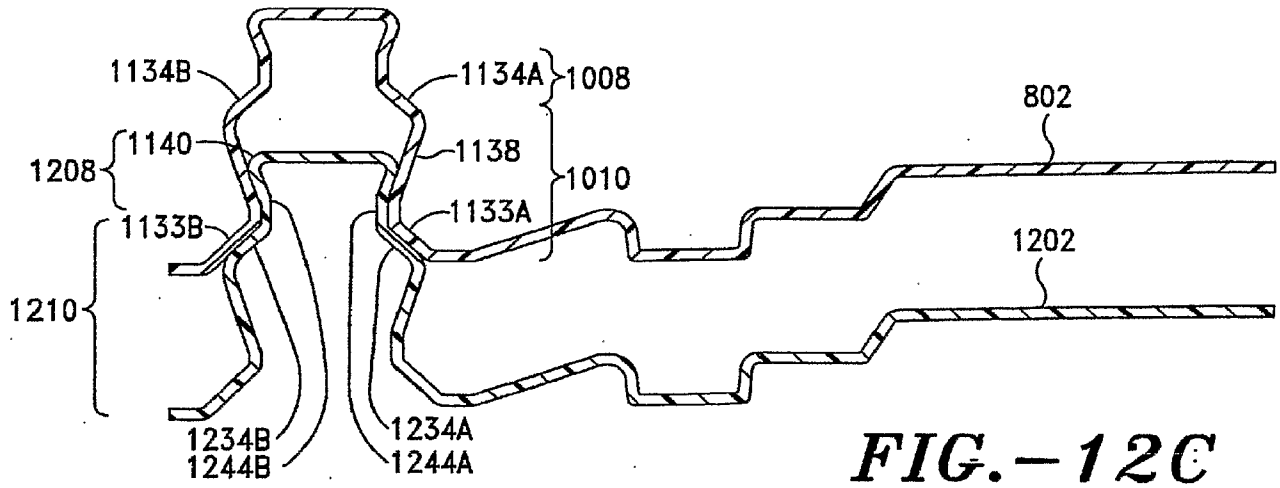

FIG.—12C

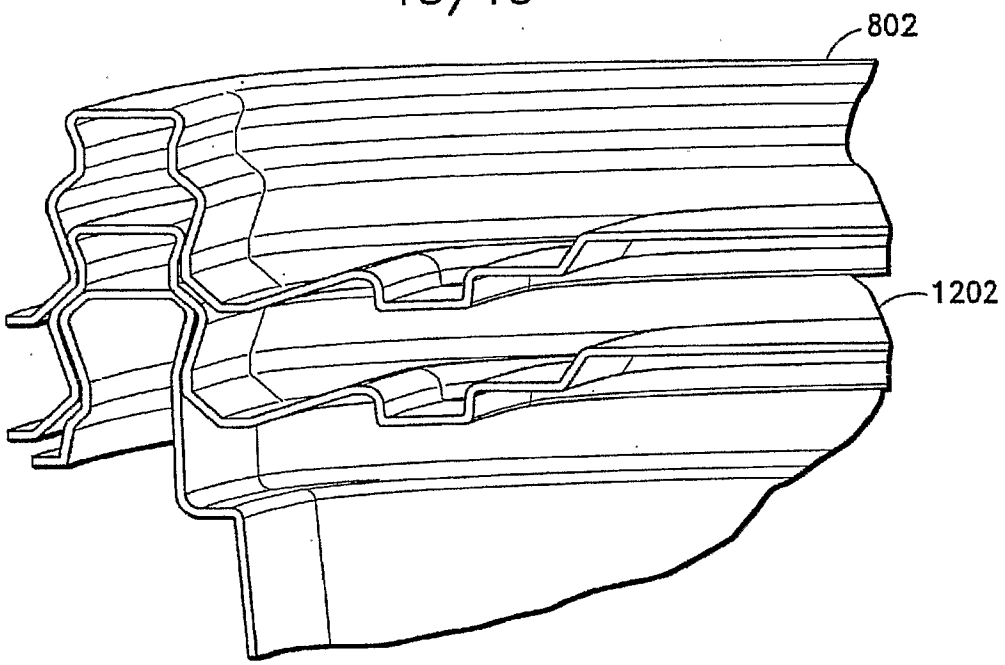

FIG.—13A

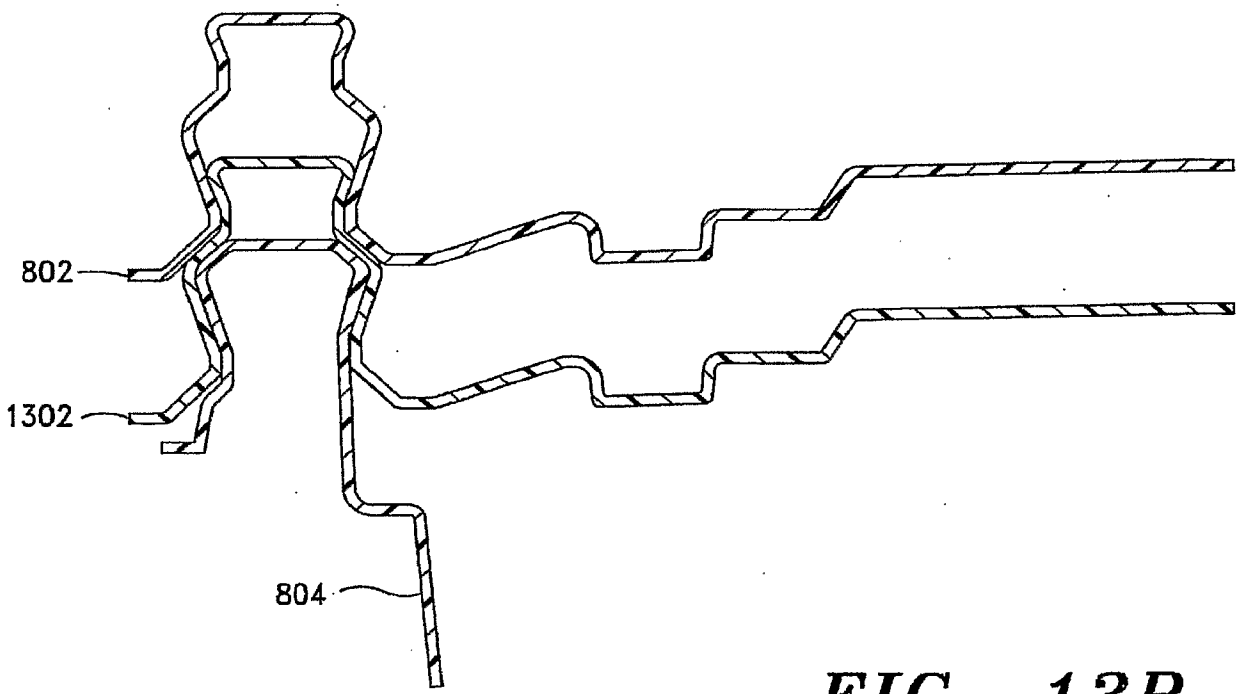

FIG.—13B