

[54] CAN END WITH BONDED SEAL SLIDE

[75] Inventor: Donald L. Douty, Franklin Township, Westmoreland County, Pa.

[73] Assignee: United States Steel Corporation

[22] Filed: May 26, 1971

[21] Appl. No.: 146,945

Related U.S. Application Data

[62] Division of Ser. No. 61,384, Aug. 5, 1970, Pat. No. 3,622,055.

[52] U.S. Cl. 222/541, 222/560, 222/561, 220/41, 220/53

[51] Int. Cl. B65d 47/10

[58] Field of Search 222/541, 560, 561; 220/41, 220/53; 229/7 SC

[56] References Cited

UNITED STATES PATENTS

3,308,986	3/1967	Balocca et al.	220/53
3,363,798	1/1968	Garangiotis	220/41

Primary Examiner—Stanley H. Tollberg

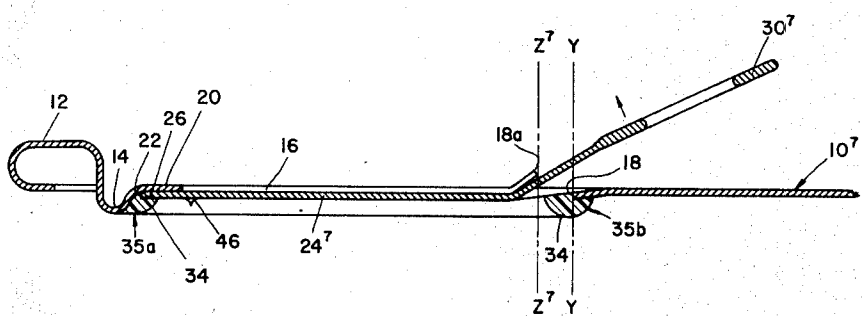
Attorney—Robert J. Leek, Jr.

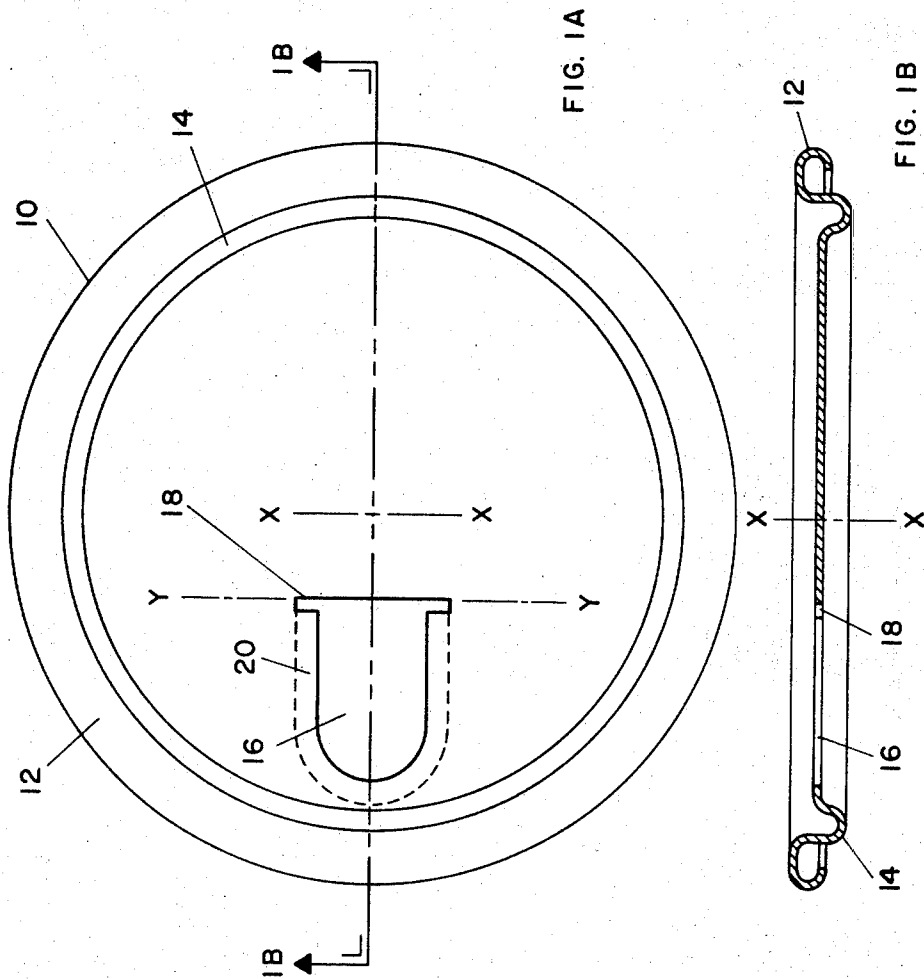
[57] ABSTRACT

Another can end is provided with a pour opening and has a pour width. The pour opening is provided with an entry aperture at one end of the pour opening. The entry aperture has a slide width greater than the pour width. The can end has a can end lapping portion and a can end sealing portion adjacent the pour opening and a plane of bulge strength adjacent the entry aperture. A slide is adapted to pass through an entry aperture and has a slide lapping portion, a slide sealing portion and a protruding portion extending from the entry aperture. The slide lapping portion is adapted to register with the can end lapping portion, and the slide sealing portion is adapted to register with the plane of bulge strength. A pull tab has a connection to the side on the protruding portion. Engaging means engage the can end lapping portion to press the can end lapping portion into intimate contact with the slide lapping portion and the slide sealing portion into intimate contact with the plane of bulge strength. A pressure barrier material for sealing the intimately contacting can end sealing portion and the slide lapping portion and also for sealing the intimately contacting plane of bulge strength and the slide sealing portion is provided. The pressure barrier material is bonded to the

can end sealing portion with a first predetermined shear strength and to the slide lapping portion and to the plane of bulge strength with a second predetermined shear strength less than the first predetermined shear strength. The pull tab has a plane of weakness on one side of the connection to the slide. The connection is disposed outwardly from the plane of weakness. The pull tab is movable away from the plane of bulge strength to break the bond between the slide and the pressure barrier material adjacent the plane of bulge strength so that the pressure barrier material functions as a guide. The pull tab is then movable away from the entry aperture to break the bond between the pressure barrier material adjacent the can end sealing portion and the slide lapping portion so that pressure barrier material adjacent the can end sealing portion functions as a guide for the slide.

IV. Yet another can end is provided with a pour opening having a pour width. The pour opening is provided with an entry aperture at one end of the pour opening. The entry aperture has a slide width greater than the pour width. The can end has a can end lapping portion and a can end sealing portion adjacent the pour opening and a plane of bulge strength adjacent the entry aperture. A slide has a pivot on the can end, is adapted to pass through the entry aperture and has a slide lapping portion and a slide sealing portion. The slide lapping portion is adapted to register with the can end lapping portion, and the slide sealing portion is adapted to register with the plane of bulge strength. A pull tab has a connection to the slide. Engaging means engage the can end lapping portion to press the can end lapping portion into intimate contact with the slide lapping portion and the slide sealing portion into intimate contact with the plane of bulge strength. A pressure barrier material is used for sealing the intimately contacting can end sealing portion and the slide lapping portion and also for sealing the intimately contacting plane of bulge strength and the slide sealing portion. The pressure barrier material is bonded to the can end sealing portion with a first predetermined shear strength and to the slide lapping portion and to the plane of bulge strength with a second predetermined shear strength less than the first predetermined shear strength. The pull tab is rotatable about the pivot to break the bond between the slide lapping portion and the pressure barrier material adjacent the can end sealing portion so that the pressure barrier material adjacent the can end sealing surface now functions as an exit and reclosure slide guide. The pull tab causes breakage of the bond between the pressure barrier material adjacent the plane of bulge strength and the slide sealing portion and causes the slide to move through the entry aperture on the pressure barrier material adjacent the plane of bulge strength





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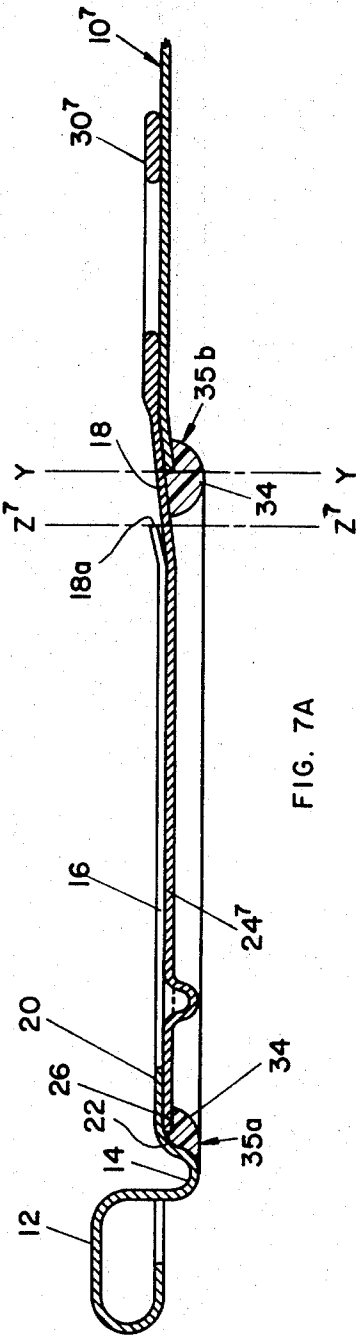


FIG. 7A

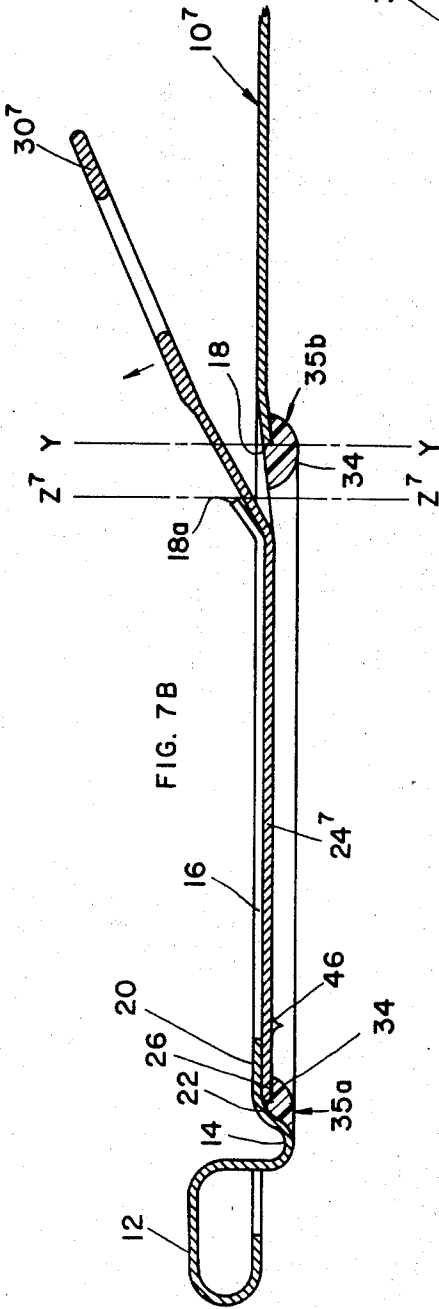


FIG. 7B

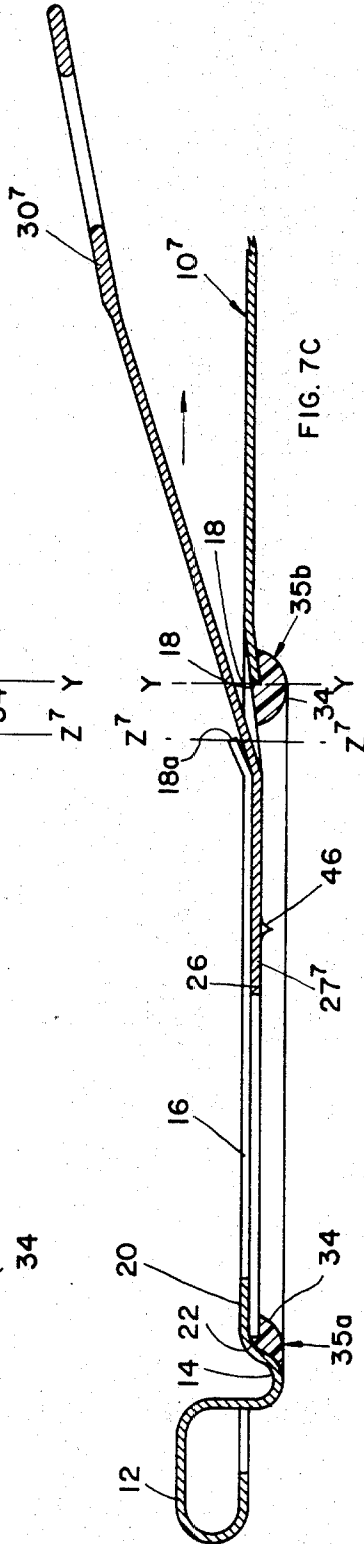
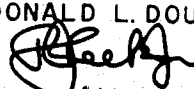
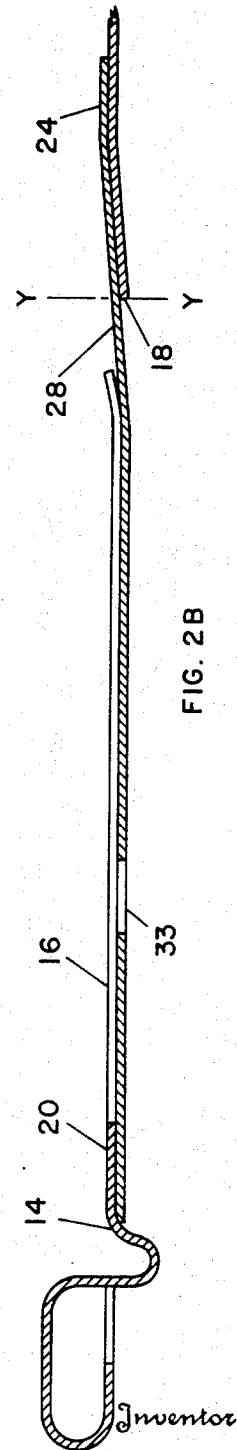
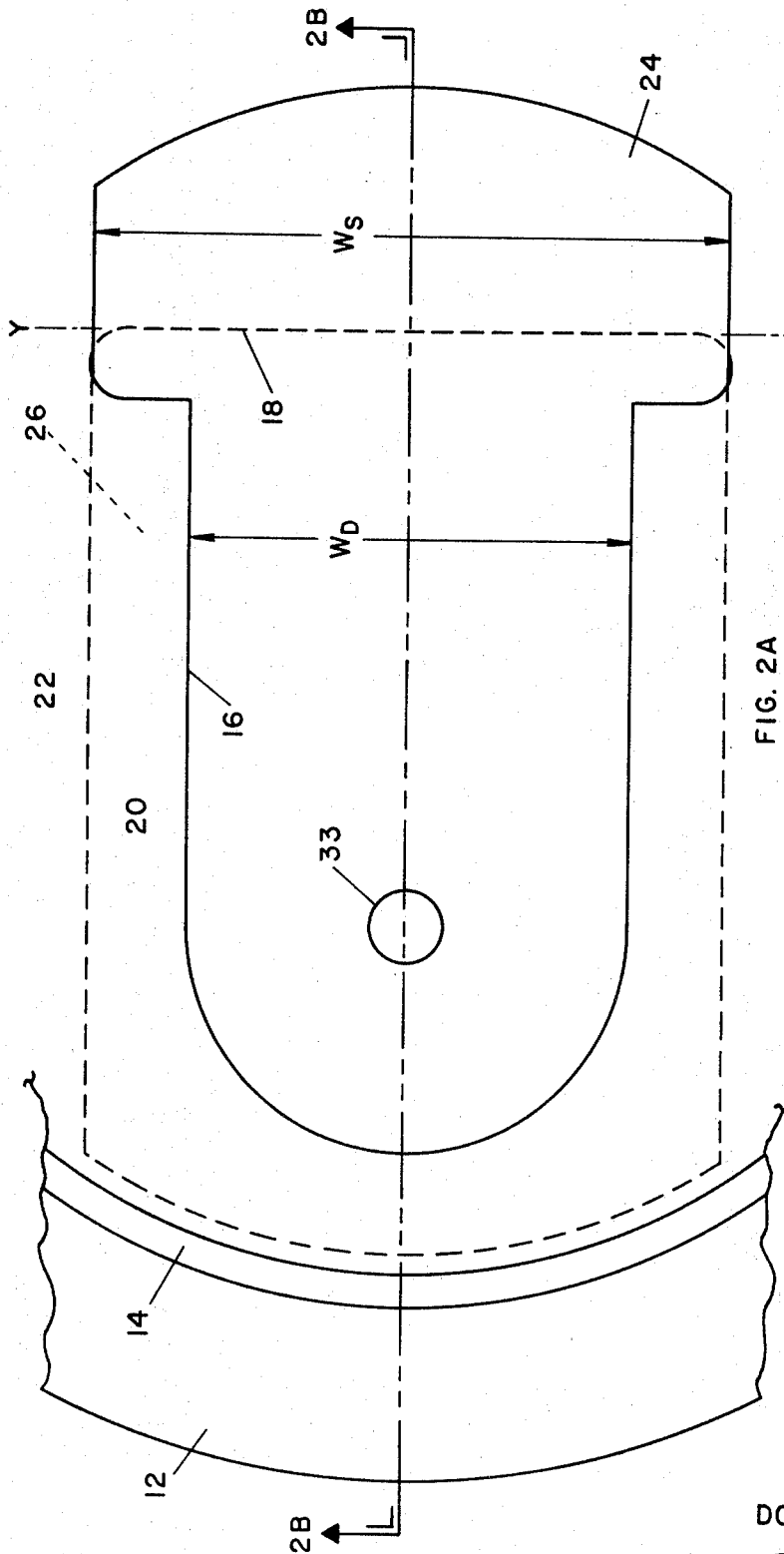


FIG. 7C

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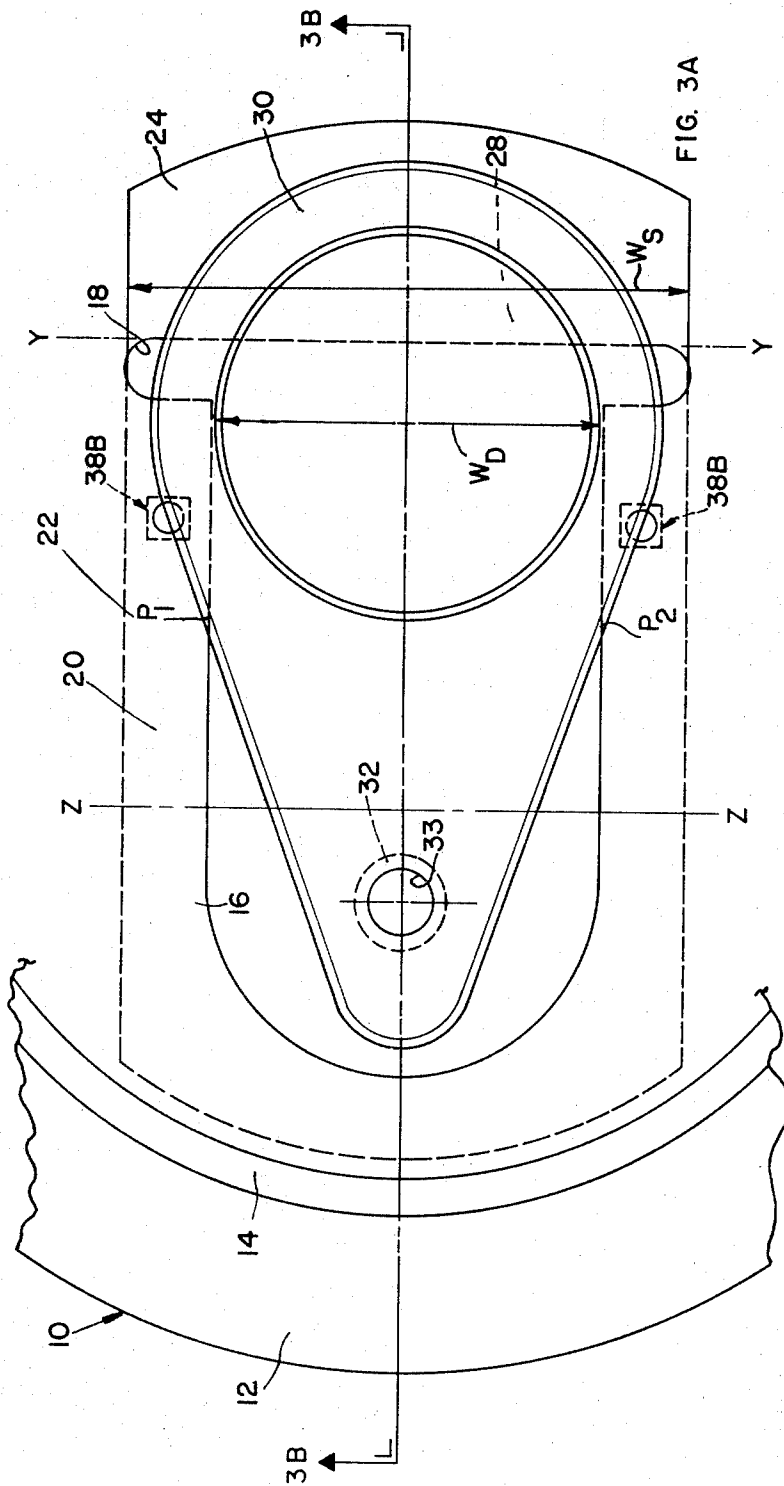


FIG. 3A

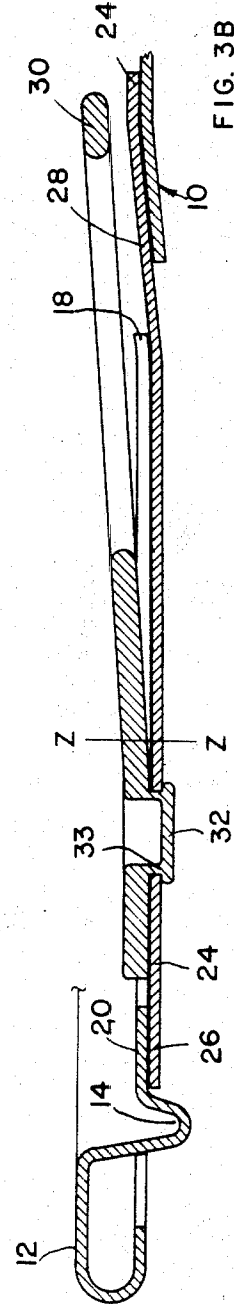


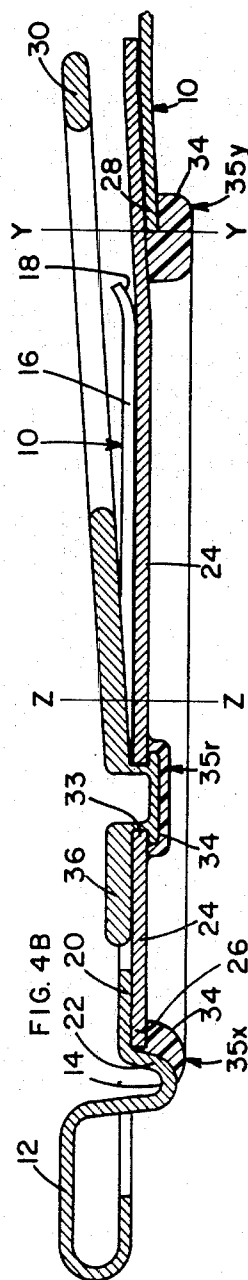
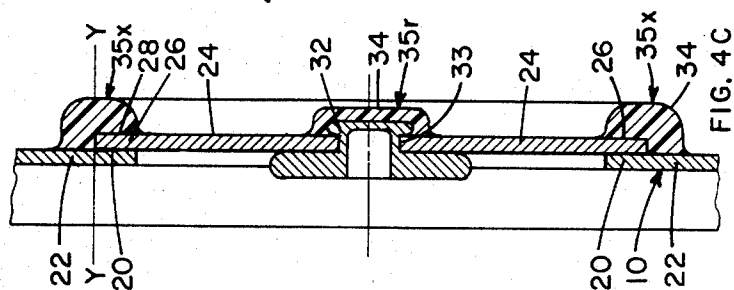
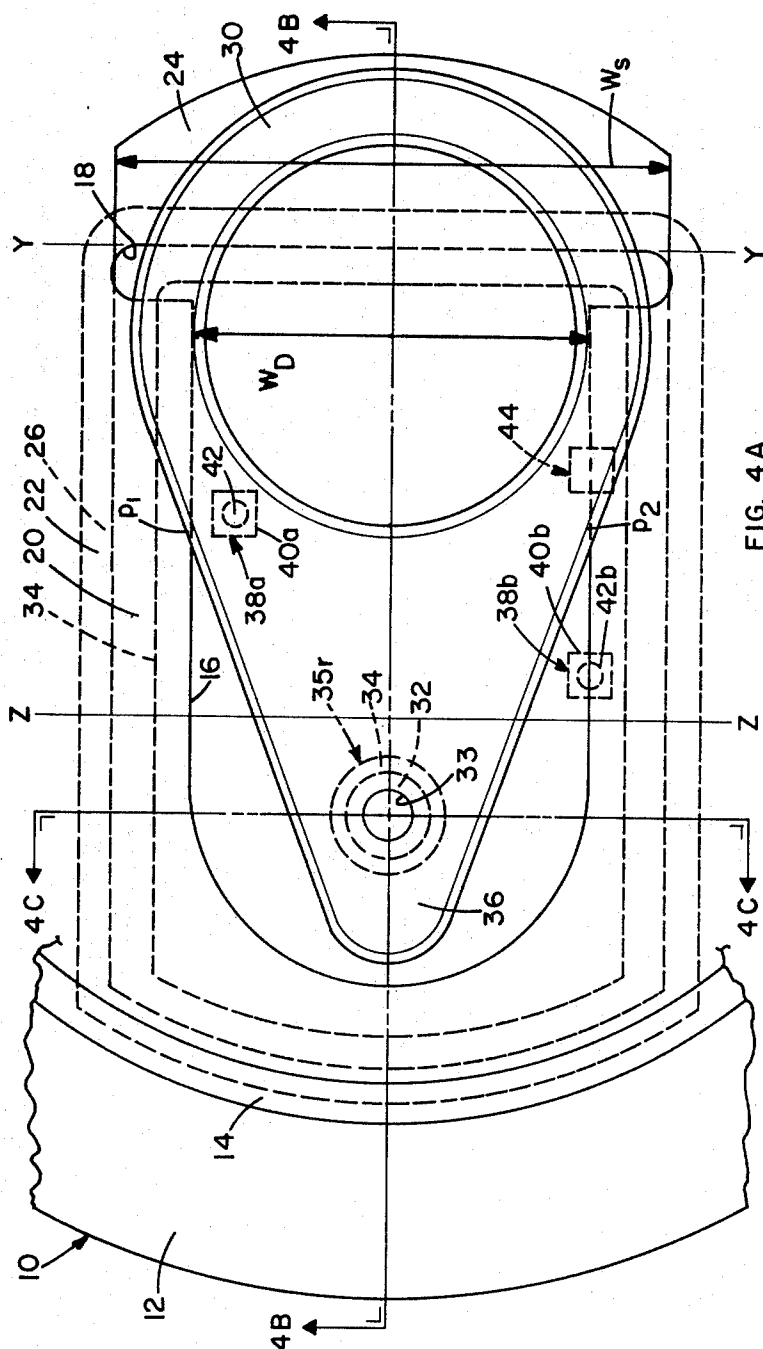
FIG. 3B

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3.708,091



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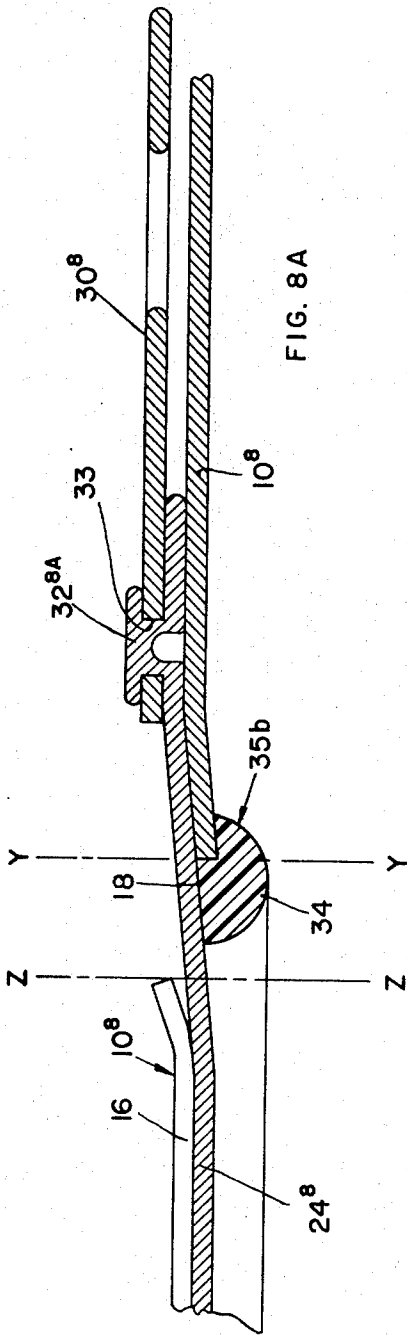


FIG. 8A

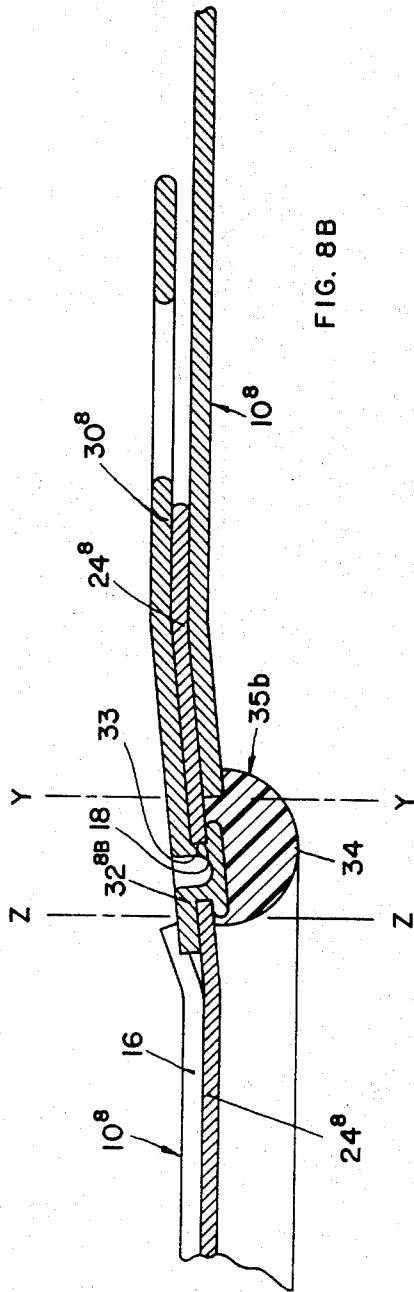


FIG. 8B

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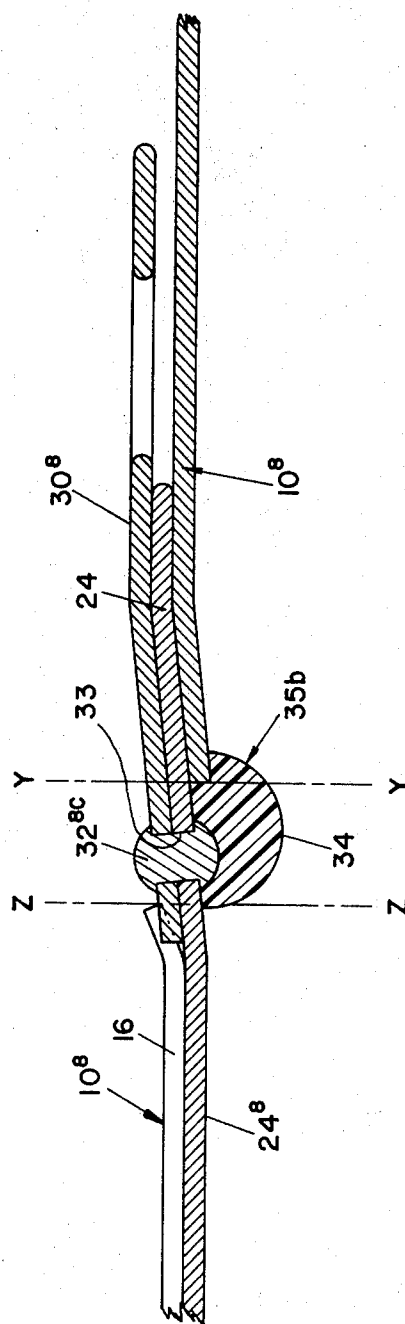


FIG. 8C

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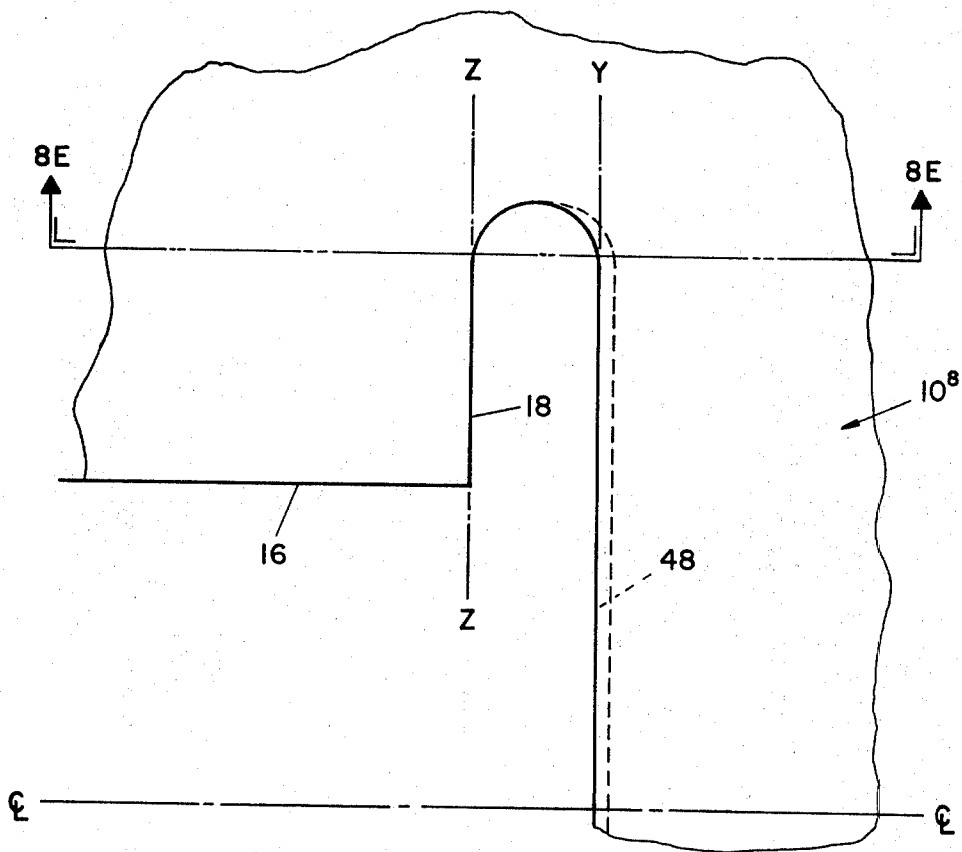


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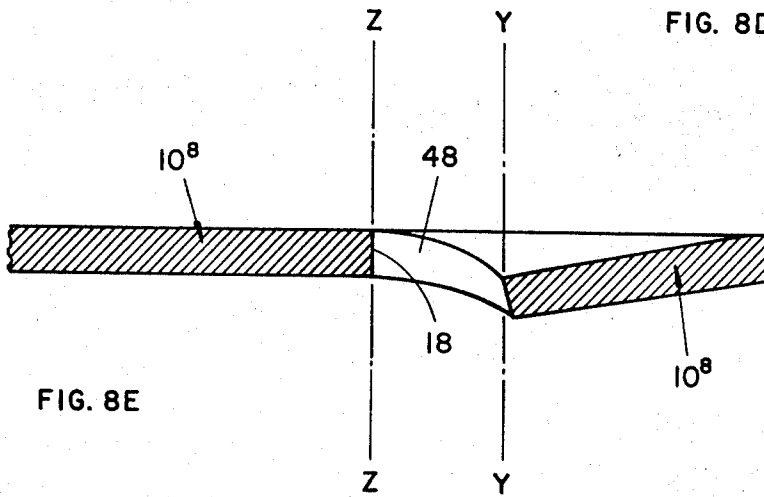


FIG. 8E

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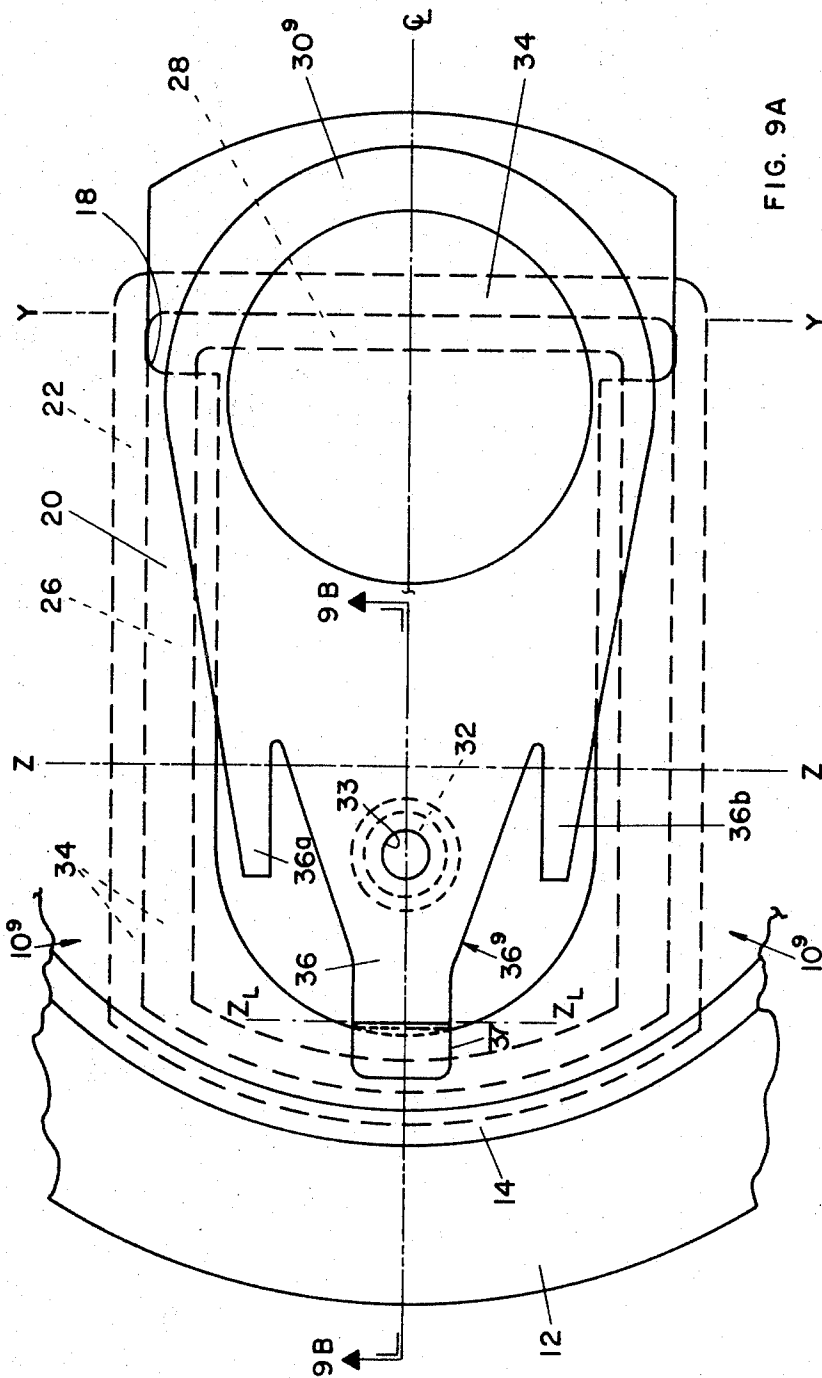


FIG. 9A

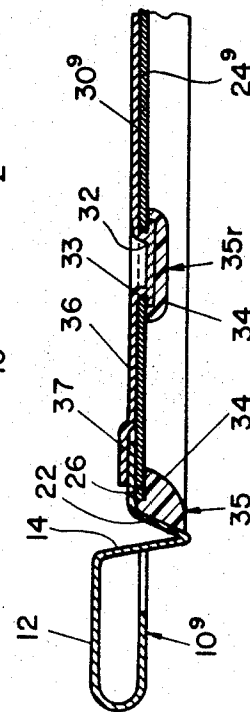


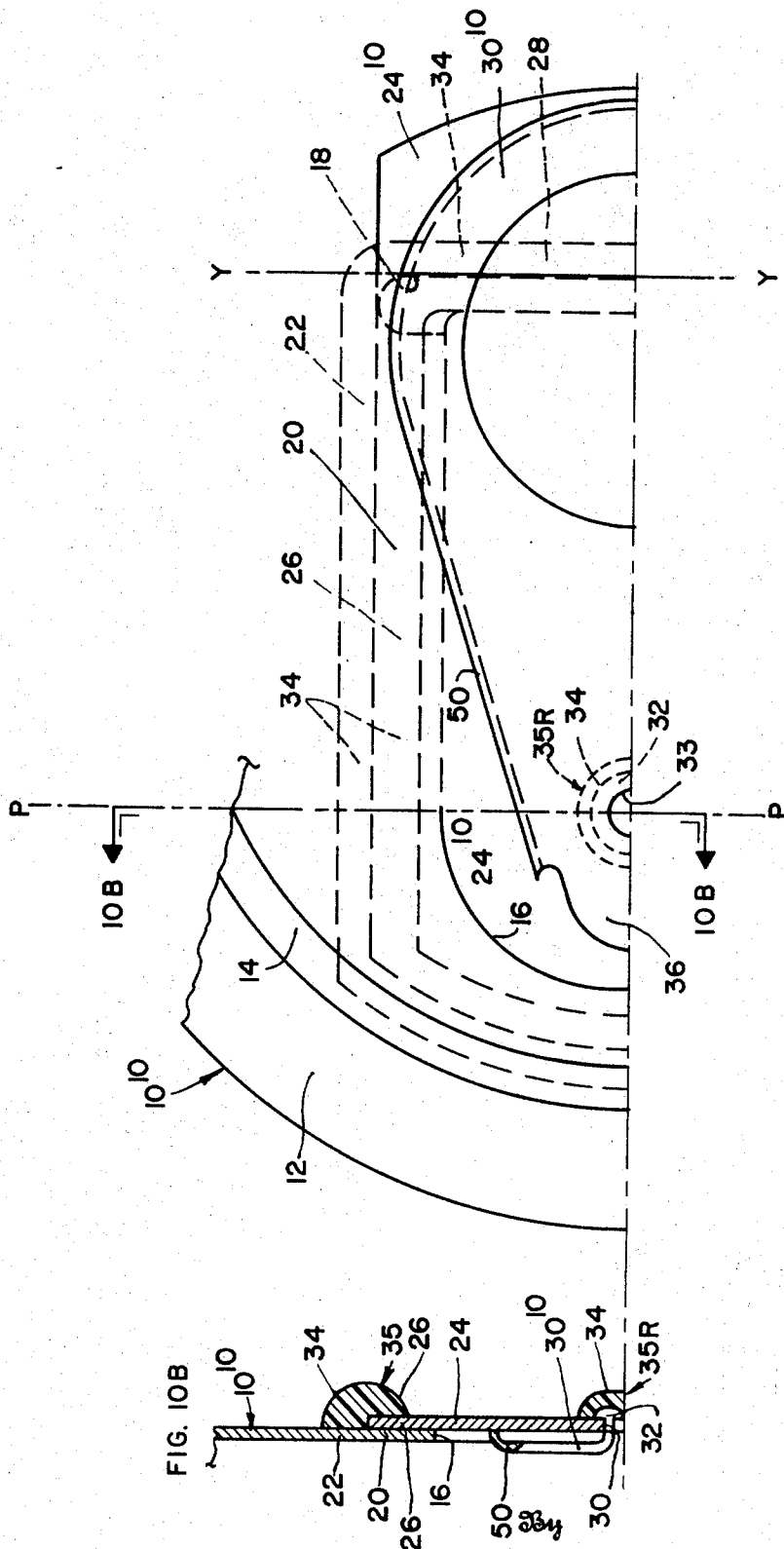
FIG. 9B

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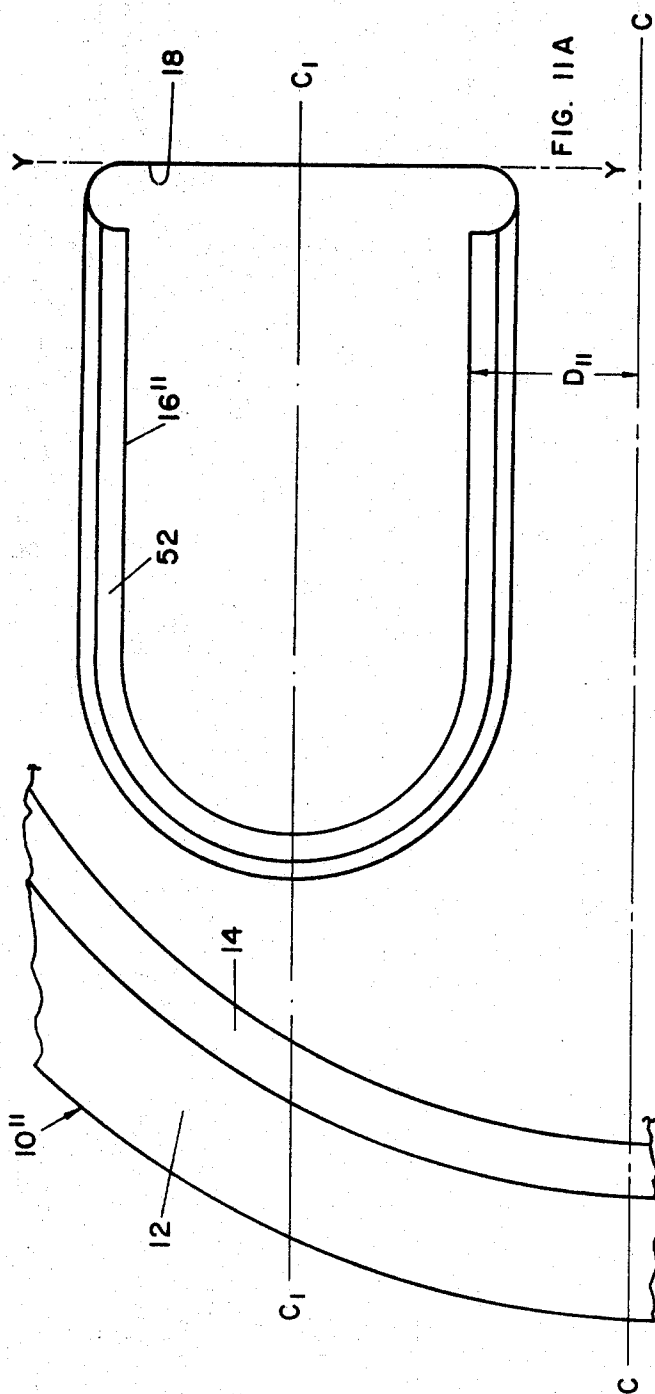


FIG. IIA

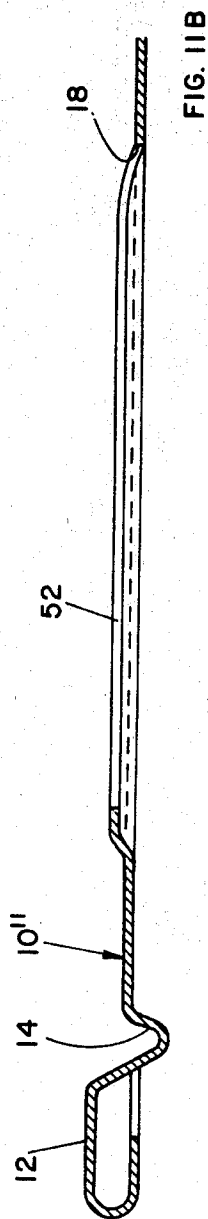


FIG. IIB

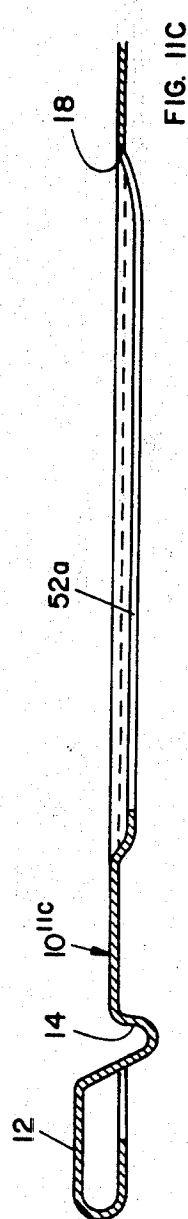


FIG. IIC

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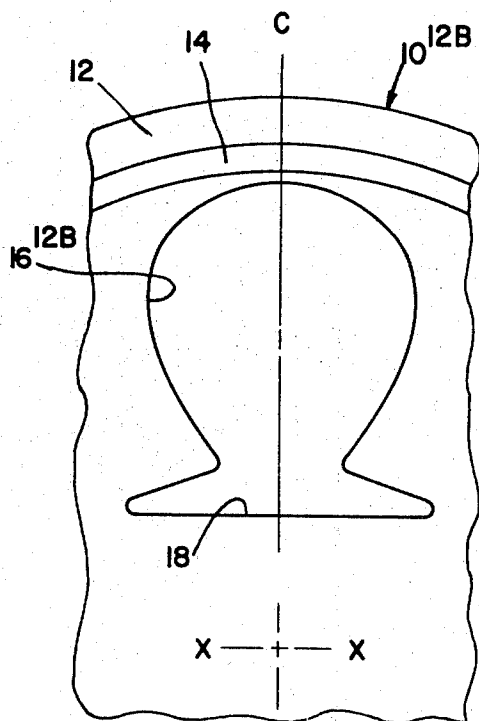


FIG. 12B

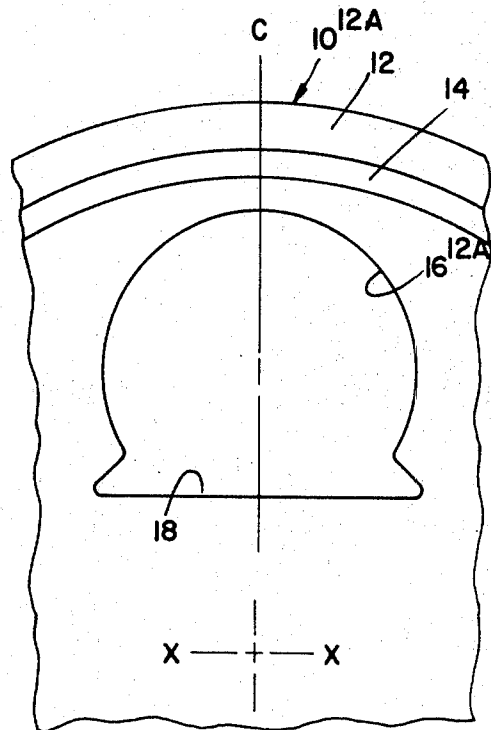


FIG. 12A

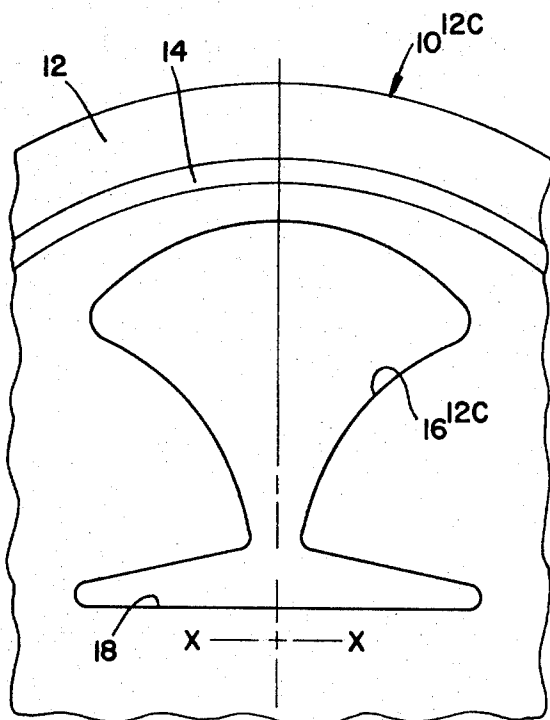
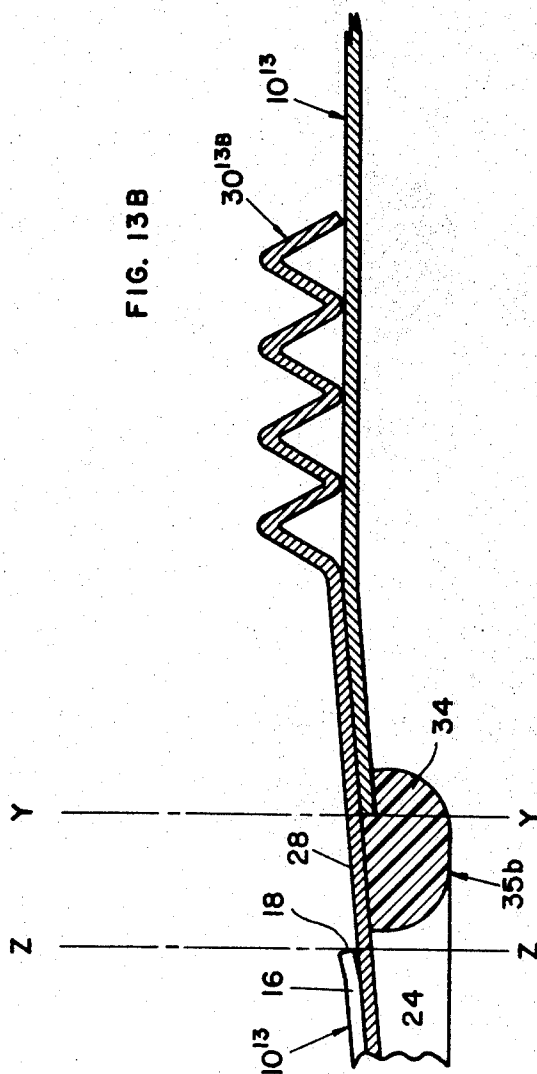
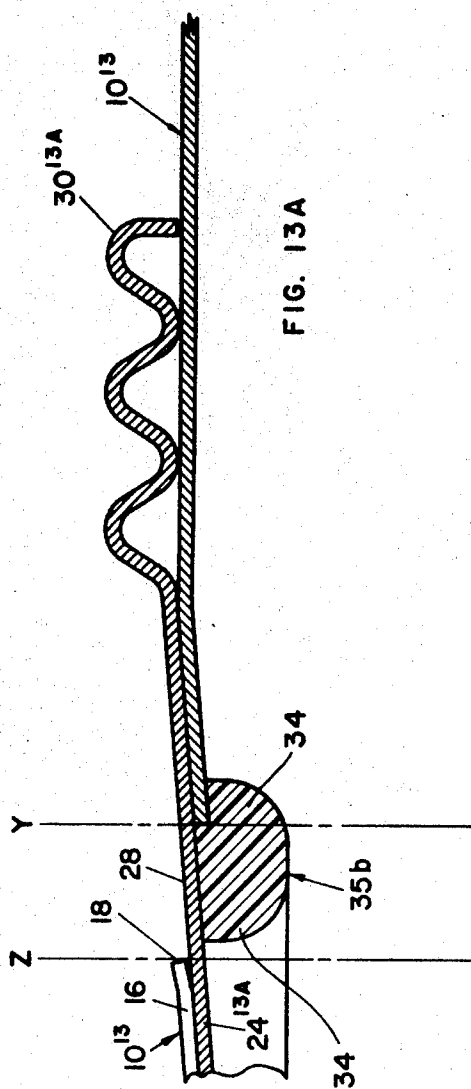


FIG. 12C

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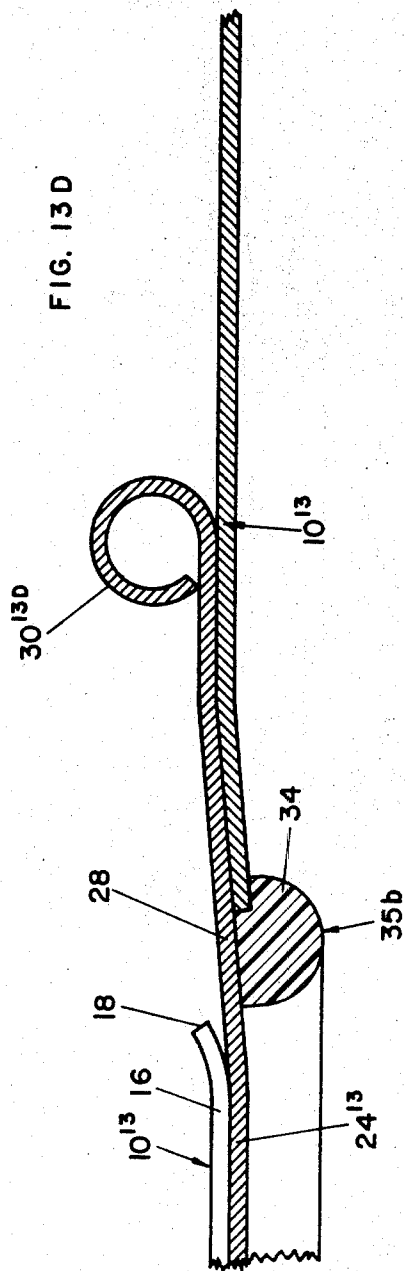
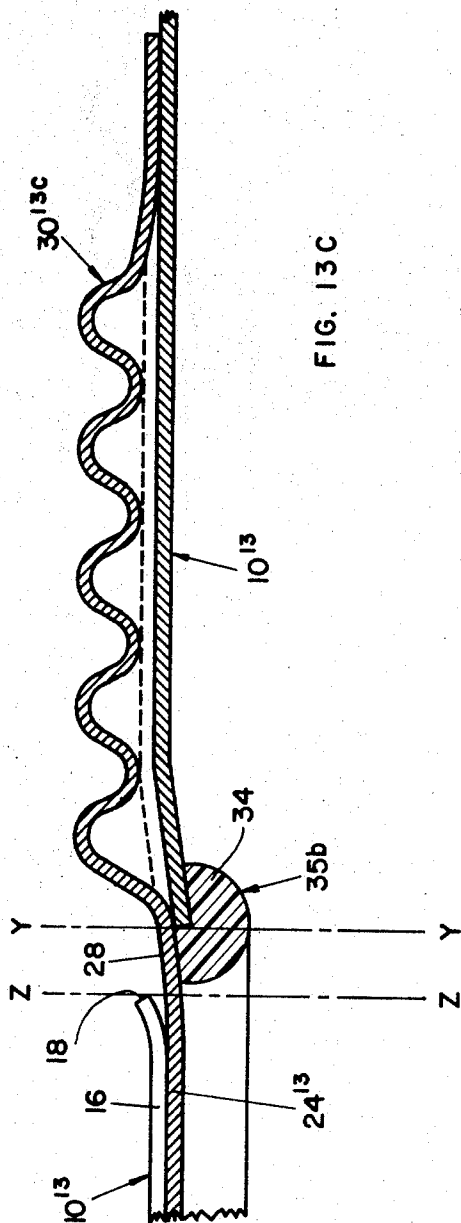
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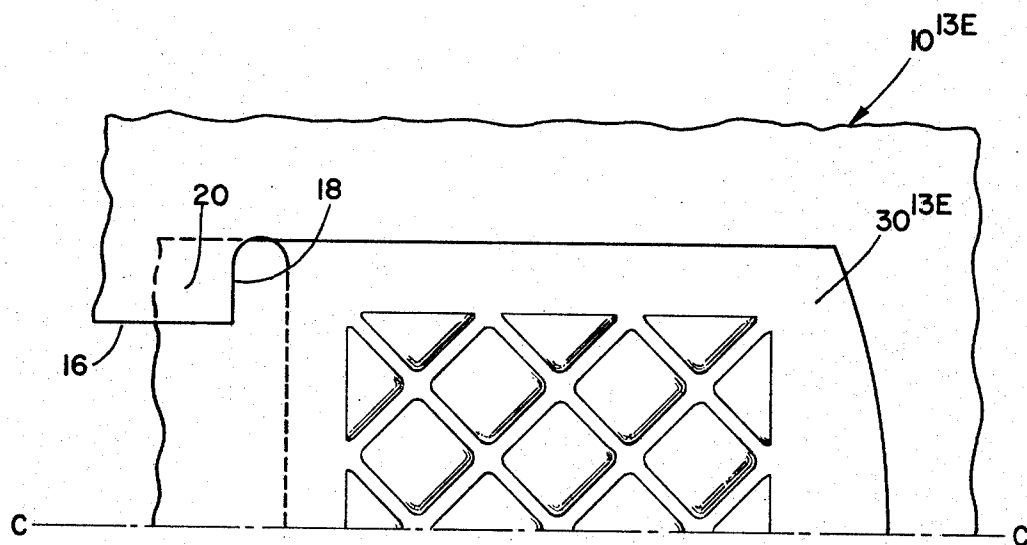


FIG. 13E

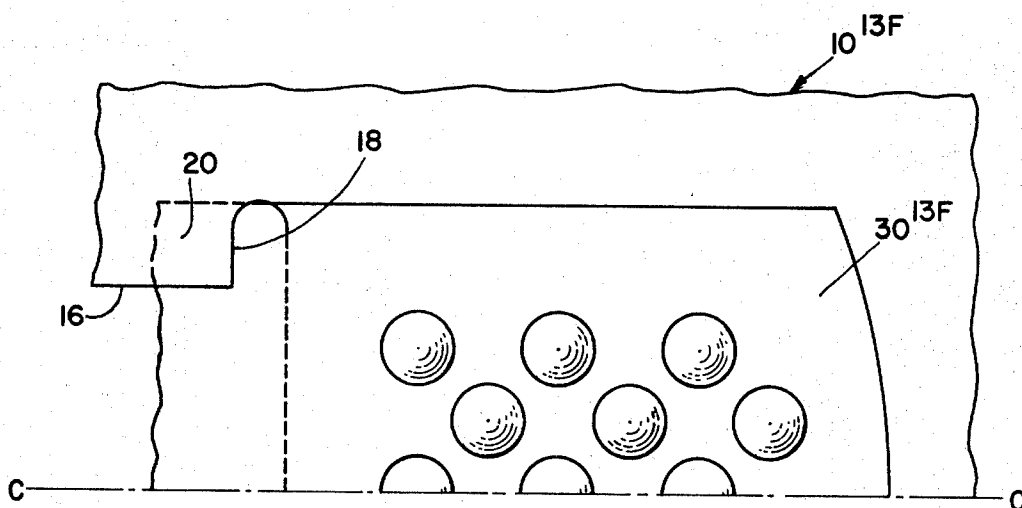


FIG. 13F

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FIG. 13G

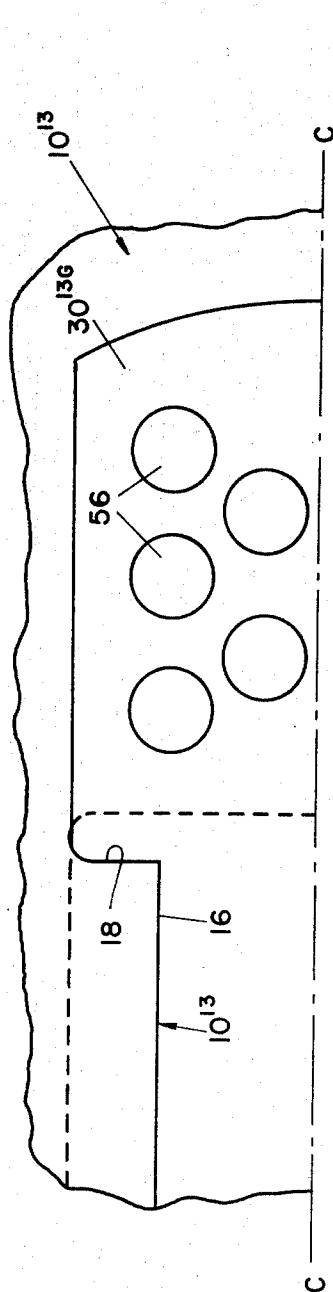
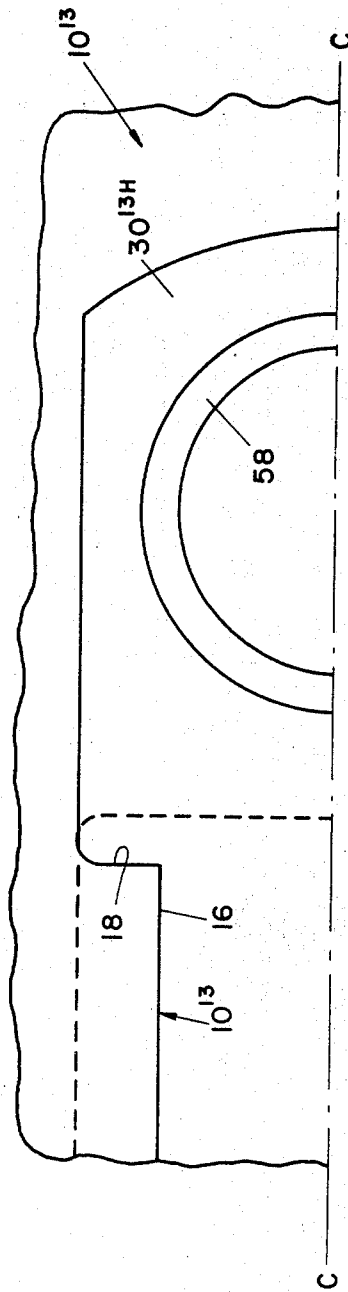
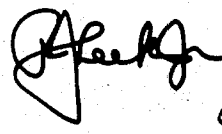


FIG. 13H



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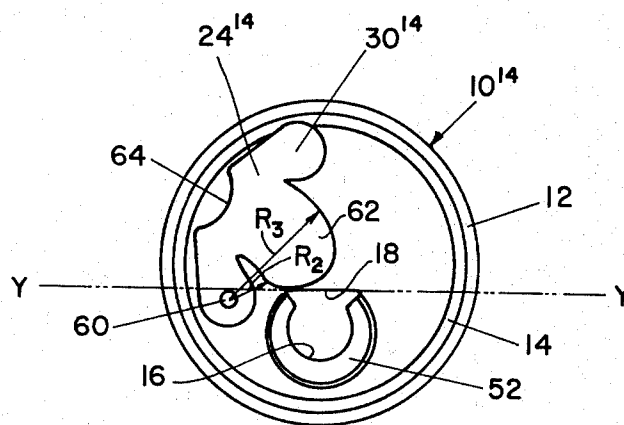


FIG. 14A

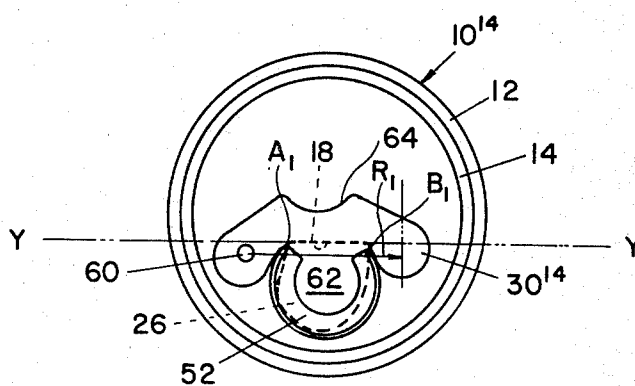


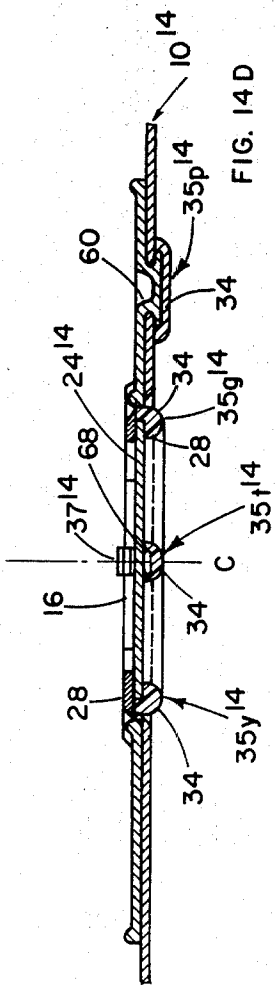
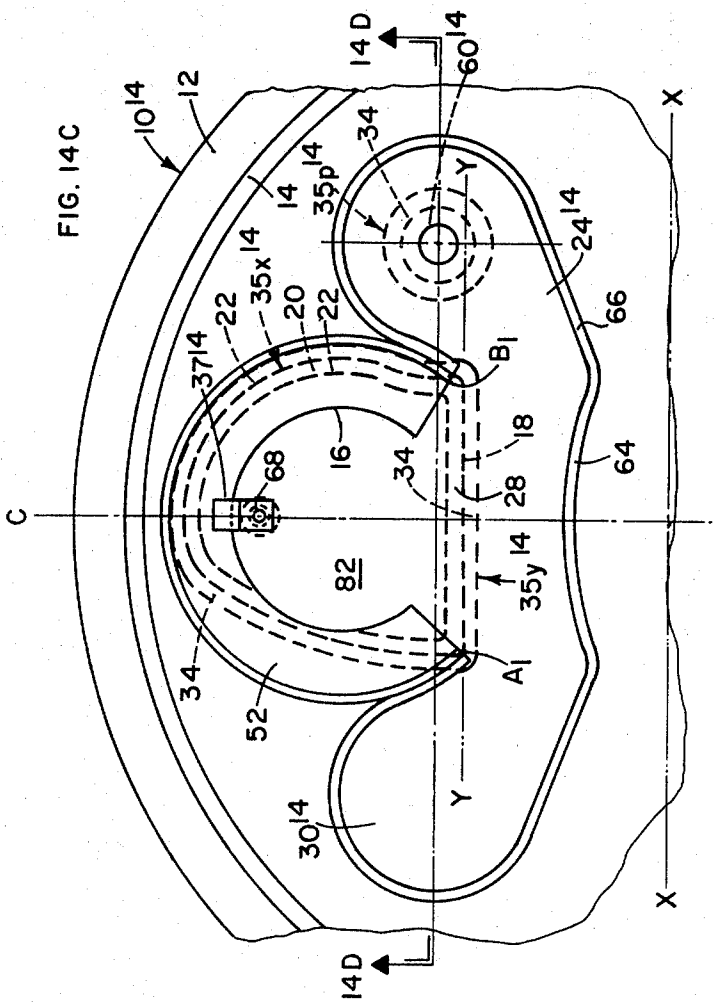
FIG. 14B

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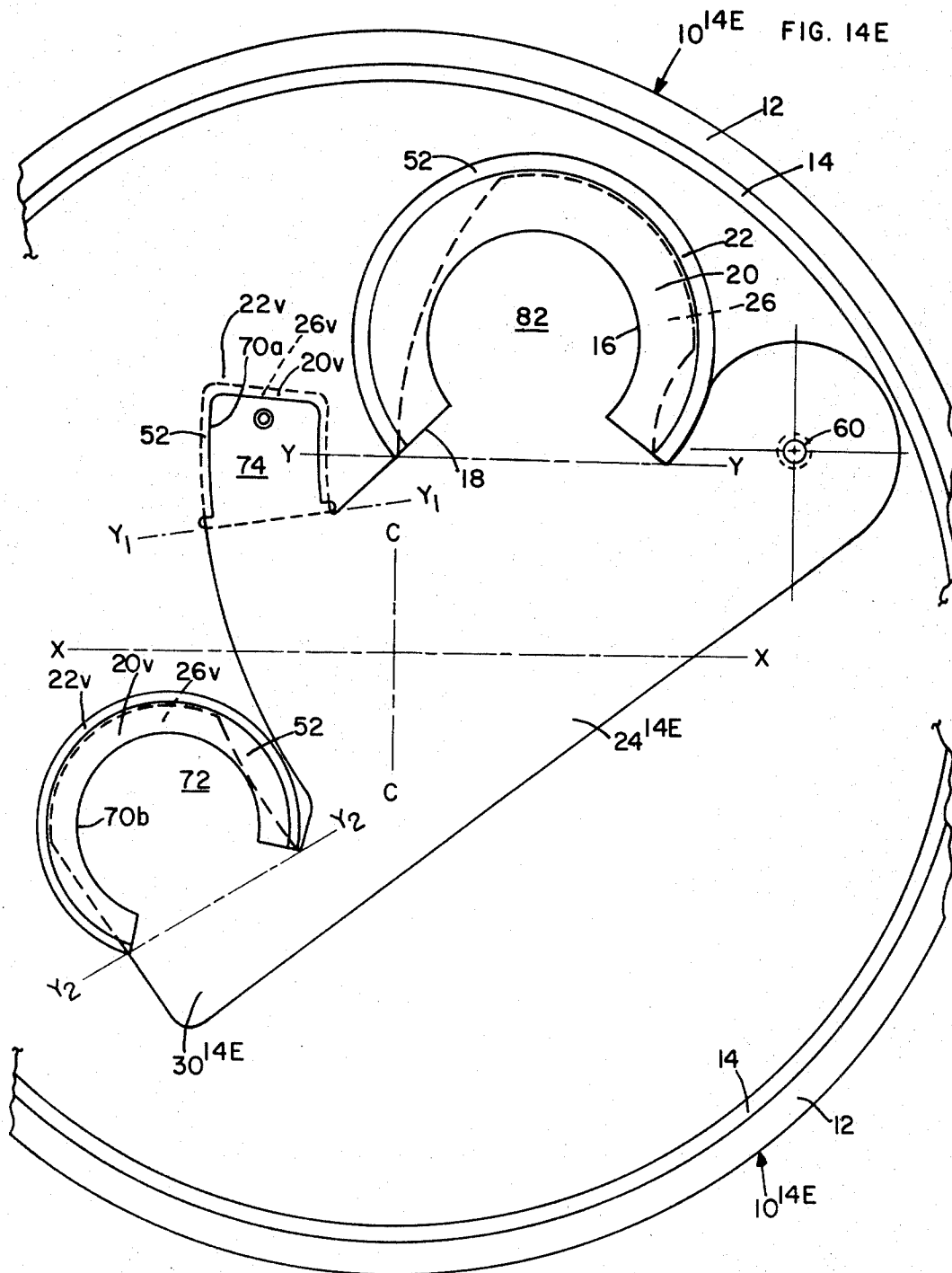


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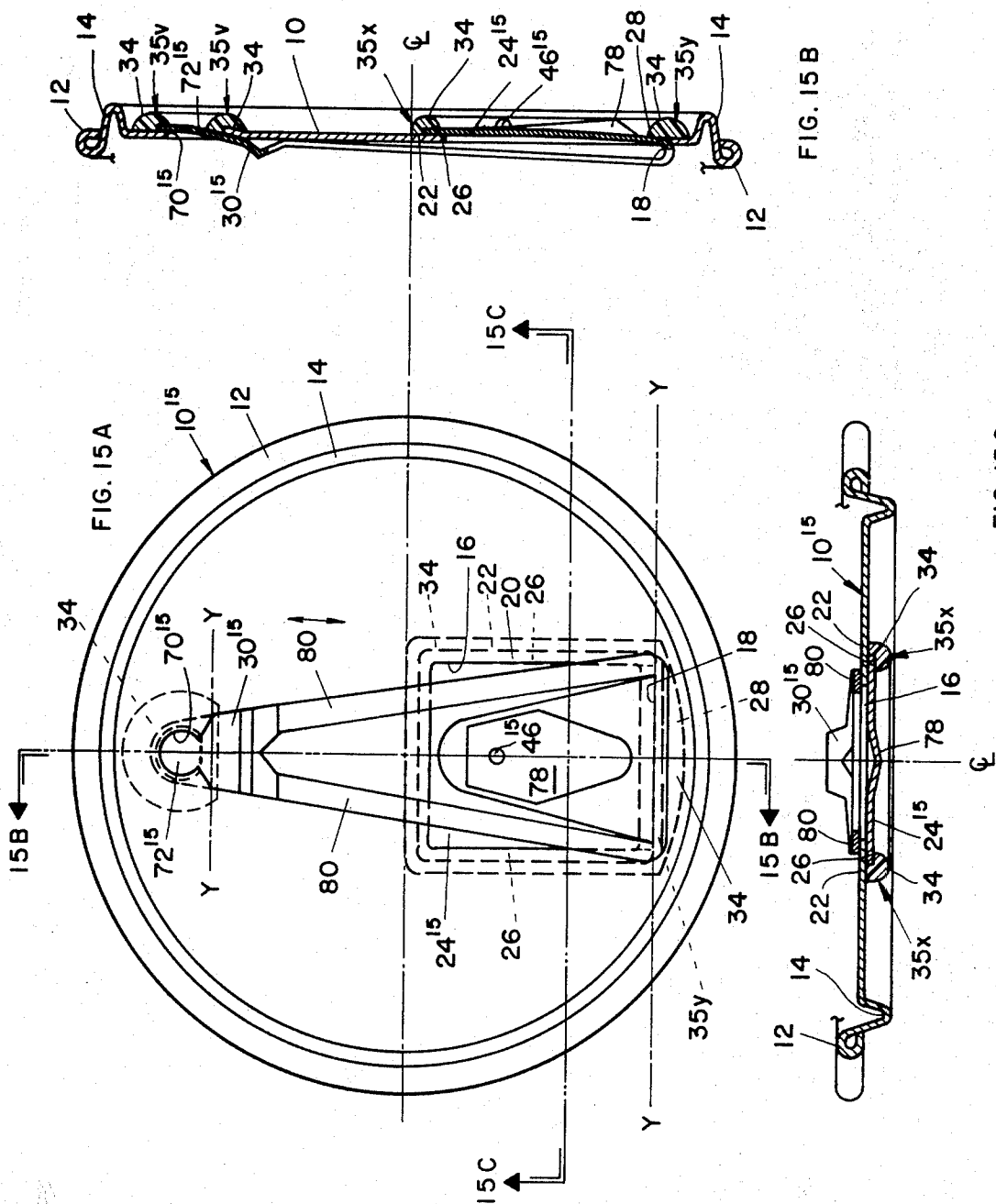
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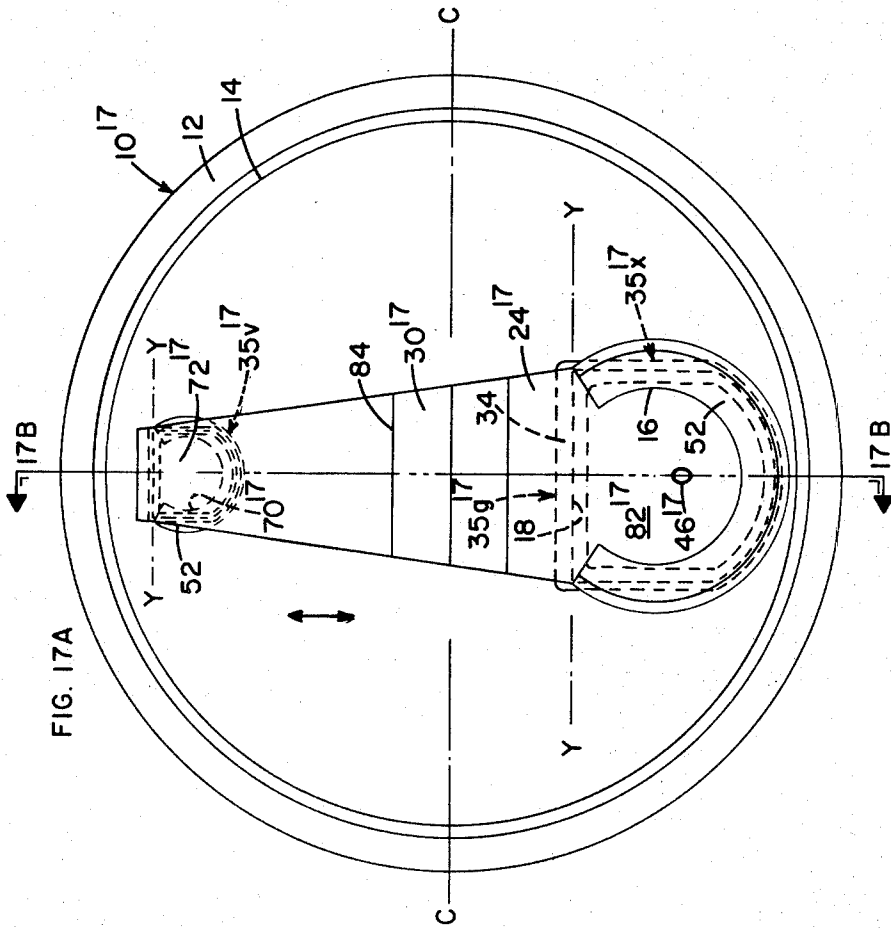
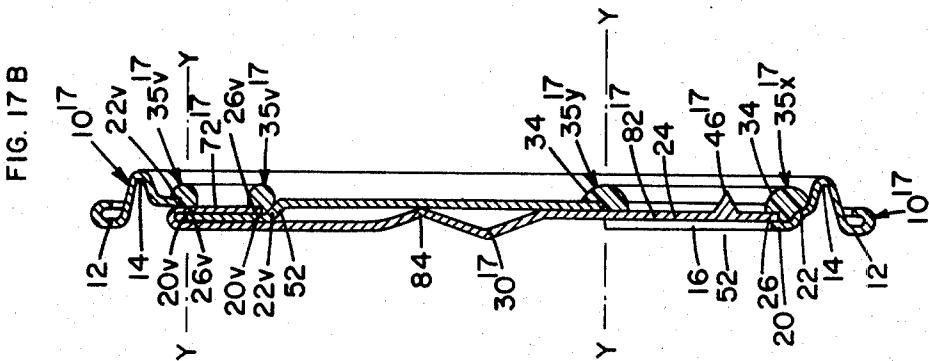


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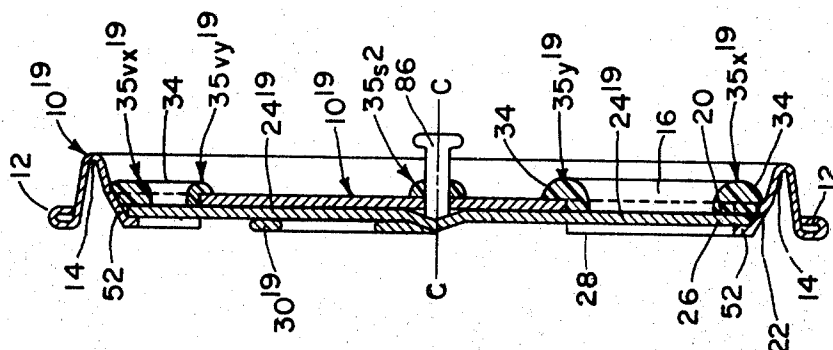
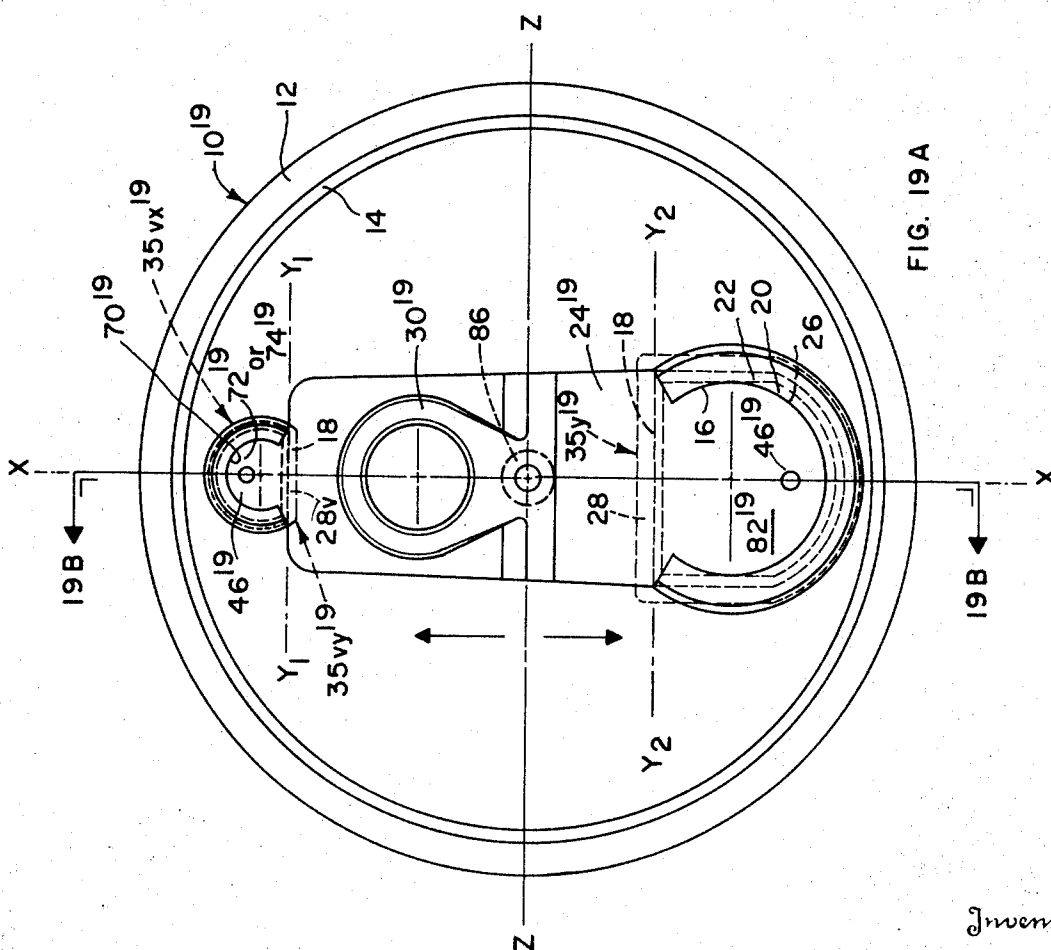
Attorney



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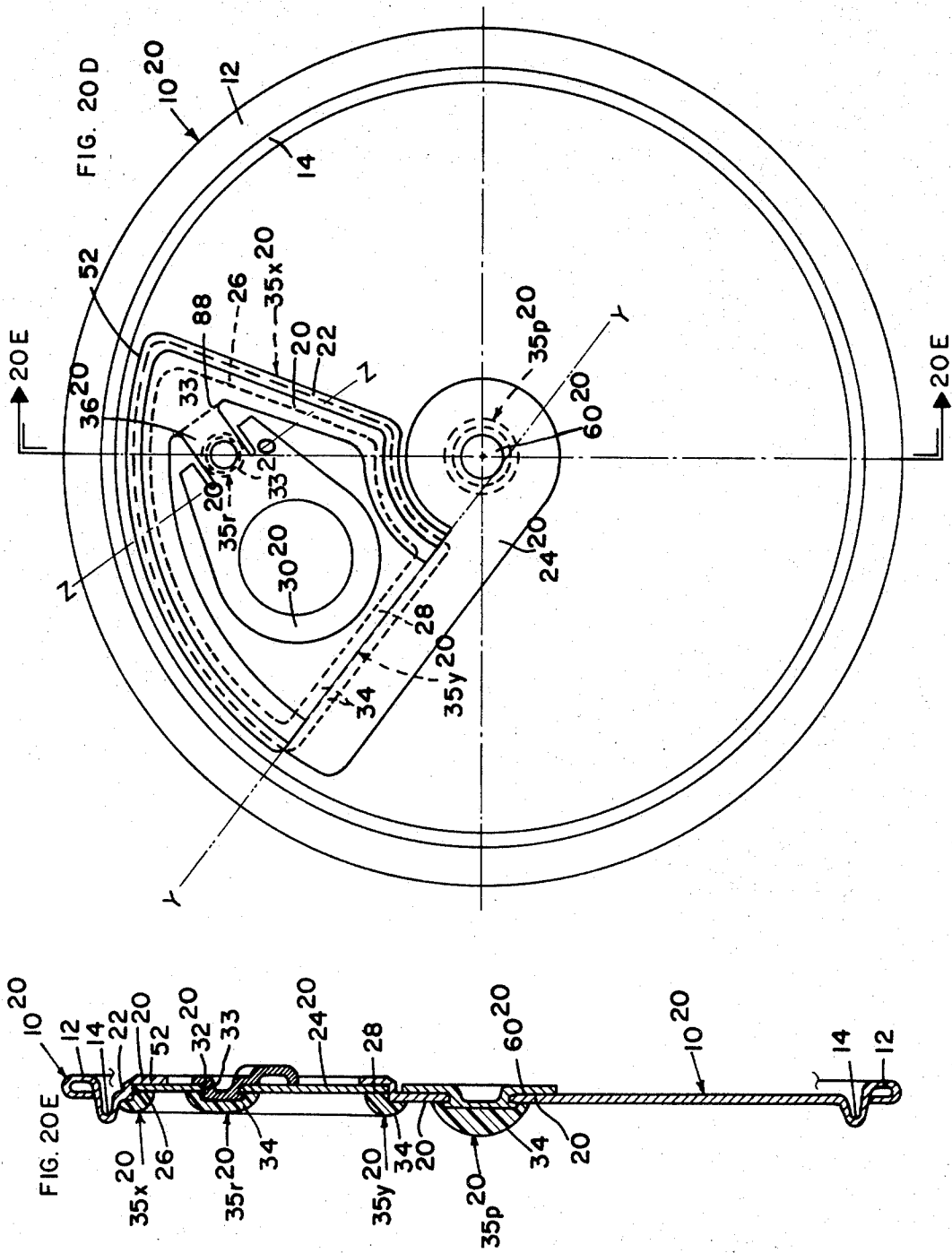
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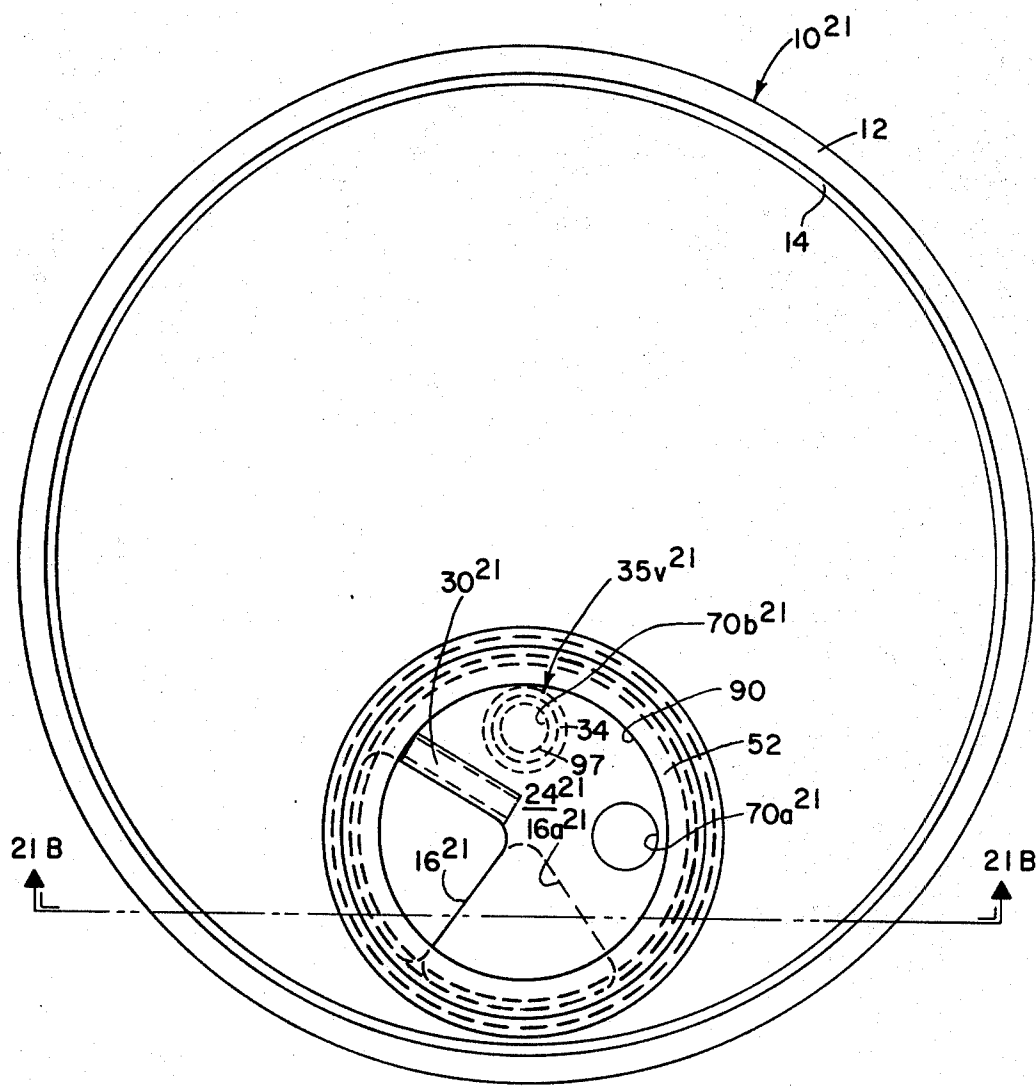


FIG. 21A

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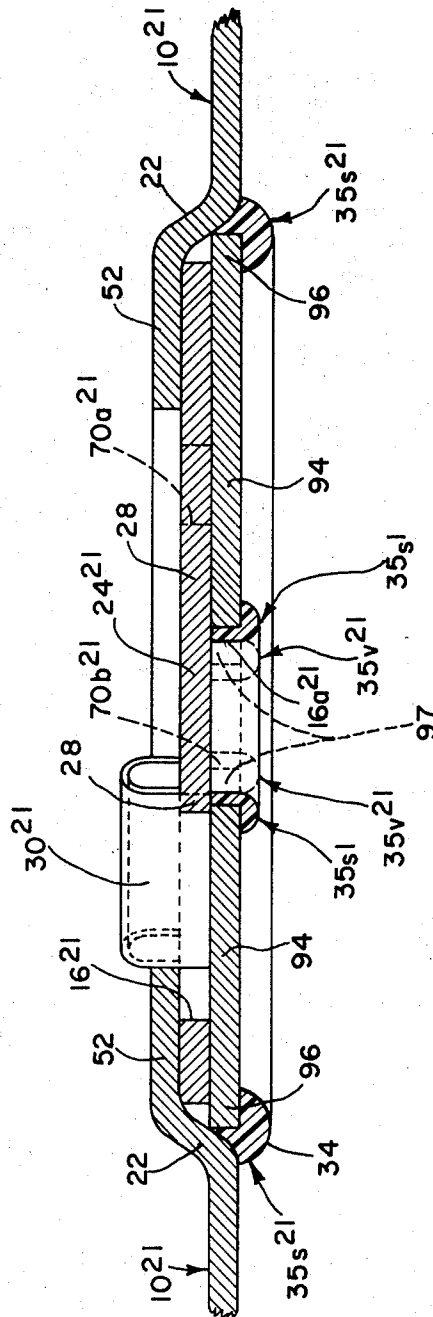


FIG. 21B

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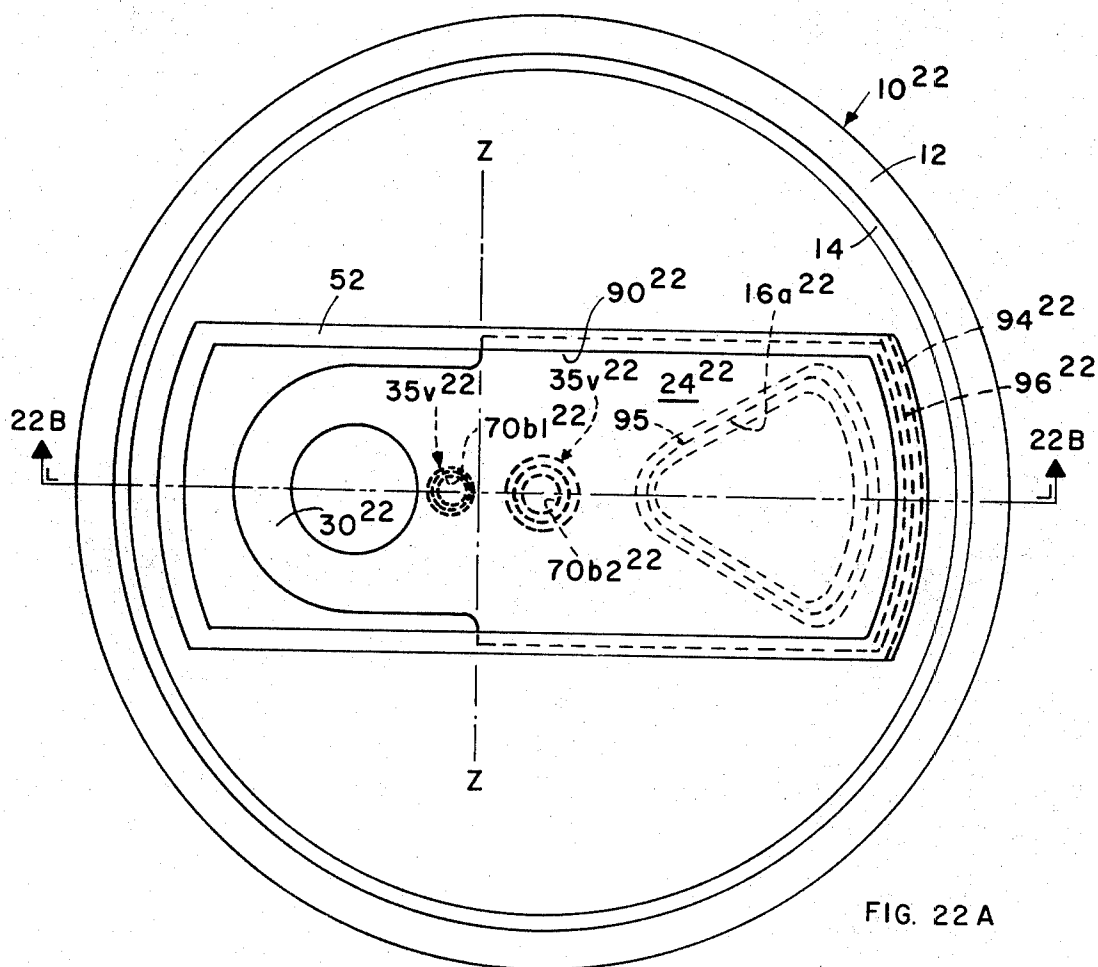


FIG. 22 A

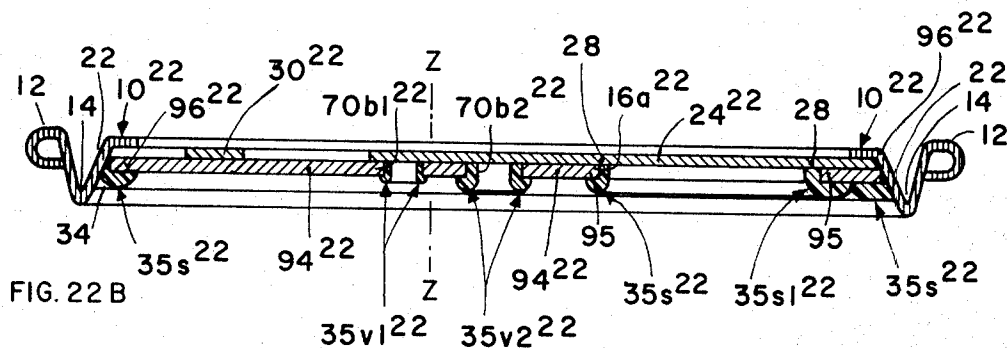


FIG. 22 B

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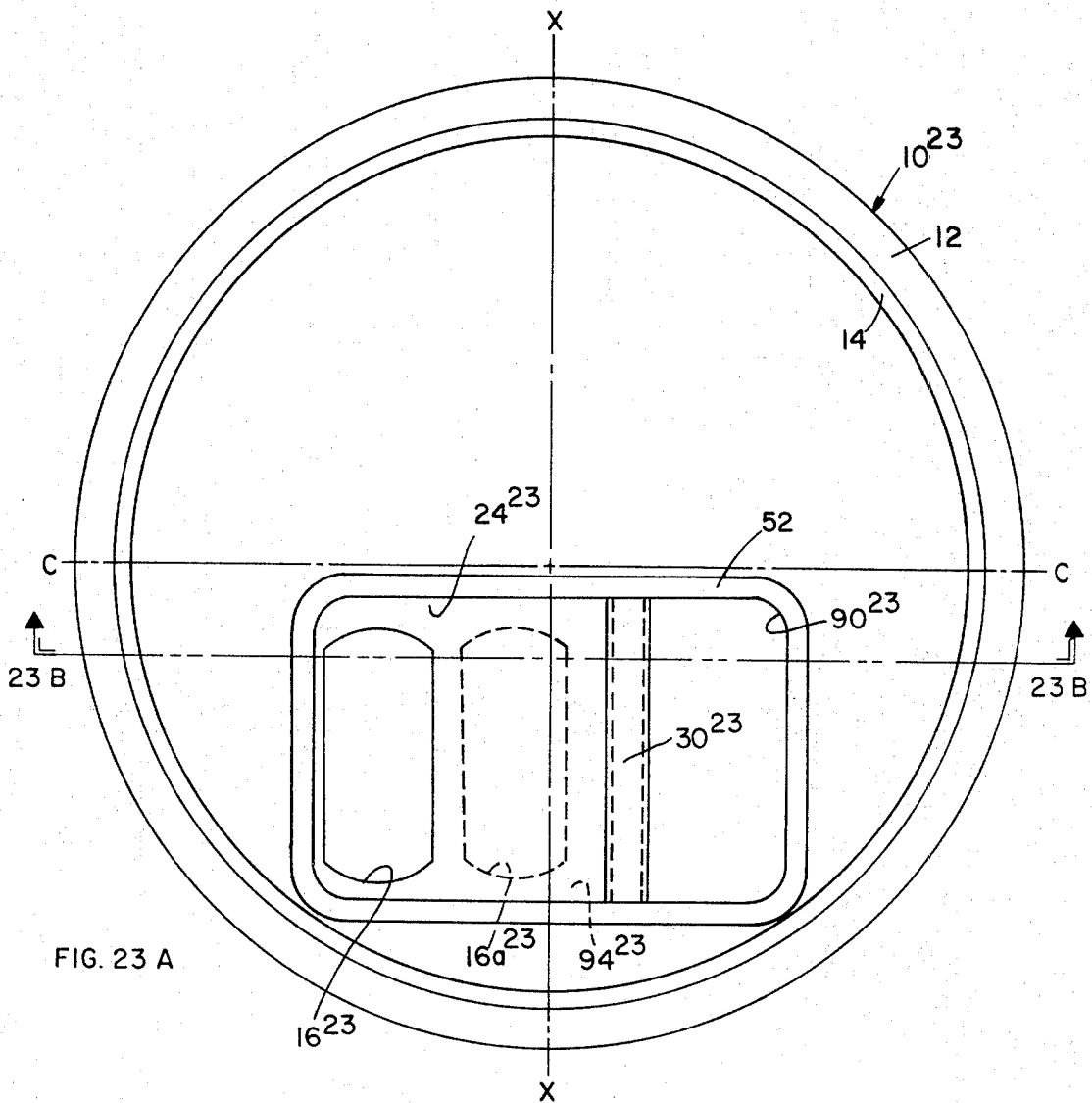


FIG. 23 A

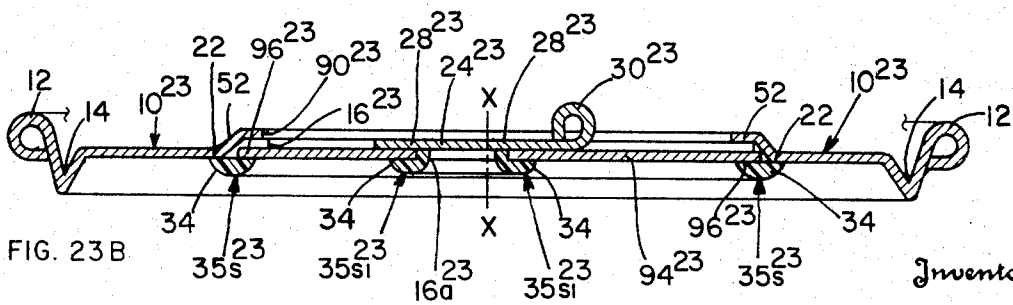


FIG. 23 B

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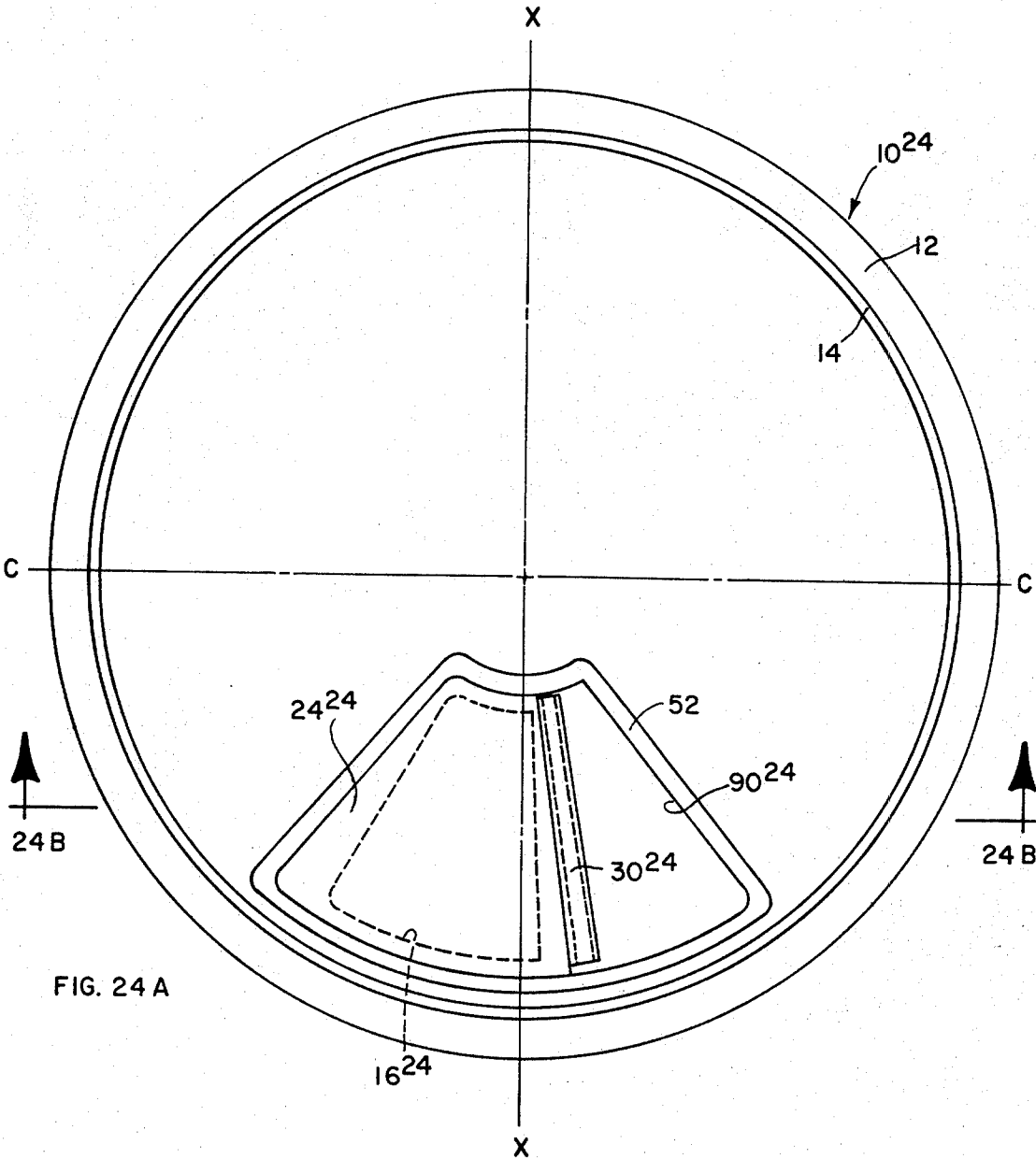


FIG. 24 A

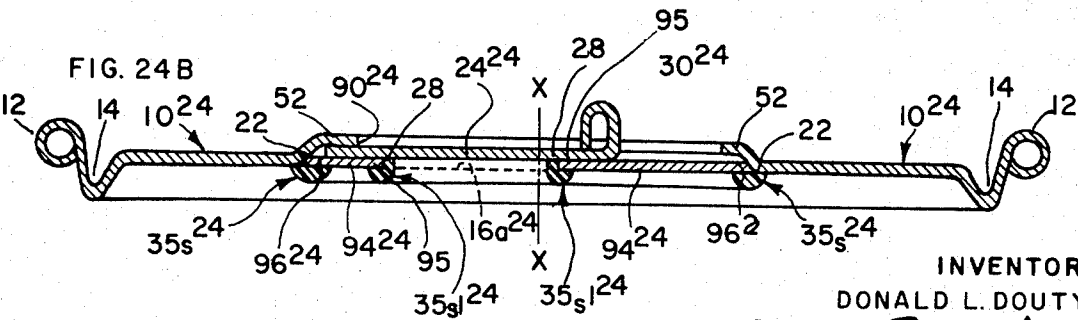


FIG. 24 B

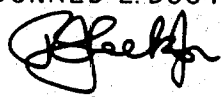
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FIG. 26A

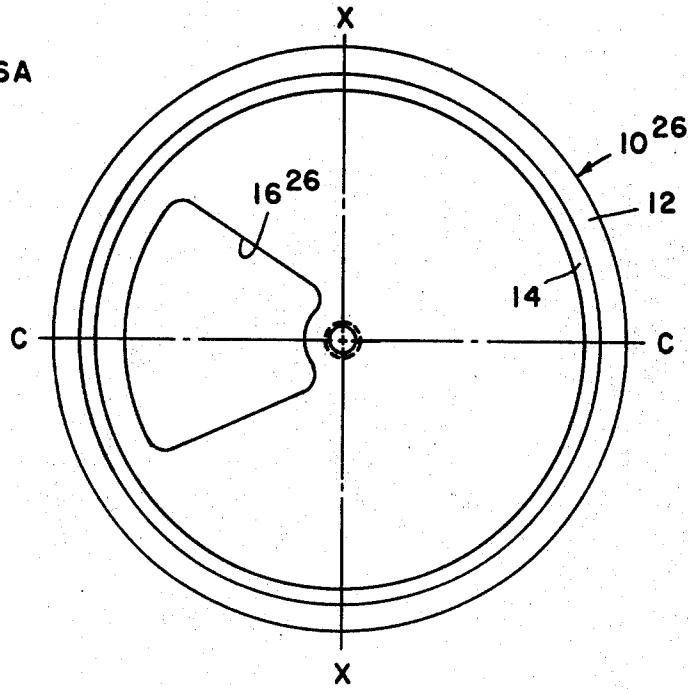


FIG. 26B

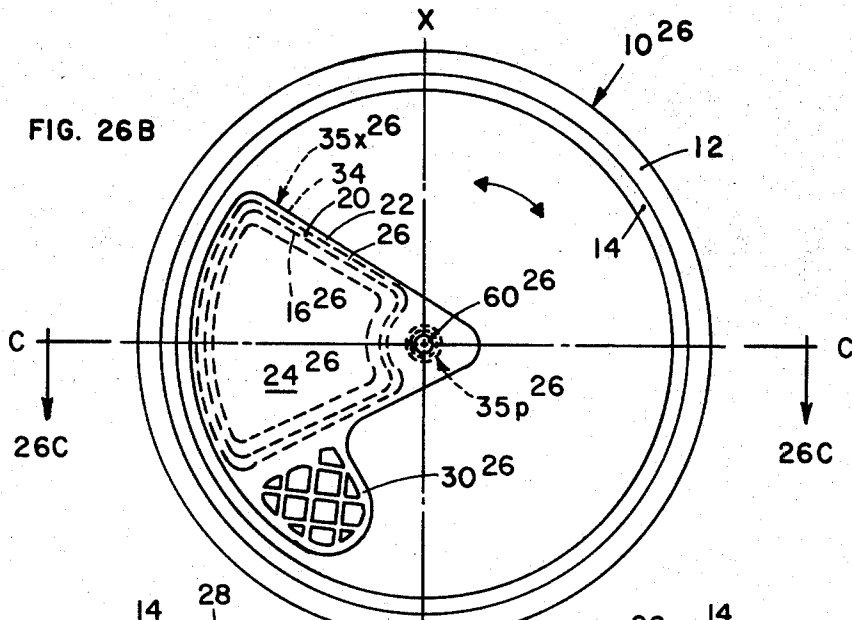
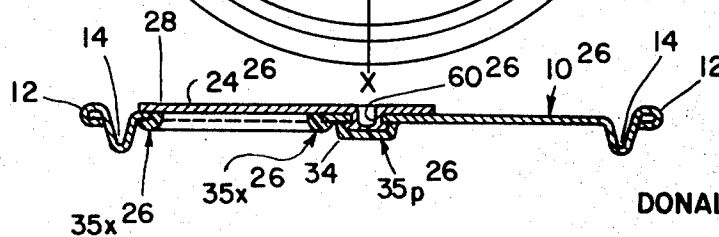


FIG. 26C



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CAN END WITH BONDED SEAL SLIDE

This application is a divisional application of U.S. Pat. application Ser. No. 61,384, filed Aug. 5, 1970 by applicant now U.S. Pat. No. 3,622,055 and assigned to the same assignee as the present application.

BACKGROUND OF THE INVENTION

Heretofore, easy-open can ends were constructed in primarily two fashions, i.e., either the scored aluminum style end or the combination steel and aluminum Zuendel end.

The metal scoring in aluminum is used in combination with a pull tab ring which is installed on top of the can end. This metal pull ring or tab is typically pulled in an upward direction, the scored portion of the can end is broken and a metal pull tab and the scored portion are removed from the lid to expose a pour-style opening. Some of the disadvantages of this scored metal and relate to improper depth of scoring and improper attachment of the metal pull tab to the can end. When either the score line or the pull tab fails to operate properly, access to the contents of the can is prevented. Another disadvantage of this style can end is the resulting sharp edge of torn metal tab that is removed from the can end. This sharp edge has occasionally resulted in fingers being cut and lips being injured. The resulting metal tab torn from the can also produces sharp contact edges that present a danger in a concerned environment, such as a beach, public park, or gas station, or the like. Another disadvantage of this metal tab is its effect on wildlife. It is commonly understood that fish cannot internally accommodate metal, such as aluminum, or the like. Another area of prime concern is the elimination of litter resulting from no deposit-no return can packages. The current thinking relating to this ecological situation is the reclamation and reuse of the can materials.

The other common style of easy-open can end, the Zuendel can has a small aluminum portion mechanically fastened into a steel can end. This aluminum insert is scored and has an integral pull tab. The aluminum insert is sealed into the bottom of the can lid with a typical plastisol compound to prevent the release of internal pressure, carbon dioxide, or the like from the beverage can. When the pull tab is lifted the scored portion in the aluminum insert is torn from the can end and thus produces many of the same problems as the first described scored aluminum type can end.

Conventional easy open can ends are shown in the following patents:

U.S. Pat. No.	Issued	Inventor	Title	Assignee
581,293	4/27/87	Leggett	Can Cover or the Like	None
1,180,913	4/25/16	Foss	Can Closure	None
1,687,179	10/9/28	Peterson	Bottle or Jar Cover	None
2,582,360	1/15/52	Sheridan	Container having Slidable Closure	None
2,606,686	8/12/52	Barranco	Cooking Utensil Cover	None
2,757,859	8/7/56	Holland	Chewing Gum Disposer	None
3,236,409	2/22/66	Cross et al.	Push-in-Can-end Closure with Holding Means	U.S. Steel Corp.
3,308,986	3/14/67	Balocca	Plastisol Coatings for Easy Open Container Ends	American

3,326,406	6/20/67	et al. Brown	Easy Opening Can End	Can Co. Dayton Reliable Tool & Mfg. Co. None
3,363,798	1/16/68	Garan-giotis	Sliding Closure, Etc.	None
3,371,818	3/5/68	Bozek	Plastic Tab and Inner Tape, etc.	Conti-ental Can Co.
3,379,333	4/23/68	Navia	Container Easy-Open Means, etc.	Reynolds Metals Co.
3,401,821	9/17/68	Bozek	Container having Tear-out Opening Means	Conti-ental Can Co.
3,420,398	1/7/69	Sungwoo	Beverage Can Top, etc.	None
3,425,590	2/4/69	Chun Duross,	Elongated Hinged Container & Method of Forming Same	Bishop and Simon
3,473,692	10/21/69	Jr. Moller	Easy Opening Container With Protective Bead	Conti-ental Can Co.

OBJECTS OF THE INVENTION

It is the general object of this invention to avoid and overcome the foregoing and other difficulties of and objections to prior art practices by the provision of improved can ends;

1. which provide an easy-open style can end wherein the pull tab remains as an integral portion of the can end

2. which have a pull tab which is an integral portion of the can end and are thus reclaimed with the can;

3. which are a two-piece style easy-open can ends;

4. which are three-piece easy-open can lids;

5. which have an ideal pour opening suitable for pouring beverages or liquids;

6. wherein the rivet used to connect the pull tab also serves as a stop to prevent removal of the slide and tab from the can end;

7. which have an easy-open pull tab which moves radially along the can end;

8. which have a pull tab which moves in a rotary direction;

9. which have a rotary pull tab which can be opened in either direction, and

10. wherein the tab may be reclosed if the contents are not completely consumed.

BRIEF SUMMARY OF THE INVENTION

The aforesaid objects of this invention, and other objects which will become apparent as the description proceeds are achieved by providing improved can ends.

II. Another can end is provided with a pour opening and has a pour width. The pour opening is provided with an entry aperture at one end of the pour opening. The entry aperture has a slide width greater than the pour width. The can end has a can end lapping portion and a can end sealing portion adjacent the pour opening and a plane of bulge strength adjacent the entry aperture. A slide is adapted to pass through an entry aperture and has a slide lapping portion, a slide sealing

portion and a protruding portion extending from the entry aperture. The slide lapping portion is adapted to register with the can end lapping portion, and the slide sealing portion is adapted to register with the plane of bulge strength. A pull tab has a connection to the slide on the protruding portion. Engaging means engage the can end lapping portion to press the can end lapping portion into intimate contact with the slide lapping portion and the slide sealing portion into intimate contact with the plane of bulge strength. A pressure barrier material for sealing the intimately contacting can end sealing portion and the slide lapping portion and also for sealing the intimately contacting plane of bulge strength and the slide sealing portion is provided. The pressure barrier material is bonded to the can end sealing portion with a first predetermined shear strength and to the slide lapping portion and to the plane of bulge strength with a second predetermined shear strength less than the first predetermined shear strength. The pull tab has a plane of weakness of one side of the connection to the slide. The connection is disposed outwardly from the plane of weakness. The pull tab is movable away from the plane of bulge strength to break the bond between the slide and the pressure barrier material adjacent the plane of bulge strength so that the pressure barrier material functions as a guide. The pull tab is then movable away from the entry aperture to break the bond between the pressure barrier material adjacent the can end sealing portion and the slide lapping portion so that pressure barrier material adjacent the can end sealing portion functions as a guide for the slide.

III. A further can end is provided with a pour opening and has a pour width. The pour opening is provided with an entry aperture at one end of the pour opening. The entry aperture has a slide width greater than the pour width. The can end has a can end lapping portion and a can end sealing portion adjacent the pour opening and a plane of bulge strength adjacent the entry aperture. A slide is adapted to pass through the entry aperture and has a slide lapping portion and a slide sealing portion. The slide lapping portion is adapted to register with the can end lapping portion, and the slide sealing portion is adapted to register with the plane of bulge strength. A pull tab has a connection to the slide. Engaging means engage the can end lapping portion to press the can end lapping portion into intimate contact with the slide lapping portion and the slide sealing portion into intimate contact with the plane of bulge strength. A pressure barrier material is provided for sealing the intimately contacting can end sealing portion and the slide lapping portion and also for sealing the intimately contacting plane of bulge strength and the slide sealing portion. The pressure barrier material is bonded to the can end sealing portion with a first predetermined shear strength and to the slide lapping portion and to the plane of bulge strength with a second predetermined shear strength less than the first predetermined shear strength. The pull tab has a pivot plane at the connection to the slide, has a pressure portion on the one side of the connection, and has a beam strength greater than the beam strength of the slide. The pull tab is movable away from the can end lapping portion about the plane weakness to cause the pressure portion to break the bond between the slide lapping

portion and the pressure barrier material adjacent the can end sealing portion so that the pressure barrier material adjacent the can end sealing portion now functions as an exit and reclosure slide guide. The pull tab then is movable to break the bond between the pressure barrier material adjacent the plane of bulge strength and the slide sealing portion and to cause the slide to move through the entry aperture on the pressure barrier material adjacent the plane of bulge strength on such pressure barrier material as a guide to uncover the pour opening.

IV. Yet another can end is provided with a pour opening having a pour width. The pour opening is provided with an entry aperture at one end of the pour opening. The entry aperture has a slide width greater than the pour width. The can end has a can end lapping portion and a can end sealing portion adjacent the pour opening and a plane of bulge strength adjacent the entry aperture. A slide has a pivot on the can end, is adapted to pass through the entry aperture and has a slide lapping portion and a slide sealing portion. The slide lapping portion is adapted to register with the can end lapping portion, and the slide sealing portion is adapted to register with the plane of bulge strength. A pull tab has a connection to the slide. Engaging means engage the can end lapping portion to press the can end lapping portion into intimate contact with the slide lapping portion and the slide sealing portion into intimate contact with the plane of bulge strength. A pressure barrier material is used for sealing the intimately contacting can end sealing portion and the slide lapping portion and also for sealing the intimately contacting plane of bulge strength and the slide sealing portion. The pressure barrier material is bonded to the can end sealing portion with a first predetermined shear strength and to the slide lapping portion and to the plane of bulge strength with a second predetermined shear strength less than the first predetermined shear strength. The pull tab is rotatable about the pivot to break the bond between the slide lapping portion and the pressure barrier material adjacent the can end sealing portion so that the pressure barrier material adjacent the can end sealing surface now functions as an exit and reclosure slide guide. The pull tab causes breakage of the bond between the pressure barrier material adjacent the plane of bulge strength and the slide sealing portion and causes the slide to move through the entry aperture on the pressure barrier material adjacent the plane of bulge strength and such pressure barrier material to act as a guide to uncover the pour opening.

V. A still further can end is provided with a pour opening having a pour width. The pour opening is provided with an entry aperture at one end of the pour opening. The entry aperture has a slide width greater than the pour width. The can end has a can end lapping portion and a can end sealing portion adjacent the pour opening and a plane of bulge strength adjacent the entry aperture. A slide is adapted to pass through the entry aperture and has a slide lapping portion and a slide sealing portion. The slide lapping portion is adapted to register with the can end lapping portion, and the slide sealing portion is adapted to register with the plane of bulge strength. A pull tab has a connection to the slide. Engaging means engage the can end

lapping portion to press the can end lapping portion into intimate contact with the slide lapping portion and the slide sealing portion into intimate contact with the plane of bulge strength. A pressure barrier material is employed for sealing the intimately contacting can end sealing portion and the slide lapping portion and also for sealing the intimately contacting plane of bulge strength and the slide sealing portion. The pressure barrier material is bonded to the can end sealing portion with a first predetermined shear strength and to the slide lapping portion and to the plane of bulge strength with a second predetermined shear strength less than the first predetermined shear strength. The pull tab is operable to move the slide lapping portion away from the can end lapping portion to break the bond between the slide lapping portion and the pressure barrier material adjacent the can end sealing portion so that the pressure barrier material adjacent the can end sealing portion now functions as an exit and reclosure slide guide. The pull tab is simultaneously operable to move the slide sealing portion away from such plane of bulge strength to break the bond between the pressure barrier material adjacent the plane of bulge strength and the slide sealing portion so that the pressure barrier material adjacent the plane of bulge strength acts as a guide to uncover the pour opening.

VI. Still another can end is provided with a pour opening having a pour width. The pour opening is provided with an entry aperture at one end of the pour opening. The entry aperture has a slide width greater than the pour width. The can end has a can end lapping portion and a can end sealing portion adjacent the pour opening and a plane of bulge strength adjacent the entry aperture. A slide is pivoted on the can end, is adapted to pass through the entry aperture and has a slide lapping portion and a slide sealing portion. The slide lapping portion is adapted to register with the can end lapping portion, and the slide sealing portion is adapted to register with the plane of bulge strength. A pull tab has a connection to the slide. The pull tab is connected to the can end by a score line. One member of the pivot and the connection press the can end lapping portion into intimate contact with the slide lapping portion and the slide sealing portion into intimate contact with the plane of bulge strength. A pressure barrier material seals the intimately contacting can end sealing portion and the slide lapping portion and also seals the intimately contacting plane of bulge strength and the slide sealing portion. The pressure barrier material is bonded to the can end sealing portion with a first predetermined shear strength and to the slide lapping portion and to the plane of bulge strength with a second predetermined shear strength less than the first predetermined shear strength. The pull tab has a plane of weakness on one side of the connection to the slide and a pressure portion on the other side of the connection. The pull tab is movable away from the can end about the plane of weakness to cause the pressure portion to break the score line and the bond between the slide lapping portion and the pressure barrier material adjacent the can end sealing portion so that the pressure barrier material adjacent the can end sealing portion now functions as an exit and reclosure slide guide. The pull tab then is movable to cause the slide to break the bond between the pressure barrier material

adjacent the plane of bulge strength and the slide sealing portion and to cause the slide to move through the entry aperture on the pressure barrier material adjacent the plane of bulge strength as a guide to uncover the pour opening.

VII. An additional can end provided with an opening and a can end sealing portion. A slide is disposed against the can end adjacent the opening, and is provided with a first pour opening. A stationary member is disposed against the slide and is provided with a second pour opening and a stationary member sealing portion. The slide has a slide sealing portion adjacent the second pour opening and is movable to a sealing position where the first pour opening does not overlap the second pour opening. A pull tab has a connection to the slide. Engaging means engage the can end and one of the slide and the stationary member to position the stationary member sealing portion adjacent the can end sealing portion, and to press the slide against the stationary member adjacent the second pour opening. A pressure barrier material is used for sealing the can end sealing portion to the stationary member sealing portion and the slide sealing portion to the stationary member adjacent the second pour opening. The pressure barrier material is bonded to the stationary member adjacent the second pour opening with a first predetermined shear strength and to the slide sealing portion with a second predetermined shear strength less than the first predetermined shear strength. The pull tab is movable to cause the slide to move away from the sealing position to break the bond between the slide sealing portion and the pressure barrier material adjacent the second pour opening. The pull tab then is movable to cause the first pour opening to overlap the second pour opening to uncover the second pour opening.

VIII. Yet another can end is provided with an opening and a can end sealing portion. A slide is disposed against the can end adjacent the opening. A stationary member is disposed against the slide and is provided with a pour opening and a stationary member sealing portion. The slide has a slide sealing portion adjacent the pour opening and is movable to a sealing position where the pour opening is covered by the slide. The pull tab has a connection to the slide. Engaging means engage the can end and one of the slide and the stationary member to position the stationary member sealing portion adjacent the can end sealing portion, and to press the slide sealing portion against the stationary member adjacent the pour opening. A pressure barrier material seals the can end sealing portion to the stationary member sealing portion and the slide sealing portion to the stationary member adjacent the pour opening. The pressure barrier material is bonded to the stationary member adjacent the pour opening with a first predetermined shear strength and to the slide sealing portion with a second predetermined shear strength less than the first predetermined shear strength. The pull tab is movable to cause the slide to move away from the sealing position to break the bond between the slide sealing portion and the pressure barrier material adjacent the pour opening. The pull tab then is movable to cause the slide to uncover the pour opening.

IX. A still further can end is provided with a pour opening. The can end has a can end lapping portion adjacent the pour opening. A slide has a pivot on the can end and has a slide lapping portion and a slide sealing portion adjacent the slide lapping portion. The slide lapping portion is adapted to register with the can end lapping portion. A pull tab has a connection to the slide. Engaging means engage the can end lapping portion to press the can end lapping portion into intimate contact with the slide lapping portion. A pressure barrier material seals the can end lapping portion at a first predetermined shear strength and the slide sealing portion at a second predetermined shear strength less than the first predetermined shear strength. The slide is rotatable by the pull tab about the pivot to break the bond between the slide sealing portion and the pressure barrier material adjacent the can end lapping portion to uncover the pour opening.

BRIEF DESCRIPTION OF THE SEVERAL FIGURES IN THE DRAWINGS

For a better understanding of the present invention, reference should be made to the accompanying drawings wherein like numerals of references indicate similar parts throughout the several views and wherein:

FIG. 1A is a plan view of a can end having a buckle ring and a double seaming flange and showing a pour opening provided with an entry aperture in the form of a slot, the entry aperture having a slit width which is greater than the width of the pour opening and defining a can end lapping portion adjacent the pour opening and also showing the plane of bulge strength adjacent the slot;

FIG. 1B is a vertical sectional view taken along the line 1B—1B of FIG. 1A in the direction of the arrows;

FIG. 2A is a fragmentary enlarged plan view showing the slide positioned in the entry aperture or slot and defining with the can end lapping portion a slide lapping portion;

FIG. 2B is a vertical sectional view taken along the line 2B—2B of FIG. 2A in the direction of the arrows;

FIG. 3A is a view similar to FIG. 2A showing the pull tab secured to the slide at a connection point within the pour opening and engaging the can end lapping surface at two pressure points to press the slide lapping portion into intimate contact with the can end lapping portion and the slide sealing surface into intimate contact with the plane of bulge strength;

FIG. 3B is a view similar to FIG. 2B taken along the line 3B—3B of FIG. 3A in the direction of the arrows;

FIG. 4A is a view similar to FIGS. 2A, 3A showing the seal between the pressure barrier material and the can end sealing portion and the slide lapping portion; the seal between pressure barrier material and the connection and the slide; and the seal between the pressure barrier material and the plane of bulge strength and the slide sealing portion;

FIG. 4B is a vertical sectional view taken 11B the line 4B—4B of FIG. 4A in the direction of the arrows;

FIG. 4C is a vertical sectional view taken along the line 4C—4C of FIG. 4A in the direction of the arrows with the pull tab removed for clarity;

FIG. 5 is a view similar to FIG. 4B showing the rotary movement of the pull tab about the plane of weakness in the pull tab away from contact with the can end

lapping portion at the pressure points to cause the pressure portion to break the bond or seal between the pressure barrier material and the slide lapping portion so that the pressure barrier material thereafter functions as a reclosure slide guide;

FIG. 6 is a view similar to FIG. 5 showing the further longitudinal movement of the pull tab to break the bond or seal between the pressure barrier material adjacent the plane of bulge strength and the slide sealing portion to permit movement of the slide through the entry aperture on the pressure barrier material as a guide to uncover the pour opening;

FIG. 7A is a view similar to FIG. 5 of an alternative embodiment showing the pull tab integral with the slide, and the plane of weakness at the inward edge of the entry aperture;

FIG. 7B is a view similar to FIG. 7A showing the movement of the pull tab away from the plane of bulge strength to break the bond between the pressure barrier material adjacent the plane of bulge strength and the slide sealing portion;

FIG. 7C is a view similar to FIGS. 7A, 7B showing the further movement of slide out of the entry aperture to break the bond between the pressure barrier material adjacent the can end sealing portion and the slide lapping portion;

FIG. 8A is a fragmentary vertical sectional view similar to a portion of FIG. 7A of another embodiment showing the rivet integral with the slide tab;

FIG. 8B is a view similar to FIG. 8A alternatively showing the rivet integral with the pull ring and embedded in the pressure barrier material adjacent the plane of bulge strength;

FIG. 8C is a view similar to FIGS. 8A, 8B showing another rivet separated from either the pull tab and the slide;

FIG. 8D is a fragmentary plan view of another alternative embodiment of the entry aperture, pour opening and can end and showing a guide means for the slide;

FIG. 8E is a fragmentary vertical sectional view taken along the line 8E—8E of FIG. 8D in the direction of the arrows;

FIG. 9A is a view similar to FIGS. 2A, 3A showing an alternative embodiment of a leg-type pressure portion of the pull tab;

FIG. 9B is a fragmentary vertical sectional view taken along the line 9B—9B of FIG. 9A in the direction of the arrows of another embodiment and showing a locking tab on the pressure portion to prevent an accidental impact on the slide from opening the pressure barrier material seals and also showing its plane of weakness for use during breakage of the pressure barrier material seals;

FIG. 10A is a fragmentary half sectional view of yet another embodiment showing a pull tab having a greater beam strength (measured in foot pounds) than the slide, omitting the plane of weakness and showing the connection as the pivot plane;

FIG. 10B is a vertical sectional view taken along the line 10B—10B of FIG. 10A in the direction of the arrows;

FIG. 11A is a view similar to FIG. 1 showing an alternative chordal type pour opening and showing an upwardly projecting peripheral embossment around such pour opening to maintain the slide flat, to add strength

to the can end, to provide a well for the pressure barrier material as it is applied and to provide an upward projection for improved pouring from the pour opening;

FIG. 11B is a vertical sectional view taken along the line 11B—11B of FIG. 11A in the direction of the arrows;

FIG. 11C is a view similar to FIG. 11B showing an alternative downwardly projecting embossment for vacuum sealing;

FIGS. 12A—12C are plan views similar to FIG. 1 of alternative embodiments of the pour opening, namely a generally circular pour opening, a tear-drop pour opening and a fish-mouth pour opening respectively;

FIGS. 13A—13D are fragmentary vertical sectional views similar to FIGS. 7A—7C and showing alternative embodiments of the pull tab, such as the corrugated pull tab in FIG. 13A, the serrated pull tab in FIG. 13B, the push-button type pull tab of FIG. 13C and the projecting type pull tab of FIG. 13D;

FIGS. 13E—13H are fragmentary plan views of further alternative embodiments of the pull tabs including the waffle type pull tab of FIG. 13E, the protuberance type pull tab of FIG. 13F, the cavity type pull tab of FIG. 13G, and the embossed aperture type pull tab of FIG. 13H;

FIG. 14A is a plan view of an alternative rotary type slide and can end showing the rotary type slide in the open or pouring position;

FIG. 14B is a view similar to FIG. 14A showing the rotary type slide in the closed position;

FIG. 14C is a fragmentary enlarged view similar to FIGS. 14A, 14B showing the pressure barrier material bonded or sealed to the slide lapping portion, the can end sealing portion, the pivot, the plane of bulge strength adjacent the entry aperture and slide sealing portion and showing a locking tab on the slide;

FIG. 14D is a vertical sectional view taken along the line 14D—14D of FIG. 14C in the direction of the arrows;

FIG. 14E is a view similar to FIG. 14C showing the can end alternatively provided with vent apertures and the slide and the pull tab provided with vent closure portions which intimately engage and cover such vent apertures preparatory for sealing thereof by the pressure barrier material;

FIG. 15A is a view similar to FIG. 14E showing a can end alternatively provided with a linear slide having a pour opening closure portion, an expansion joint type pull tab and a vent aperture closure portion, the can end being provided with a pour opening, a pour opening embossment and a vent aperture embossment;

FIG. 15B is a vertical sectional view taken along the line 15B—15B of FIG. 15A in the direction of the arrows;

FIG. 15C is a vertical sectional view taken along the line 15C—15C of FIG. 15A in the direction of the arrows and omitting the vent aperture and vent closure portion for clarity;

FIG. 16A is a view similar to FIG. 15A of an alternative can end provided with a pour opening and vent opening and having a linear type slide provided with a pour opening closure portion and a vent aperture closure portion;

FIG. 16B is a view taken along the line 16B—16B of FIG. 16A in the direction of the arrows;

FIG. 17A is a view similar to FIG. 15A showing an alternative embodiment of a can end wherein the slide moves during its bond breaking movement toward the entry aperture of the pour opening (as distinguished from the embodiment shown in FIG. 15A where the slide, during its bond breaking movement, moves outwardly from the entry aperture of the pour opening), such slide being provided with an expansion type tab, a wrap-around slide tab vent closure portion and a plurality of stops including a stop associated with the expansion type pull tab and a stop associated with the slide;

FIG. 17B is a vertical sectional view taken along the line 17B—17B of FIG. 17A in the direction of the arrows;

FIG. 18A is a view similar to FIG. 14D showing an alternative embodiment of a rotatable slide (having a slide vent closure portion) which slide is pivotable about a pivot disposed between the slide pour opening closure portion and the slide vent closure portion, as distinguished from the embodiment of FIG. 14E where the slide pivot is disposed outside either the slide pour opening closure portion or the slide vent closure portion;

FIG. 18B is a vertical sectional view taken along the line 18B—18B of FIG. 18A in the direction of the arrows;

FIG. 19A is a view similar to FIG. 17A showing an alternative linear chordal type slide having a vent closure portion and a pull tab disposed therebetween, which pull tab is operable during the bond breaking operation to move the pull tab vent closure portion of the pull tab and the pour opening closure portion of the slide inwardly toward the center of the can end by upward movement of the pull tab away from the can end as limited by a stop means attached to the pull tab;

FIG. 19B is a vertical sectional view taken along the line 19B—19B of FIG. 19A in the direction of the arrows;

FIG. 20A is a perspective view of an alternative can having a can end provided with a pour opening and showing the can end provided with a pull tab connected to a portion of the pour opening by a score line and having a slide pivot opening therein;

FIG. 20B is a perspective view of a rotary type slide having a pivot hole and a connection hole for coupling the pull tab of FIG. 20A on the can end to the slide;

FIG. 20C is a view similar to FIG. 20A showing the slide pivotably connected to the can end and secured to the score attached pull tab preparatory for application of the pressure barrier material;

FIG. 20D is a plan view of the can end shown in FIG. 20C and showing the slide connected to the pull tab preparatory for the application of the pressure barrier material which pressure barrier material has been omitted for clarity;

FIG. 20E is a vertical, sectional view similar to one taken along the line 20E—20E of FIG. 20D in the direction of the arrows, but showing the pressure barrier seal applied to the pivot for the slide and the pressure barrier seals for bonding the pressure barrier material to the slide lapping surface and to the can end sealing surface;

FIG. 21A is a plan view of a further alternative embodiment of the can end having an embossed rotary

slide cavity and showing an upper or movable disk provided with a pour opening and a first vent aperture and a second lower or stationary disk provided with a second pour opening and a second vent aperture;

FIG. 21B is a vertical sectional view taken along the line 21B—21B of FIG. 21A in the direction of the arrow and showing the pressure barrier seals between the bottom stationary disk and the can end sealing portion, the dotted line seal between the second vent hole in the bottom or stationary disk and the bottom surface of the top or movable disk, and the seal between the bottom of the top or movable disk and the edge of stationary member adjacent the second pour opening in the bottom or stationary disk;

FIG. 22A is a horizontal plan view showing an alternative embodiment of a can end showing a linear radial type slide having a pull tab provided with a plane of weakness and showing a stationary member disposed below the slide and provided with a first alternative embodiment of a vent hole on the outboard side of the plane of weakness and a second alternative embodiment of a vent hole or aperture on the inboard side of the plane of weakness of such pull tab;

FIG. 22B is a vertical sectional view taken along the line 22B—22B of FIG. 22A in the direction of the arrows;

FIG. 23A is a plan view of an alternative can end having a linear type slide in a sealing position where the first pour opening in the slide does not contact a second pour opening in the stationary member;

FIG. 23B is a vertical sectional view taken along the line 23B—23B of FIG. 23A in the direction of the arrows;

FIG. 24A is a plan view of another alternative can end showing an oscillatable slide and a stationary member provided with a pour opening which is covered by the oscillatable slide when such slide is in the sealing position;

FIG. 24B is a vertical sectional view taken along the line 24B—24B of FIG. 24A in the direction of the arrows;

FIG. 25A is a plan view of an alternative embodiment of a can end wherein the slide is of the linear type and the slide is provided with another pour opening and showing the slide operable after the bond breaking operation to cause the other pour opening in the slide to open the pour opening in the stationary member, showing also the pull tab engaging the can end at two pressure points to press the can end and the slide sealing portion against the stationary sealing portion, showing also the slide provided with a dish portion which functions as a pour lip when the slide is in the pour opening uncovering position and finally showing a vent aperture in the stationary member covered by the slide and sealed by the pressure barrier material to the slide with the second predetermined shear strength;

FIG. 25B is a vertical sectional view taken along the line 25B—25B of FIG. 25A in the direction of the arrows;

FIG. 26A is a plan view of another can end having a sector type pour opening and a generally centrally located pivot hole;

FIG. 26B is a view similar to FIG. 26A and showing the slide in closed position over the pour aperture and bonded by the pressure barrier material to the can end; and

FIG. 26C is a vertical sectional view taken along the line 26C—26C in the direction of the arrows.

Although the principles of this invention are broadly applicable to can ends, this invention is particularly adapted for use in conjunction with easy open can ends and hence it has been so illustrated and will be so described.

DETAILED DESCRIPTION

With specific reference to the form of this invention illustrated in the drawings, and referring particularly to FIGS. 1A and 1B, a can end is indicated generally by reference numeral 10.

This can end 10 has a peripheral double seaming flange 12 (FIGS. 1A, 2A, 2B, 3A, 3B, 4A, 4B, 5 and 6) and a peripheral buckle ring 14 (FIGS. 1A, 2A, 2B, 3A, 3B, 4A, 4B, 5 and 6). Such can end 10 is provided with a pour opening 16 (FIGS. 1A, 1B, 2A, 2B, 3A, 3B, 4A—4C, 5 and 6) having a pour width W_p (FIGS. 1A, 2A, 3A, and 4A). The pour opening 16 is also provided with an entry aperture 18 (FIGS. 1A, 1B, 2A, 2B, 3A, 3B, 4A, 4B, 5 and 6), suitably a slit, slot or the like, disposed at one end of the pour opening 16. In this case, the entry aperture 18 is disposed at the inboard end of such pour opening 16. This entry aperture 18 has a slide width W_s (FIGS. 1A, 2A, 3A, 4A) suitably greater than the pour width W_p . The can end 10 has a can end lapping portion 20 (FIGS. 1A, 2A, 3A, 4A) and a can end sealing portion 22 (FIG. 4A), disposed adjacent the pour opening 16. In addition, the can end 10 has a plane of bulge strength Y—Y (FIGS. 1A, 1B, 2A, 2B, 3A, 3B, 5 and 6) adjacent the entry aperture 18 and spaced a distance D from the centerline X—X of the can end 10 (FIGS. 1A, 1B, 2A, 2B, 3A, 3B).

A slide 24 (FIGS. 2A, 2B, 3A, 3B, 4A, 4C), which is adapted to pass through the entry aperture 18, has a slide lapping portion 26 (FIGS. 2A, 2B, 3A, 3B, 4A, 4B) and such slide lapping portion 26 is adapted to register with the can end lapping portion 20 of the can end 10.

The slide lapping portion 26 is adapted, as shown in FIGS. 2A and 2B, (after insertion of the slide 24 through the entry aperture 18), to register with the can end lapping portion 22 of the can end 10. Simultaneously therewith, a slide sealing portion 28 (FIGS. 2B, 3B, 4B, 4C) is adapted to register with the plane of bulge strength Y—Y.

The slide 24 has a pull tab 30 (FIGS. 3A, 3B, 4A, 4B, 5 and 6) and a connection 32, such as an integral rivet (FIGS. 3A, 3B, 4A, 4B, 4C, 5 and 6) or the like, carried by such pull tab 30 and inserted through a hole 33 (FIGS. 2A, 2B, 3A, 3B, 4A—4C) in the slide 24 and peened over the slide 24. This connection 32 to the slide 24 is in this case disposed within the pour opening 16 at the left-hand end thereof, as viewed in FIGS. 2A, 2B, 3A, 3B, 4A—4C, 5 and 6.

The pull tab 30 engages the can lapping portion 20 at one or more pressure points such as P_1 , P_2 or the like (FIGS. 3A, 3B, 4A, 4B), to press the can end lapping portion 20 into intimate contact with the slide lapping portion 26 and also the slide sealing portion 28 into intimate contact with the plane of bulge strength Y—Y.

Alternatively, external means may be employed to provide intimate contact between the can end lapping portion 20 and the slide lapping portion 26 and between the slide sealing portion 28 and the plane of bulge strength Y—Y as hereafter explained.

Preparatory for the application of a pressure barrier material 34 (i.e., a plastisol vinyl sealer, the trade name for a sealer manufactured by Chemical Products Corp., East Providence, Rhode Island, or the like) to the can end sealing portion 22, the slide lapping portion 26 and the sealing of the pressure barrier material 34 to the plane of bulge strength Y-Y and the slide sealing portion 28, it will be understood by those skilled in the art that prior to the assembly of the slide 24 to the can end 10, the can end 10 is coated with a primer (not shown) such as an epoxy phenolic primer of the type 15X manufactured by Jones-Dabney Co., Division of Celanese Corp., Louisville, Kentucky and a finish stick coating of the vinyl plastisol type such as type EGL 68463 manufactured by Glidden-Durkee Co., Cleveland, Ohio or the like. The primer and finish stick coat are adapted when combined with the pressure barrier material 34 to provide a first predetermined shear strength, such as about ten pounds force or the like. Further, the slide 24 is also previously coated with a primer (not shown) and a finish nonstick coating of the epoxy amine type such as type 9-30L manufactured by Thompson and Co., Division of Benjamin Moore Co., Newark, New Jersey. This primer and nonstick finish coat are adapted when combined with the pressure barrier material 34 to produce a second predetermined shear strength, such as about 5 pounds force or the like. This second predetermined shear strength is less than the first predetermined shear strength.

It will be understood by those skilled in the art that in order to apply the pressure barrier material 34, such as the plastisol sealer 34 or the like, the can end 10 and slide 30 are inverted from the position shown in FIGS. 4A, 4B, and the pressure barrier material 34 is applied to the can end sealing portion 22, the slide lapping portion 26, the slide sealing portion 28, and the plane of bulge strength Y-Y by means of either a pressure nozzle (not shown) or a plurality of pressure nozzles (not shown) used in combination with a bead forming platen (also not shown).

As shown, particularly in FIGS. 4B, 4C, 5 and 6, the pressure barrier material 34 forms: (1) a seal 35x between the pressure barrier material 34 and the slide lapping portion 26 and the can end sealing portion 22; (2) a seal 35y between the pressure barrier material 34 and the plane of bulge strength Y-Y and the slide sealing portion 28; and (3) a seal 35r between the rivet 32 and the slide 24.

The pull tab 30 has a plane of weakness Z-Z (FIGS. 3A, 3B, 4A, 4B, 5 and 6) on one side of the connection 32 to the slide 24 and a pressure portion 36 (FIGS. 3A, 3B, 4A, 4B, 5 and 6) on the other side of the connection 32. In the showing of FIGS. 3A and 3B, the plane of weakness Z-Z is disposed on the right-hand side of such connection 32 and the pressure portion 36 is disposed on the left-hand side of such connection 32.

The pull tab 30 is movable away from the position shown in FIG. 4B from the can end lapping portion 20 about the plane of weakness Z-Z to the position shown in FIG. 5 in the direction of the rotary arrow of FIG. 5, thereby causing the pressure portion 36 to break the bond or seal 35x (FIGS. 4B, 4C) between the slide lapping portion 26 and the pressure barrier material 34 (as shown in FIG. 5), so that the pressure barrier material 34x (FIGS. 5 and 6) adjacent the slide lapping portion 26 now functions as a longitudinal exit and reclosure slide guide.

Movement of the pull tab 30 from the position shown in FIG. 5 to the position shown in FIG. 6 (in the direction of the longitudinal arrow of FIG. 6) breaks the bond or seal 35y (FIGS. 4B, 4C) between the pressure barrier material 34y (FIGS. 5, 6) adjacent the plane of bulge strength Y-Y and the slide sealing portion 28 to permit movement of the slide 24 through the entry aperture 18 thereby uncovering the pour opening 16 preparatory for emptying of the fluid or comminuted solid contents of the can (not shown).

It will be understood that after rupture of the bond 35y (FIGS. 4B, 4C) between the pressure barrier material 34 (FIGS. 5, 6) adjacent the plane of bulge strength Y-Y and the slide sealing portion 28, such pressure barrier material 34 functions as an guide for the in and out movement of the slide 24 with respect to the entry aperture 18.

The slide 24 has a bulge strength measured in pounds per square inch, equal to or greater than the bulge strength of the can end.

It will be noted that the connection 32 (sealed at 35r to the slide 24) acts as a stop when it encounters the inboard end of the entry aperture 18 (FIG. 6) to prevent the slide 24 from pulling out of the can end 10.

The slide 24, the can end 10 or the tab 30 may be formed of a metal, such as steel, aluminum, a tin free steel, tin plated steel or the like or a plastic, such as polyethylene, polyurethane, polypropylene, or the like.

ALTERNATIVE EMBODIMENTS

It will be understood by those skilled in the art that alternatively as shown in FIG. 4A, the engaging means 38a having a stationary member 40a in engagement with, for example, the pull tab 30 and a movable pin-like member 42 (FIG. 4A) in engagement with the slide 24. Further, as shown in FIG. 4A, the engaging means 38b may comprise the stationary plate-like member 40b in engagement with the can end lapping portion 20 and the slide 24 and a pin-like movable member 24b likewise engaging the can end lapping portion 20 and the slide 24. To the right of the above described embodiment shown in FIG. 4A, a further alternative embodiment of the engaging means such as the magnet 44, suitably of the permanent or electromagnetic type or the like, may be applied to any one of the can end lapping portion 20, the slide 24, the pull tab 30, the can end lapping portion 20, or the slide lapping portion 26 to hold the can end lapping portion 26 into integral contact with the slide lapping portion 26 preparatory for the application of the pressure barrier material 34 to form the above described seals 35x, 35y, 35r.

FIG. 7A shows a pull tab 30' which is integral for the slide 24'. The plane of weakness Z'-Z' is disposed at the outboard edge 18a of the entry aperture 18. As the pull tab 30' is rotated from the generally horizontal position shown in FIG. 7A to the position shown in FIG. 7B, such movement of the pull tab 30' away from the plane of bulge strength Y-Y breaks the seal 35b between the pressure barrier material 34 adjacent such plane of bulge strength Y-Y and the inboard portions of the can end 10'. Thereafter, as shown in FIG. 7C, the longitudinal movement of the pull tab 30' and the slide 24' (from the position shown in FIG. 7B to the position shown in FIG. 7C out of the entry aperture 18) breaks the bond or seal 35a adjacent the can end sealing portion 22 and the slide lapping portion 26 so that the slide

24⁷ may be withdrawn to uncover the pour opening 16 until a protuberance or stop means 46 engages the entry aperture 18 thereby preventing the complete withdrawal of the slide 24⁷ from the entry aperture 18 during the uncovering of the pour opening.

The stop means 46 may be a dimple or protuberance of any desired shape formed in the slide 24⁷, or may be formed of the pressure barrier material 34.

FIG. 8A shows a connection 32^{8A} wherein the rivet is carried by the slide 24⁸ and is peened over the pull tab 30⁸;

FIG. 8B shows a rivet 32^{8B} carried by the pull ring 30⁸ and peened over the slide 24⁸;

FIG. 8C shows a separate rivet 32^{8C} for connecting the pull tab 30^{8C} to the slide 24⁸. Such rivet 32^{8C} is embedded in the pressure barrier material 34 associated with the seal 35b between the plane of the bulge strength Y—Y and the slide 24⁸;

In FIGS. 8D and 8E, the entry aperture 18 is provided with a guide means, such as the inboard portion 48 of the entry aperture 18 being formed arcuately and downwardly as shown particularly in FIG. 8E or the like, to guide the ingress and egress of the slide (not shown in FIGS. 8D and 8E) with respect to the entry aperture 18;

FIG. 9A shows an alternative embodiment of the pressure portion, namely 36⁹. Such pressure portion 36⁹ has the above described pressure portion 36 and a pair of legs 36a, 36b on either side of the above described pressure portion 36. The legs 36a, 36b project from the body of the pull tab 30⁹ adjacent the vicinity of the plane of weakness Z—Z. It will also be appreciated by those skilled in the art that the above described connections 32 (FIGS. 1-6, etc.) may suitably be welds (not shown), or an adhesive of the NEXUS type or the like. NEXUS adhesives are the trade names for adhesives manufactured by United States Steel Corporation, Pittsburgh, Pennsylvania;

Referring again particularly to FIGS. 9A, 9B, the pressure portion 39⁸ is provided with a locking tab 37 projecting upwardly from the end of the pressure portion 36 and then horizontally outwardly to engage the portion of the can end 10⁹ adjacent the buckle ring 14. This locking tab 37 has a plane of weakness Z_L—Z_L. The locking tab 37 prevents an accidental impact on the slide 24 from opening the pressure barrier material seals 35a, 35r. The plane of weakness Z_L—Z_L of the locking tab 37 permits breakage of these pressure barrier seals 35a, 35r by the pressure portion 36⁹ at the desired time.

FIGS. 10A and 10B show an alternative embodiment of the pull tab, namely the pull tab 30¹⁰ having a pivot plane P—P through the centerline of the connection or rivet 32. In addition, the pull tab 30¹⁰ has a cantilever beam strength, which cantilever beam strength of the tab 30¹⁰ is greater than the cantilever beam strength in ft. lbs. of the slide 24¹⁰. To further reinforce the rivet pull tab 30¹⁰, such pull tab 30¹⁰ is provided with a reinforcement rib or shoulder 50 extending substantially the length of the pull tab 30¹⁰;

FIGS. 11A and 11B show another alternative embodiment of the can end 10¹¹ wherein the pour opening 16¹¹ is chordal in nature and spaced the distance D¹¹ from a centerline C—C of the can end 10. The pour opening 16¹¹ is distinguishable from the radial type pour opening 16 shown in FIG. 1;

FIGS. 11A and 11B also show an upward embossment 52 extending substantially around the pour opening 16¹¹. This embossment 52 maintains the slide (not shown in FIGS. 11A, 11B) in a horizontal plane during movement of such slide into and out of the entry aperture 18, adds strength to the can end 10¹¹, provides a well for the pressure barrier material 34 as it is applied to the can end 10¹¹ and provides an upward projection around the pour opening 16¹¹ for improved pouring from the pour opening 16¹¹.

It will also be understood by those skilled in the art that alternatively the pressure barrier material 34 may be:

a. a micro-crystalline wax of the type manufactured by Standard Oil of Ohio, Cleveland, Ohio, or the like.

Alternatively, the following primers for a stick finish coat may be applied to the can end sealing portion 22 to provide the first predetermined shear strength and the slide tab portion 26 and to the plane of bulging strength Y—Y to provide the second predetermined shear strength:

- a. oleoresinous coating;
- b. epoxy amino resin coating;
- c. epoxy phenolic coating; and
- d. epoxy acrylic coating.

The following primers for a no-stick finish coat may be used:

- a. epoxy phenolic coating;
- b. vinyl phenolic coating;
- c. epoxy ester coating;
- d. vinyl alkyd coating;
- e. polybutadiene coating; and
- f. acrylic compounds.

Alternatively, the following finish stick coats may be used because of taste requirements and are approved by the Federal Drug Administration:

- a. polyvinyl chloride acetate copolymer;
- b. polyvinylidene copolymer.

Alternatively, the following non-stick coats may be used:

- a. epoxy phenolic coating without stick or lubricating agents;
- b. vinyl phenolic coating.

For motor oil filling (i.e., non-food type applications) the primers are eliminated and the base metal may be tin free steel, tin plate or black plate.

FIGS. 12A-12C show alternative embodiments of pour openings having arcuate sides. In FIG. 12A, a generally circular pour opening 16^{12A} is shown. FIG. 12B shows a tear-drop type pour opening 16^{12B} and FIG. 12C shows a fish-mouth type pour opening 16^{12C}. It will be understood that the generally circular pour opening 16^{12A} may be elliptical, hyperbolic, parabolic, or the like.

FIGS. 13A-13G show alternative embodiments of the pull tab. For example, in FIG. 13A, a corrugated pull tab 30^{13A} is shown. FIGS. 13B and 13C show serrated pull tabs 30^{13B} and pushbutton type pull tabs 30^{13C}. FIG. 13D shows a projecting type pull tab 30^{13D}. In FIG. 13E, a waffle-type pull tab 30^{13E} is shown while FIG. 13F shows a pull tab 30^{13F} having a plurality of protuberances 54. Cavities 56 in the pull tab 30^{13G} are shown in FIG. 13G. FIG. 13H shows a pull tab 30^{13H} having an embossed aperture 58.

Referring now to FIGS. 14A-14D, the can end 10¹⁴ is provided with a generally circular pour opening 16 sur-

rounded by an embossment 52 and is provided with the entry aperture 18. As shown particularly in FIGS. 14A-14C, a slide 24¹⁴ is pivoted at 60 and is adapted to move from the open position shown in FIG. 14A to the closed position shown in FIG. 14B. The closure portion 82 of the slide 24¹⁴ (FIGS. 14A-14D) has sides provided with radii R₂ and R₃ (FIG. 14A) to adapt such closure portion 82 to pass through the pour opening 16 as shown in FIG. 14B. The pull tab 30¹⁴ is disposed opposite to the pivot 60 as an ear-like portion of the slide 24¹⁴. For the purpose of adapting the slide 24¹⁴ to follow the bulge contours of the can end 10¹⁴ when such slide 24¹⁴ is in the closed position shown in FIGS. 14B and 14C, such slide 24¹⁴ is provided with a curve of bulge weakness 64. The means utilized to strengthen the slide 24¹⁴ and particularly the curve of bulge weakness 64 is an embossment 66, not shown in FIGS. 14A and 14B, for purposes of clarity, but shown solely in the enlarged fragmentary view 14C. As the pull tab 30¹⁴ is moved by the operator from the position shown in FIG. 14A to the position shown in FIG. 14B, the tab 30¹⁴ moves on a radius R₁ (shown in FIG. 14B) to move the slide 24¹⁴ and in particular, the closure portion 82 into the embossment 52 on the can end 10¹⁴. The closure movement of the closure portion 82 of the slide 24¹⁴ is limited by engagement of the closure portion 82 with the embossment 52 at A₁ and B₁ (FIG. 14C). As shown solely in FIG. 14C, the closure portion 82 of the slide 24¹⁴ is provided with a locking tab 37¹⁴, which locking tab 37¹⁴ is connected by a rivet 68 or the like (FIGS. 14C, 14D). As shown particularly in FIGS. 14C and 14D, the pressure barrier material 34 is formed about the pivot 60 and the can end 10¹⁴ to provide the seal 35p¹⁴; the pressure barrier material 34 is formed about the can end sealing portion 22 and the slide lapping portion 26 to form the seal 35x¹⁴; the pressure barrier material 34 is formed about the rivet 68 to form the seal 35r¹⁴; and the pressure barrier material 34 is formed about the slide sealing portion 28 and the plane of bulge strength Y-Y to form the seal 35y¹⁴.

Refer now to FIG. 14E, the can end 10^{14E} is provided with a pair of vent apertures 70a and 70b. In one embodiment of FIG. 14E, the pull tab 30^{14E} is provided with a vent closure portion 72 which is adapted to seal the vent aperture 70b and engage such vent aperture 70b into intimate contact preparatory for the sealing of the vent closure portion 72 to the vent aperture 70b by pressure barrier material 34, not shown in FIG. 14E. Alternatively, the slide 24^{14E} may be provided with a slide vent closure portion 74 which is similarly operable to cover and integrally engage the vent aperture 70a in the can end 10^{14E} preparatory again to the sealing by the pressure barrier material 34 (not shown in FIG. 14E) to the slide vent closure portion 74 of the slide 24^{14E} and to the can end sealing portions 22v adjacent the vent aperture 70a. Here the can end 10^{14E} has stop means 76, such as a dimple, protuberance or the like, for limiting the rotary movement of the of the slide 24^{14E} (FIG. 14C). FIG. 14E shows the stop means 76^{14E} on either the pull tab vent closure portion 72 or the slide vent closure portion 74.

Referring now to FIGS. 15A-15C, the can end 10¹⁵ is provided with a pour opening 16 having an entry aperture 18 (FIGS. 15A, 15B). The slide 24¹⁵ is provided with a generally centrally located dish 78 (FIGS.

15A-15C) and has its forward or outer portions as viewed in FIG. 15A connected by pull tab legs 80 to a pull tab of the expansion type 30¹⁵. The slide 24¹⁵ reciprocates in the direction of the arrows shown in FIG. 15A to close the pour opening 16 and to open such pour opening 16 respectively.

The pull tab 30¹⁵ is provided with a pull tab vent closure portion 72¹⁵ which is adapted to enter a vent aperture 70¹⁵ in the can end 10¹⁵. When both the slide 24¹⁵ and the pull tab vent closure portion 72¹⁵ are disposed in the closed position (FIGS. 15A, 15C), pressure barrier material 34 is applied to form the seals 35v about the vent aperture 70¹⁵; the seal 35x about the can end sealing portion 22 and the slide lapping portion 26; and the seal 35y about the plane of bulge strength Y-Y and the slide sealing portion 28.

The can end 10¹⁶ (FIGS. 16A-16B) has a linear type slide 24¹⁶ of the parallel chordal movement type. The slide 24¹⁶ has a pour opening closure portion 82 adapted to close and be sealed to the pour opening 16 in the can end 10¹⁶ and a slide vent closure portion 74¹⁶ similarly adapted to close and be sealed to the vent aperture 70¹⁶ as hereinbefore explained. The expansion type pull tab 30¹⁶ is operable to move the slide 24¹⁶ in the direction of the arrows shown along the centerline C-C of the can end 10¹⁶.

Referring now to FIGS. 17A and 17B, and the linear chordal type of slide 24¹⁷ shown therein, such slide 24¹⁷ moves inwardly toward the centerline C-C of the can end 10¹⁷ away from the entry aperture 18 of the pour opening 16. Simultaneously, with such movement of the slide 24¹⁷ by the expansion type tab 30¹⁷, the pull tab vent closure portion 72¹⁷ moves in the same direction out of the vent aperture 70¹⁷ to break the seal at 35v¹⁷ between the pressure barrier material 34 and the vent aperture 70¹⁷. During this above described movement, the slide 24¹⁷ and in particular the pour opening closure portion 82¹⁷ of such slide 24¹⁷ breaks the bonds at 35y¹⁷ (between the plane of bulge strength Y-Y and the slide sealing portion 28 and the seal or bond at 35x¹⁷ between the pressure barrier material 34 and the can end sealing portion 22 and the slide lapping portion 26. Such bond breaking movement is limited by a stop 84 on the expansion type tab 30¹⁷ engaging the embossment 52 (FIG. 17B) or by a stop 46¹⁷ on the pour opening closure portion 82¹⁷ engaging the entry portion 18 of the pour opening 16.

In FIGS. 18A, 18B, the pour opening closure portion 82¹⁸ of the slide 24¹⁸ and the slide vent closure portion 74¹⁸ are disposed on opposite sides of the slide pivot 60¹⁸. In order to break the seal 35y¹⁸ between the pressure barrier material and the slide sealing portion 28 and the plane of bulge strength Y₁-Y₁, the seal 35x¹⁸ between the pressure barrier material 34 and the slide lapping portion 26 and the can end sealing portion 22, the seal 35v¹⁸ between the pressure barrier material 34 and the slide vent closure sealing portion 28v and the plane of bulge strength Y₂-Y₂; and the seal 35v₂¹⁸ between the pressure barrier material 34 and the vent closure lapping portion 26b and the can end sealing portion 22v adjacent the vent aperture 70¹⁸, the slide 24¹⁸ is rotated (in the showing of FIG. 18A) clockwise to break such above mentioned bonds or seals.

As shown in FIGS. 19A and 19B, the opposed linear chordal movement type slide 24¹⁹ has an expansion

type, ring type pull tab 30¹⁹ disposed between either a pull tab vent closure portion 72¹⁹ or a slide vent closure portion 74¹⁹ and a pour opening closure portion 82¹⁹, so that when the pull ring 30¹⁹ is pulled upwardly from the slide 24¹⁹ in the position shown in FIGS. 19A and 19B, about 90° to a vertical position (not shown) on the plane of weakness Z-Z of the pull tab 30¹⁹. When the whole pull tab 30¹⁹ is then moved upwardly away from the can end 10¹⁹, both the vent closure portions 72¹⁹ or 74¹⁹ and the pour opening closure portion 82¹⁹ move inwardly in the direction of the arrows of FIG. 19A to uncover both the vent aperture 70¹⁹ and the pour opening 16. As shown in FIGS. 19A, 19B, the upward bond breaking movement of the pull tab 30¹⁹ is limited by a rivet type stop 86 attached to the pull tab 30¹⁹ and extending through the can end 10¹⁹. Such rivet stop 86 is sealed by the pressure barrier material 34 through the interior side of the can end 10¹⁹ to form the stop seal 35S₂.

Referring now to FIGS. 20A-20E, the rotary type slide 24²⁰ is pivotably connected at 60²⁰ to the can end 10²⁰ of the can C. Pressure barrier material 34 (FIG. 20E) forms the seal 35p²⁰ between the pivot 60²⁰ and the can end 10²⁰. In this case, the pull tab 30²⁰ is connected to one portion of the pour opening 16 (FIGS. 20A, 20C, 20E) by a score line 88 or the like. Such pull tab 30²⁰ is provided with a connection 32²⁰ for connection to the slide 24²⁰ through a connection hole 33 shown in FIGS. 20B, 20D.

In order to break the seals 35x²⁰ and possibly the seal 35r²⁰ (FIG. 20E), the pull ring 30²⁰ is moved upwardly about 90° away from the can end 10²⁰ so that the pressure portion 36²⁰ moves about the plane of weakness Z-Z of the pull tab 30²⁰ to break the score line 88 and break these seals 35x²⁰ and possibly the seal 35r²⁰. This upward movement is indicated by the arcuate arrow marked No. 1 in FIG. 20C. Thereafter, in order to break the seal 35y²⁰ (shown in FIG. 20D) between the slide sealing portion (not shown) and the plane of bulge strength Y-Y (FIGS. 20A, 20C, 20D), the pull tab 30²⁰ and the slide 24²⁰ are moved outwardly from the pour opening 16 in the direction of the straight arrow marked No. 2 in FIG. 20C to break such seal 35y²⁰ between the slide sealing portion (not shown) and the plane of bulge strength Y-Y.

As shown in FIGS. 21A and 21B, the can end 10²¹ has an opening 90 of generally circular shape and a can end sealing portion 22. A rotary slide 24²¹ is disposed against an embossment 52 surrounding the opening 90 and the slide 24²¹ is provided with a first pour opening 16²¹. A stationary member, suitably a stationary disk 94 or the like, is disposed against the movable slide 24²¹, and the stationary member 94 is provided with a second pour opening 16a²¹ and the stationary member sealing portion 96 (FIG. 21B). The slide 24²¹ has a slide sealing portion 28 (FIG. 21B) adjacent the second pour opening 16a²¹ and is movable to a sealing position shown in FIGS. 21A and 21B where the first pour opening 16²¹ does not overlap the second pour opening 16a²¹. A pull tab 30²¹ may have a connection (not shown) to the slide 24²¹ or such pull tab 30²¹ may be an integral part of such slide 24²¹, as shown in FIGS. 21A, 21B. Engaging means (not shown) of the type illustrated in FIGS. 1-6 where the pull tab engages the can end lapping portion, or of the type shown in FIG.

4A utilizing a stationary member and a movable member, or of the magnetic type shown in FIG. 4A may be employed. A pressure barrier material 34 is employed to seal the can end sealing portion 22 to the stationary member sealing portion 96 to form seal 35s and to seal the slide sealing portion 28 to the portion 95 of the stationary member 94 adjacent the second pour opening 16a²¹. The pressure barrier material is bonded to the first stationary member 94 adjacent the second pour opening 16a²¹ with a first predetermined shear strength and to the slide sealing portion 28²¹ with a second predetermined shear strength less than such first predetermined shear strength. The pull tab 30²¹ is movable away from the sealing position to break the bond between the slide sealing portion 28 and the pressure barrier material 34 adjacent the second pour opening 16a²¹. The pull tab 30²¹ is then movable to cause the first pour opening 16²¹ to overlap the second pour opening 16a²¹ to uncover the second pour opening 16a²¹.

The slide 24²¹ is provided with a first vent aperture 70a²¹ when the stationary member 94 is adapted to cover such first vent aperture 70a²¹, when the slide 24²¹ is in the sealing position shown in FIG. 21A. The stationary member 94 is provided with a second vent aperture 70b²¹. The pressure barrier material 34 is adapted to seal the second vent aperture 70b²¹ to the slide 24²¹ at seal 35v²¹ with the above mentioned second predetermined shear strength. The slide 24²¹ is operable during movement of the slide 24²¹ away from the sealing position shown in FIGS. 21A and 21B to break the bond 35v²¹ between said stationary member 94 adjacent said second vent aperture 70b²¹. Thereafter, the slide 24²¹ is operable to move the first vent opening 70a²¹ into lapping engagement with the second vent opening 70b²¹ to uncover the second vent opening 70b²¹.

As shown in FIG. 21B, the seal 35s²¹ is formed by the pressure barrier material 34 and the stationary member sealing portion 96 and the can end sealing portion 22. The seal 35v²¹ is between the pressure barrier material 34, the slide 24²¹ and the portion 97 of the stationary member 94 adjacent the second vent opening 70b²¹. The seal 35s₁ is between the pressure barrier material 34 and the slide 24²¹ and the portion 95 of the stationary member 94 adjacent the second pour opening 16a²¹.

In FIGS. 22A, 22B, the can end 10²² is provided with an opening 90²² and a can end sealing portion 22²². A slide 24²² is disposed against an embossment 52 surrounding the hole 90. A stationary member 94²² is disposed against the movable slide 24²² and is provided with a pour opening 16a²² and a stationary member sealing portion 96²². The slide 24²² has a slide sealing portion 28 adjacent the pour opening 16a²² and is movable to a sealing position shown in FIGS. 22A, 22B where the pour opening 16a²² in the stationary member 94²² is covered by the slide 24²². A pull tab 30²² is integral with the slide 24²². Engaging means (not shown) but hereinbefore described with respect to FIGS. 1-6 and 4A are operable in this embodiment.

The pressure barrier material 34 seals the can end sealing portion 22 to the stationary member sealing portion 96²² to form the seal 35s²². Additionally, the pressure barrier material 34 seals the slide sealing portion 28 to a portion 95 of the stationary member 94²².

adjacent the pour opening 16a²² to form the seal 35s²². As described in the embodiment, this pressure barrier material 34 is bonded to the portion 95 of the stationary member 94²² adjacent the pour opening 16a²² with a first predetermined shear strength and bonded to the slide sealing portion 28 with a second predetermined shear strength less than the first predetermined shear strength. The pull tab 30²² is movable from the generally horizontal position shown in FIGS. 22A and 22B upwardly about 90° to break the bond 35s²² between the slide sealing portion 28 and the pressure barrier material 34 adjacent the pour opening 16a²². The pull tab 30²² is movable down the embossment 52 to uncover the pour opening 16a²². It will be noted from a consideration of FIGS. 22A and 22B that the pull tab 30²² is provided with a zone of weakness Z—Z. As the vent hole or aperture 70b²² is disposed on the outboard side of the plane of weakness Z—Z, the first upward movement of the pull tab 30²² breaks the bond 35v²² between the pressure barrier material 34, the slide 24²² and the stationary member 94²² adjacent the first vent hole 70b²². If the vent aperture 70b²² is disposed on the inboard side of the plane of weakness Z—Z, the bond or seal 35v²² is broken by the simultaneous movement of the slide 24²² to break the seal 35s²² between the stationary member sealing portion 96²² and the can end sealing portion 22.

FIGS. 23A, 23B show a can end 10²³ having a rectangular shaped opening 90²³ surrounded by an embossment 52. The slide 24²³ is provided with a first pour opening 16²³ which does not contact a second pour opening 16a²³ in the stationary member 94²³. Pressure barrier material 34 is disposed about the stationary member sealing portion 96²³ and the can end sealing portion 22²³ to form the seal 35s²³. The pressure barrier material 34 is simultaneously disposed about the slide sealing portion 28²³ and the portion of the stationary member 94²³ adjacent the second pour opening 16a²³ to form the seal 35s²³.

In FIGS. 24A, 24B, the can end 10²⁴ has a sector-type opening 90²⁴ surrounded by the usual peripheral embossment 52. The stationary plane 94²⁴ is provided with a pour opening 16a²⁴ and the slide 24²⁴ carries a pull tab 30²⁴. The pressure barrier material 34 forms the seal 35s²⁴ about the stationary member sealing portion 96²⁴ and the can end sealing portion 22. In addition, the pressure barrier material 34 is also sealed at 35s²⁴ about the slide sealing portion 28 and the portion 95 of the stationary member 94²⁴ adjacent the pour opening 16a²⁴.

The can end 10²⁵ has a linear type slide 24²⁵. The slide 24²⁵ (FIGS. 25A, 25B), is provided with another pour opening 16²⁵. The linear type slide 24²⁵ is operable after the bond breaking operation to cause the pour opening 16²⁵ in the slide 24²⁵ to open the pour opening 16a²⁵ in the stationary member 94²⁵ (FIG. 25B). The pull tab 30²⁵ engages the can end 10²⁵ at the pressure points P₁, P₂ to press the can end 10²⁵ and the slide sealing portion 28²⁵ against the stationary member sealing portion 96²⁵. It will be noted from a consideration of FIGS. 25A and 25B that the slide 24²⁵ is provided with a dish portion 78²⁵, shown only in FIG. 25A for purposes of clarity. This dish portion 78²⁵ functions as a pour lip when the slide 24²⁵ is in the pour opening uncovering position (not shown in FIGS. 25A and 25B).

In FIGS. 25A, 25B the stationary member 94²⁵ (FIG. 25B) is provided with a vent aperture 70b²⁵ and the slide 24²⁵ is adapted to cover the vent aperture 70b²⁵ when the slide 24²⁵ is in the sealing position shown in FIGS. 25A, 25B. The pressure barrier material 34 is adapted to seal the stationary member 94²⁵ adjacent the vent aperture 70b²⁵ to the slide 24²⁵ to form the seal 35v²⁵ with the above mentioned second predetermined shear strength. The slide 24²⁵ is then operable upon the movement of the slide 24²⁵ away from the sealing position shown in FIGS. 25A, 25B to break the bond 35b²⁵ between the portion 95²⁵ of the stationary member 94²⁵ adjacent the vent aperture 16a²⁵ and the slide 24²⁵.

In FIGS. 26A–26C, a can end 10²⁶ is provided with a pour opening 16²⁶. The can end 10²⁶ has a can end lapping portion 20 adjacent the pour opening 16²⁶. A slide 24²⁶ has a pivot 60²⁶ on the can end 10²⁶. In addition, the slide 24²⁶ has a slide lapping portion 28 adjacent the entry aperture 18. The slide lapping portion 26 is adapted to register with the can end lapping portion 20. When the slide 24²⁶ is in the pour opening closure position shown in FIG. 26B, a pull tab 30²⁶ (shown only in FIG. 26B) is integral with the slide 24²⁶. The hereinbefore described engaging means (not shown in FIGS. 26A–26C) but shown in FIGS. 4A, 7A–7C, may be employed with this embodiment.

A pressure barrier material 34 is employed to seal the can end sealing portion 22 at a first predetermined shear strength and also to seal the slide lapping portion 26 at a second predetermined shear strength less than the above mentioned first predetermined shear strength. This seal is seal 35x²⁶.

The slide 24²⁶ is rotatable by the pull tab 30²⁶ in either a clockwise or counterclockwise direction, as shown by the arcuate arrows in FIG. 26B, about the pivot 60²⁶ to break the seal 35x²⁶ between the slide lapping portion 26 and the pressure barrier material 34 adjacent the can end lapping portion 20 to uncover the pour opening 16²⁶.

SUMMARY OF THE ACHIEVEMENTS OF THE OBJECTS OF THE INVENTION

It will be recognized by those skilled in the art that the objects of this invention have been achieved by the provision of improved can ends 10 (FIGS. 1–6) through 10²⁶ (FIGS. 26A–26C);

1. which provide an easy open style can end 10 (FIGS. 1–6) through 10²⁶ (FIGS. 26A–26C), wherein the pull tab 30 (FIGS. 1–6) through 30²⁶ (FIGS. 26A–26C) remain as an integral portion of the can end 10 (FIGS. 1–6) through 10²⁶ (FIGS. 26A–26C);

2. which have pull tabs 30 (FIGS. 1–6) through 30²⁶ (FIGS. 26A–26C) which are an integral portion of the can end 10 (FIGS. 1–6) through 10²⁶ (FIGS. 26A–26C) and are thus reclaimed with the can (not shown);

3. which are two-piece style easy open can ends 10 (FIGS. 1–6) through 10²⁶ (FIGS. 26A–26C);

4. which also provide a three-piece easy open can lid 10 (FIGS. 1–6) through 10²⁶ (FIGS. 26A–26C);

5. which have an ideal pour opening 16 (FIGS. 1–6) through 16²⁶ (FIGS. 26A–26C);

6. wherein the connection used to connect the pull tab 30 (FIGS. 1–6) through 30²⁶ (FIGS. 26A–26C) also serves as a stop to prevent removal of such pull tab and slide 24 (FIGS. 1–6) through 24²⁶ (FIGS. 26A–26C)

from the can end 10 (FIGS. 1-6) through 10²⁸ (FIGS. 26A-26C);

7. which have an easy-open pull tab 30 (FIGS. 1-6) through 30²⁸ (FIGS. 26A-26C) which move linearly along the can end 10 (FIGS. 1-6) through 10²⁸ (FIGS. 26A-26C);

8. which have a pull tab 30 (FIGS. 1-6) through 30²⁸ (FIGS. 26A-26C) which move in a rotary direction on such can lid 10 (FIGS. 1-6) through 10²⁸ (FIGS. 26A-26C);

9. which have a rotary pull tab 30²⁸ (FIGS. 26A-26C) which can be opened in either counter-clockwise or clockwise direction; and

10. wherein the pour opening 16 (FIGS. 1-6) through 16²⁸ (FIGS. 26A-26C) may be reclosed by the slide 24 (FIGS. 1-6) through 24²⁸ (FIGS. 26A-26C) if the contents of the can (not shown) were not completely consumed.

While in accordance with the patent statutes, preferred and alternative embodiments of this invention have been illustrated and described in detail, it is to be particularly understood that the invention is not limited thereto or thereby.

I claim:

1. In combination:

a. a can end provided with a pour opening having a pour width,

1. said pour opening being provided with an entry aperture at one end of said pour opening, said entry aperture having a slide width greater than said pour width,

2. said can end having a can end lapping portion and a can end sealing portion adjacent said pour opening and a plane of bulge strength adjacent said entry aperture,

b. a slide adapted to pass through said entry aperture and having a slide lapping portion, a slide sealing portion and a protruding portion extending from said entry aperture,

1. said slide lapping portion being adapted to register with said can end lapping portion, and

2. said slide sealing portion being adapted to register with said plane of bulge strength,

c. a pull tab having a connection to said slide on said protruding portion,

d. engaging means engaging said can end lapping portion to press said can end lapping portion into intimate contact with said slide lapping portion and said slide sealing portion into intimate contact with said plane of bulge strength,

e. a pressure barrier material for sealing said intimately contacting can end sealing portion and said slide lapping portion and also for sealing said intimately contacting plane of bulge strength and said slide sealing portion,

1. said pressure barrier material being bonded to said can end sealing portion with a first predetermined shear strength and to said slide lapping portion and to said plane of bulge strength with a second predetermined shear strength less than said first predetermined shear strength,

f. said pull tab having a plane of weakness on one side of said connection to said slide,

g. said connection being disposed outwardly from said plane of weakness,

h. said pull tab being movable away from said plane of bulge strength to break the bond between said slide and said pressure barrier material adjacent said plane of bulge strength so that said pressure barrier material functions as a guide, and

i. said pull tab being then movable away from said entry aperture to break the bond between said pressure barrier material adjacent said can end sealing portion and said slide lapping portion so that pressure barrier material adjacent said can end sealing portion functions as a guide for said slide.

2. The combination recited in claim 1 wherein said pull tab is integral with said protruding portion.

3. The combination recited in claim 1 wherein said connection is integral with one of said pull tab and said slide.

4. The combination recited in claim 1 wherein said connection is separate from one of said pull tab and said slide.

5. The combination recited in claim 1 wherein said entry aperture is a slit.

6. The combination recited in claim 1 wherein said entry aperture is a slot.

7. The combination recited in claim 1 wherein said entry aperture is provided with a slide guide means.

8. The combination recited in claim 1 wherein said slide has a bulge strength measured in pounds per square inch equal to or greater than the bulge strength of said can end.

9. The combination recited in claim 1 wherein said engaging means has a stationary member supporting one member of said pull tab, said slide and said can end and a movable member engaging another member of said pull tab, said slide and said can end.

10. The combination recited in claim 1 wherein said engaging means is magnetic.

11. The combination recited in claim 1 having stop means on said slide for engaging said entry aperture to prevent said slide from leaving said entry aperture.

12. The combination recited in claim 1 wherein said connection is a weld.

13. The combination recited in claim 1 wherein said connection is an adhesive.

14. The combination recited in claim 1 wherein said pressure portion is a leg.

15. The combination recited in claim 1 wherein said connection is sealed to said slide by said pressure barrier material.

16. The combination recited in claim 1 wherein said pour opening is radial.

17. The combination recited in claim 1 wherein said pour opening is chordal.

18. The combination recited in claim 1 wherein said can end has an embossment around said pour opening.

19. The combination recited in claim 18 wherein said embossment is upward.

20. The combination recited in claim 18 wherein said embossment is downward for vacuum sealing.

21. The combination recited in claim 1 wherein said pressure portion has a locking tab for engaging said can end.

22. The combination recited in claim 21 wherein said locking tab has a locking tab plane of weakness.

23. The combination recited in claim 1 wherein said pour opening has arcuate sides and said entry aperture

vents said pour opening when said pour opening is exposed.

24. The combination recited in claim 1 wherein said pull tab is of the corrugated type.

25. The combination recited in claim 1 wherein said pull tab is of the ring type.

26. The combination recited in claim 1 wherein said pull tab is of the serrated type.

27. The combination recited in claim 1 wherein said pull tab is of the projecting type.

28. The combination recited in claim 1 wherein said pull tab is of the waffle type.

29. The combination recited in claim 1 wherein said pull tab has a plurality of protuberances.

30. The combination recited in claim 1 wherein said pull tab has a plurality of cavities.

31. The combination recited in claim 1 wherein said pull tab is of the embossed aperture type.

32. The combination recited in claim 1 wherein said can end is provided with a vent aperture and one vent closure portion of said slide or said pull tab is adapted to cover said vent aperture, said pressure barrier material being adapted to seal said vent aperture to said one vent closure portion, said one vent closure portion being operable to break said seal between said vent aperture and said one vent closure portion when said slide moves out of said entry aperture.

33. The combination recited in claim 32 wherein said vent aperture is provided with a vent entry aperture.

34. The combination recited in claim 33 wherein said vent entry aperture is a slot.

35. The combination recited in claim 33 wherein said vent entry aperture is a slit.

36. The combination recited in claim 33 wherein said vent entry aperture is provided with a slide guide means.

37. The combination recited in claim 33 wherein said one vent closure portion has stop means for engaging said entry aperture to prevent said one vent closure portion from leaving said entry aperture.

38. The combination recited in claim 32 wherein said one vent closure portion has a bulge strength measured in lbs/sq. inch equal to or greater than the bulge strength of said can end.

39. The combination recited in claim 32 wherein said vent aperture is radial.

40. The combination recited in claim 32 wherein said vent aperture is chordal.

41. The combination recited in claim 32 wherein said can end has an embossment around said vent aperture embossment.

42. The combination recited in claim 32 wherein said vent aperture embossment is upward.

43. The combination recited in claim 32 wherein said vent aperture embossment is downward for vacuum seals.

44. The combination recited in claim 32 wherein said one vent closure portion has locking tab for engaging said can end.

45. The combination recited in claim 32 wherein said vent aperture has substantially straight sides.

46. The combination recited in claim 32 wherein said vent aperture has arcuate sides.

47. The combination recited in claim 32 and having vent closure engaging means, said vent closure engaging means having a stationary member supporting one member of said pull tab, said slide and said can end and a movable member engaging another member of said pull tab, said slide and said can end.

48. The combination recited in claim 32 having magnetic type vent closure engaging means.

49. The combination recited in claim 32 wherein said one vent closure portion is integral with either said slide or said pull tab.

50. The combination recited in claim 32 wherein said one vent closure portion is separate from either said slide or said pull tab and having a vent closure connection for connecting said one vent closure portion to either said slide or said pull tab.

51. The combination recited in claim 1 wherein said stop means is on said can end.

52. The combination recited in claim 1 and having stop means on said one vent closure portion for limiting the movement of said slide by engagement of said stop means with said can end.

53. The combination recited in claim 32 wherein said pull tab is of the expansion type.

54. The combination recited in claim 1 wherein said pour opening has substantially straight sides and said entry aperture vents said can end when said pour opening is upward.

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