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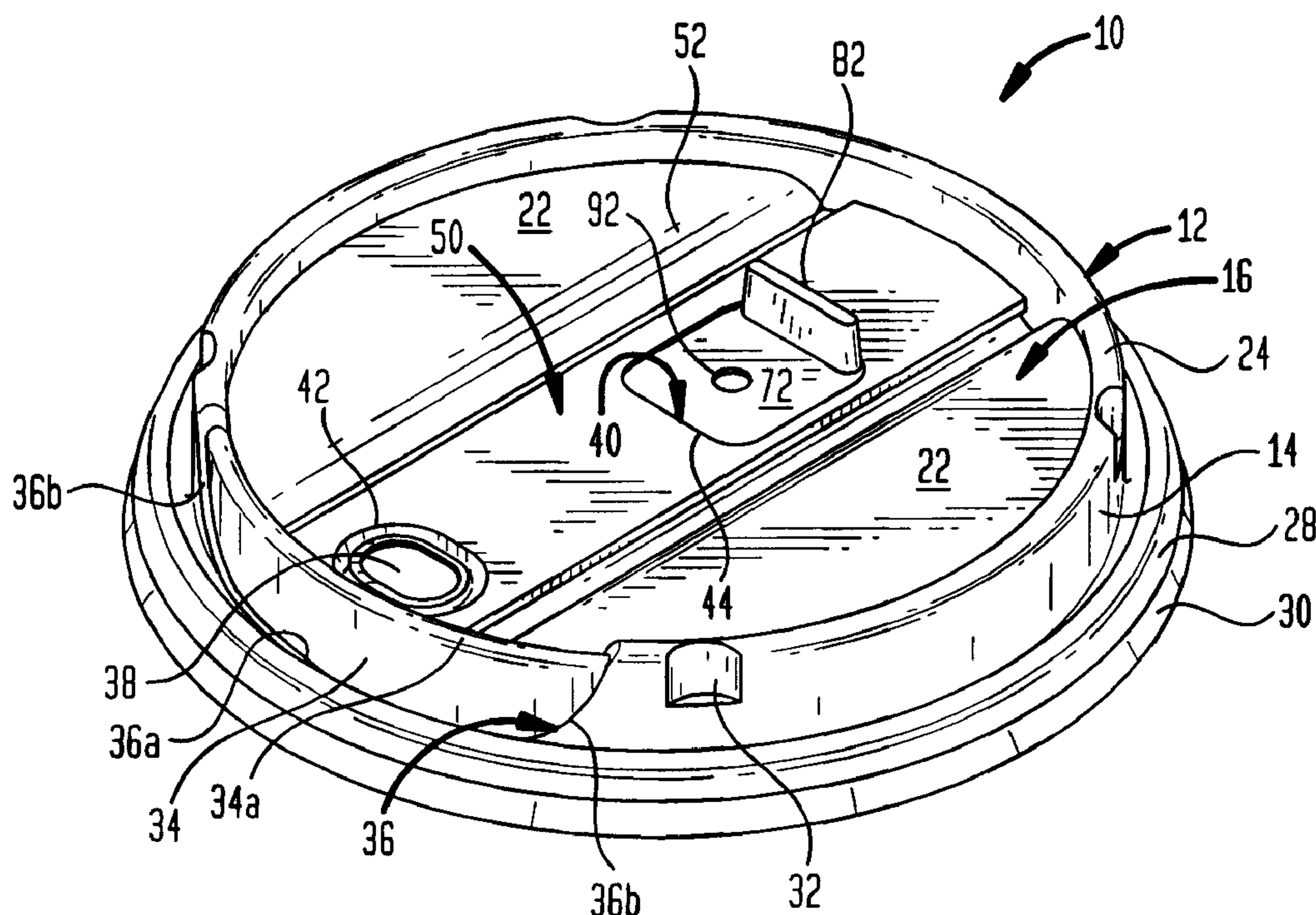
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(54) Title: RECLOSABLE CUP LID



(57) **Abrégé/Abstract:**

A reclosable cup lid thermoformed from a polymeric material includes a domed member and an elongate closure panel. The thermoformed domed member is provided with a sidewall and a top wall, the top wall having upper and lower surfaces and a drinking aperture at a periphery of the top wall. The top wall further defines a pair of slide tracks depending from the lower surface of the top wall and also defines a post aperture disposed inwardly with respect to the drinking aperture. The elongate closure panel has opposed engagement edges, an upper surface provided with a post projecting upwardly therefrom, and a drinking aperture sealing area. As assembled, the domed member and elongate closure panel are configured such that the opposed engagement edges of the elongate closure panel are slidingly mounted in the slide tracks for generally radial displacement.

ABSTRACT

A reclosable cup lid thermoformed from a polymeric material includes a domed member and an elongate closure panel. The thermoformed domed member is provided with a sidewall and a top wall, the top wall having upper and lower surfaces and a drinking aperture at a periphery of the top wall. The top wall further defines a pair of slide tracks depending from the lower surface of the top wall and also defines a post aperture disposed inwardly with respect to the drinking aperture. The elongate closure panel has opposed engagement edges, an upper surface provided with a post projecting upwardly therefrom, and a drinking aperture sealing area. As assembled, the domed member and elongate closure panel are configured such that the opposed engagement edges of the elongate closure panel are slidingly mounted in the slide tracks for generally radial displacement.

RECLOSABLE CUP LID

Priority Claim

This application claims priority to U.S. Provisional Application Serial No. 60/617,123, filed October 8, 2004, which application is incorporated herein in its
5 entirety by this reference.

Technical Field

The present invention relates generally to cup lids and, more particularly, to a dome-type cup disposable lid with a drinking aperture and an undermounted
10 elongate closure panel displaceable along a generally radial direction between an open position wherein the aperture communicates with the interior of the dome and a closed position where the closure panel covers the aperture to reduce or substantially prevent spillage.

Background

Substantial variations are known in the configuration of reclosable lids in general as evidenced by the following: United States Patent No. 581,293 entitled "Can Cover or the Like" of *C.H. Leggett*; United States Patent No. 949,974 entitled "Closure for Cans" of *G.A. Cibulka*; United States Patent No. 1,433,544
20 entitled "Sifter Can" of *J.C. Gibbs*; United States Patent No. 1,765,284 entitled "Ink Well Closure" of *L.B. Pronsnitz*; United States Patent No. 1,888,363 entitled "Inkwell" of *C.E. Tannewitz*; United States Patent No. 2,492,846 entitled "Dispensing Container with Slide Closure" of *J. Coyle et al.*; United States Patent No. 4,170,724 entitled "Vendable Reclosable Beverage Container" of *Waterbury*;
25 United States Patent No. 4,201,320 entitled "Measuring Dispenser" of *Eppenbach*; United States Patent No. 4,434,906 entitled "Container Having Resealable Opening Means" of *Florczyk et al.*; United States Patent No. 5,025,945 entitled "Beverage Container" of *Lyon*; United States Patent No. 5,086,941 entitled "Dispenser Closure Assembly" of *English et al.*; United States Patent No.
30 5,462,189 entitled "Resealable, Refillable Container System" of *Pierce*; United

States Patent No. 6,354,454 entitled "Bottle Cap" of *Wong*; and United States Patent No. 6,439,442 entitled "Lid With a Slidable Dispensing Spout" of *Markert et al.* The disclosures of these aforementioned references are incorporated herein in their entireties by this reference.

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Reclosable beverage lids or containers are seen in United States Patent No. 4,749,099 entitled "Drink Preserver" of *Davis et al.*; United States Patent No. 5,470,817 entitled "Slidable Reclosable Plastic Lid" of *Hambleton et al.*; and United States Patent No. 4,127,212 entitled "Vendable Reclosable Beverage Container" of *Waterbury*, each of which is incorporated herein in its entirety by this reference. In *Davis et al.*, a push-in tab is interconnected to a slide panel within a track formed in the metal top of the container. The push-in tab operates to tear a scored portion down into the top for exposing an opening whereby the slide panel can be moved over the opening to protect unused contents within the container. In *Hambleton et al.*, a plastic container lid includes a main lid member and a slide member. The main lid member has supporting guideways between which the slide member is situated, and the guideways are angled relative to the plane of the main lid member so as to hold the slide member on the lid. An aperture is provided in the main lid and the slide member may cover the aperture. The slide member also includes a finger engageable portion. *Waterbury* is directed to a reclosable beverage container and provides a slidable cap mounted on an upper end of the container for movement over an opening in the lid. The cap cannot be removed from the lid.

25 The foregoing items are not generally suitable for the disposable lid/cup market where cost, storage, ease of manufacture and so forth are paramount.

With respect to disposable cup lids, closure panels have commonly been incorporated into the upper wall of a plastic lid, defined by scores such that the closure panel is ripped away from the adjacent parts of the cover along the scores and then folded back to open the drinking aperture of the lid; optionally secured in

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its open position to an upwardly projecting boss; and refolded to the brim to close the lid. These lids can be difficult to operate properly and often allow substantial spillage (especially troublesome with hot beverages) but have nevertheless enjoyed substantial commercial success, because, in part, they satisfy the
5 demanding cost criteria of the disposable products market.

Dome cup lids, though not reclosable, have displaced flatter lids with folding type closure panels to a substantial degree because they are preferred by consumers and inherently control some spillage due to the fact that they add
10 “splash height” to the cup above a contained beverage. Such lids as are generally known in the art include a dome shape formed from a thermoplastic polymeric material and have an opening for consuming a beverage when the lid is applied to a cup. Various shapes are provided to the lid and the openings and closures formed therein.

15 A reclosable dome lid is seen in United States Patent No. 6,732,875 entitled “Reclosable Container Lid” of *Smith et al.* and United States Design Patent No. D489,260 entitled “Reclosable Container Lid” of *Smith et al.*, each of which is incorporated herein in its entirety by this reference. The lid includes a
20 cover member and a rotatable disk member mounted in the cover of the lid. A post is located at a periphery of the lid to rotate the disk between open and closed positions beneath the drinking aperture. It is apparently necessary to incorporate features such as drain holes and the like due to the disk/lid geometry and the lid/disk combination appears to require redundant construction of the cover, that
25 is, two layers over the whole top wall. Moreover, the cover features proposed prevent efficient nesting, increasing storage, packaging and transportation costs. The disclosed embodiments furthermore likely prevent stacking in a cup on lid arrangement when multiple beverages are purchased by a consumer; a drawback which might negate spillage gains by closing the drinking aperture.

Despite numerous options, existing and proposed disposable lids have one or more of the following drawbacks: difficulty of operation and ineffective resealing; ineffective spillage control; high material costs; inordinate storage, packaging and shipping costs; inability to stack in a cup on lid arrangement and so forth. By way of the present invention, such deficiencies in the art are overcome and there is provided a reclosable lid which is durable yet disposable, easy to use, stackable, effective for splash and spill prevention, easily manufactured out of a thermoplastic material with existing machinery, and low in cost.

10 Summary of Invention

The invention provides a disposable, reclosable cup lid thermoformed from a polymeric material and includes a domed member and an elongate closure panel. The thermoformed domed member can be provided with a sidewall and a top wall, a top wall having upper and lower surfaces and a drinking aperture at a periphery of the top wall. The top wall can further define a pair of slide tracks depending from the lower surface of the top wall and also define a post aperture disposed inwardly with respect to the drinking aperture. The elongate closure panel can have opposed engagement edges, an upper surface provided with a post projecting upwardly therefrom, and a drinking aperture sealing area. As assembled, the domed member and elongate closure panel can be configured such that the opposed engagement edges of the elongate closure panel are slidingly mounted in the slide tracks for generally radial displacement. In use, the cup lids are stackable so as to minimize space requirements.

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Still other features and advantages of the present invention will become apparent from the discussion and drawings which follow.

Brief Description of Drawings

30 The invention is described in detail below in connection with the appended drawings wherein like numerals designate like parts and wherein:

Figure 1 is a perspective view of a two-piece reclosable beverage lid for a cup according to the present invention, wherein the closure panel is in an open position;

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Figure 2 is a top view of the lid shown in **Figure 1** with the closure panel in an open position panel;

Figure 3 is a top view of the lid shown in **Figure 1** with the closure panel in a closed position;

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Figure 4 is a bottom perspective view showing additional detail of the lid shown in **Figure 1**;

Figure 5A is a cross-sectional view of the inventive lid taken along line 5-5 in **Figure 2** illustrating an interconnection of the domed member with the elongate closure panel and a cup stacked on the lid;

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Figure 5B is an enlarged detail of the interconnection of the domed member with the elongate closure panel of **Figure 5A**;

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Figure 6A is an end view of the elongate closure panel;

Figure 6B is an enlarged detail of an edge of the elongate closure panel as represented in **Figure 6A**;

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Figure 6C is a view in section along the centerline of the closure panel showing the profile of the post and sealing groove;

Figure 7 is an enlarged partial sectional view illustrating detail of the slide tracks and elongate closure panel of the inventive lid;

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Figure 7A is a detail showing the profile of a slide track;

Figure 8 is a view in partial section showing the sealing ridge around the
5 drinking aperture;

Figure 9 is a side sectional view illustrating cup on lid stacking according to the present invention as well as the profile of the lid along line 9-9 of **Figure 2**;

10 **Figure 10** is a partial sectional view of an alternative interconnection of a dome and elongate closure panel wherein the closure panel is essentially planar except for the post;

Figure 11 is a side view showing lid-on-lid nested stacking according to
15 the present invention;

Figure 12 is a bottom view showing an alternate embodiment of the lid of the invention, wherein the dome has a pair of scalloped slide tracks;

20 **Figure 13** is a profile of a slide track of **Figure 12** at maximum inward projection;

Figure 14 is a view in perspective of an alternate configuration of the slide panel of the inventive lid having beveled corners;

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Figure 15 is a partial profile of the closure panel of **Figure 14**;

Figure 16 is a view in perspective of yet another slide panel used in connection with the lid of the present invention, wherein the slide panel has a
30 generally chamfered shape; and

Figure 17 is a partial end view of the closure panel of **Figure 15**.

Detailed Description

5 The invention is described in detail below for purposes of exemplification and illustration only. Modifications within the spirit and scope of the present invention, set forth in the appended claims, will be readily apparent to those of skill in the art. As used herein, terminology is given its ordinary meaning unless a more specific definition is given or the context indicates otherwise.

10 “Aspect ratio” refers to a ratio of an object length to an object width, for example a length of the elongate closure panel to a width of the same elongate closure panel.

15 “Generally radially” refers to a direction substantially parallel to or substantially along a diameter of the article.

“Modified S shape” refers to those profiles similar to an S shape, such as in the shape of a “5”, such as in Figure 7A.

20 “S-shaped profile” refers to a substantially S-shaped profile configuration as shown in the drawings, such as in Figures 5A and 5B, element 176. An S-shaped profile, whether modified or otherwise, is to be distinguished from the C-shaped profile disclosed in U.S. Patent No. 6,824,003, which disclosure is incorporated herein in its entirety by this reference.

25 “Undercut depth” refers to the distance that a recess extends laterally under (or over) a laterally projecting portion of the same thermoformed feature to define a lateral groove in the part. Undercuts are characterized by so-called “negative draft” discussed below. A part or feature has a positive draft if it is not
30 undercut. When used in connection with undercuts of varying depth such as a

scalloped undercut, undercut depth refers to undercut depth at the maximum lateral depth of the undercut.

“Scalloped orientation” means in the form of a continuous series or
5 circular elements or angular projections forming a border. A non-limiting example of a scalloped orientation is shown in Figure 12, element 158.

“Disposable” means that the object is intended to be disposed of after one or, at most, a few uses.

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“Substantially seals” means that there is no or substantially no spillage from the elongate closure panel in the closed position.

In one form, the invention provides a reclosable and disposable lid for a
15 cup, the lid being made from polymeric material and including: a) a thermoformed domed member provided with a sidewall and a top wall, the top wall having upper and lower surfaces and a drinking aperture at a periphery of the top wall, the top wall further defining a pair of slide tracks depending from the inside of the top wall, the top wall also defining a post aperture disposed inwardly with respect to
20 the drinking aperture; b) a thermoformed elongate closure panel having opposed engagement edges along its length, an upper surface provided with a post projecting upwardly therefrom, and a drinking aperture sealing area; c) the domed member and elongate closure panel being configured such that the opposed engagement edges of the elongate closure panel may be slidingly mounted in the
25 slide tracks on the underside of the top wall to reclosably seal the drinking aperture; wherein the post projects upwardly through the post aperture in the top wall, the elongate closure panel being further characterized in that the post is displaceable in a generally radial direction in the slide tracks to move between a sealing position wherein the sealing area of the closure member seals the drinking
30 aperture and an open position wherein the drinking aperture is in communication with the interior of the domed member, provided further that the closure member

substantially seals the post aperture when it is in the sealing position. The slide tracks can substantially span the top wall of the domed member and define generally parallel undercut grooves between lower portions of the slide tracks and the lower surface of the top wall. In a suitable form, the grooves can be
5 configured in a scalloped orientation along a longitudinal direction to define grooves of variable undercut depth.

In a further form, the elongate closure panel can be substantially planar and the opposed engagement edges of the elongate closure panel can be of
10 substantially the same thickness as the elongate closure panel and engage with the generally parallel undercut grooves of the slide tracks. In a still further form, the opposed engagement edges of the elongate closure panel are provided with thermoformed rims having a profile shaped to engage with the generally parallel undercut grooves of the slide tracks in surface-to-surface contact over at least a
15 portion of their respective profiles. In such cases, the opposed engagement rims of the elongate closure panel can have a substantially S-shaped profile and the undercut grooves of the slide tracks can have a matching S-shaped profile. Alternatively, the engagement rims of the closure panel or the undercut grooves of the slide tracks can have a substantially S-shaped profile and the substantially S-
20 shaped profile thereof can be matched with a modified S-shaped profile of corresponding undercut grooves or engagements rims such that upon mounting the closure member in the slide tracks, the respective profiles of the rims and edges define an air gap between the engagement rims of the closure member and the slide tracks over at least a portion of the profile of the mounted closure member in
25 the slide tracks. The closure panel can have chamfered longitudinal edges if so desired; a suitable angle of chamfer being from about 5 to about 15 degrees, or from about 8 to about 12 degrees.

The undercut grooves can have an undercut depth of from about 0.020 to
30 about 0.060 inches; typically the undercut grooves have an undercut depth of at least about 0.025 inches and up to about 0.060 inches.

The reclosable lid of the present invention can also include: a length of the elongate closure panel of from about $\frac{1}{2}$ to about $\frac{3}{4}$ the length of a diameter of the domed member; the length of the elongate closure panel can be about $\frac{2}{3}$ of the diameter of the domed member; as well as an area of the elongate closure panel of
5 from about 5 to about 25% of the area of the top wall. The area of the elongate closure panel is typically not more than from about 25 to about 35 % of the area of the top wall. The elongate closure panel can have an aspect ratio (as defined herein) of at least about 1.5, or at least about 2.0 or at least about 3.

10 The upper surface of the top wall generally defines a recess with a recess surface and a crown of height, H , above the recess surface thereabout, the recess and crown being adapted to receive the bottom of a cup, whereby a plurality of lidded cups are stackable with each other. To allow for stacking, the post projects upwardly from the surface of the recess at most about $1.25H$ and is disposed
15 inwardly with respect thereto when the elongate closure member is secured in the slide tracks. In a suitable form, the crown has a top wall with an arcuate upper surface for example, the top wall of the crown can have a radius of curvature of from about 0.025 to about 0.1". In a suitable form, the crown has a gapped portion of lower height above the recess surface radially aligned with the drinking
20 aperture wherein the gapped portion of the crown has an arcuate upper surface. When provided, the gapped portion typically has a height of from about $0.75H$ to about $0.95H$ above the recess surface.

The elongate closure member may be provided with a vent hole
25 positioned such that the post aperture communicates with the interior of the domed member when the elongate closure member is in the open position, thereby venting the interior in the open position to facilitate consumption of a beverage. Alternatively, a vent may be positioned elsewhere in the lid when venting is desirable.

A specific construction of the inventive lid includes: a) a unitary domed member provided with a sidewall and a top wall, i) the sidewall having at its lower portion a mounting groove configured to engage the brim of a cup and form a seal therewith; ii) the top wall also having an upper surface and a lower surface and
5 defining a drinking aperture at a periphery of the top wall provided with a sealing ridge formed thereabout, the sealing ridge projecting downwardly from the upper surface, the top wall further defining a pair of generally parallel slide tracks defining generally parallel undercut grooves between the lower surface of the top wall and a lower portion of the slide tracks, the top wall also having a post
10 aperture disposed inwardly with respect to the drinking aperture; b) a thermoformed elongate closure panel having an upper surface provided with a post projecting upwardly therefrom, a sealing groove formed about a sealing area and opposed engagement edges along its length; c) the domed member and elongate closure panel being configured such that the longitudinal engagement
15 edges of the closure panel may be slidingly mounted in the slide tracks on the lower surface of the top wall of the domed member to reclosably seal the drinking aperture when the elongate closure panel is slid along the slide tracks; d) wherein the post of the closure panel projects upwardly through the post aperture when the elongate closure panel is mounted in the slide tracks, the post aperture and post
20 thereby cooperating to limit displacement of the elongate closure panel with respect to the domed member; and e) a sealing position of the elongate closure panel being further characterized wherein the sealing ridge about the drinking aperture seats in the sealing groove of the elongate closure panel.

25 Another specific construction of the inventive lid includes: a) a domed thermoformed member provided with a sidewall and a top wall, i) the sidewall having a mounting groove for removably mounting the lid to the cup, the sidewall defining a crown around a recess with a recess surface in the top wall, the crown defining a height, **H**, above the recess surface of the top wall; ii) the top wall
30 having an upper surface and a lower surface and defining a drinking aperture at a periphery thereof, the top wall further defining a guideway depending from its

lower surface, the top wall also having a post aperture disposed inwardly with respect to the drinking aperture; b) a thermoformed elongate closure panel having an upper surface provided with a post projecting upwardly therefrom and a drinking aperture sealing area; c) the domed member and elongate closure panel
5 being configured such that the elongate closure panel may be slidingly mounted for generally radial displacement in the longitudinal guideway on the lower surface of the top wall to reclosably seal the drinking aperture with its drinking aperture sealing area, wherein the post projects upwardly through the post aperture in the top wall; d) the post aperture and post thereby cooperating to limit radial
10 displacement of the elongate closure panel with respect to the domed member, and e) wherein the post height projects upwardly from the recess surface at most to about the 1.25 H, such that lid stacking occurs free of substantial interference from the post when a plurality of assembled beverage lids of the type defined in elements a-e above are nested in a stack.

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In one form, the lids of the invention are made by thermoforming. Generally speaking, thermoforming is the pressing and/or stretching of heated deformable material into a final shape. In the most basic aspect, thermoforming is the draping of a softened sheet over a shaped mold. In the more detailed aspect,
20 thermoforming is the automatic high speed positioning of a heated sheet having an accurately controlled temperature into a pneumatically actuated forming station whereby the article's shape is defined by the mold, followed by trimming and regrind collection as is well known in the art. Forming techniques other than conventional thermoforming can also be suitable for the manufacture of articles
25 described in the present invention. These include variations such as presoftening the extruded sheet to temperatures below the final melting temperature, cutting flat sections (*i.e.* blanks) from the sheet, transfer of blanks by gravity or mechanical means into matched molds whereby the blanks are shaped into the article by heat and pressure. Still other alternative arrangements include the use of
30 drape, vacuum, pressure, free blowing, matched die, billow drape, vacuum snap-back, billow vacuum, plug assist vacuum, reverse draw with plug assist, pressure

bubble immersion, trapped sheet, slip, diaphragm, twin-sheet cut sheet, twin-sheet rolled forming and suitable combinations of the above. Details are provided in J.L. Throne's book, *Thermoforming*, published in 1987 by Coulthard. Pages 21 through 29 of that book are incorporated herein by reference. Suitable alternate
5 arrangements also include a pillow forming technique which creates a positive air pressure between two heat softened sheets to inflate them against a clamped male/female mold system to produce a hollow product. Metal molds are etched with patterns ranging from fine to coarse in order to simulate a natural or grain like texturized look. Suitable formed articles can be trimmed in line with a cutting
10 die with the trimmings being optionally reused. Other arrangements for productivity enhancements include the simultaneous forming of multiple articles with multiple dies in order to maximize throughput and minimize scrap.

Thermoplastic materials are intended to encompass materials suitable for
15 thermoplastic molding of dome hot cup lids. A material suitable for the lid is a styrene polymer composition, which may be filled or unfilled. The composition can have enough pigment to provide opacity or near opacity. Other suitable materials include polyolefins such as polyethylenes, polypropylenes and mixtures thereof, polyesters, polyamides, polyacrylates, polysulfones, polyetherketones,
20 polycarbonates, acrylics, polyphenylene sulfides, acetyls, cellulose, polyether imides, polyphenylene ethers/oxides, styrene maleic anhydride copolymers, styrene acrylonitrile copolymers, polyvinyl chlorides, and engineered resin derivatives thereof. These materials can likewise be filled or unfilled. Fillers for any of the polymeric materials can be any conventional materials, as would be
25 well known to one of ordinary skill in the art.

The lid may be thermoformed from a sheet of thermoplastic material. Typically, the thermoplastic sheet from which the lids are made has a caliper of from about 10 to about 20 mils (thousandths of an inch), or from about 14 to about
30 19 mils. The sheet from which the blanks have been cut out can be collected from regrind material and can be recyclable. Yet further, the sheet from which the

blanks have been cut can be made from virgin material. Yet, still further, the sheet material from which the blanks have been cut can be prepared from a mixture of virgin and regrind material.

5 Articles which are thermoformed should be designed so as to permit the die section to be parted free of the molded articles without undue interference with the surfaces of the articles. The surfaces of such articles generally include a so-called positive "draft" with respect to the direction in which the die sections are moved during parting to insure that there is little or no interference between the
10 molded article and the interior surfaces of the die sections during parting. Interference between the articles and the dies is commonly known as "negative draft". The draft may be thought of as the difference between the upper lateral span of a mold cavity and that span below it. A positive draft allows the pattern to be pulled cleanly from the mold; however, undercuts inherently have a negative
15 draft.

 In the present invention, the undercut depth and distance required to secure the closure panel to the domed part of the lid is generally minimized in order to reduce the manufacturing difficulties that can be associated with negative draft.
20 In particular, the side tracks can have undercut grooves defined by an inner wall thereof and an outer wall of positive draft, wherein the outer walls of the slide tracks have an arcuate profile.

 Turning now to **Figures 1 through 11**, there is shown a reclosable,
25 thermoformed beverage lid **10** for a cup **100**, the lid being configured in accordance with the present invention (including variations of the various features). The inventive lid includes a thermoformed domed member **12** and an elongate closure panel **70**, the elongate closure panel **70** being undermounted on the domed member **12** as will be further explained.

Domed member **12** includes a peripheral sidewall **14** depending from a disc-shaped top wall **16**. Sidewall **14** and top wall **16** of domed member **12** define an interior dome cavity **18**. Top wall **16** further includes an inner surface **20** when viewed from interior dome cavity **18** and an outer surface **22** opposite inner surface **20**. As will be appreciated from viewing the figures, top wall **16** is recessed with respect to sidewall **14** because an upper end of sidewall **14** forms a crown **24**. Crown **24** is rounded at its top so as to enhance ergonomics of domed member **12** and make it more comfortable for contact by a user's lips. For example, about a full 0.050 inch radius, **R1**, can be used for crown **24**. A height of the crown **24** is specified by **H** as a distance the crown extends above outer surface **22** of domed member **12**. Further details of crown **24** will be described below in connection with additional features of lid **10**.

Sidewall **14** further includes a generally annular skirt portion **26** depending therefrom. Skirt portion **26** includes an annular sealing groove **28** formed adjacent a distal end of sidewall **14** and a generally annular flared trim **30** depending from annular sealing groove **28**. Annular sealing groove **28** is configured to engage a brim **104** of cup **100** and form a seal therewith, as is known in the art and shown by way of reference in **Figure 10**. Thus, annular sealing groove **28** provides one means to prevent leakage of contents from cup **100** when lid **10** is secured thereto. Generally annular flared trim **30** provides a gripping surface for a user to remove or apply lid **10** to cup **100**.

Sidewall **14** additionally includes stacking notches **32** formed in sidewall **14** and crown **24**. Stacking notches **32** facilitate stacking individual lids **10** with each other and to prevent lids **10** from sticking together when being unstacked. Four stacking notches **32** are shown for each lid **10**; however this number is not critical and may be changed according to manufacturing needs or end use. An example of lid-on-lid stacking is shown in **Figure 11**.

A lip recess **34** is also formed in a portion of sidewall **14** to visually direct a user to a drinking aperture **38** of the lid **10** as well as provide a thinner, more comfortable drinking surface on sidewall **14**. Lip recess **34** as shown, shaped to accommodate a lower lip of a consumer. Specifically, an edge **36** of lip recess **34** defines the configuration of lip recess **34**. In a specific form, edge **36** has a generally straight base portion **36a** that connects with a generally outwardly curved end segment **36b** at each end. Lip recess **34** is positioned radially inward from a surface of sidewall **14**. Although lip recess **34** is shown positioned on both crown **24** and sidewall **14**, lip recess **34** can be limited to either crown **24** or sidewall **14**. Further, an overall height **H** of crown **25** is reduced at a location of lip recess **34** to facilitate drinking from lid **10** without interference from crown **24**. The shape and configuration of lip recess **34** can be varied to conform to numerous design parameters. Similarly, the degree of recess **34** and crown height **H** thereat can vary. The crown has a gapped portion **34a** at lip portion **34** of lower height, **H'**.

Top wall **16** includes drinking aperture **38** and further includes a post aperture **40**. Drinking aperture **38** is positioned adjacent crown **24** and specifically can be positioned within an area defined by lip recess **34**. Post aperture **40** is positioned in a substantially center of top wall **16** and radially inward from drinking aperture **38**. Even more specifically, post aperture **40** is in diametric alignment with drinking aperture **38**. A male sealing ridge **42** surrounds and corresponds in shape to drinking aperture **38**, but is greater in overall circumference than drinking aperture **38**. By way of example, drinking aperture **38** can be about 0.0438 inch in width and about 0.250 inch in length, wherein length corresponds to diametrical direction of top wall **16**. Sealing ridge **42** is oriented to project toward interior dome cavity **18** by a distance of about 0.04 inches and have an arcuate radius of about 0.04 inches as well.

Post aperture **40** is substantially rectangular in shape and defines a "CLOSE" stop limit edge **44** and an "OPEN" stop limit edge **46** in directions

toward and away from drinking aperture 38, respectively. CLOSE stop limit edge 44 can be about 1.185 inch from a center of drinking aperture 38, and an overall length of post aperture 40 can be about 0.678 inch. Each of drinking aperture 38 and post aperture 40 are die or punch cut during a manufacturing process of lid 10 as is known in the art.

A pair of slide tracks 48 is formed on inner surface 20 of top wall 16 to traverse substantially an entire diameter of top wall 16 along the direction of drinking aperture 38 and post aperture 40. Slide tracks 48 depend from inner surface 20 of top wall 16 and define respective corresponding longitudinal undercut grooves 62 in each of slide tracks 48, respectively, and inner surface 20 of top wall 16. Slide tracks 48 present a different profile when viewed from inner surface 20 or outer surface 22 of top wall 16 as follows.

When viewed from outer surface 22 of top wall 16, slide tracks 48 are positioned so as to straddle aligned drinking aperture 36 and post aperture 38 by a distance sufficient to define a land area 50 therebetween. Land area 50 is visually distinguishable from a remainder of top wall 16, and is therefore suitable for receiving indicia or the like thereon. Formation of slide tracks 48 is such that substantially planar outer surface 22 includes a smooth arcuate transition surface 52 at the outer wall of the track terminating in a flat bottomed surface 54 having a channel 56 opposing transition surface 52. Channel 56 is bounded by a substantially vertical wall 58 terminating at land area 50 of top wall 16. Thus, when viewed from outer surface 22, slide tracks 48 appear to have channel 56 tucked beneath longitudinal undercut edges of land area 50 in top wall 16.

When viewed from dome cavity 18, channel 56 defines a gripping surface or overhang 60 adapted for receiving elongate closure panel 70 and undercut groove 62 is formed between gripping surface 60 and inner surface 20 of land area 50. Arcuate transition surface 52 has a radius of curvature of about 0.25 inches and defines, about a 45° angle with respect to flat bottomed surface 54. Flat

bottomed surface **54** can be about 0.062 inches wide along a length of each slide track **48**. An inside radius of curvature of channel **56** can be about 0.043 inches. Undercut groove **62** has undercut depth of from about 0.02 to about 0.03 inches, and more specifically, a depth of about 0.025 inches.

5

Undercut depth **65** is the distance from the outermost projection of portion **60** to the bottom of groove **62** at **59** as is been seen in **Figure 7A**.

Formation of slide tracks **48** in top wall **16** in this manner is found to allow molding material to deform into a retention area of slide tracks **48** and minimize thinning of the thermoplastic material. To prevent opposing ends of slide tracks **48** from being thinner than desired, a vacuum crack can be provided in the mold, which reduces thinning in extreme corners of ends of slide tracks **48**. Optionally, it is possible to machine a larger radius in the corner which will define an ellipse.

15

A second part of lid **10** is elongate closure panel **70**. Elongate closure panel **70** is an elongated rectangular member having an upper surface **72**, a lower surface **74**, opposed longitudinal engagement edges **76** (see **Figure 6B**) and opposed ends including a closure end **78** and a non-closure end **80**. A post **82** projects from upper surface **72** of elongate closure panel **70** a spaced distance from a sealing area **84**. Sealing area **84** is formed at closure end **78** of elongate closure panel **70** and includes a female groove **86** corresponding in shape and size to drink aperture sealing ridge **42** of top wall **16**. Opposed longitudinal edges **76** of elongate closure panel **70** are formed either with a particular engaging shape (**Figures 5A, 5B, 6A, 6B** and **7**), or, optionally, as a substantially planar termination of planar elongate closure panel **70** (**Figure 10**).

25

Referring especially to **Figures 5A and 5B**, opposed longitudinal edges **76** are each substantially in the shape of the letter "S" with one side being reversed with respect to an opposing shape. Each of opposed longitudinal edges **76** includes an upper outwardly projecting insertion lip **88** transitioning to a lower

30

inwardly arcuate engagement portion 90. Insertion lip 88 is sized to fit within undercut groove 62 of domed member 12. Further, insertion lip 88 is sized to be slidingly received within undercut groove 62 such that a slight friction is obtained therebetween, but is preferably not exactly the same shape as the undercut groove 62, thereby avoiding suction or too much friction between the undercut groove 62 and insertion lip 88 which would inhibit sliding motion. In this respect, there is preferably a slight gap 63 between the closure panel and undercut groove 62 as seen in **Figure 7**. Lower inwardly arcuate engagement portion 90 is shaped to at least partially surround a corresponding gripping surface 60 of slide tracks 48. By at least partially surrounding gripping surface 60 with arcuate engagement portion 90, improved leak prevention is obtained when cup 100 is tipped or overturned with lid 10 secured thereon and/or for keeping heat within cup 100 when lid 10 is applied. This is due to an increased surface area and hence, increased surface contact between domed portion 12 and elongate closure panel 70 as compared with known lids.

Dimensions of closure panel 70 are designed to correspond to those of slide tracks 48 in order to provide a substantially fluid tight engagement therebetween, yet allow sliding movement of elongate closure panel 70 within slide tracks 48. Accordingly, insertion lip 88 can have an inner radius of about .010, outwardly arcuate engagement portion can have an outer radius of about .057 inches, and a distance between an inner surface of insertion lip 88 and inner surface of arcuate engagement portion 90 as viewed from an inner surface of elongate closure panel 70 can be about .060 inches.

25

Opposing closure end 78 and non-closure end 80 may be formed with the same outwardly arcuate insertion lip 88 transitioning to lower inwardly arcuate engagement portion 90, or, alternatively, terminate in the same plane with upper surface 72 of elongate closure panel 70. In the case where ends 78, 80 are formed with outwardly arcuate insertion lip 88 and lower inwardly arcuate engagement

30

portion **90**, the formations may either be continuous around elongate closure panel **70** or broken at one or more corners of elongate closure panel **70**.

Elongate closure panel **70** also includes a vent hole **92** formed therein.

5 Vent hole **92** can be positioned between sealing area **84** and post **82** such that vent hole **92** is exposed when drinking aperture **38** is open. Vent hole **92** is adapted to ensure the continuous flow of the container contents though drinking aperture **38** while venting the container. Alternatively, vent hole **92** can be placed elsewhere in lid **10**. In addition, post **82** and sealing area **84** are spaced apart a distance
10 defined by drinking aperture **38** and stop limit close **44** of post aperture **40**.

As can be seen from the figures, elongate closure panel **70** is of a length of from about one-half to about three-fourths the length of a diameter of the top wall **16**. The length of the elongate closure panel can be about two-thirds the length of
15 the diameter of the top wall **16**. Stated another way, the area of the elongate closure panel can be from about 5 to 25 percent of the area of the top wall **16** or from about 10 to about 45 percent of the area of the top wall **16**, but not more than about 50 percent.

20 It is noted elongate closure panel **70** has an aspect ratio (L/W , **Figure 4**) of at least about 1.5, at least about 2, or at least about 3.

In **Figure 9**, there is illustrated cup-on-lid stacking as will be easily achieved with the lid **10** of the present invention. Cup **100** includes a base end
25 **102**, an upper brim **104**, and sidewalls **106** connecting base end **102** to brim **104**. Base end **102** includes an annular support surface **108** and a cup bottom **110** recessed within annular support surface **108** to define a wall height **112** between annular support surface **108** and cup bottom **110**. Limits of annular support surface **108**, cup bottom **110**, and wall height **112** define an open area **114** therein.
30 Such a construction of a cup base end **102** is well known in the art. Annular support surface **108** seats on lid **10** against and/or within crown **24**, while post **82**

easily fits in open area 114. Stacking of cup-on-lid without interference from post 82 is therefore achieved in connection with two-piece lid 10 in a manner not previously possible.

5 As will be appreciated from **Figure 5A**, the height, **H''**, of post 82 can be only slightly higher than the height, **H**, of crown 24 above surface 22. This feature allows for cup-on-lid stacking as noted above as well as lid-to-lid stacking discussed further herein.

10 In operation, shaped longitudinal edges 76 of elongate closure panel 70 are fit to slidably engage with longitudinal undercut grooves 62, and gripping surfaces 60, such as at an assembly location and prior to use by a consumer. Upon assembly, post 82 protrudes through post aperture 40 and drinking aperture 38 is either open or closed according to a position of elongate closure panel 70. At a
15 point of consumer use, post 82 is movable within post aperture 40 between open stop limit edge 46 and close stop limit edge 44 in order to open or close drinking aperture 38, respectively. Urging post 82 to close stop limit 44 (toward drinking aperture 38) will cause male sealing ridge 42 of top wall 16 to engage with female groove 86 of elongate closure panel 70, causing a snap fit closure therebetween.
20 Urging post 82 to open stop limit 46 (away from drinking aperture 38) will disengage male sealing ridge 42 from female groove 86, releasing the snap fit closure between those parts and thereby opening drinking aperture 38. Stop limits 44 and 46 will limit movement of post 82 and hence elongate closure panel 70 to positions which encompass fully closed and fully opened drinking aperture. Any
25 position in between outermost limits of motion are also available, and will be maintained due to slight friction between longitudinal edge shapes of elongate closure panel 70 and slide track 50 configuration of top wall 16.

 Sealing area 84 of elongate closure panel 70 which contains female groove
30 86 does not protrude through drinking aperture 38 but instead defines a surface area 94 within female groove 86 and covers a larger area than an area of drinking

aperture 38. Because elongate closure panel 70 has surface area 94 completely covering drinking aperture 38 from inner surface 20 of top wall 16, inversion or tipping of a lidded and closed container will cause the contents of the container to further force elongate closure panel 70 and thus surface 94 against drinking aperture 38. Accordingly, having drinking aperture 38 sealed from an interior of lid 10 will prevent leaking better than a closure from an upper surface of lid 10, thus enhancing sealing of the container contents.

While a closure panel with shaped edges is preferred, a substantially planar closure panel with flat engagement edges 76 will likewise be suitable as shown schematically in Figure 10. Figure 10 is a view in section similar to Figure 5A.

Crown 24 of sidewall 14 is specifically provided to prevent a stacked cup 100 from sliding off of lid 10. In particular, crown 24 is of a height and dimension such that a base end 102 of cup 100 will fit against an inner wall surface 25 of crown 24. Further, crown 24 has a height H substantially corresponding to a height of post 82 and because post 82 is positioned away from crown 24, stacking of cups 100 and lids 10 is unaffected by post 82 because post 82 will fit within open area 114 of known containers and cups when stacking occurs.

Referring to Figure 11, it is seen that the lids of the invention 10, 110, 120 can be readily stacked in a nested stack 125 at a separation distance 130 of about 0.180" because the post does not protrude substantially above crown 24.

Although shapes of drinking aperture 38, male sealing ridge 42 and female groove 86 are shown to be generally oval, it will be appreciated that any suitable shape will accomplish the intended function of sealing drinking aperture 38 as long as male sealing ridge 420 and female groove 86 correspond in shape and dimension to achieve a snap fit therebetween. For example, alternative shapes of

drinking aperture **38** may include, but not be limited to, circular, square, or rectangular.

Although described separately, domed member **12**, sidewall **14**, and skirt
5 portion **26** are suitably formed as a one-piece ensemble in a thermoforming
process. In an effort to clarify the features of the present invention, various
features have been discussed in conjunction with the formation of a single lid;
however, it will be appreciated by those skilled in the art that a plurality of lids
may be simultaneously formed from a single sheet of thermoplastic material
10 utilizing known manufacturing methods.

Generally, lid **10** has a wall caliper of from about 10 to about 20 mils, or
from about 14 to about 18 mils.

15 Elongate closure panel **70** can be formed from the same material used to
form the remainder of lid **10**. However, elongate closure panel **70** can be formed
from other lightweight materials.

Referring to **Figures 12** and **13**, there is shown another lid **150** configured
20 in accordance with the present invention. Lid **150** has a closure panel **152**
generally as described above as well as dome **154** with a pair of opposed side
tracks **156**, **158**. Side tracks **156** and **158** have undercut grooves as noted in
connection with the embodiment of **Figure 1**; however, the slide tracks can have a
scalloped geometry along the longitudinal direction as shown in **Figure 12**. The
25 scallops facilitate product stripping from the mold and may have a radius of
curvature of about 0.25 inches or so. The scalloped geometry also facilitates a
deeper undercut groove as is seen in **Figure 13**, which is a view of a portion of the
profile of the dome along lines **13-13** which is an area maximum inward
projection.

It is seen in **Figure 13** that undercut groove **160** has an undercut depth **162** from about 45 to about 40 mils or so; a maximum depth that is intermittent with lesser depths.

5 Alternate configurations are also available for closure panels of the inventive lid. Panel **170**, for example, shown in **Figure 14**, may be used in the slide tracks **156, 158** of **Figure 12**. Panel **170** is similar to the closure panel shown in **Figure 1**; however, panel **170** has a plurality of beveled corners **172, 174, 176, 178** as well as generally square ends. So also, the edges may be
10 provided with a deeper undercut as shown in **Figure 15**. In **Figure 15**, longitudinal edge **180** of panel **170** is provided with an undercut depth **182** of about 40 mils or so.

Referring to **Figures 16 and 17**, there is shown still yet another closure
15 panel **190** which is generally similar to the closure panels described above, except that panel **190** has chamfered edges **192, 194** which are perhaps better appreciated by reference to **Figure 17** which is a partial end view of panel **190**.

Panel **190** has an upper medial surface **196** which changes direction
20 downwardly at a chamfer angle **198** which may be any suitable angle, for example about 10 degrees or so being suitable.

While the invention has been described in connection with numerous
features, modifications to those examples within the spirit and scope of the
25 invention will be readily apparent to those of skill in the art. In view of the foregoing discussion, relevant knowledge in the art and references discussed above in connection with the Background and Detailed Description, the disclosures of which are all incorporated herein by reference, further description is deemed unnecessary.

WHAT IS CLAIMED IS:

1. A beverage lid for a cup, the lid being made from polymeric material and comprising:
 - a) a thermoformed domed member provided with a sidewall and a top wall, the top wall having upper and lower surfaces and a drinking aperture at a periphery of the top wall, the top wall further defining a pair of slide tracks depending from the underside of the top wall, the top wall also defining a post aperture disposed inwardly with respect to the drinking aperture;
 - b) a thermoformed elongate closure panel having opposed engagement edges along its length, an upper surface provided with a post projecting upwardly therefrom, and a drinking aperture sealing area;
 - c) the domed member and elongate closure panel being configured such that the opposed engagement edges of the elongate closure panel may be slidably mounted in the slide tracks on the underside of the top wall to reclosably seal the drinking aperture; wherein the post projects upwardly through the post aperture in the top wall, the elongate closure panel being further characterized in that the post is displaceable in a generally radial direction in the slide tracks to move between a sealing position wherein the sealing area of the closure member seals the drinking aperture and an open position wherein the drinking aperture is in communication with the interior of the domed member, provided further that the closure member seals the post aperture when it is in the sealing position, wherein the lid is disposable.

2. The lid according to Claim 1, wherein the slide tracks substantially span the top wall of the domed member.
3. The lid according to Claim 1, wherein the slide tracks define generally parallel undercut grooves between lower portions of the slide tracks and a lower surface of the top wall.
4. The lid according to Claim 1, wherein the undercut grooves are configured in a scalloped orientation along their longitudinal direction to define grooves with variable undercut depth.
5. The lid according to Claim 3, wherein the elongate closure panel is substantially planar and the opposed engagement edges of the elongate closure panel are of substantially the same thickness as the elongate closure panel and engage with the generally parallel undercut grooves of the slide tracks.
6. The lid according to Claim 3, wherein the opposed engagement edges of the elongate closure panel are provided with thermoformed rims having a profile shaped to engage with the generally parallel undercut grooves of the slide tracks in surface-to-surface contact over at least a portion of their respective profiles.
7. The lid according to Claim 6, wherein the opposed engagement rims of the elongate closure panel have a substantially S-shaped profile and the undercut grooves of the slide tracks have a matching S-shaped profile.
8. The lid according to Claim 6, wherein the engagement rims of the closure panel or the undercut grooves of the slide tracks have a substantially S-shaped profile and the substantially S-shaped profile thereof is matched with a modified S-shaped profile of corresponding undercut grooves or engagement

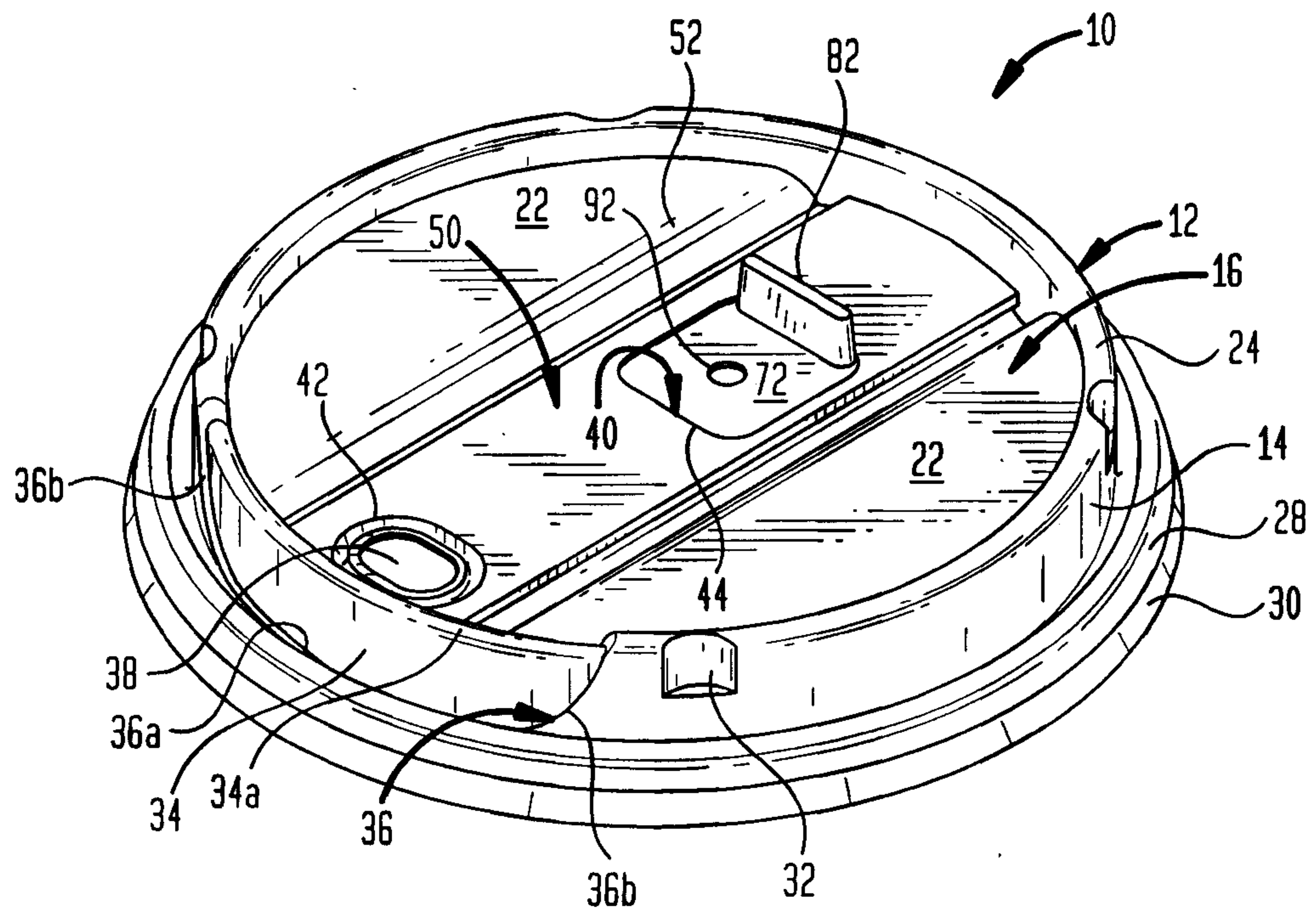
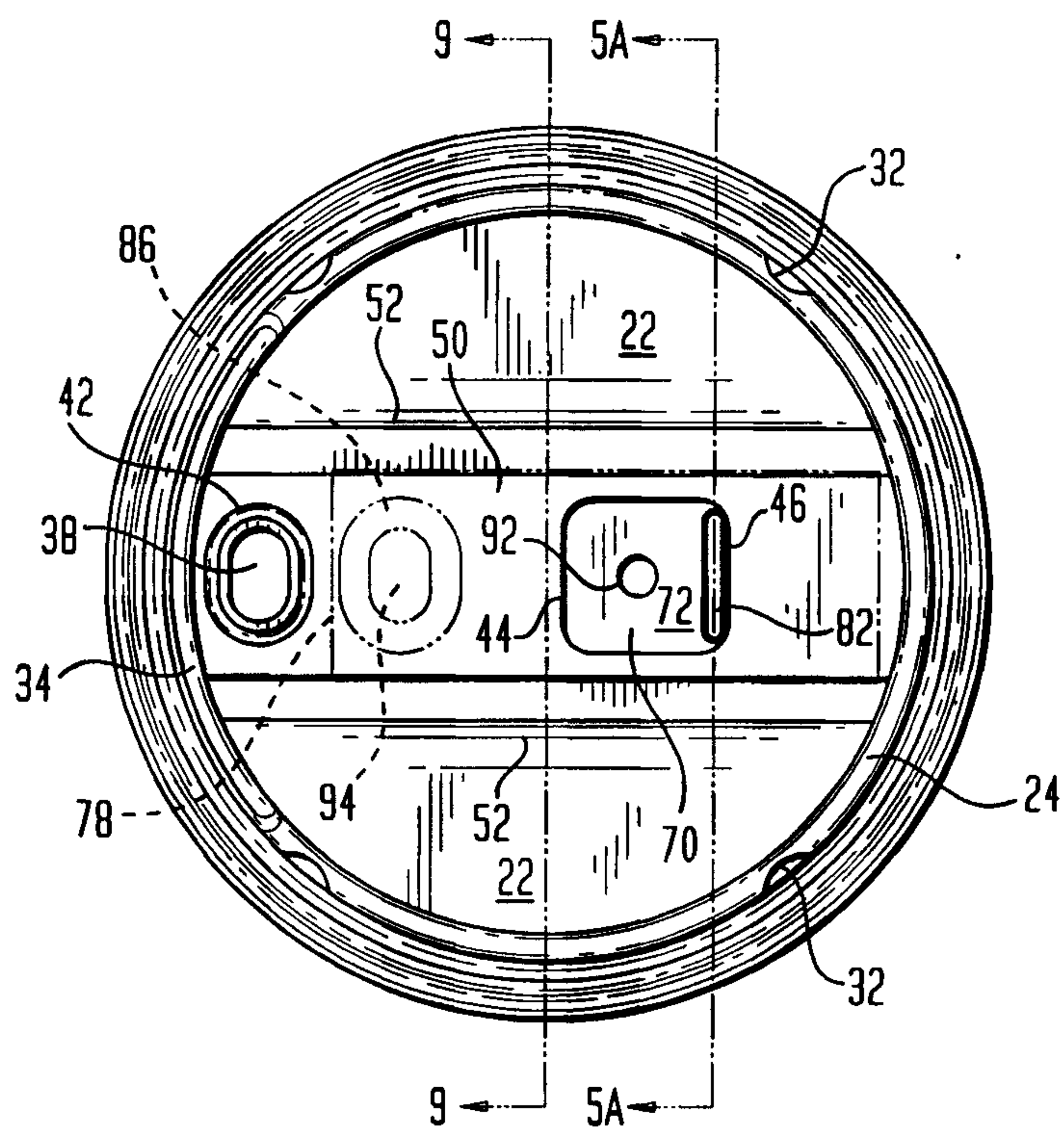
rims such that, upon mounting the closure member in the slide tracks, the respective profiles of the rims and edges define an air gap between the engagement rims of the closure member and the slide tracks over at least a portion of the profile of the mounted closure member in the slide tracks.

9. The lid according to Claim 3, wherein the closure panel has chamfered longitudinal edges.
10. The lid according to Claim 9, wherein the edges define a chamfer angle of from about 5 to about 15 degrees with respect to an upper surface of the panel.
11. The lid according to Claim 3, wherein the undercut grooves have an undercut depth of from about 0.02 to about 0.06 inches.
12. The lid according to Claim 1, wherein a length of the elongate closure panel is of a length of from about $\frac{1}{2}$ to about $\frac{3}{4}$ the length of a diameter of the domed member.
13. The lid according to Claim 1, wherein the area of the elongate closure panel is from about 5-25% of the area of the top wall.
14. The lid according to Claim 1, wherein the area of the elongate closure panel is not more than about 30% of the area of the top wall.
15. The lid according to Claim 1, wherein the elongate closure panel has an aspect ratio of at least about 1.5.
16. The lid according to Claim 1, wherein the elongate closure panel has an aspect ratio of at least about 3.

17. The lid according to Claim 1, wherein the side tracks have undercut grooves defined by an inner wall thereof and an outer wall of positive draft.
18. The lid according to Claim 1, wherein the outer walls of the slide tracks have an arcuate profile.
19. The lid according to Claim 1, wherein the upper surface of the top wall defines a recess with a recess surface and a crown of height, **H**, above the recess surface thereabout, the recess and crown being adapted to receive the bottom of a cup, whereby a plurality of lidded cups are securely stackable with each other.
20. The lid according to Claim 19, wherein the post projects upwardly from the surface of the recess at most about 1.25 H and is disposed inwardly with respect thereto when the elongate closure member is secured in the slide tracks.
21. The lid according to Claim 19, wherein the crown has a top wall with an arcuate upper surface.
22. The lid according to Claim 21, wherein the top wall of the crown has a radius of curvature of from about 0.025 to about 0.1".
23. The lid according to Claim 19, wherein the crown has a gapped portion of lower height above the recess surface radially aligned with the drinking aperture.
24. The lid according to Claim 23, wherein the gapped portion of the crown has an arcuate upper surface.

25. The lid according to Claim 23, wherein the gapped portion has a height of from about $0.75H$ to about $0.95H$ above the recess surface.
26. The lid according to Claim 1, wherein the elongate closure member is provided with a vent hole positioned such that the post aperture communicates with the interior of the domed member when the elongate closure member is in the open position, thereby venting the interior in the open position to facilitate consumption of a beverage.
27. The lid according to Claim 1, thermoformed from a thermoplastic sheet comprising polystyrene.

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FIG. 1**FIG. 2**

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FIG. 3

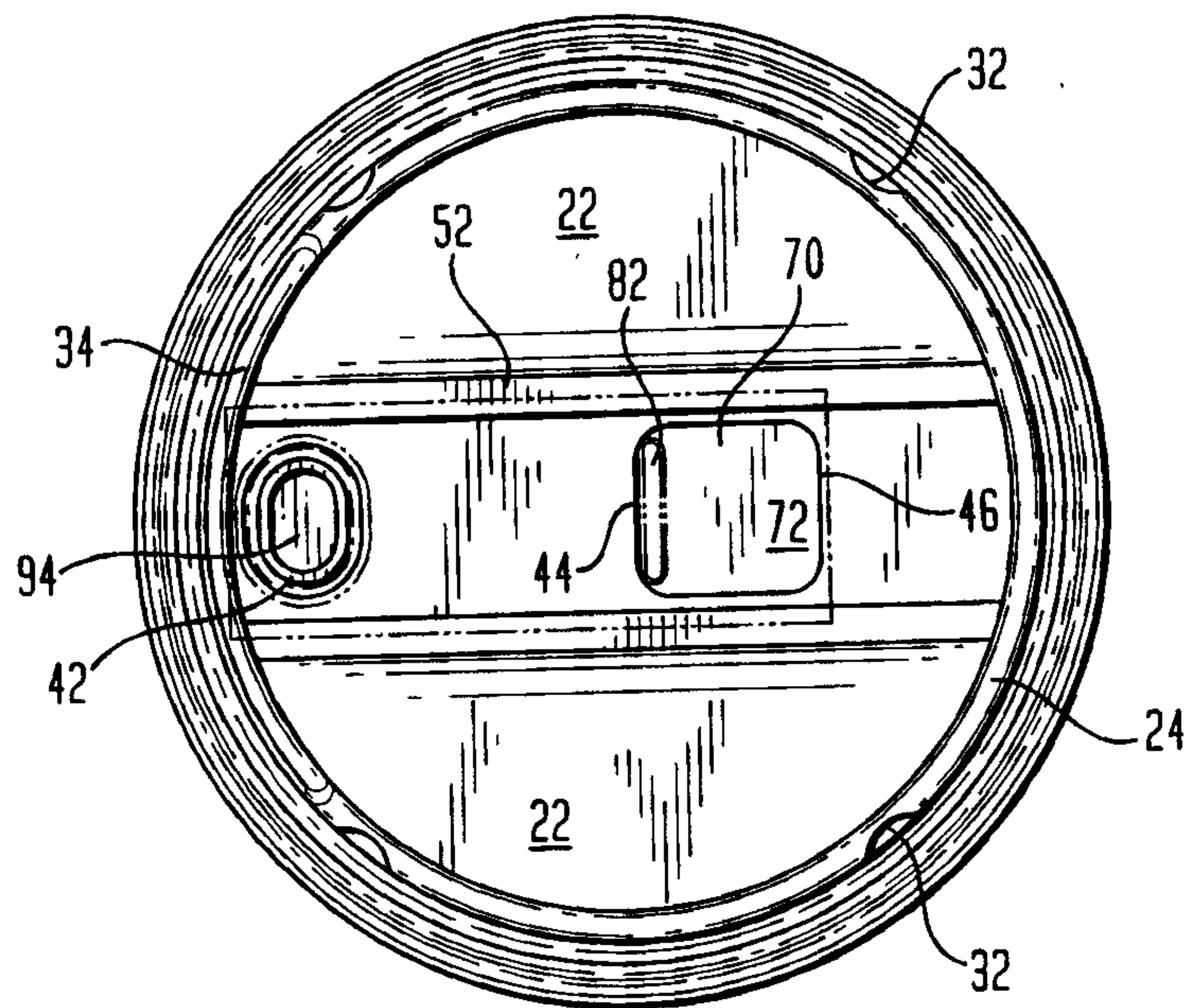
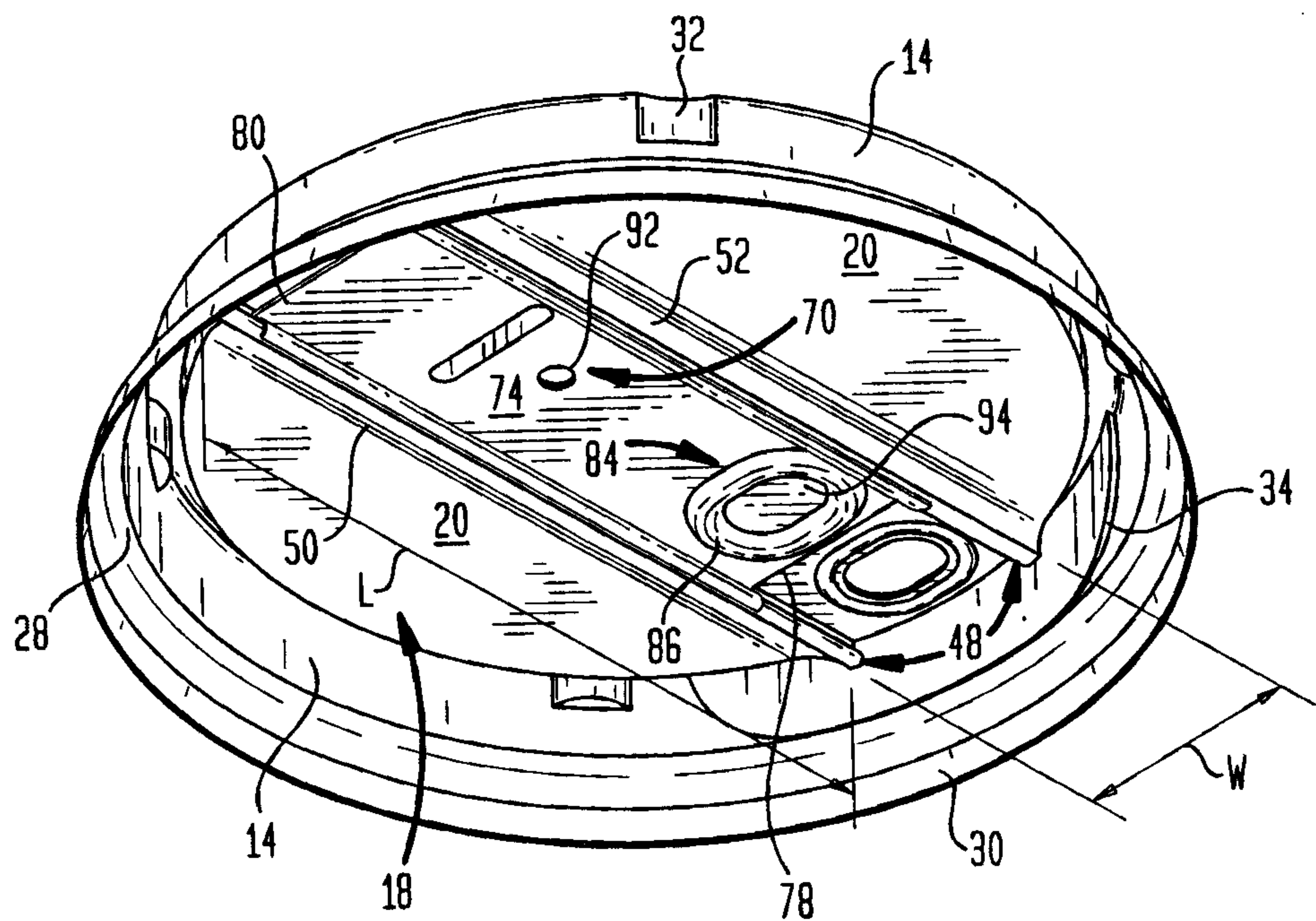


FIG. 4



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FIG. 5A

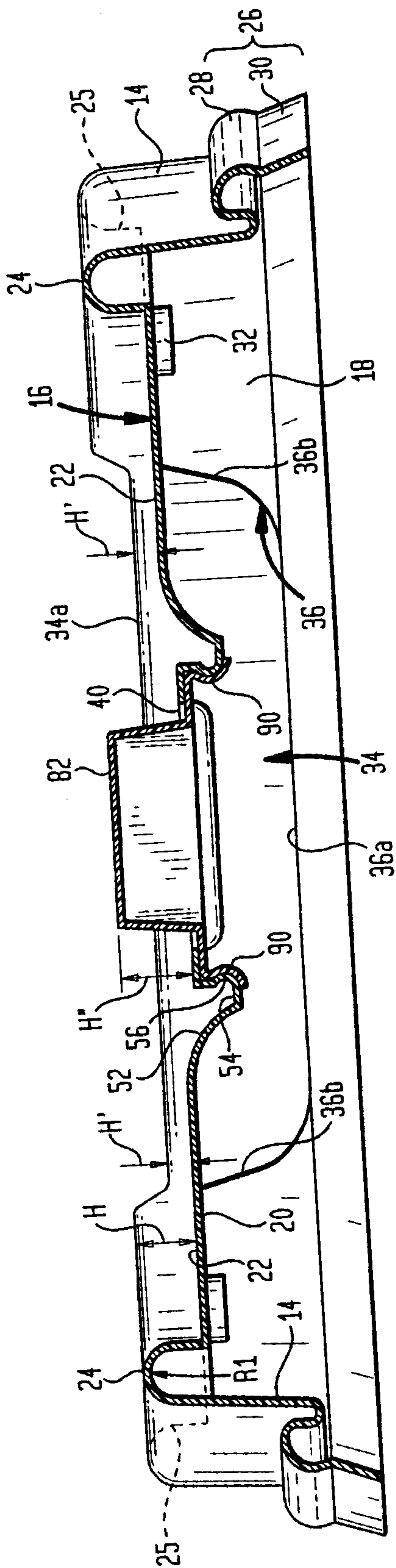
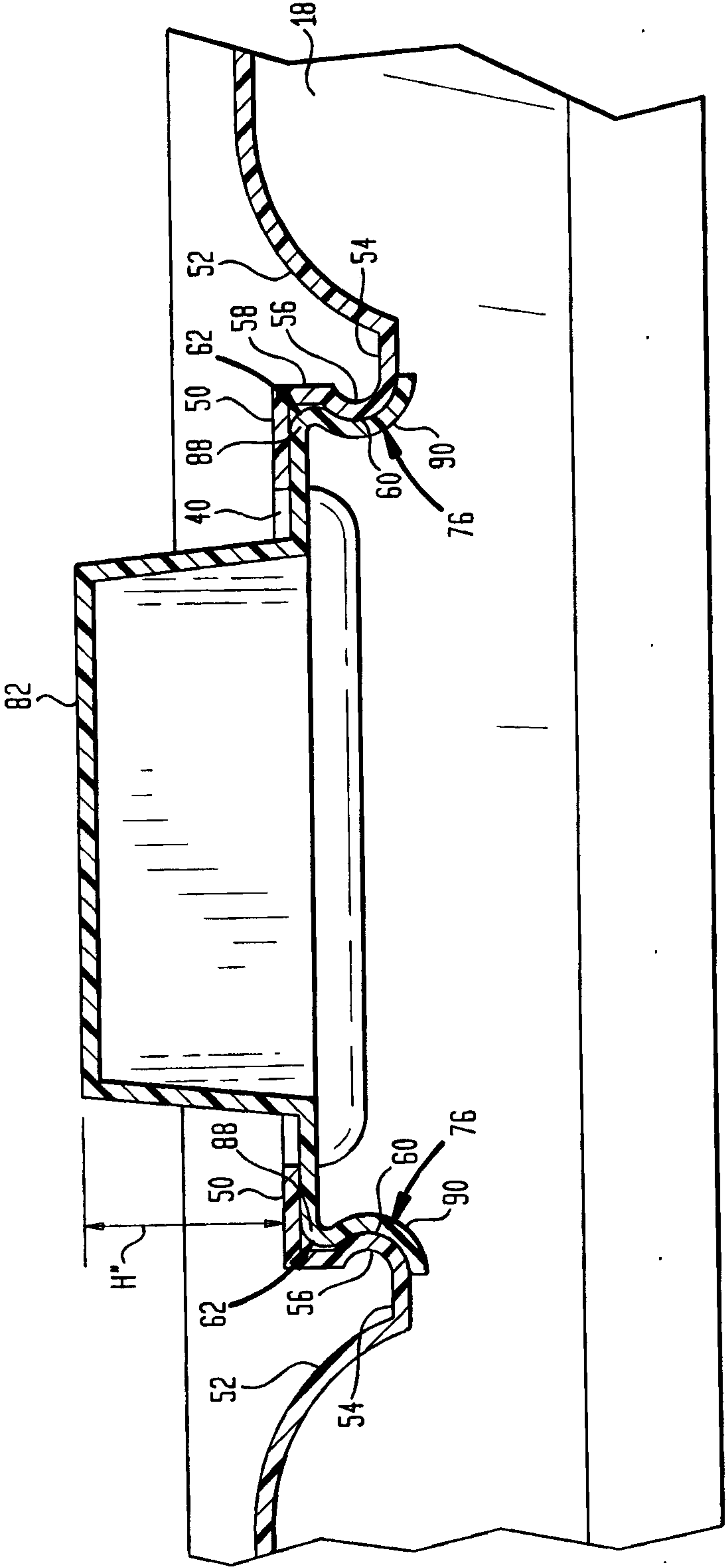
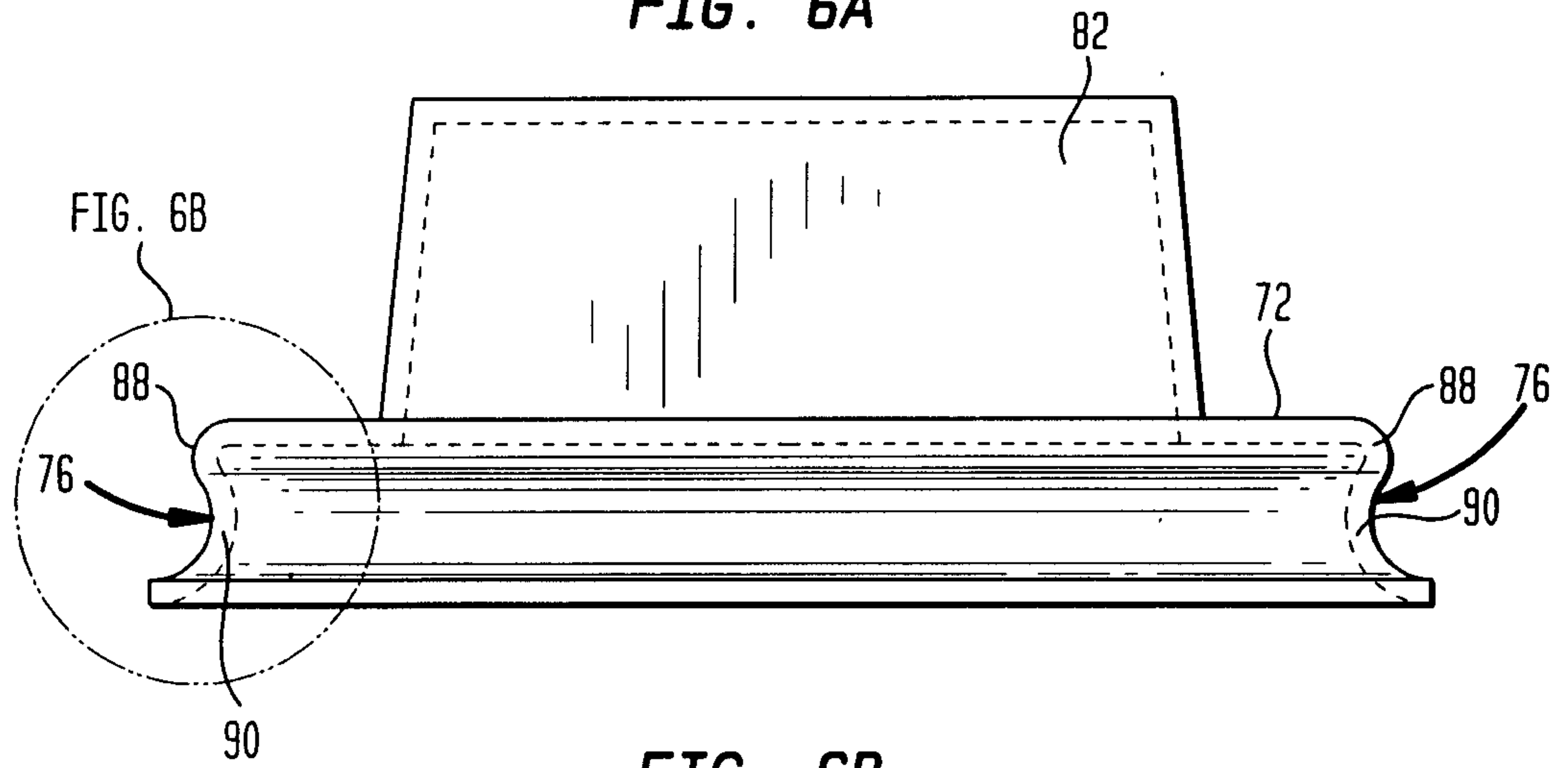
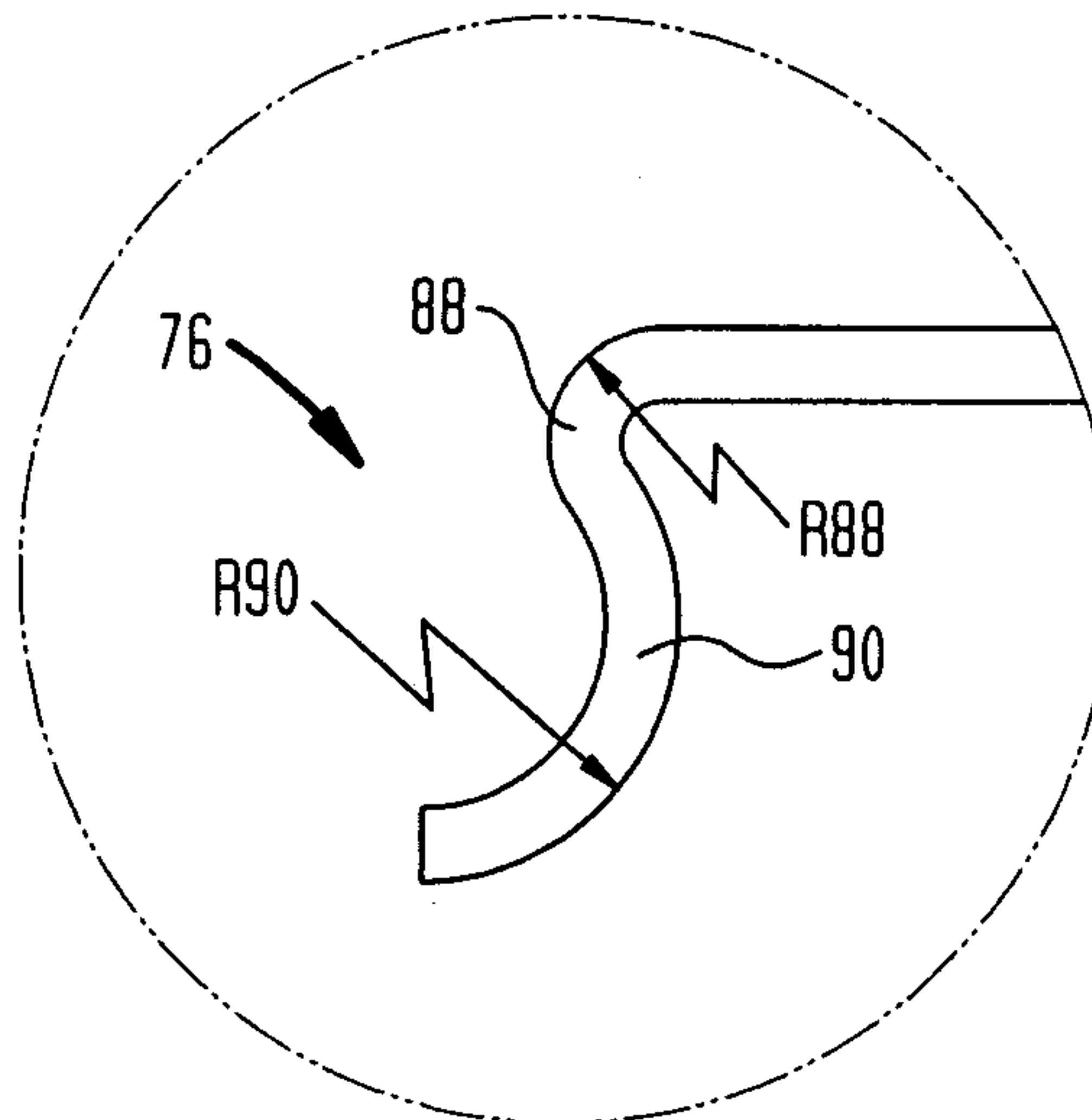
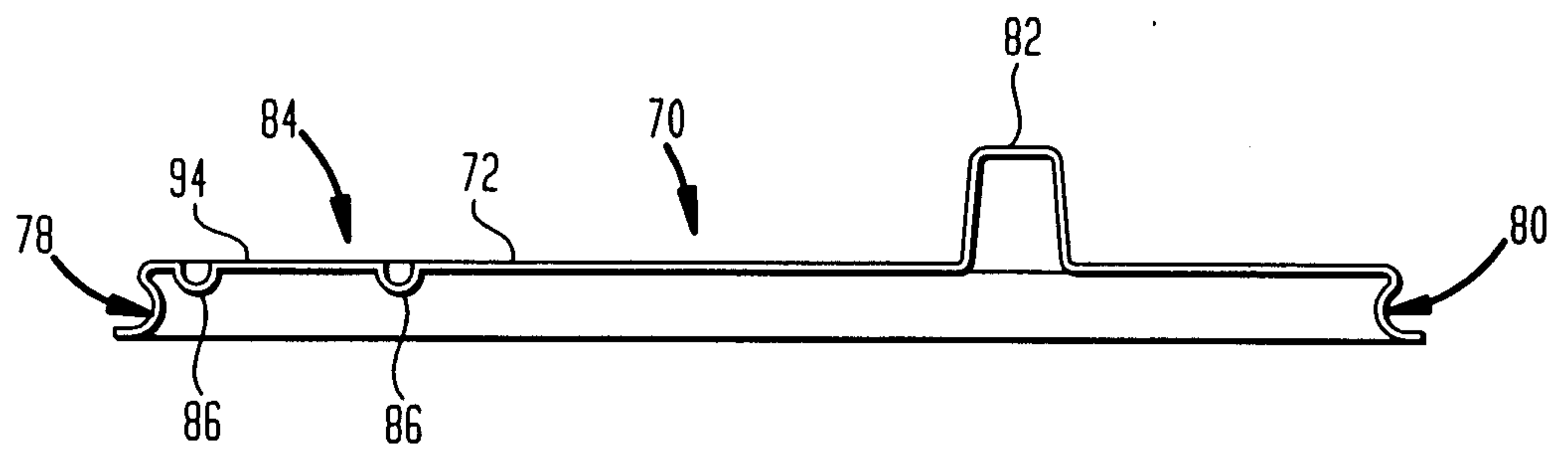


FIG. 5B



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FIG. 6A**FIG. 6B****FIG. 6C**

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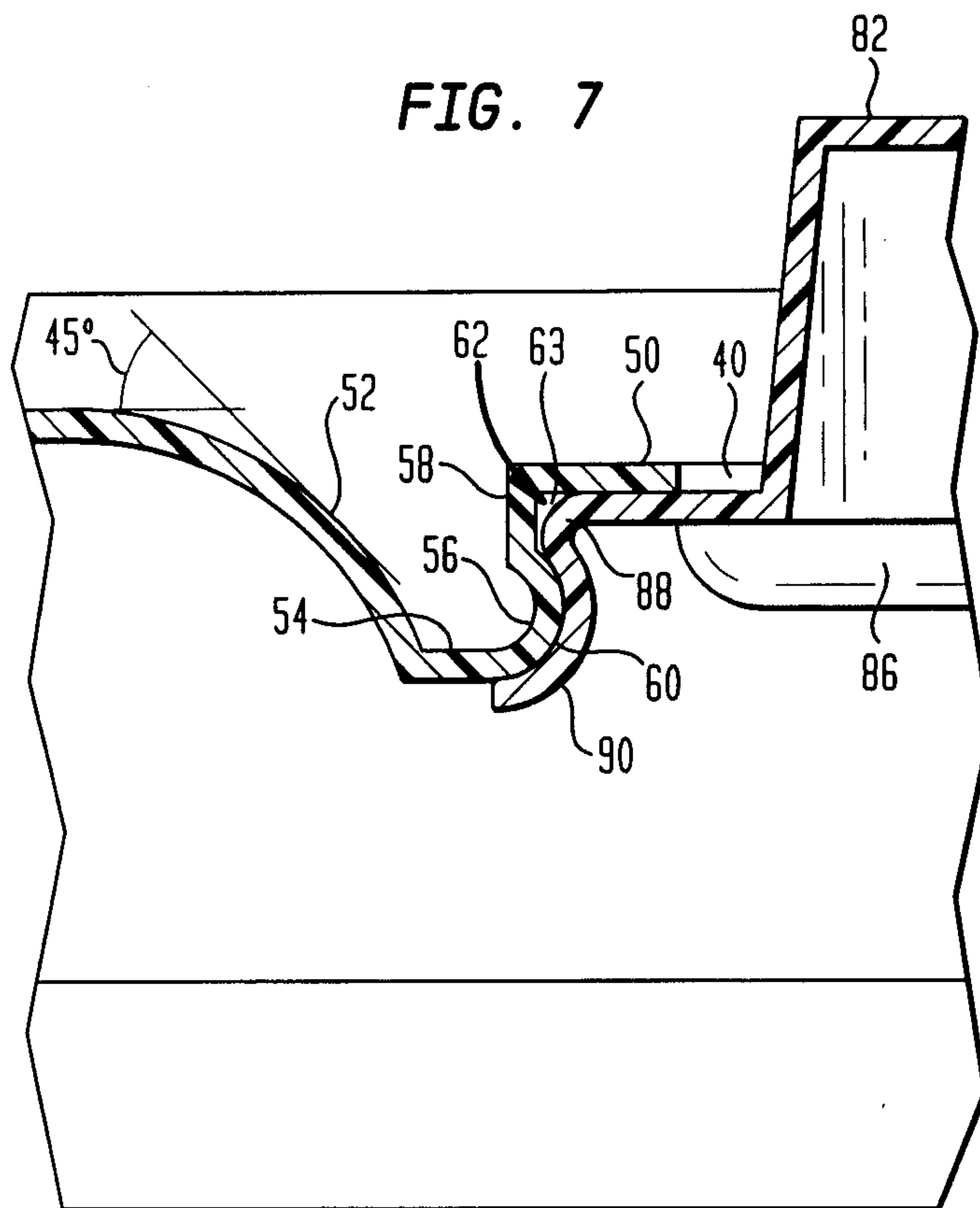
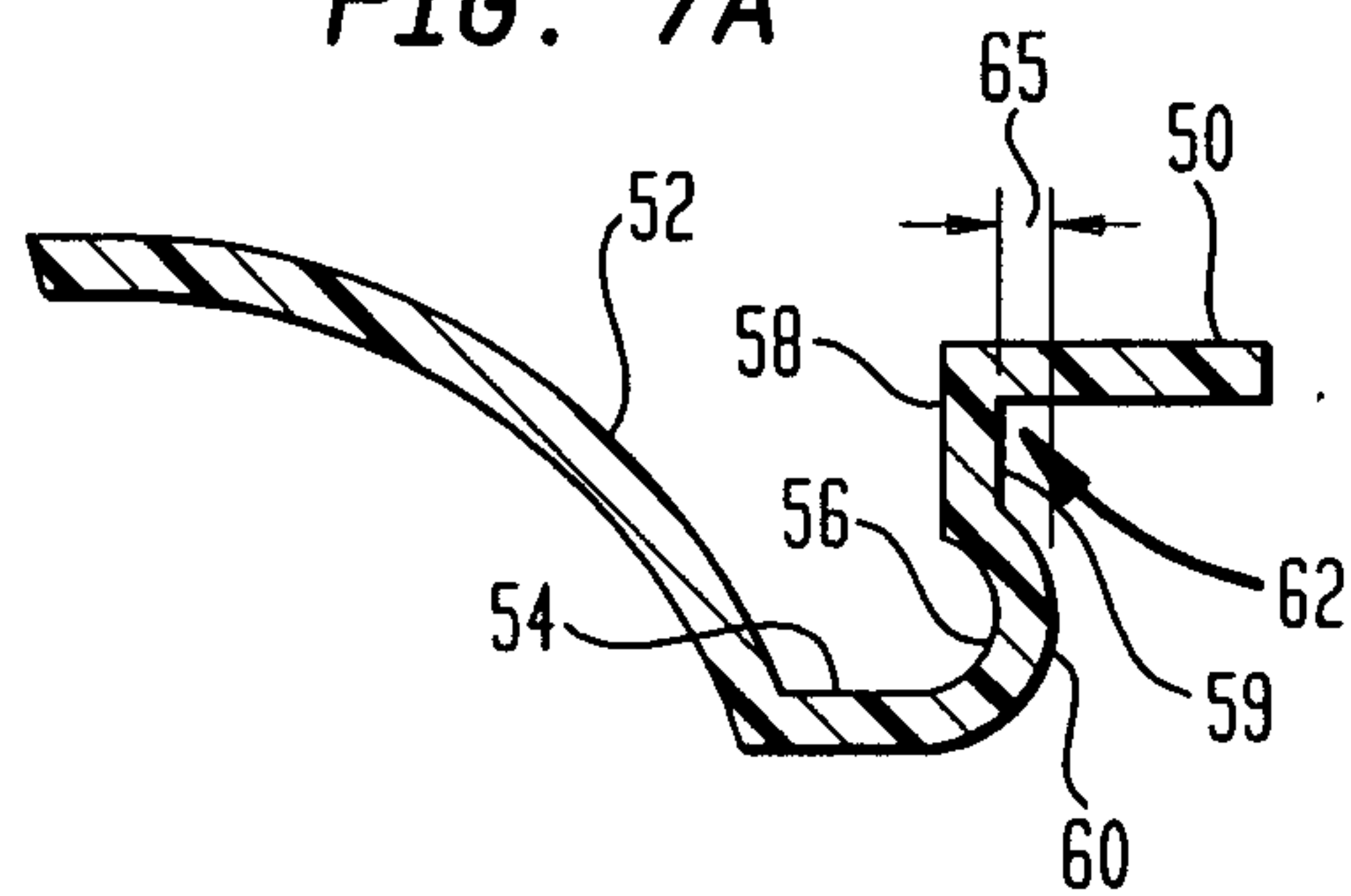
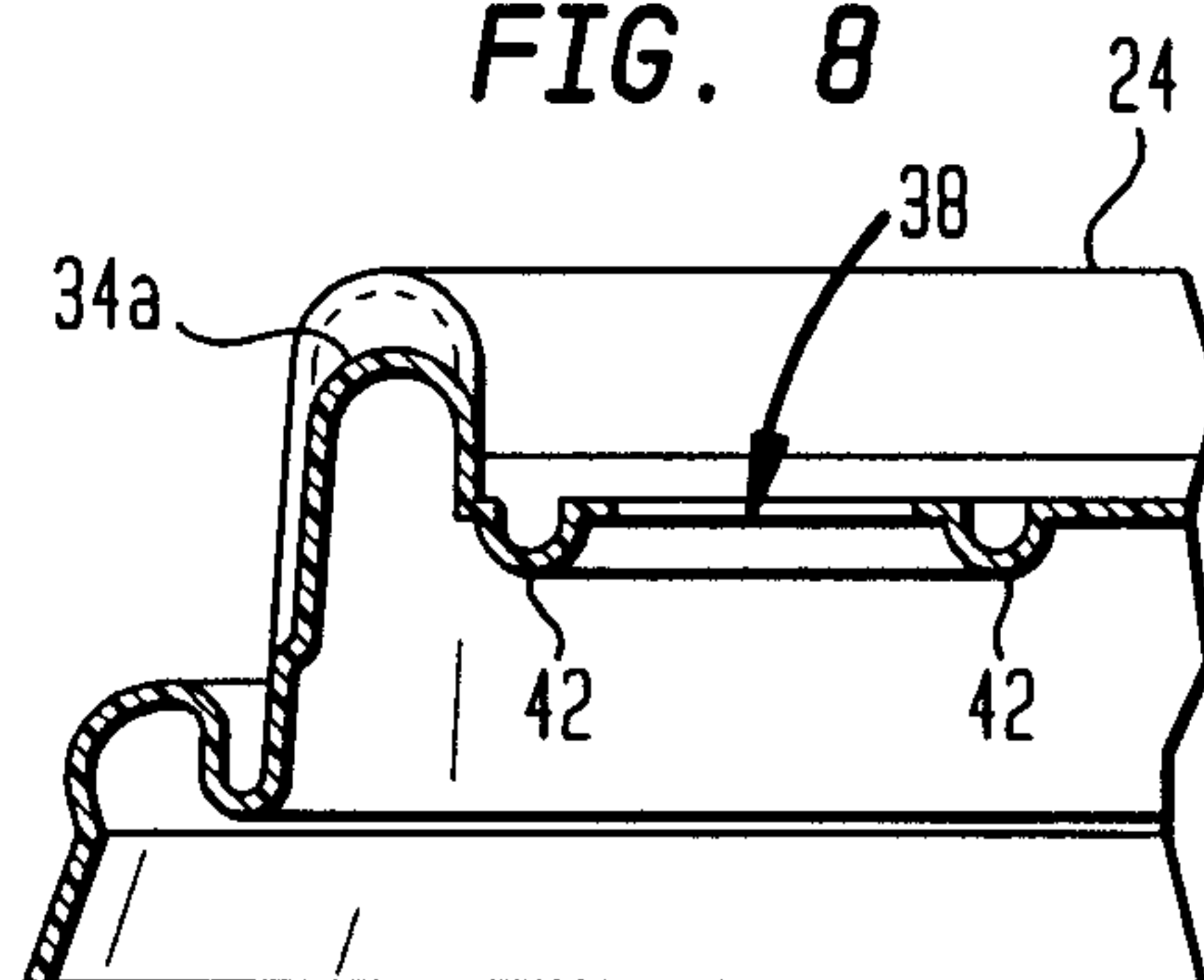
FIG. 7**FIG. 7A****FIG. 8**

FIG. 9

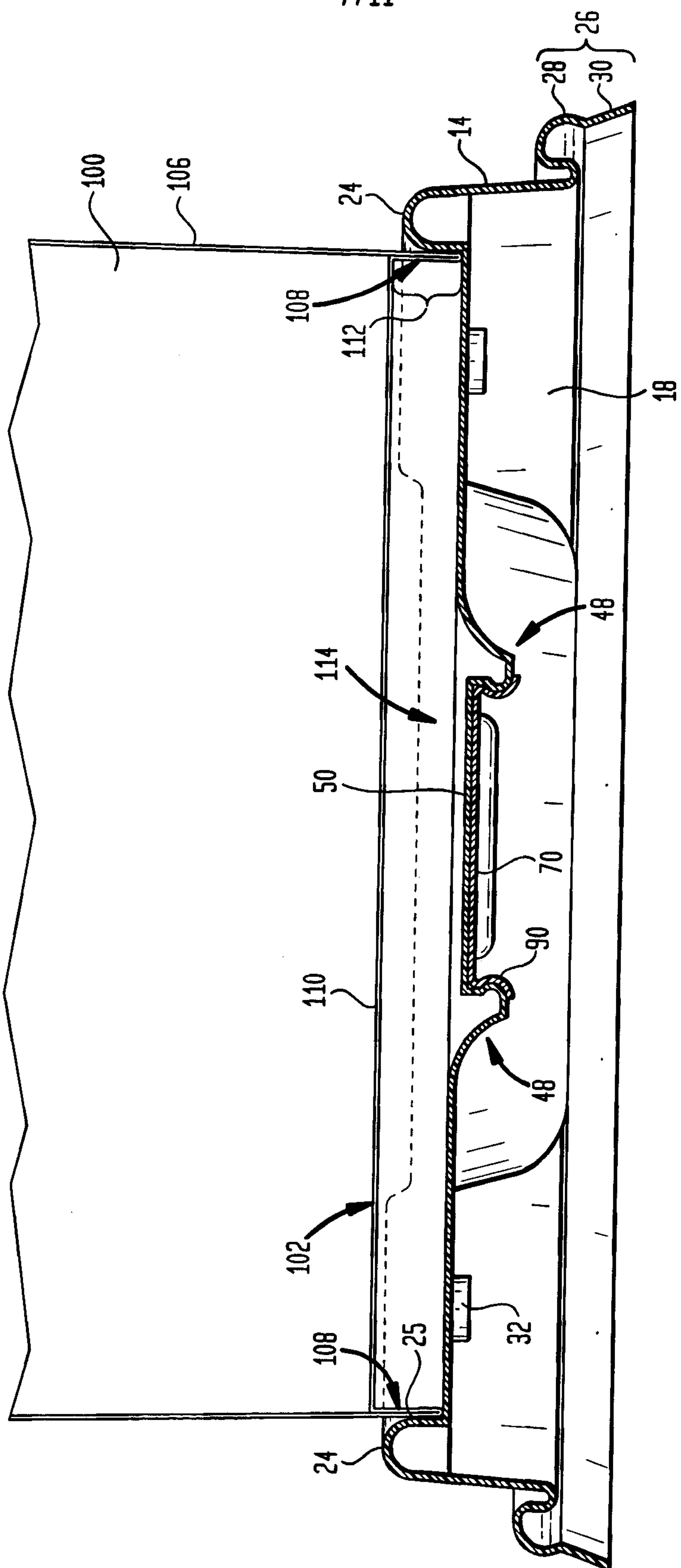


FIG. 10

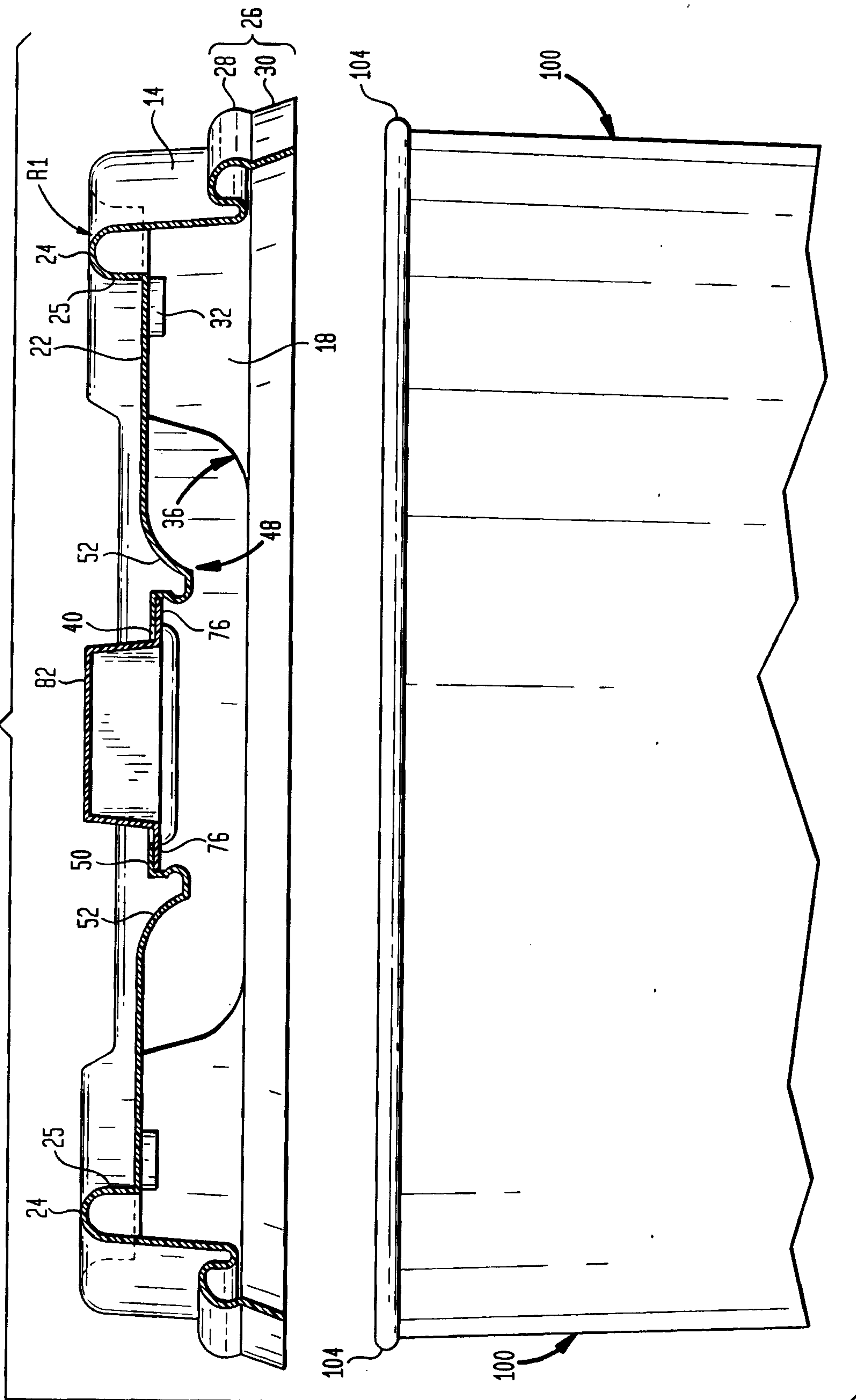
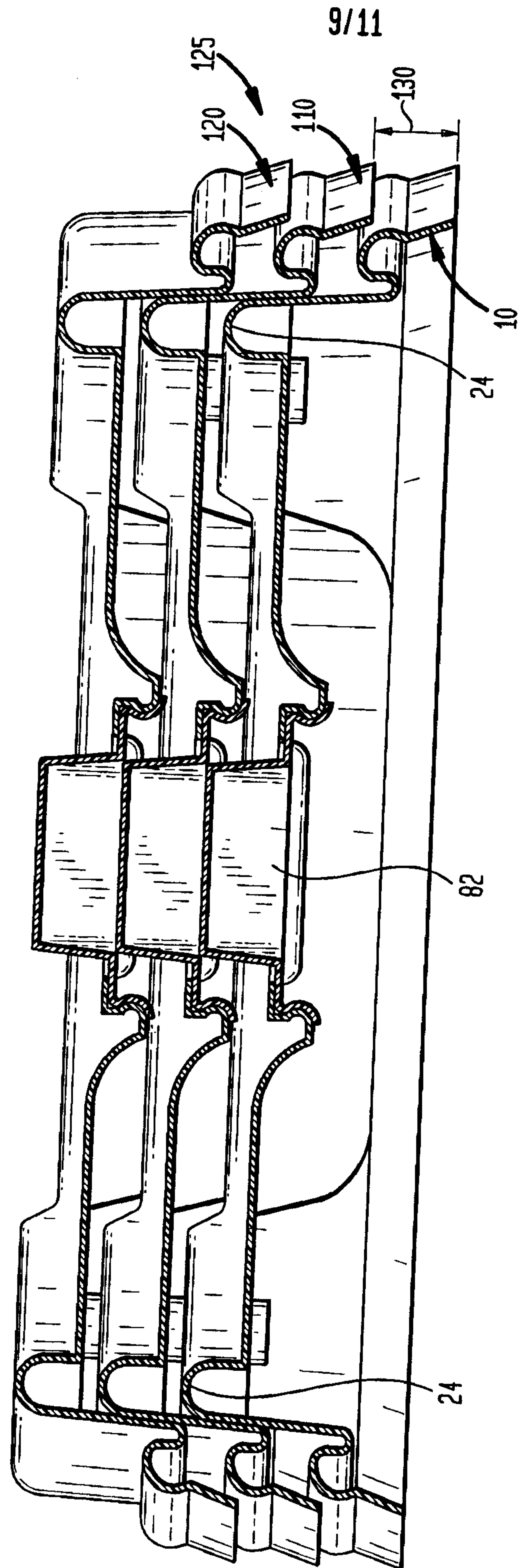
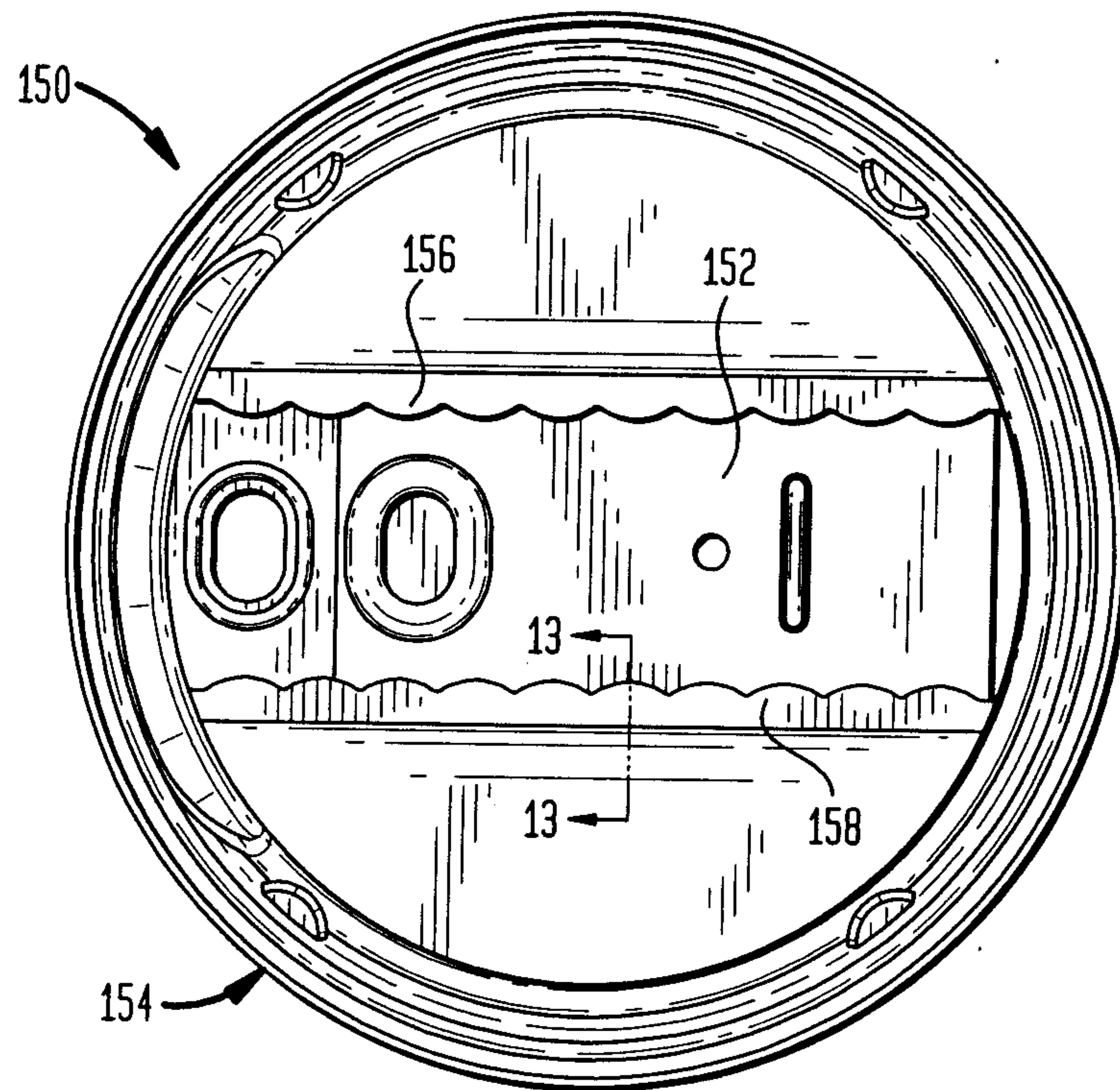
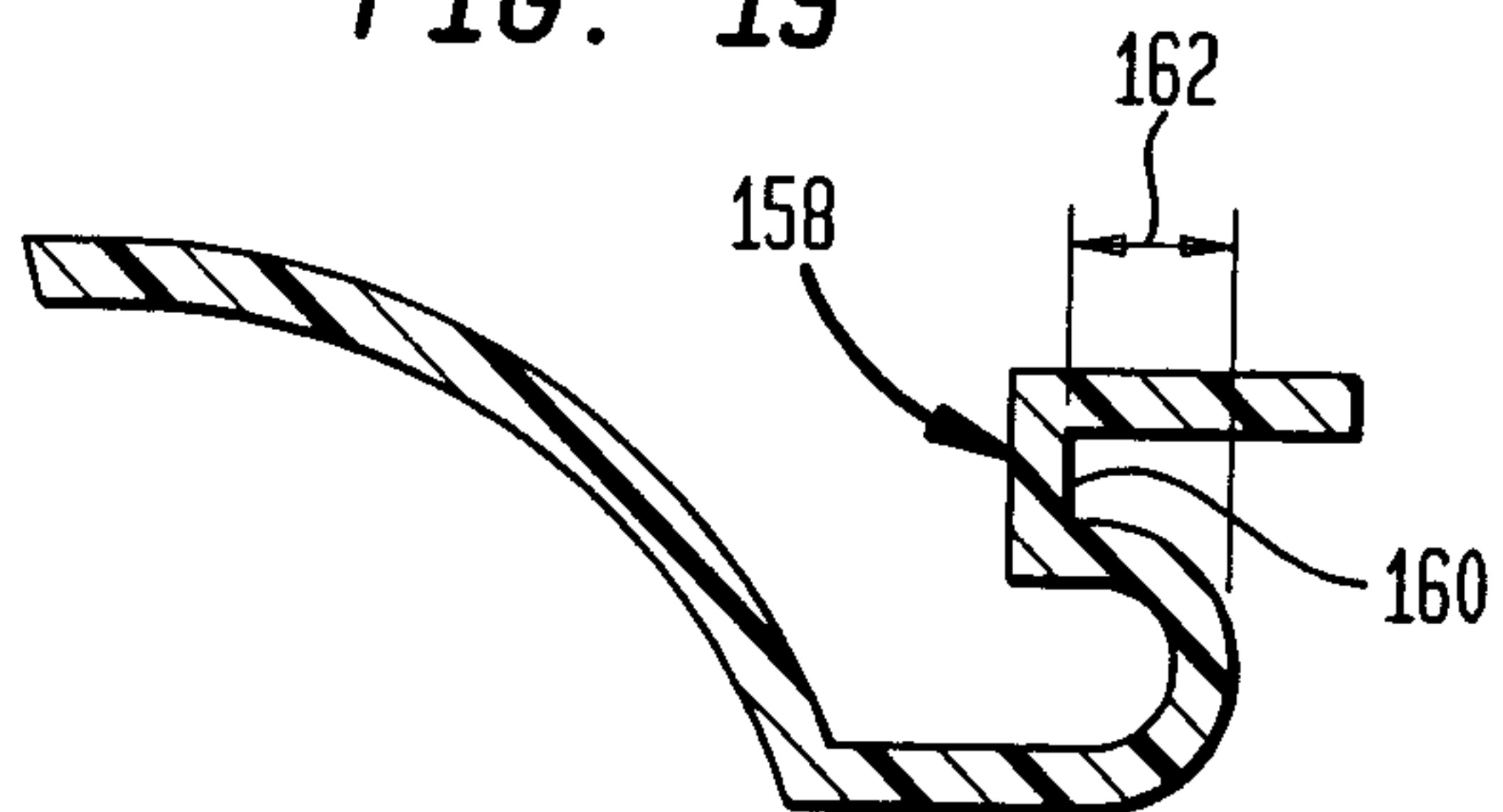
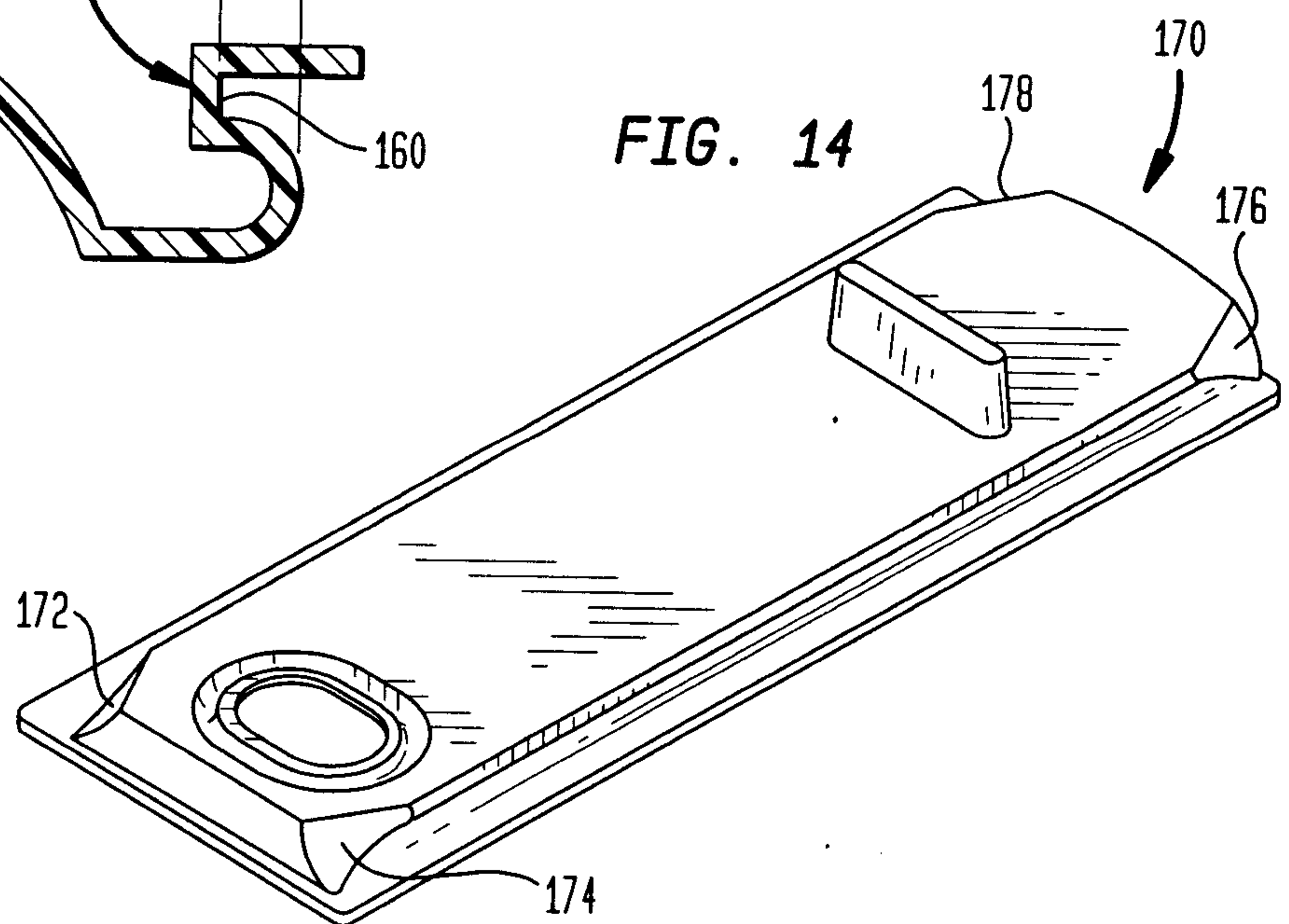


FIG. 11



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FIG. 12**FIG. 13****FIG. 14**

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FIG. 15

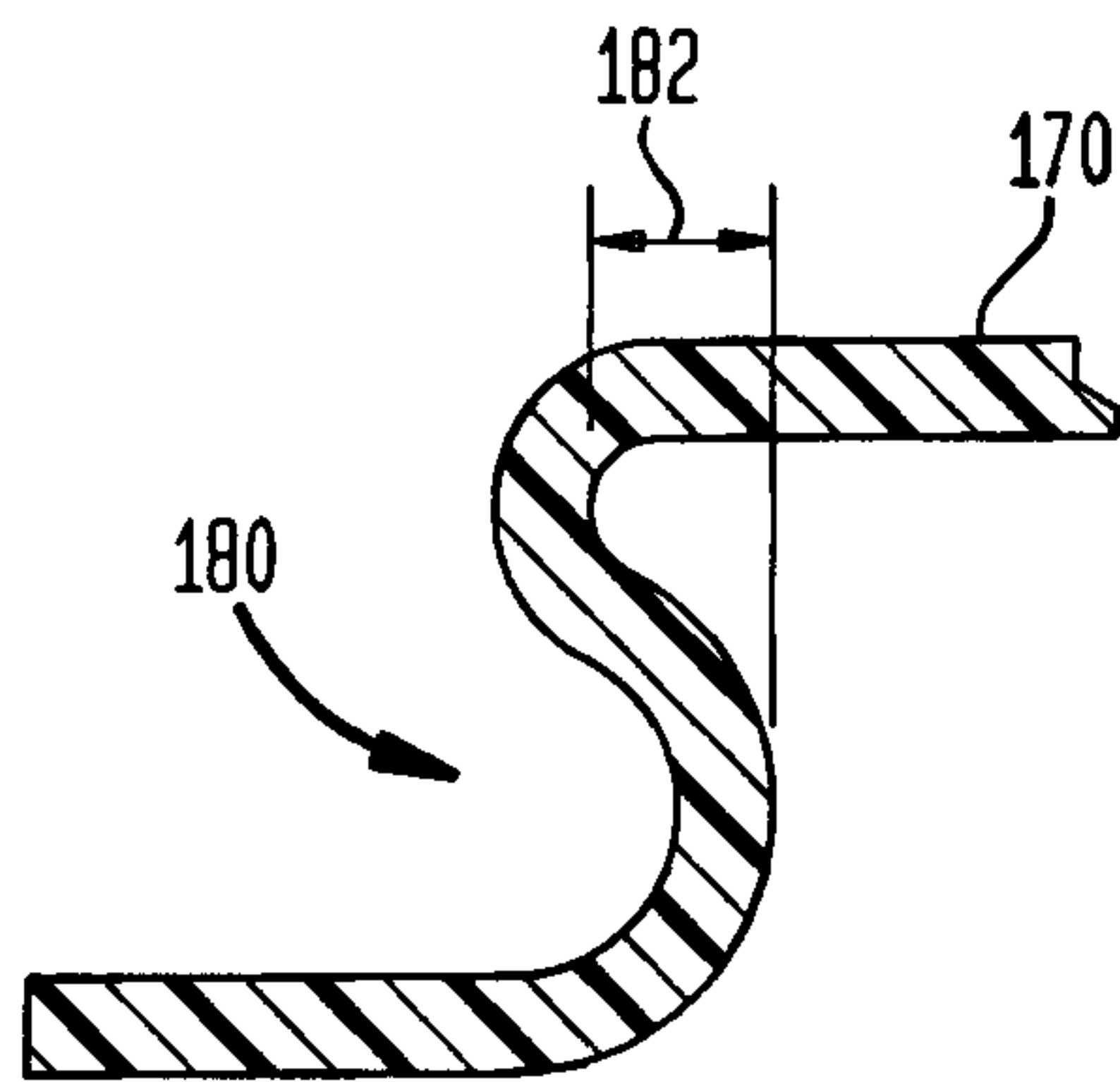


FIG. 16

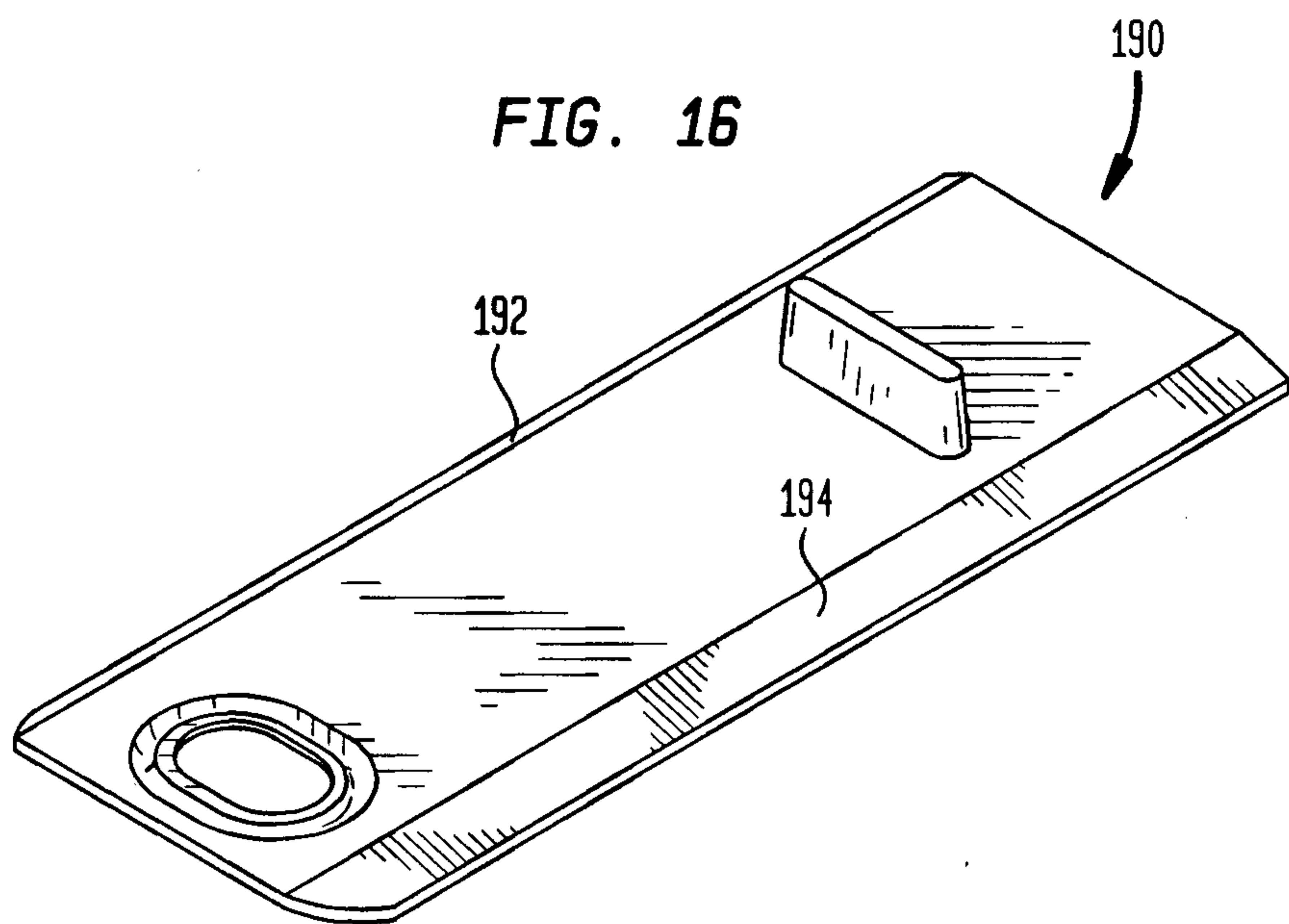


FIG. 17

