United States Patent

[11] 3,622,055

[72] Inventor **Donald L. Douty**
Franklin Township, Westmoreland County, Pa.

[21] Appl. No. **61,384**
[22] Filed **Aug. 5, 1970**
[45] Patented **Nov. 23, 1971**
[73] Assignee **United States Steel Corporation**

[54] **CAN END WITH BONDED SEAL SLIDE**
56 Claims, 71 Drawing Figs.

[52] **U.S. Cl.** **222/541,** 222/561, 220/41, 220/53
[51] **Int. Cl.** **B65d 47/10**
[50] **Field of Search** ..... 222/541, 559, 561, 560, 153; 220/47, 41, 53, 54, 23, 46; 229/7 SC

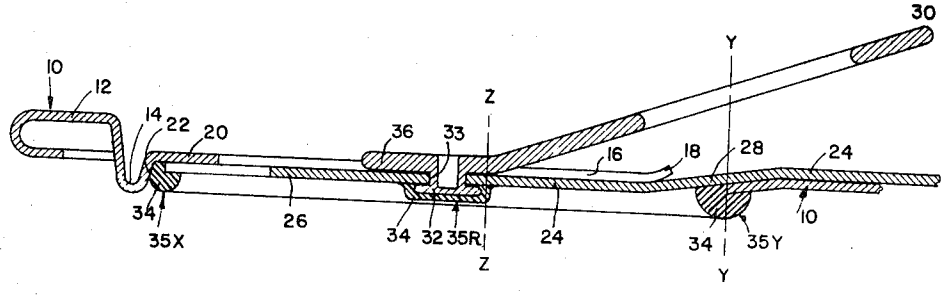
[56] **References Cited**

UNITED STATES PATENTS

3,250,436	5/1966	Kurtz	222/153
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.

ABSTRACT: A can end is disclosed which 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 having 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 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 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 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 and on such pressure barrier material as a guide to uncover the pour opening.



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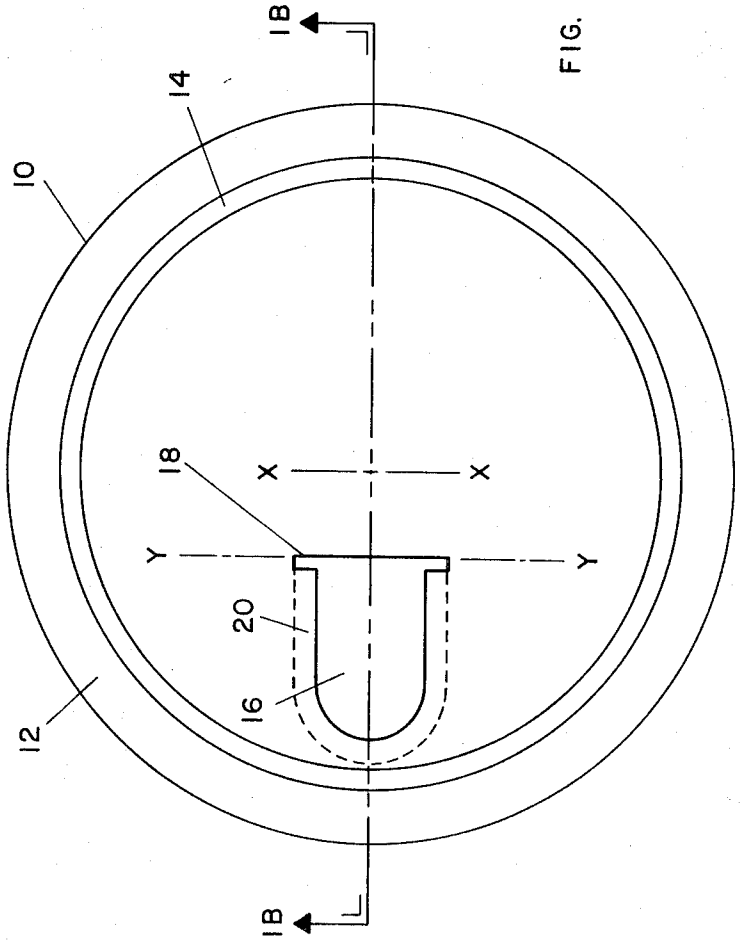


FIG. 1A

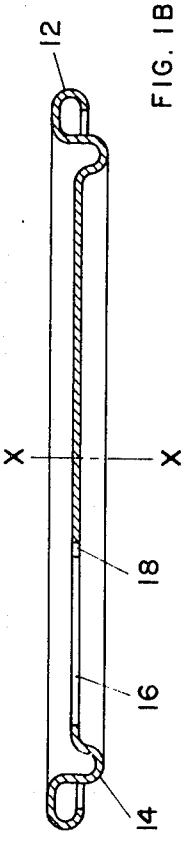


FIG. 1B

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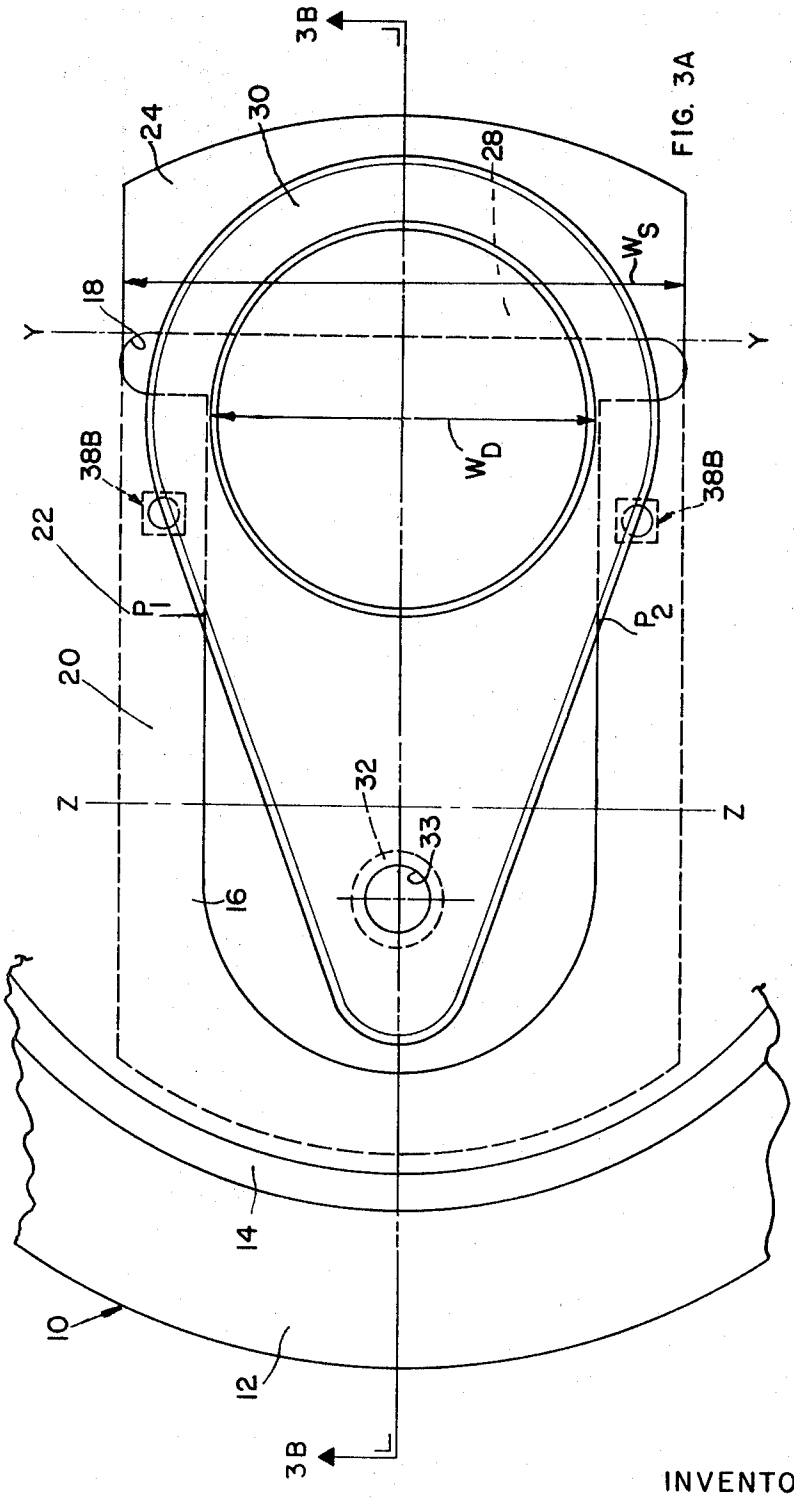


FIG. 3A

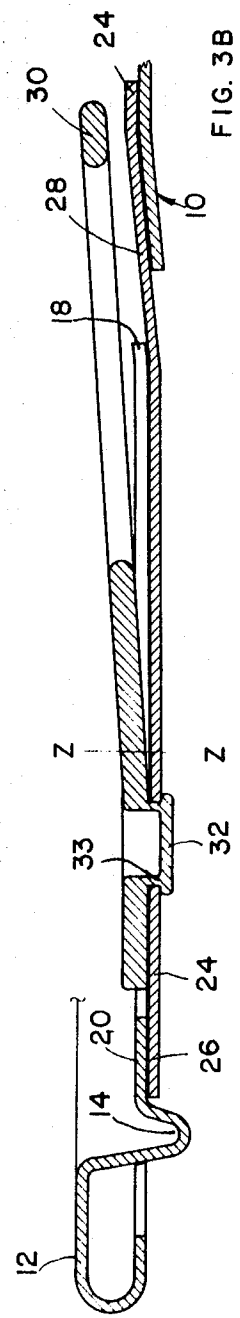


FIG. 3B

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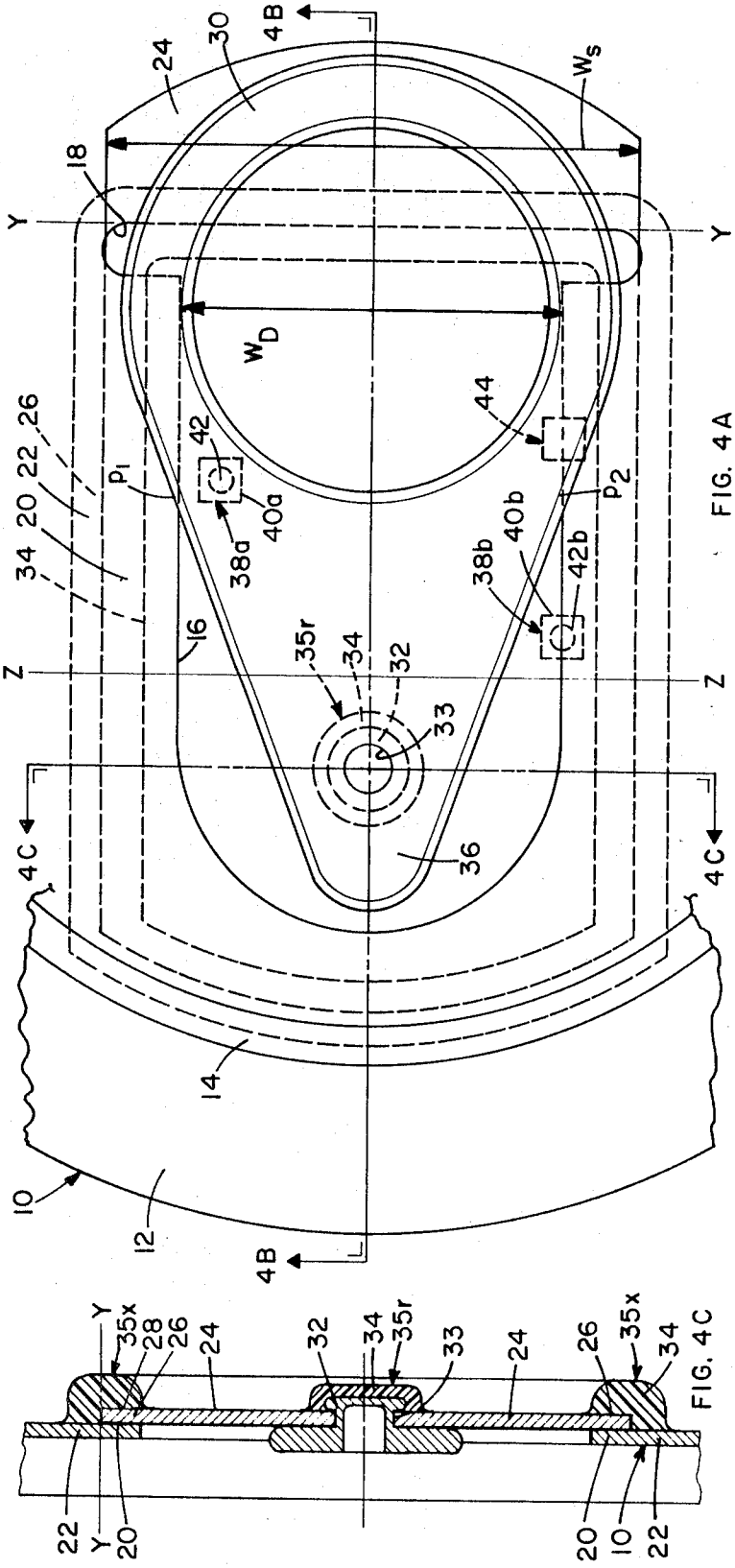


FIG. 4A

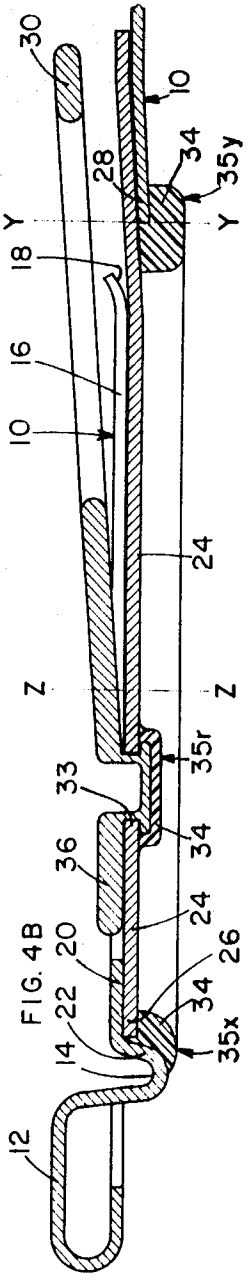


FIG. 4B

FIG. 4C

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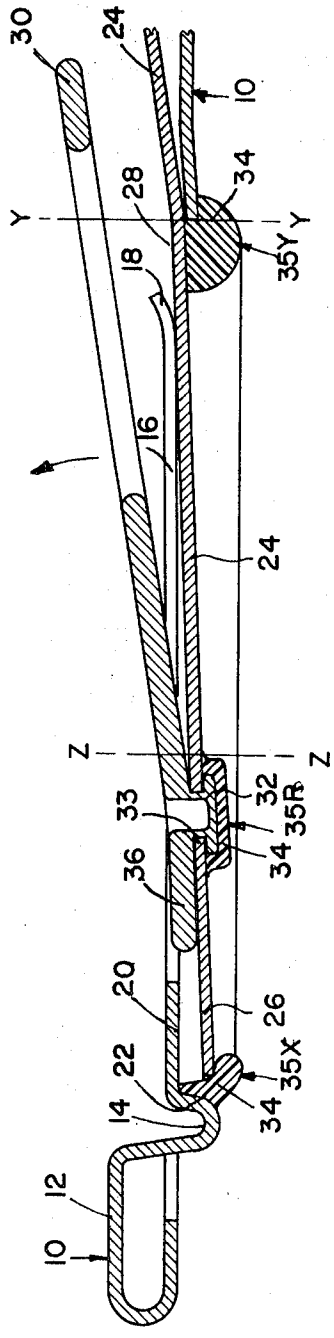


FIG. 5

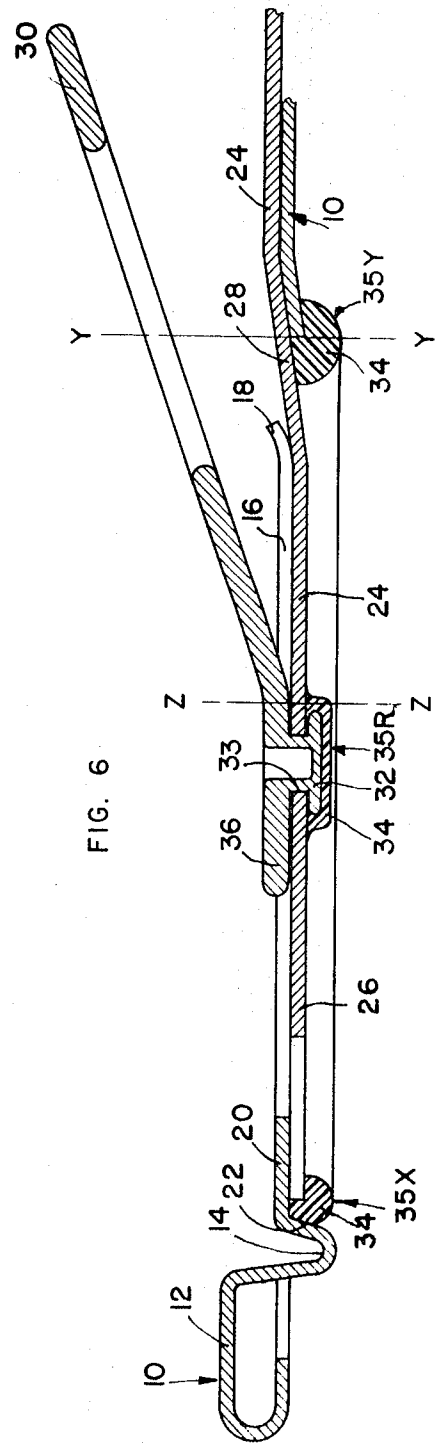


FIG. 6

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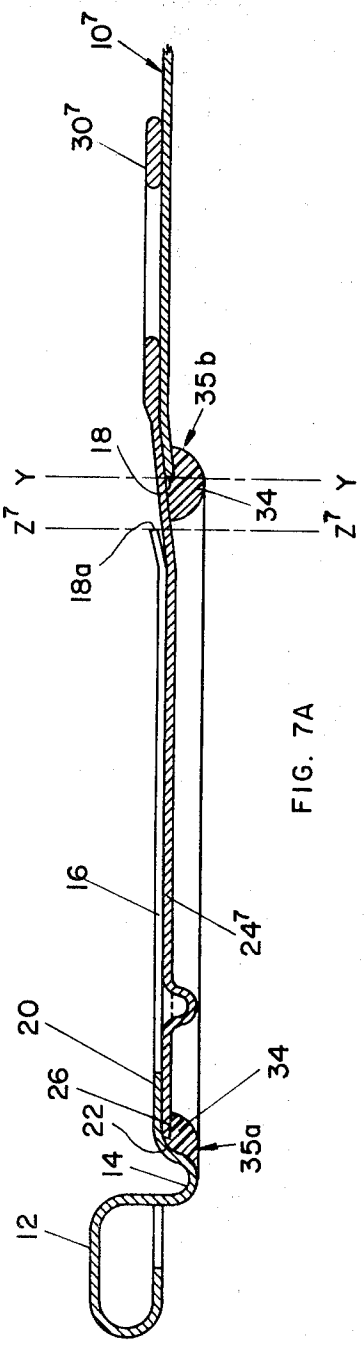


FIG. 7A

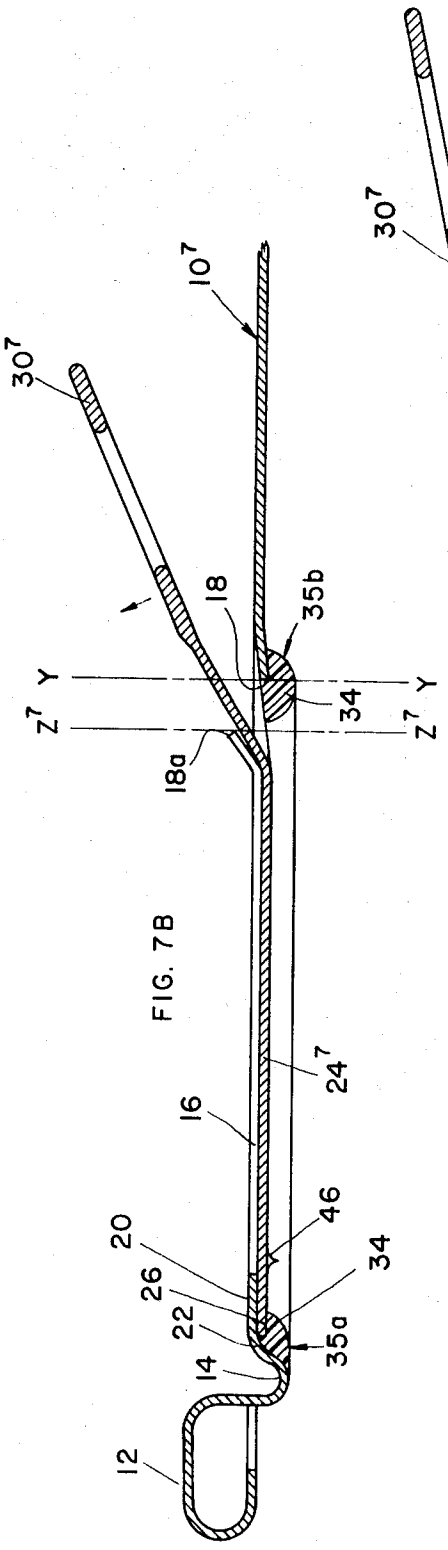


FIG. 7B

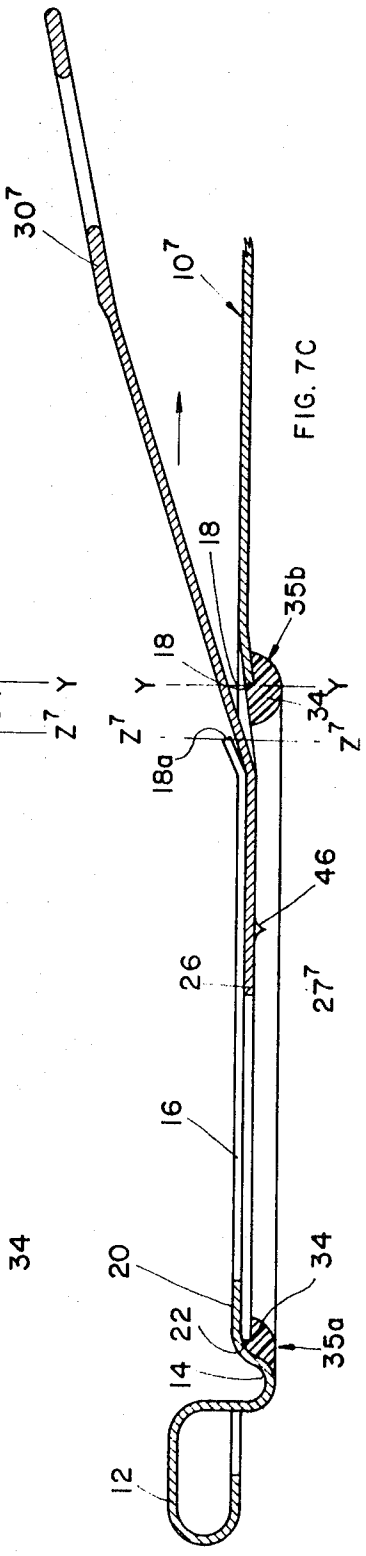


FIG. 7C

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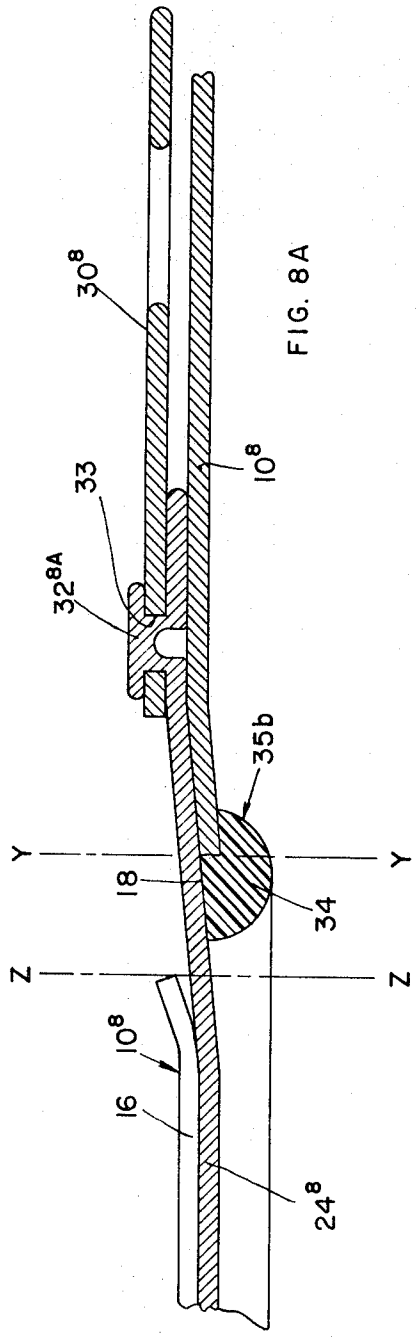


FIG. 8A

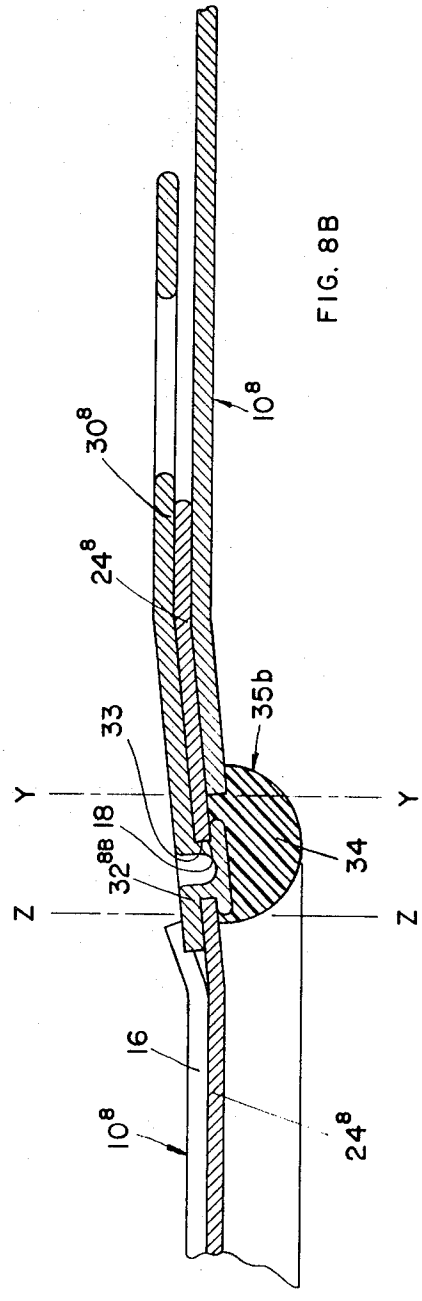


FIG. 8B

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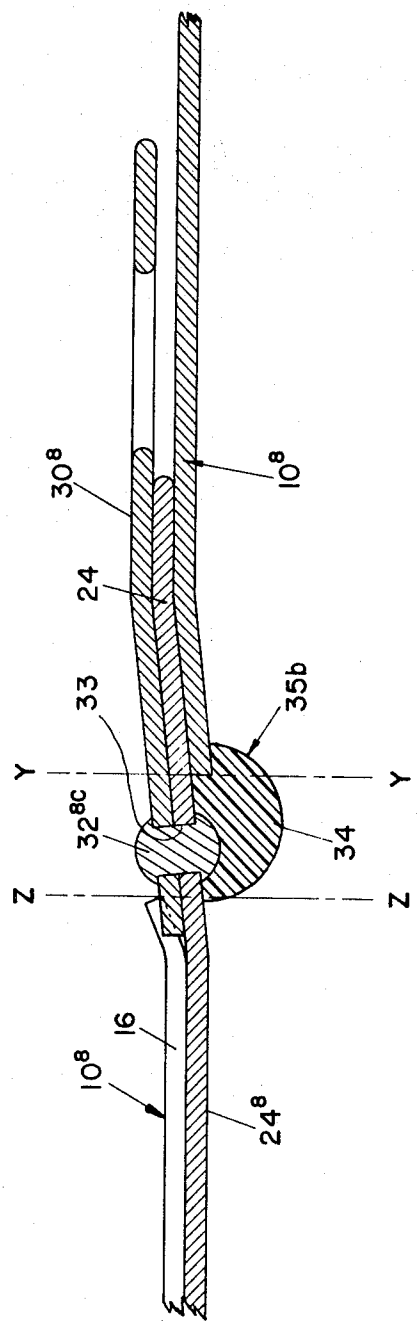


FIG. 8C

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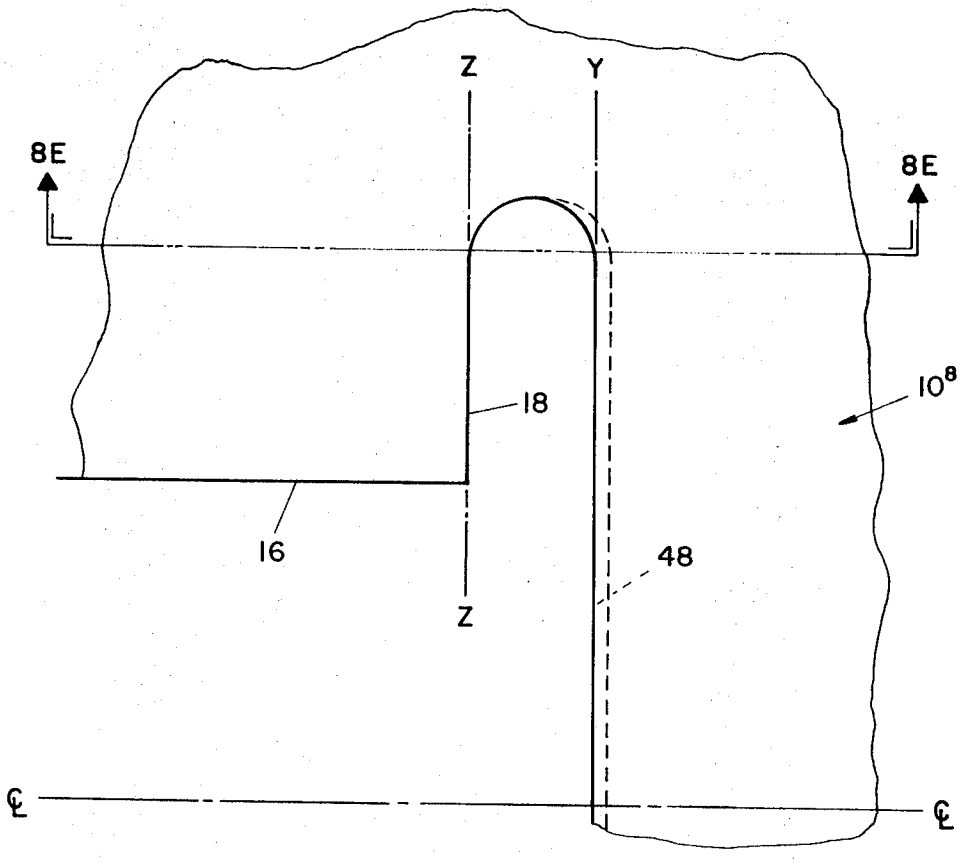


FIG. 8D

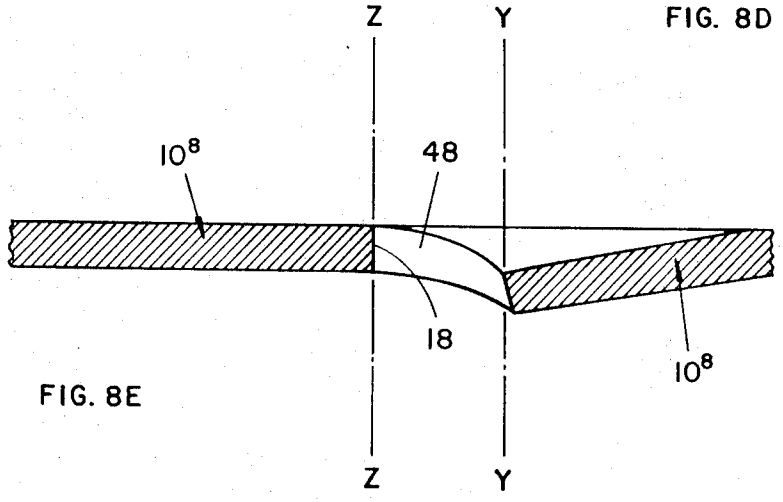


FIG. 8E

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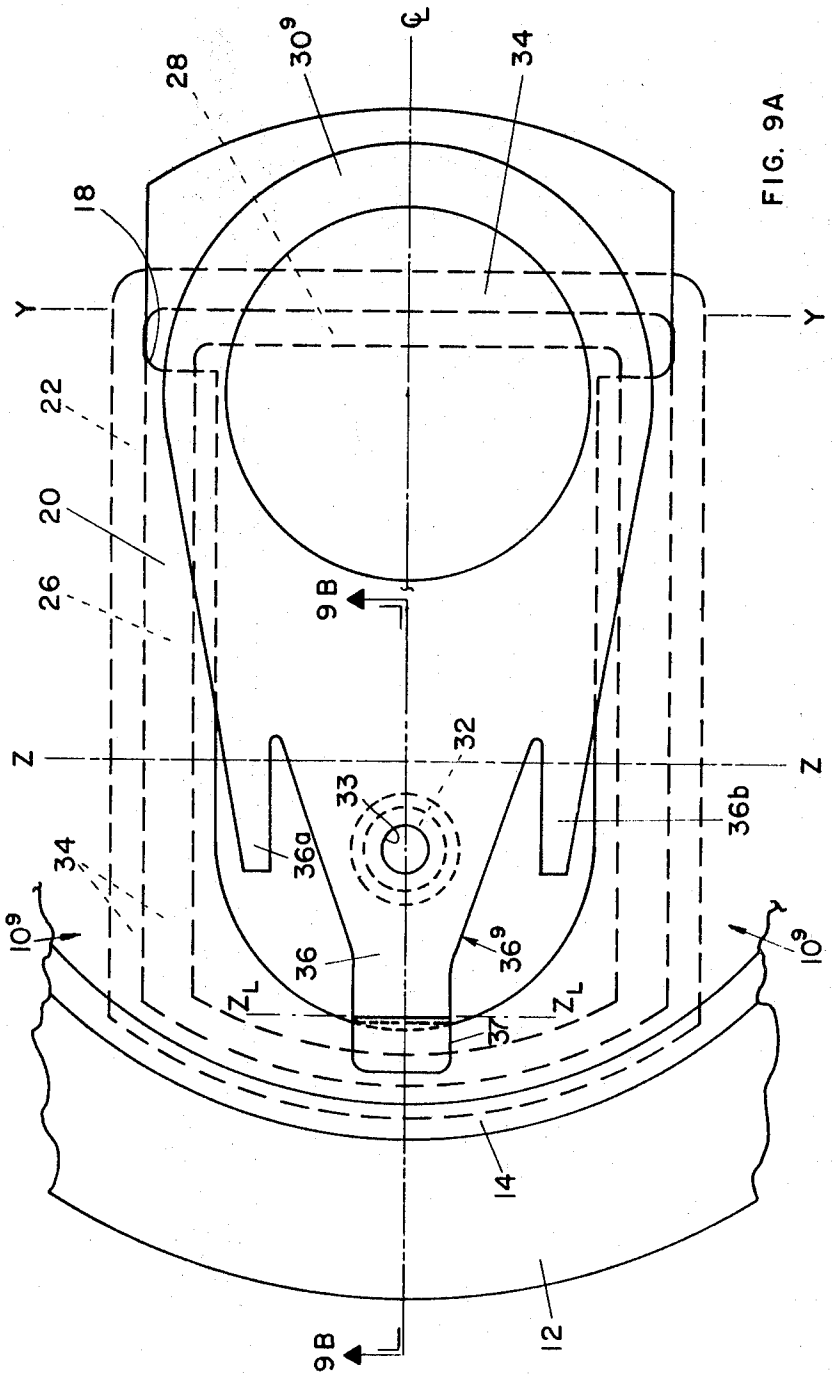


FIG. 9A

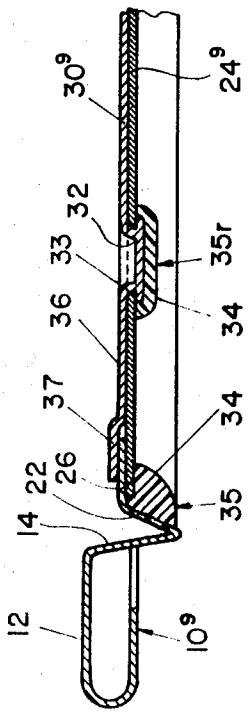


FIG. 9B

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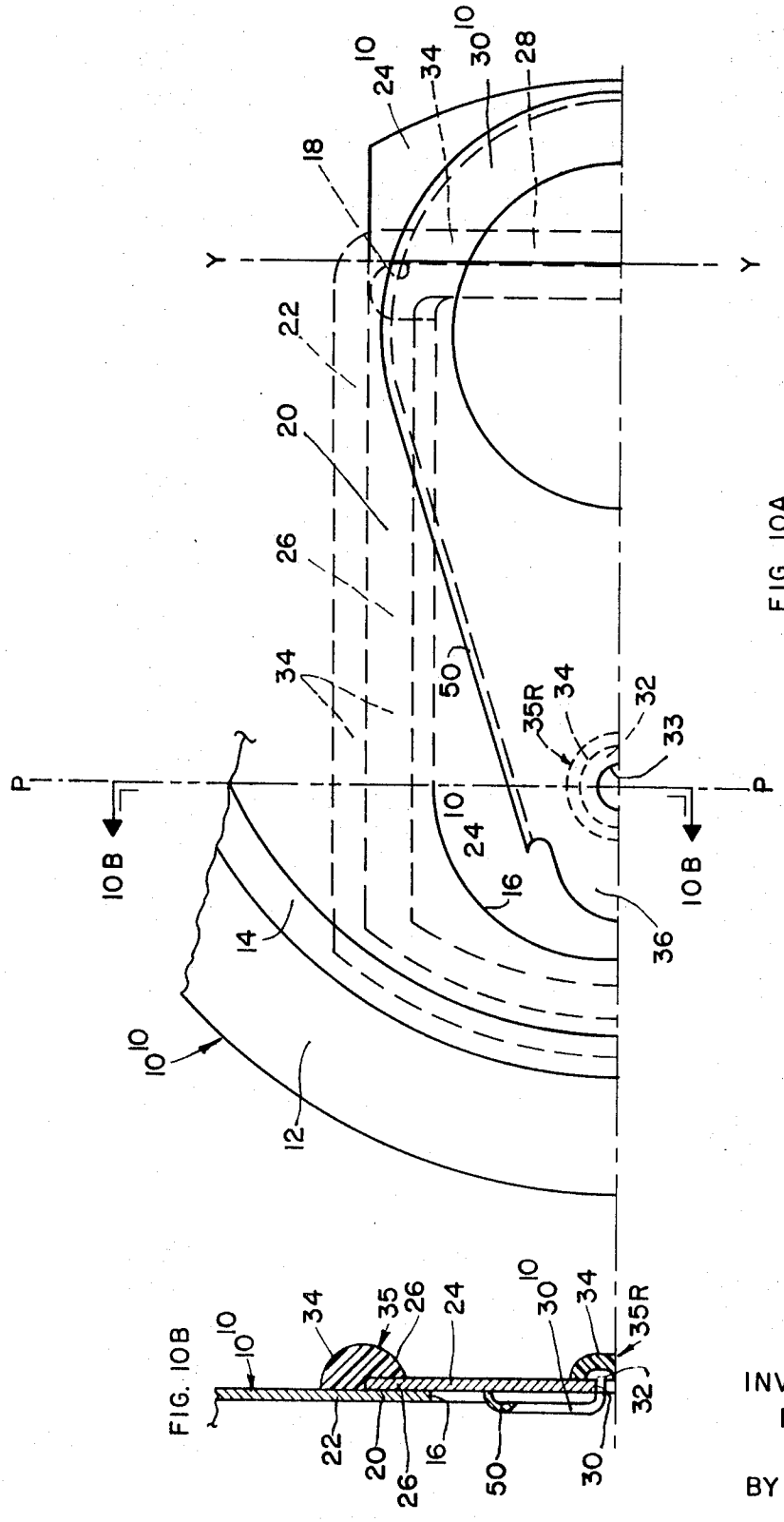


FIG. 10A

FIG. 10B

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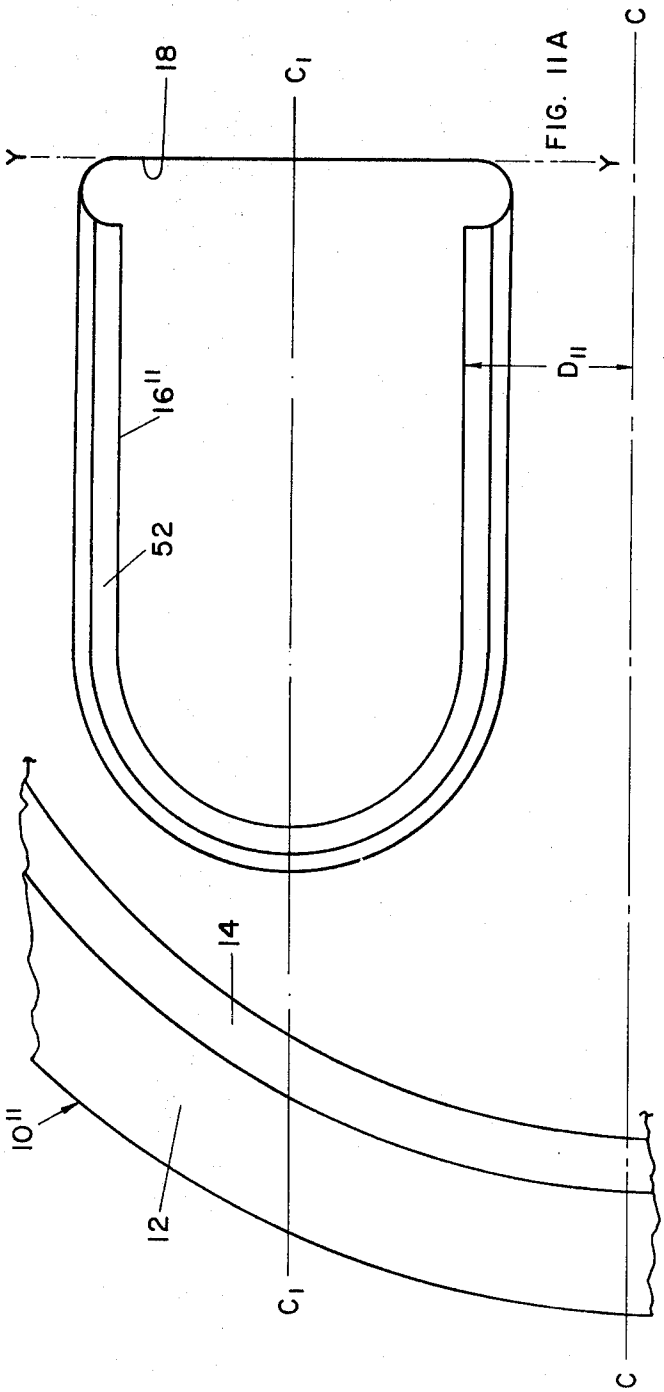


FIG. IIA

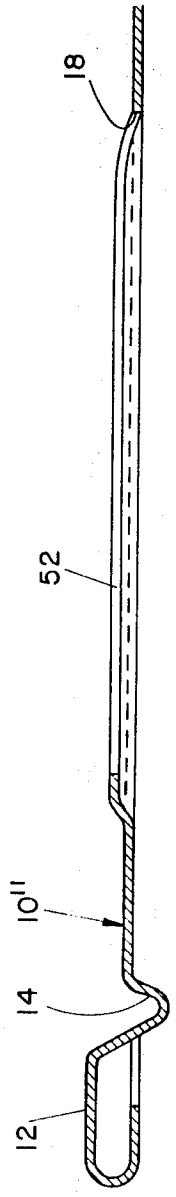


FIG. IIB

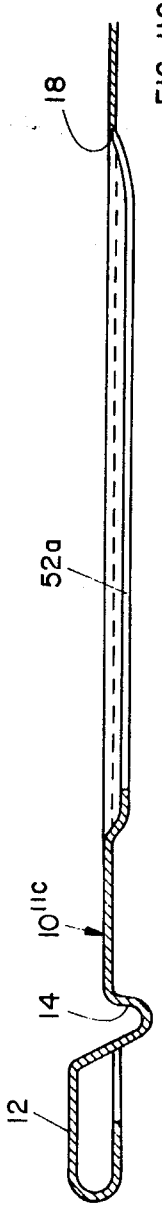


FIG. IIC

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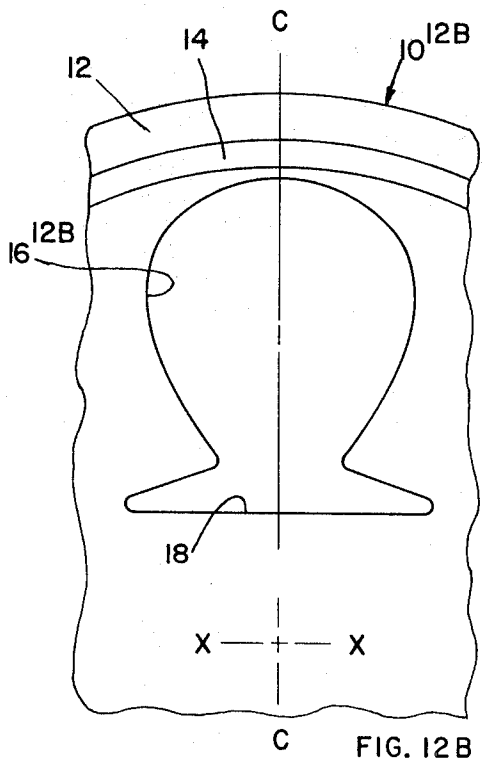


FIG. 12B

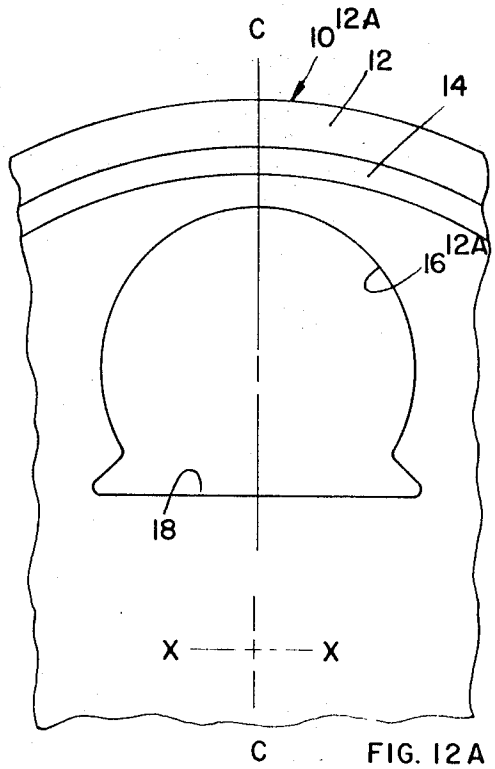


FIG. 12A

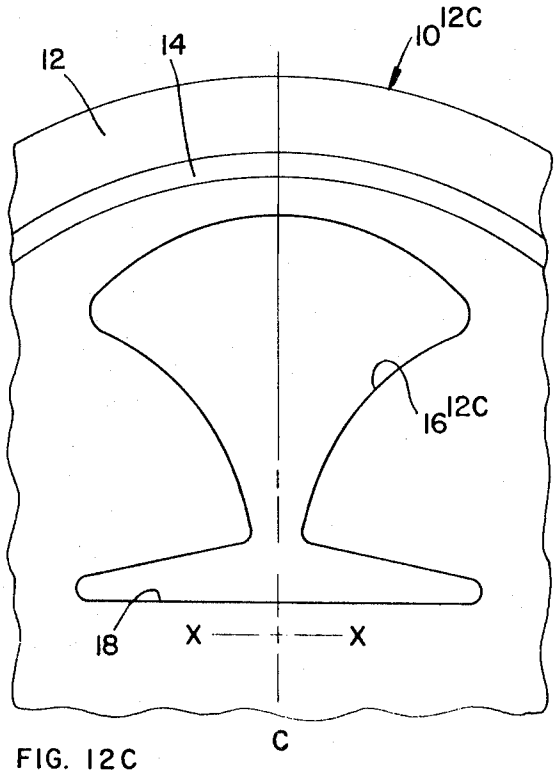


FIG. 12C

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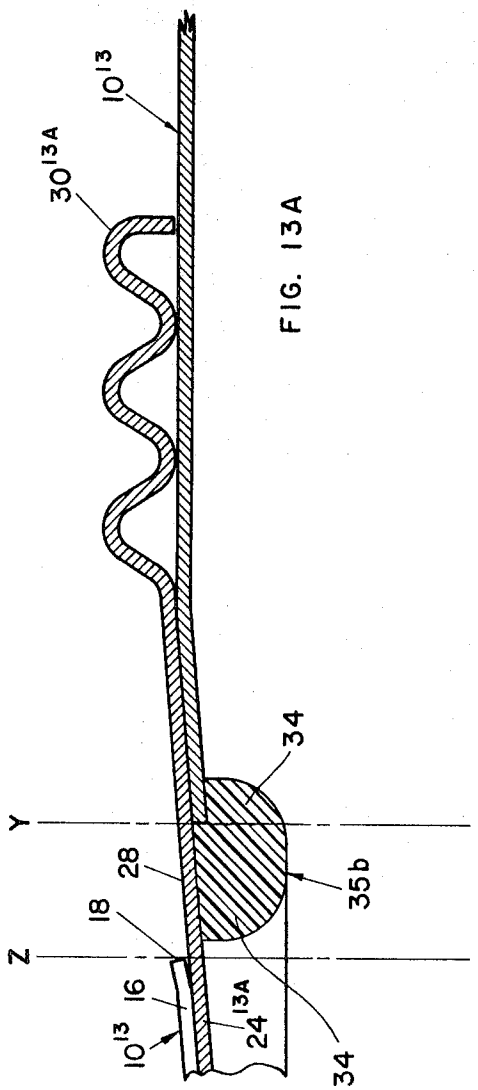


FIG. 13A

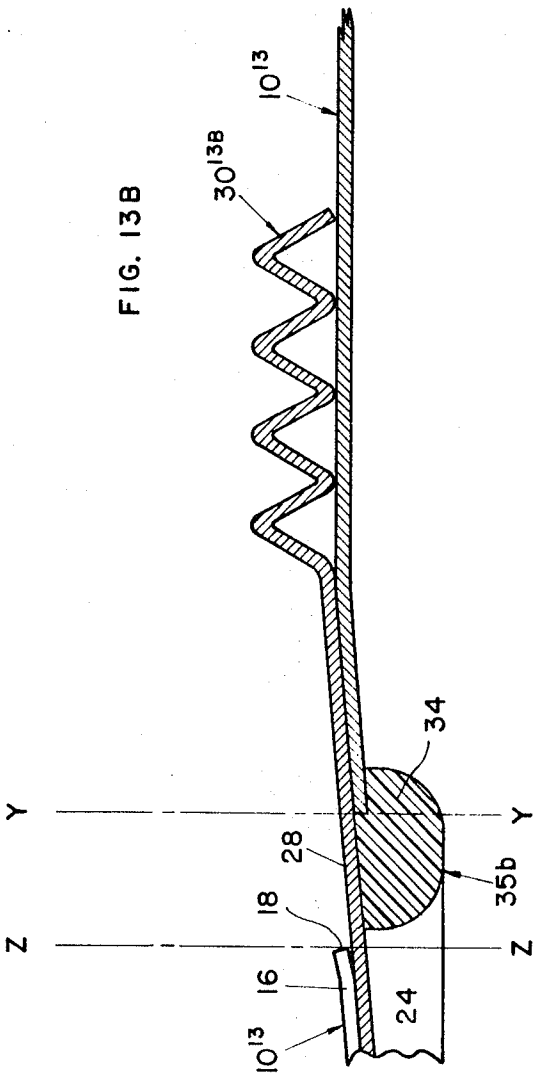


FIG. 13B

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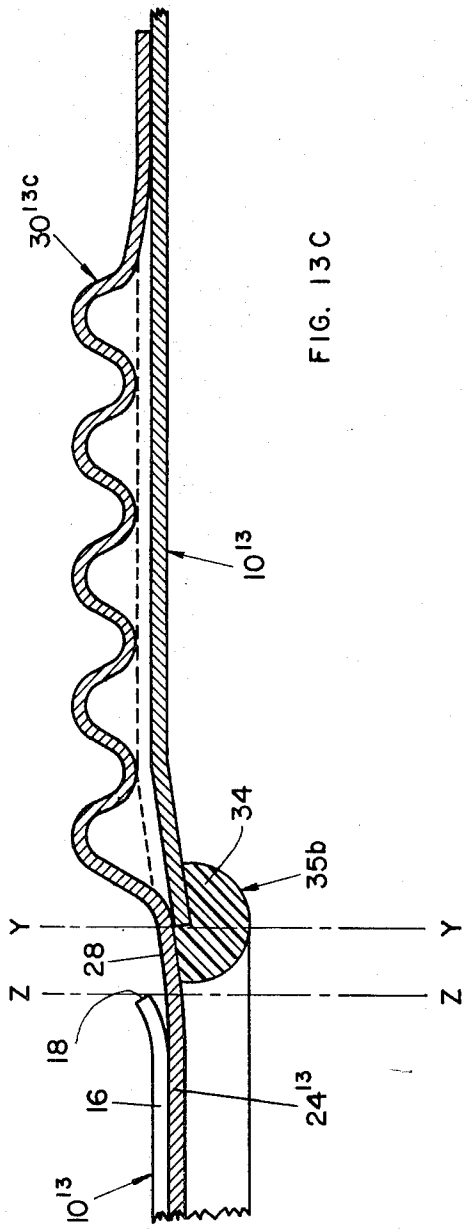


FIG. 13C

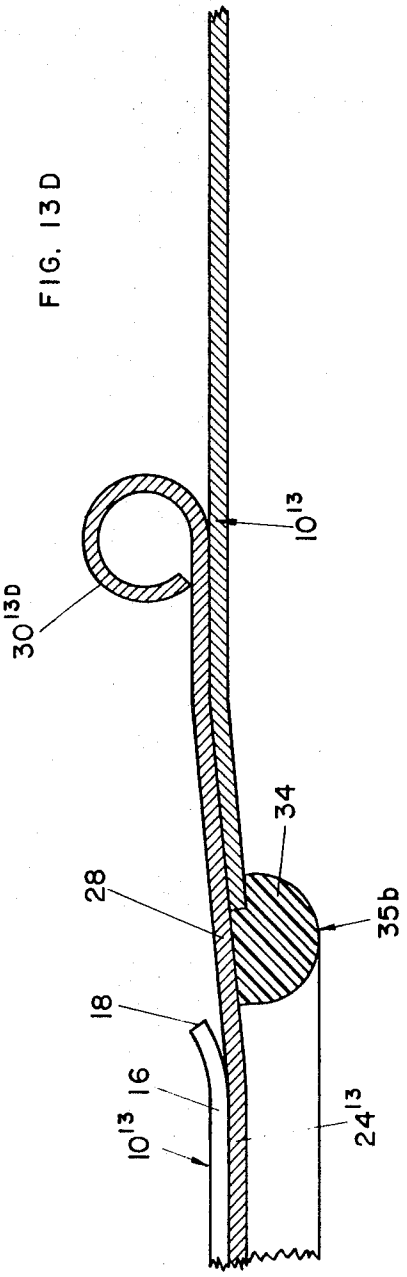


FIG. 13D

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DONALD L. DOUTY

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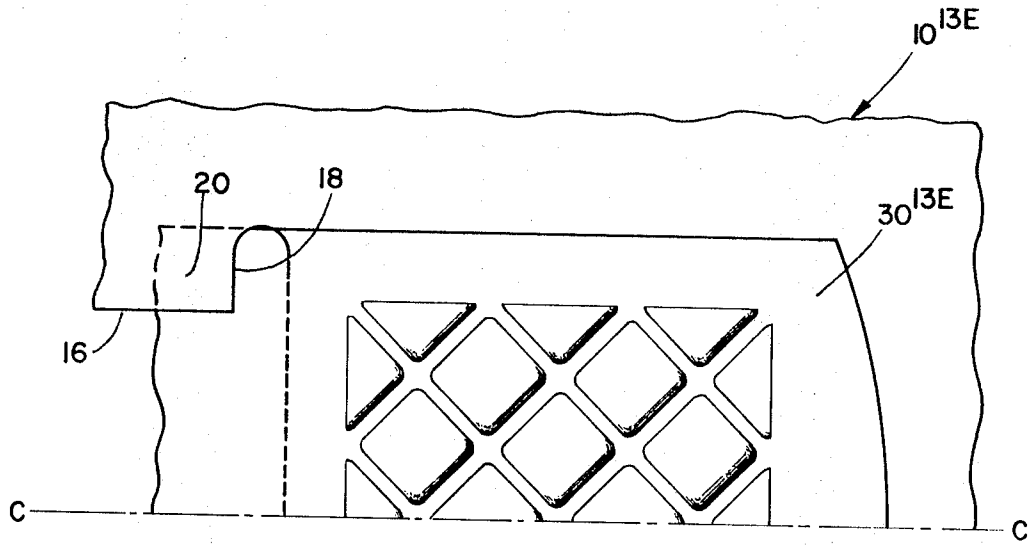


FIG. 13E

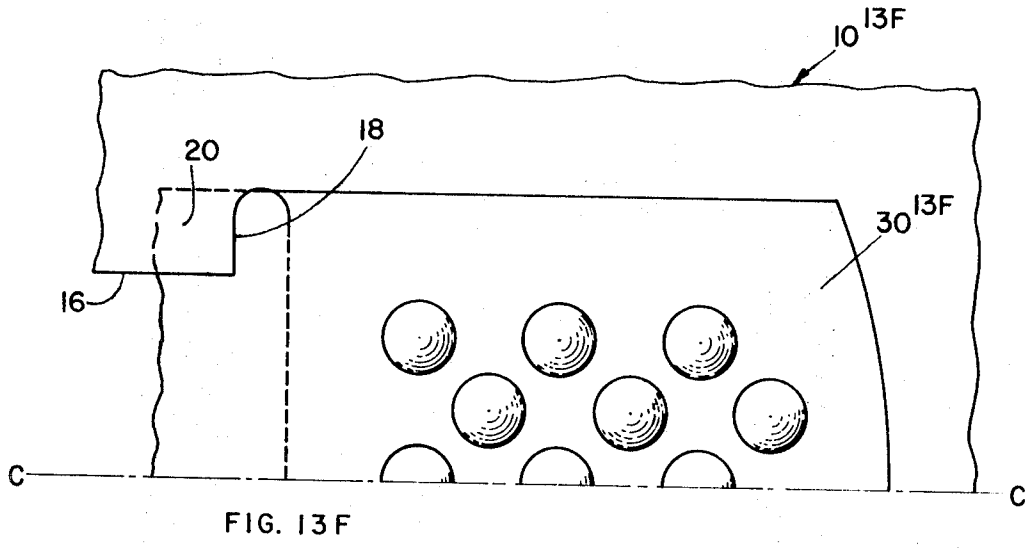


FIG. 13F

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DONALD L. DOUTY

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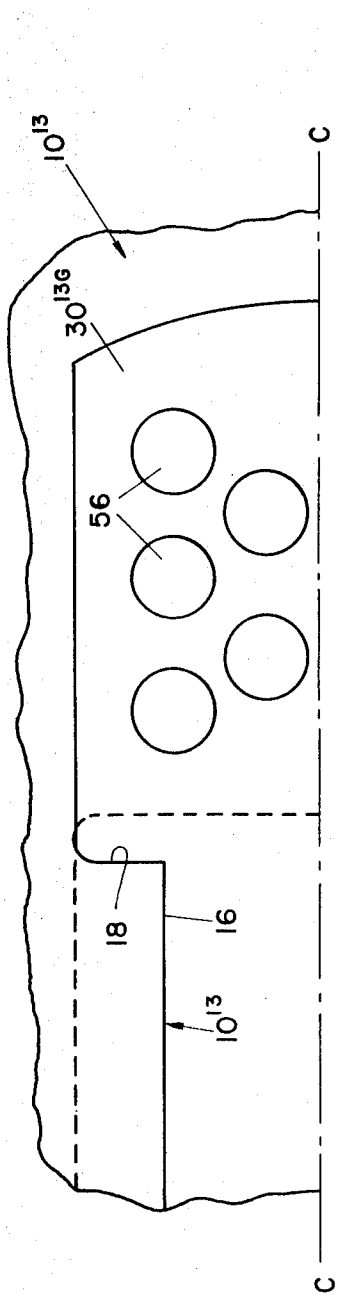


FIG. 13G

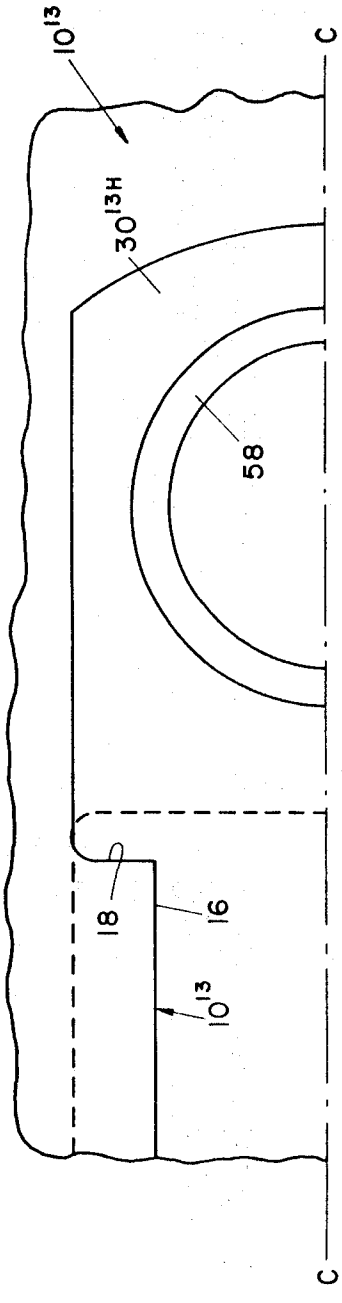


FIG. 13H

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DONALD L. DOUTY

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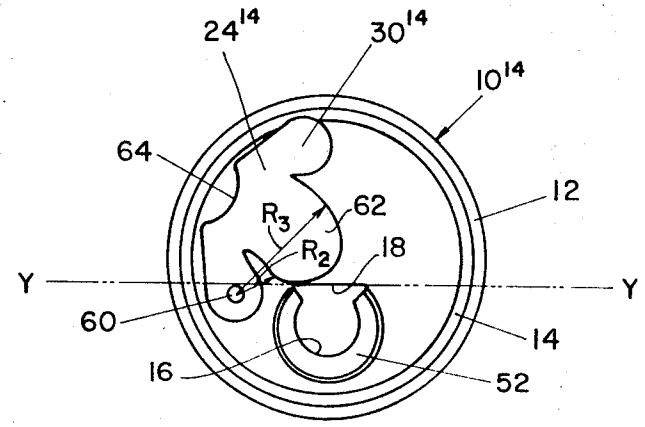


FIG. 14A

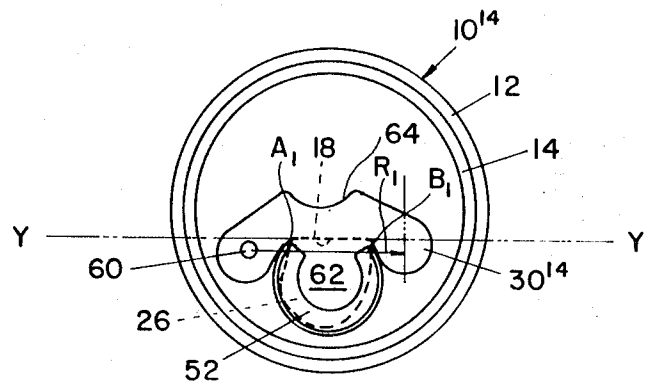
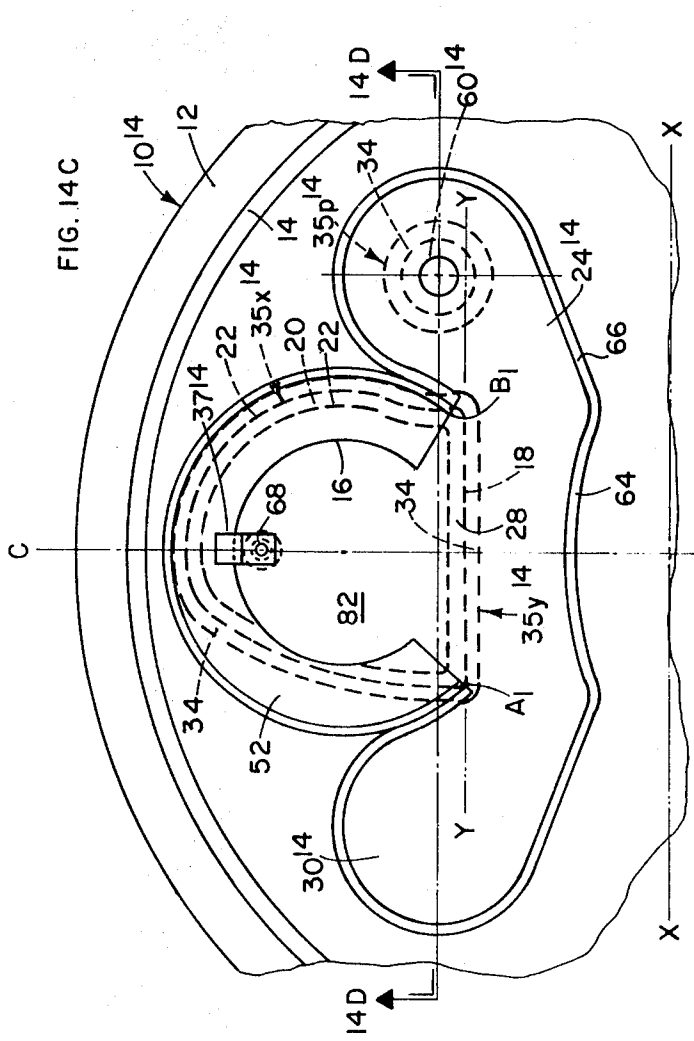


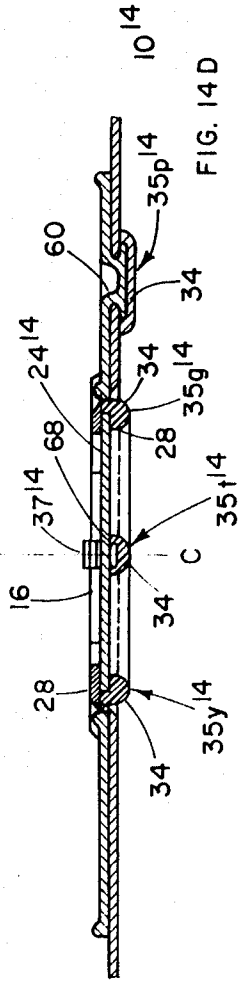
FIG. 14B

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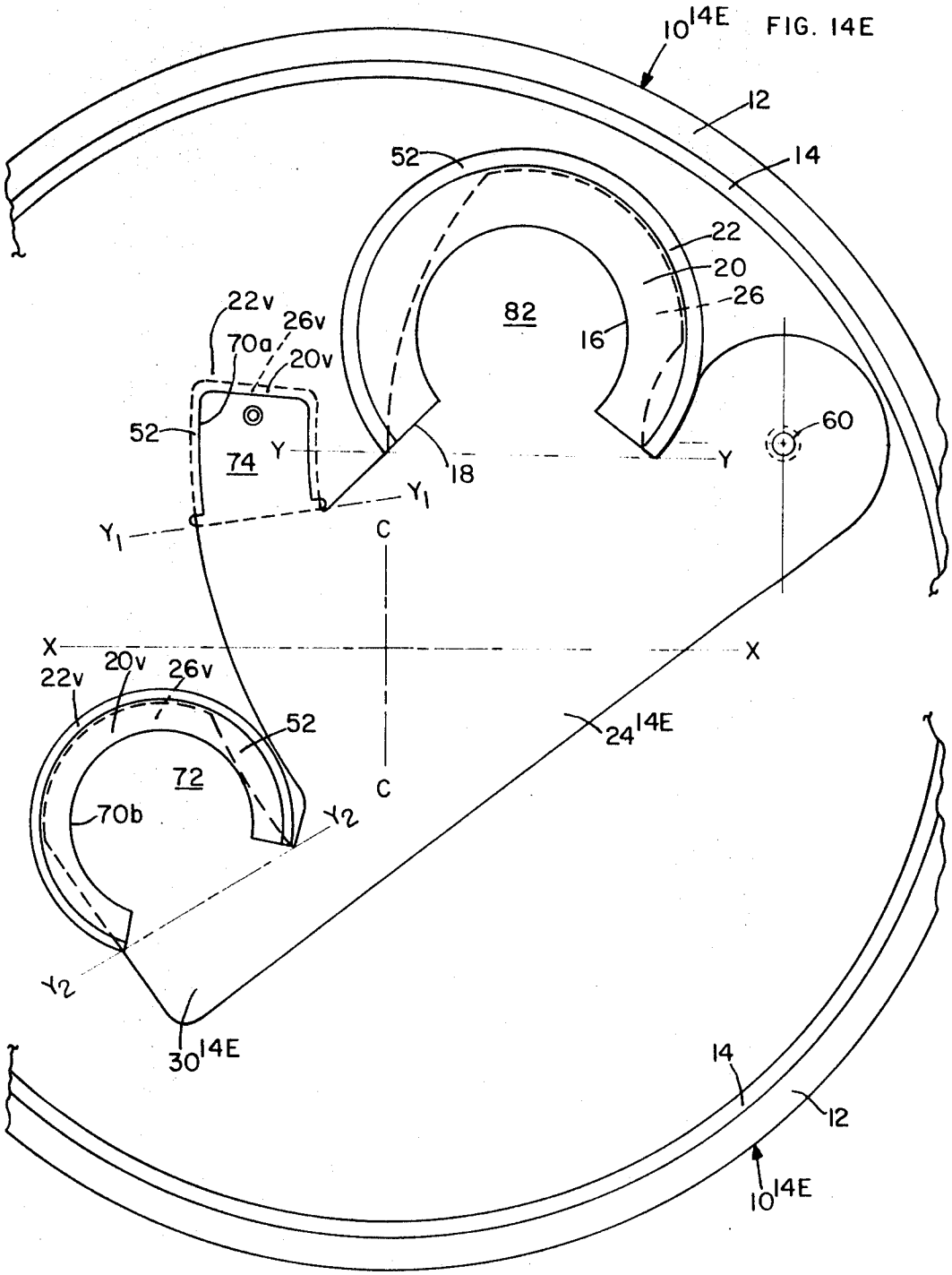


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FIG. 14E



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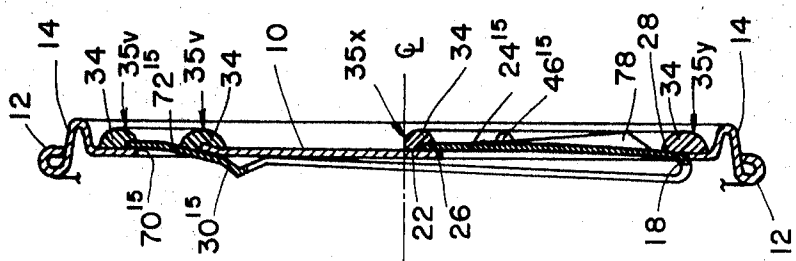


FIG. 15 B

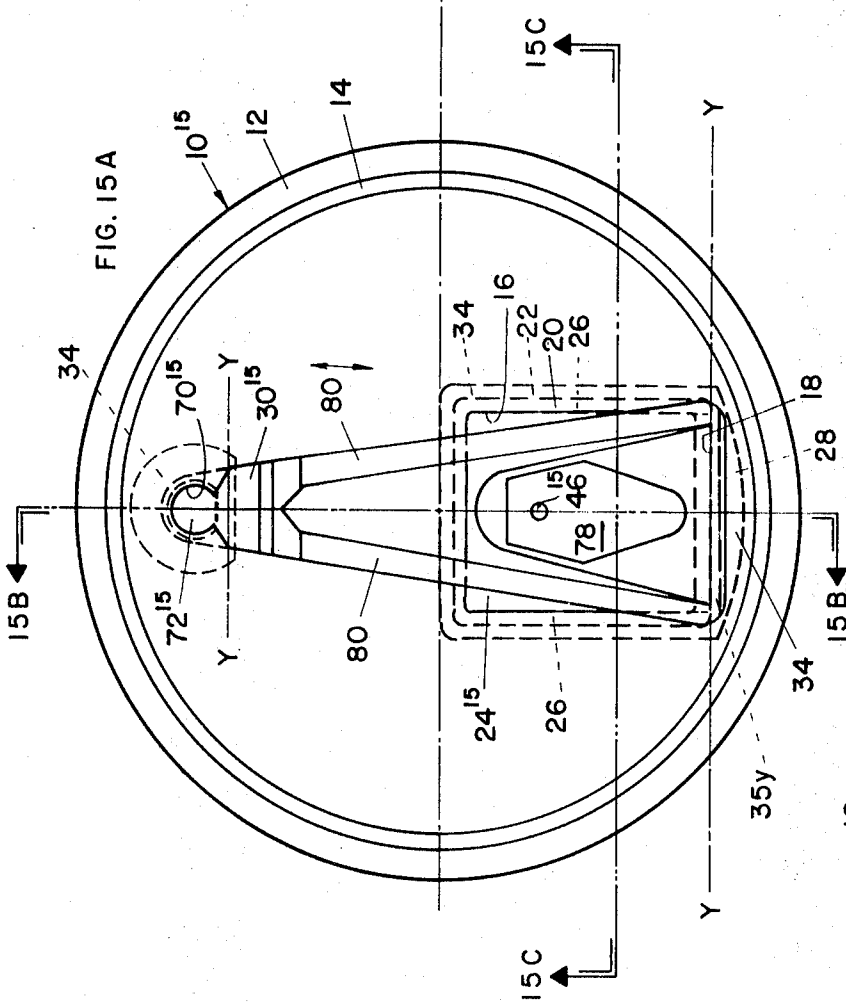


FIG. 15 A

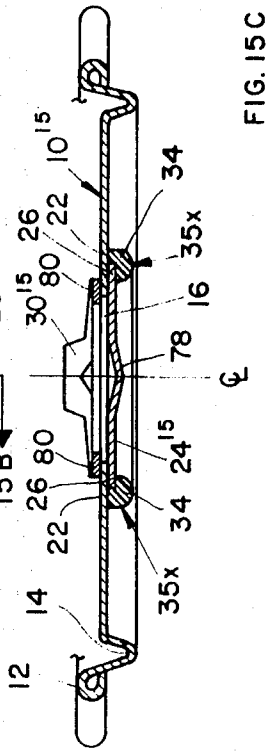


FIG. 15 C

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FIG. 16B

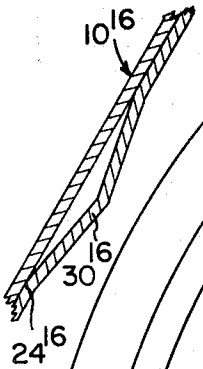


FIG. 16A

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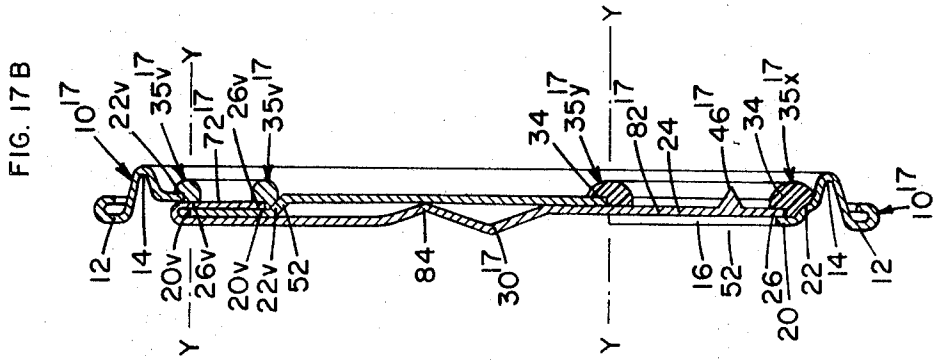


FIG. 17 B

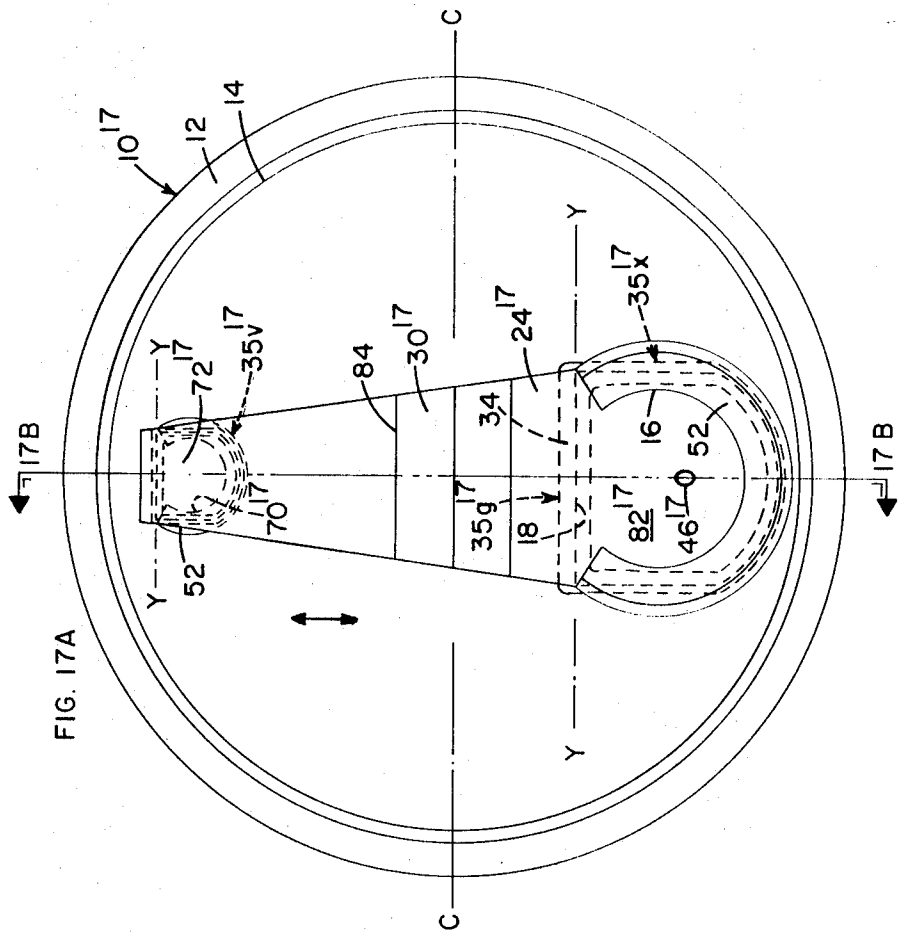
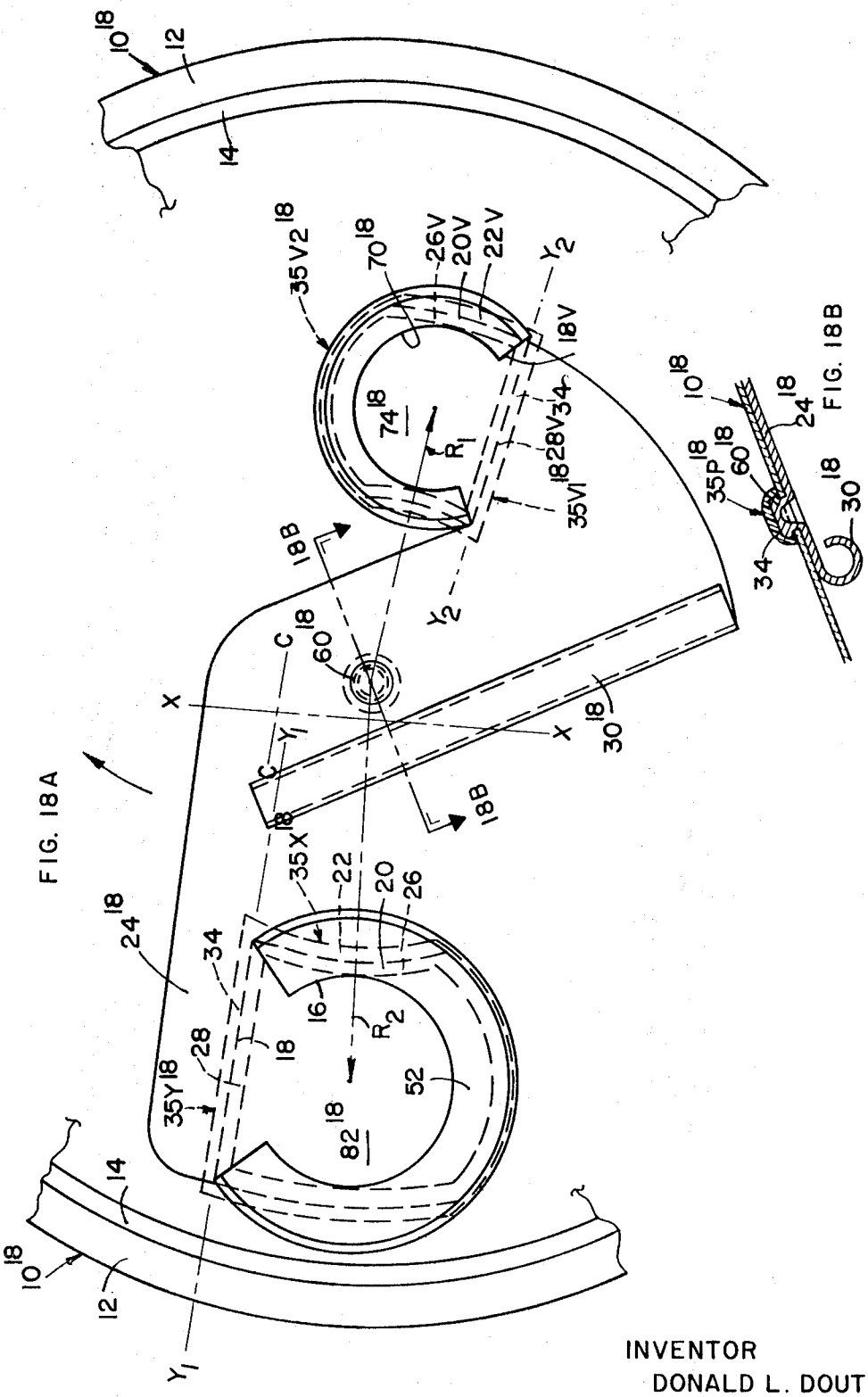


FIG. 17A

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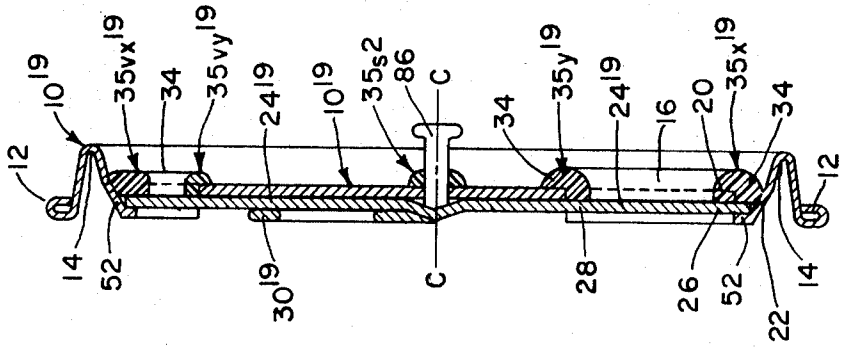


FIG. 19B

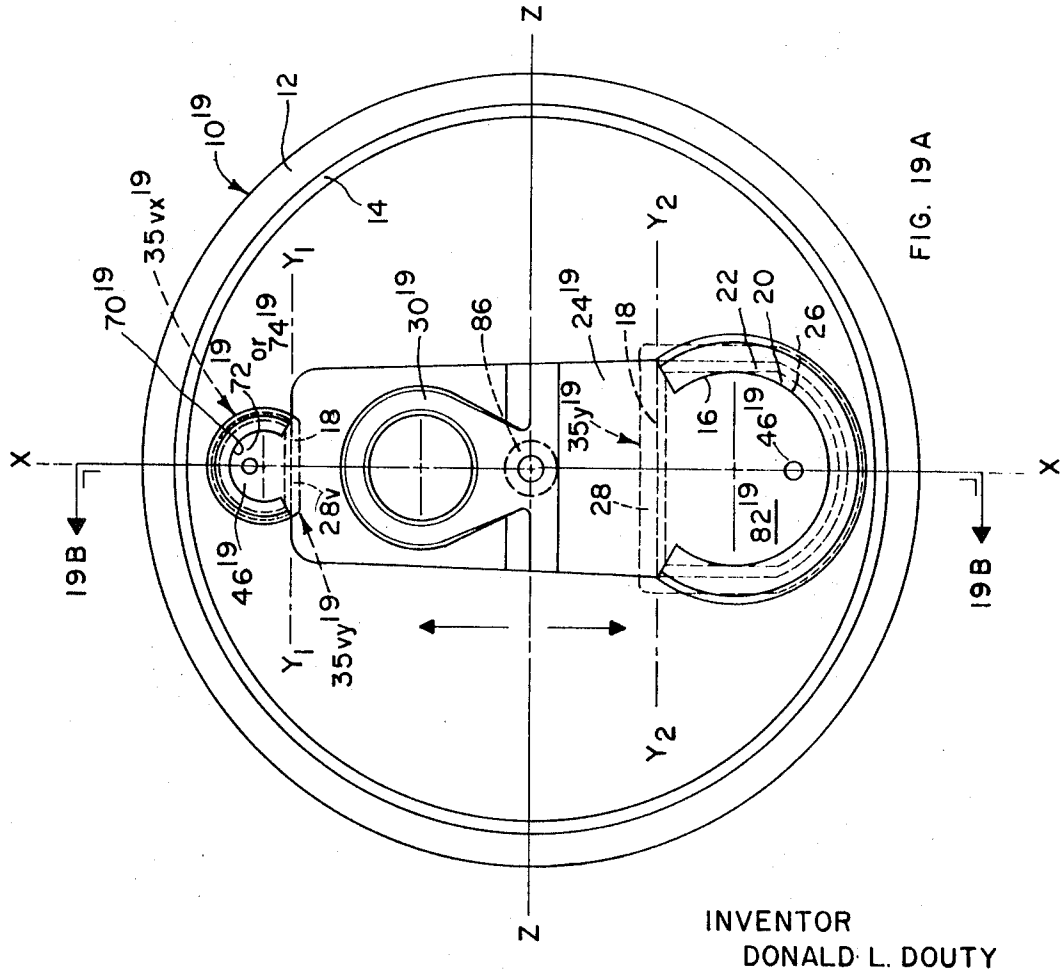


FIG. 19A

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FIG. 20A

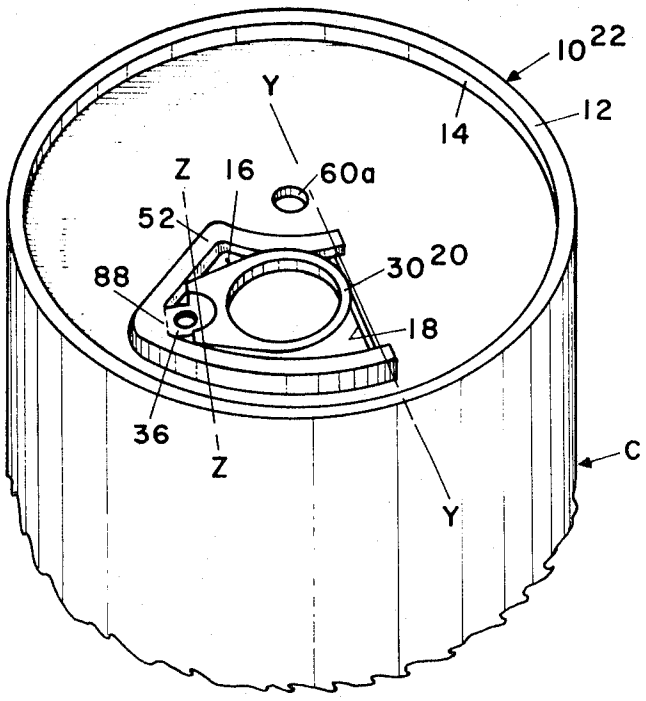


FIG. 20B

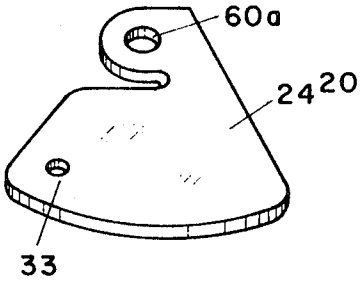
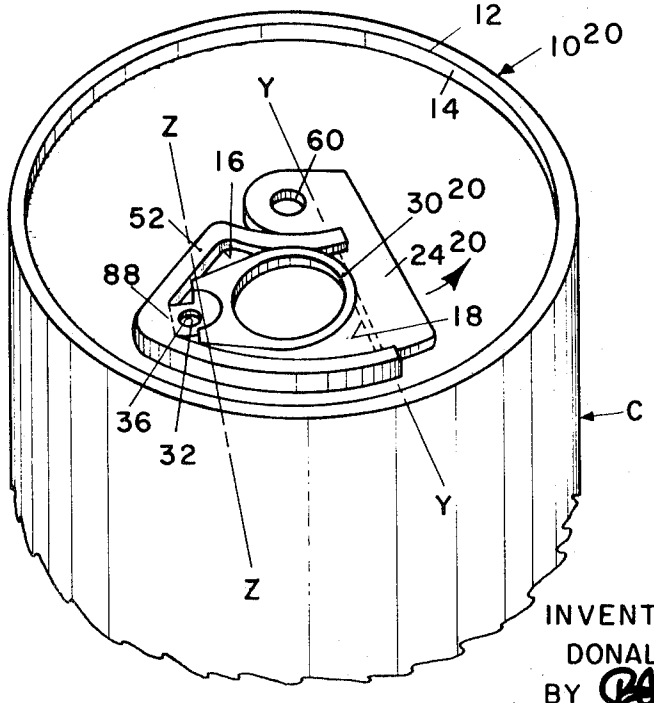


FIG. 20C



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FIG. 20 D

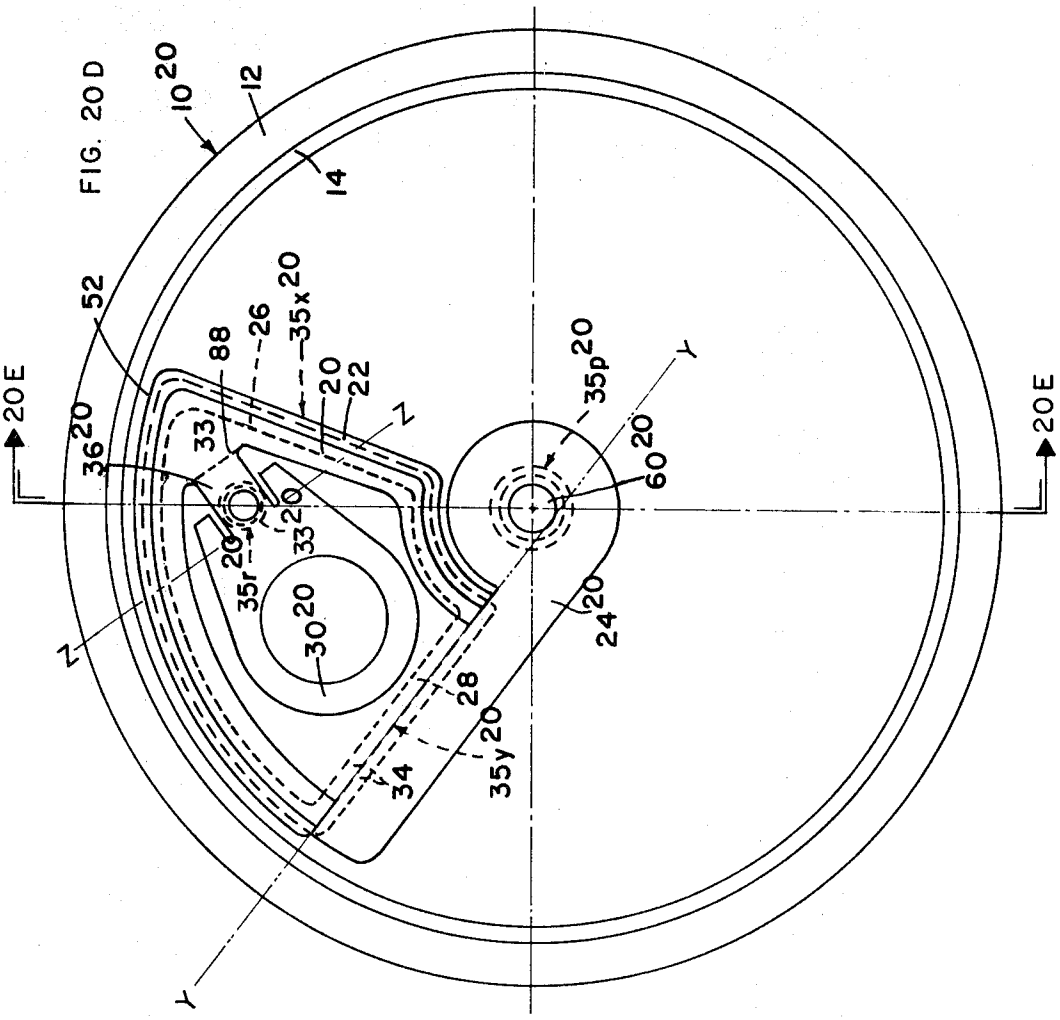
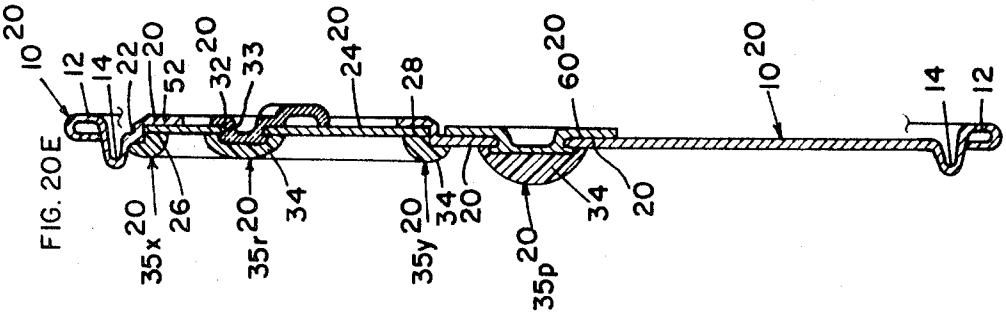


FIG. 20E



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DONALD L. DOUTY

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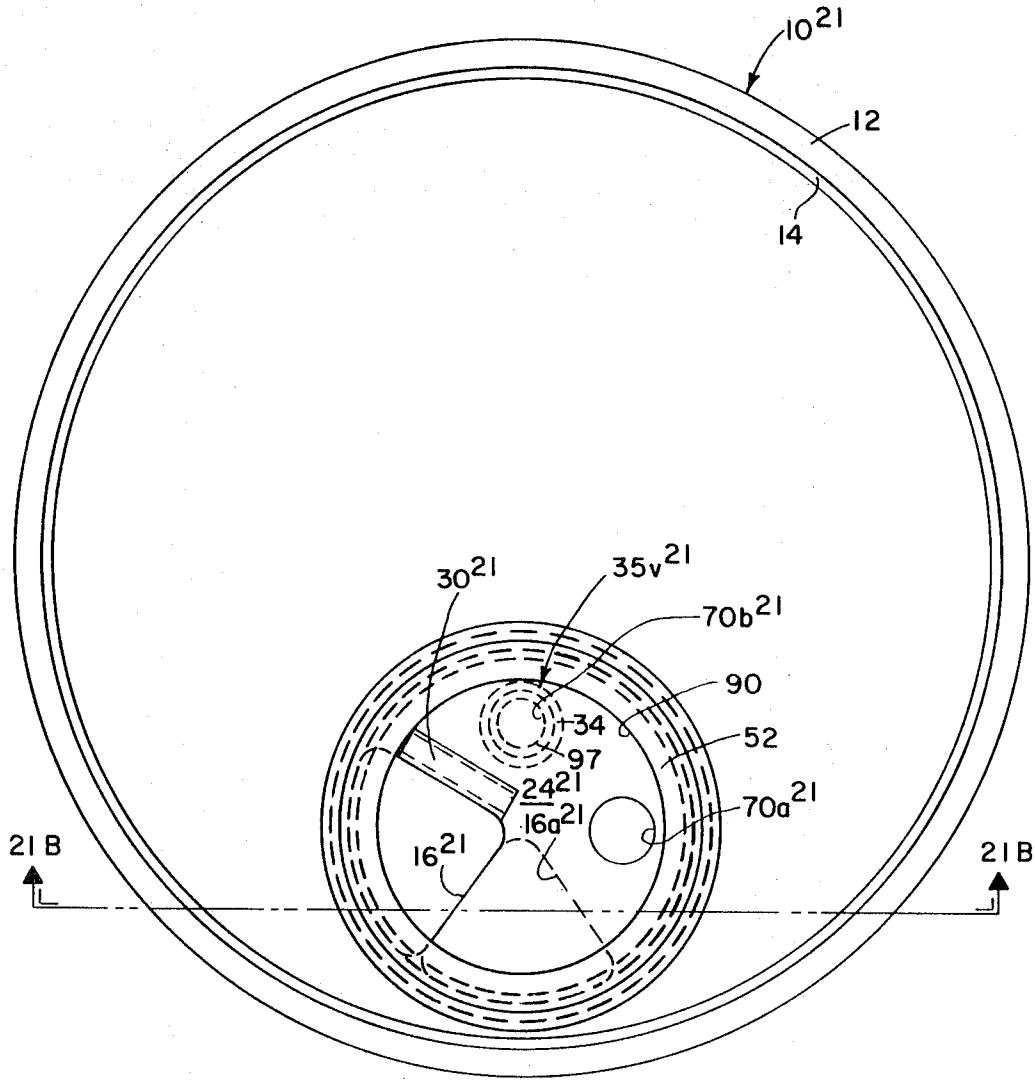


FIG. 21A

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DONALD L. DOUTY
BY

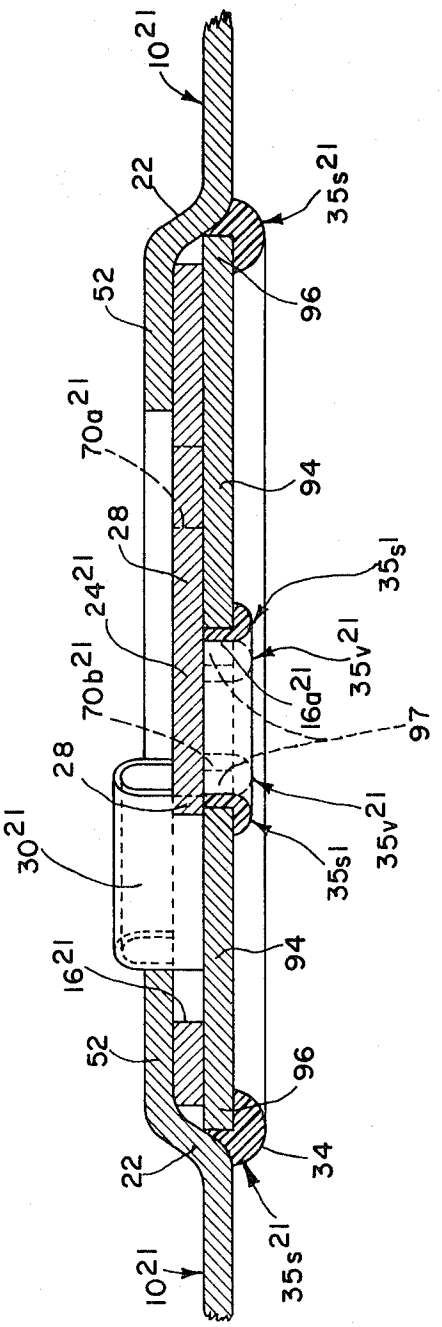


FIG. 21B

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DONALD L. DOUTY
BY

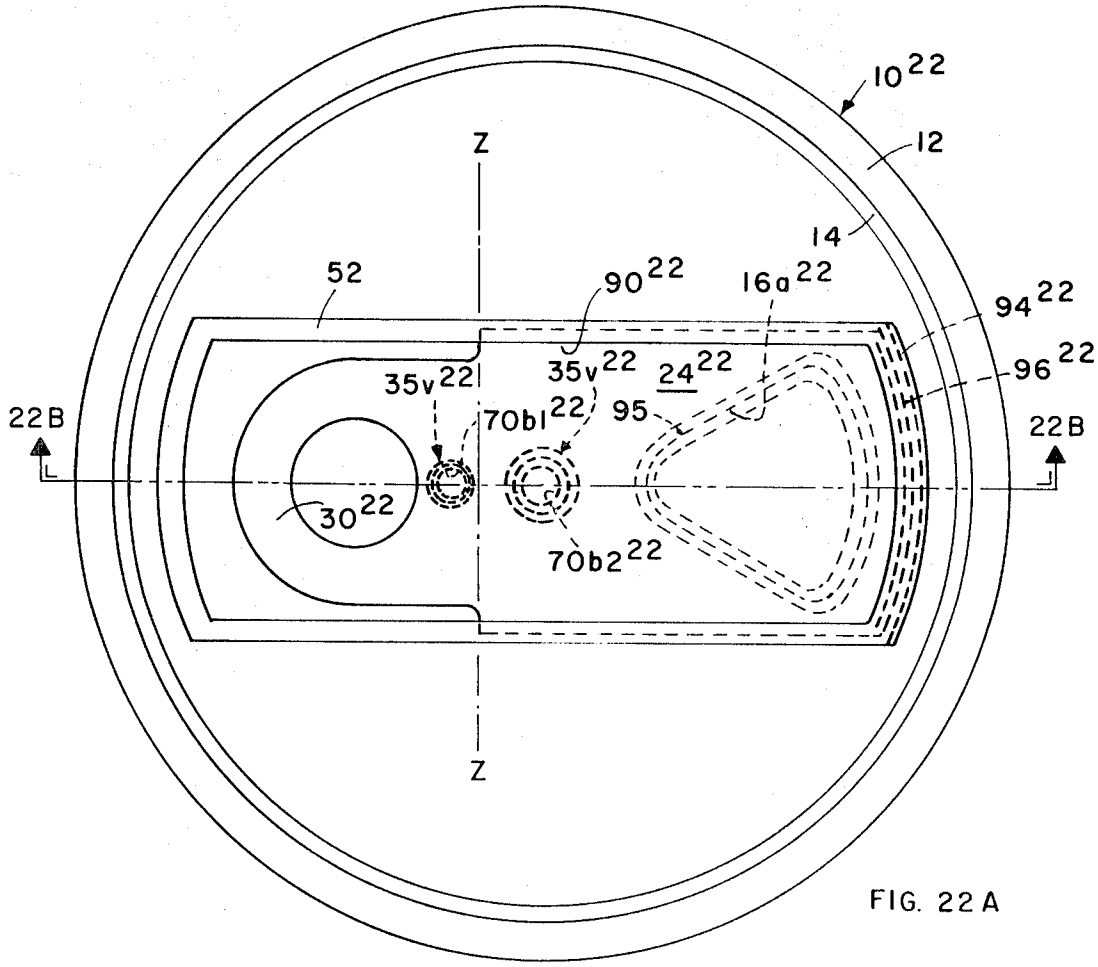


FIG. 22 A

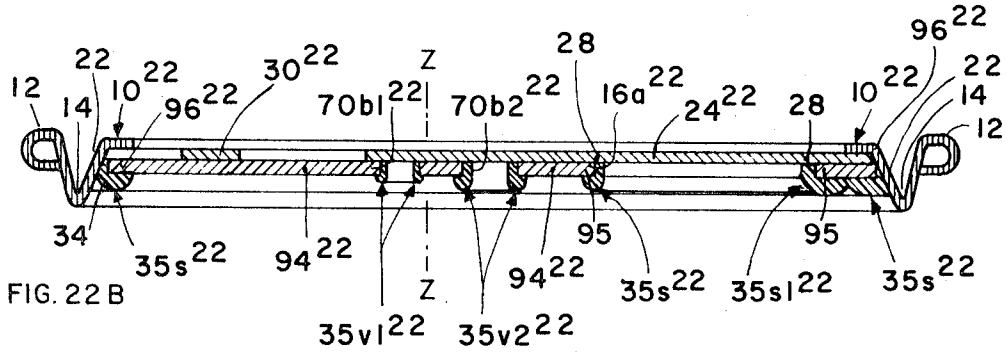


FIG. 22 B

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DONALD L. DOUTY

BY

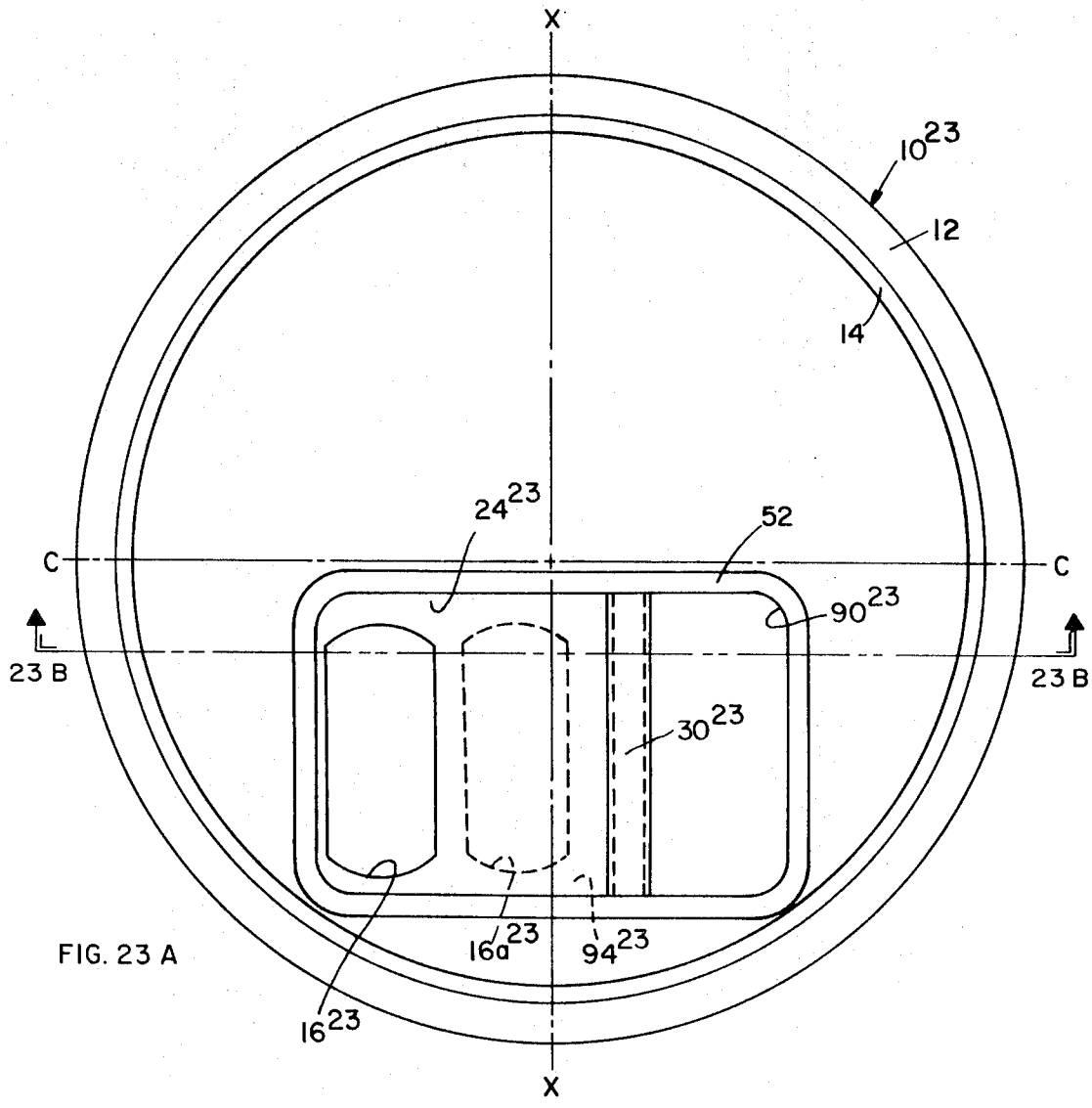


FIG. 23 A

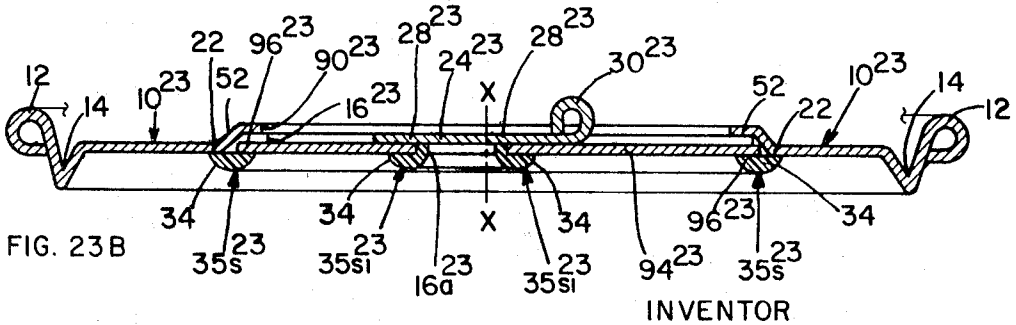


FIG. 23B

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DONALD L. DOUTY
BY

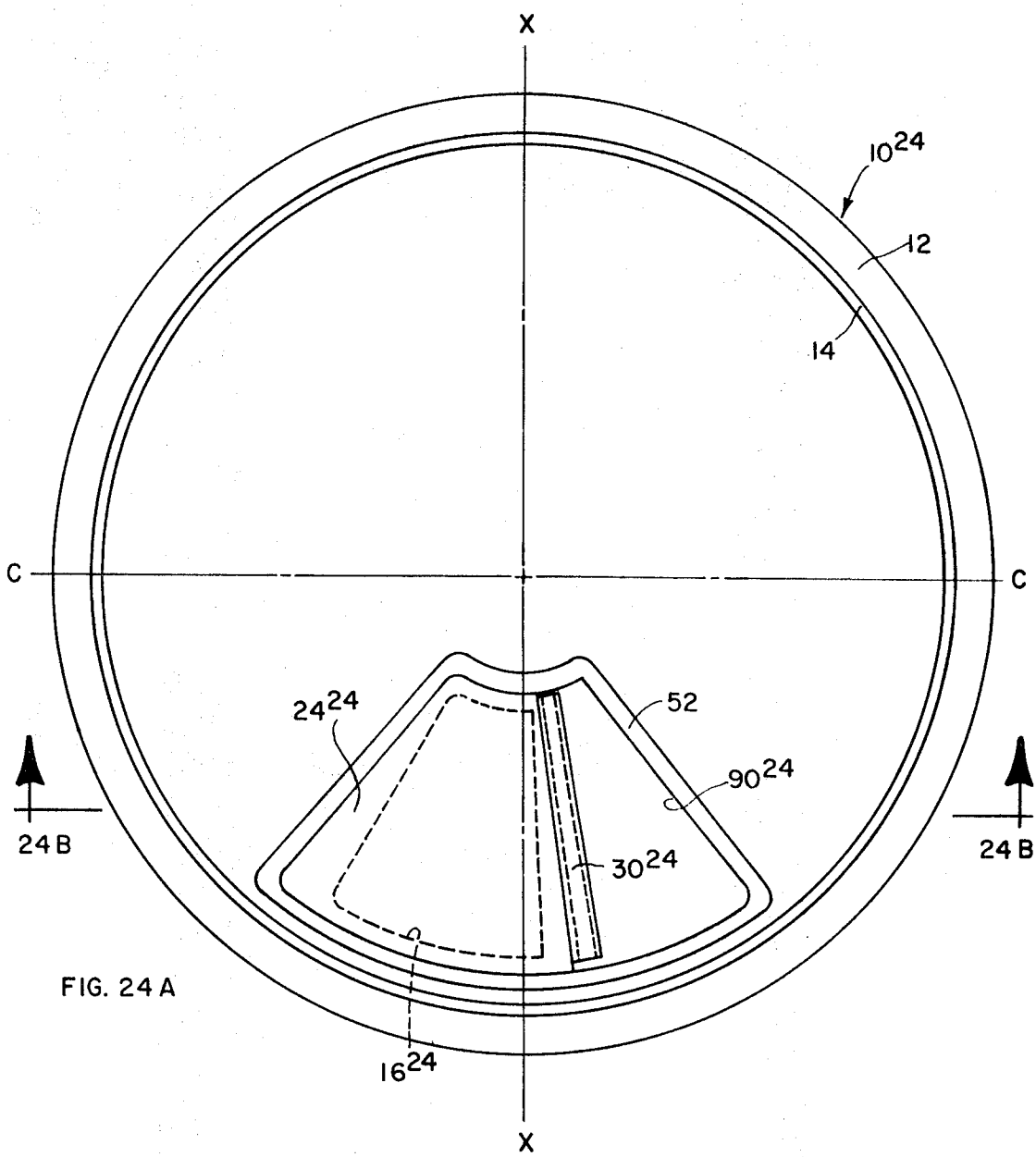


FIG. 24 A

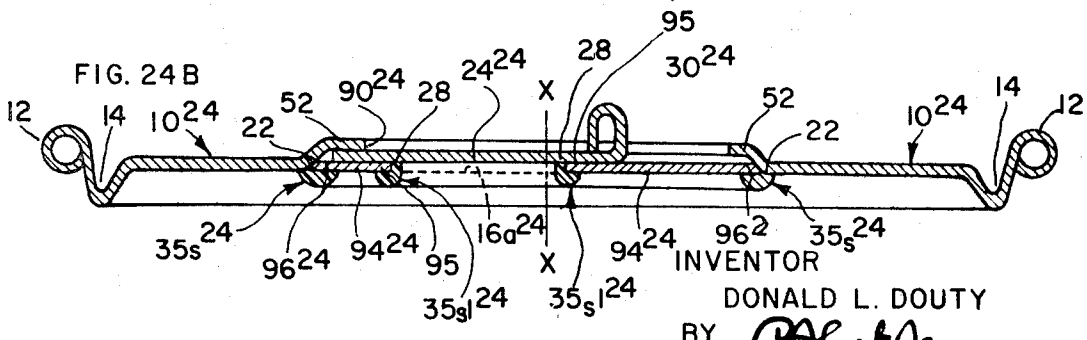


FIG. 24 B

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DONALD L. DOUTY
BY

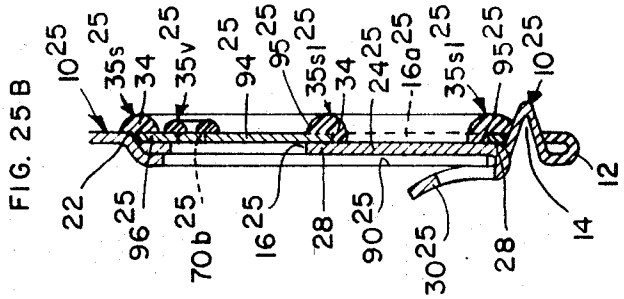


FIG. 25 B

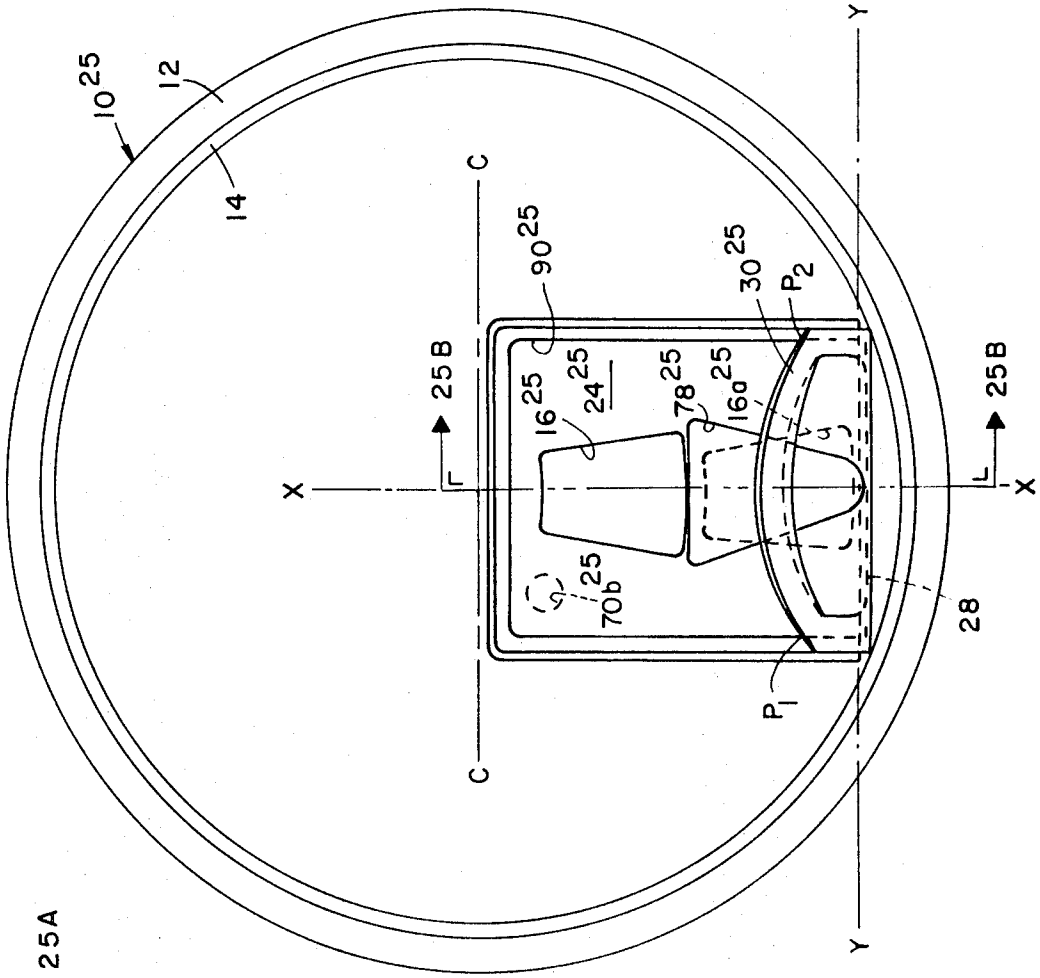


FIG. 25A

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DONALD L. DOUTY
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FIG. 26A

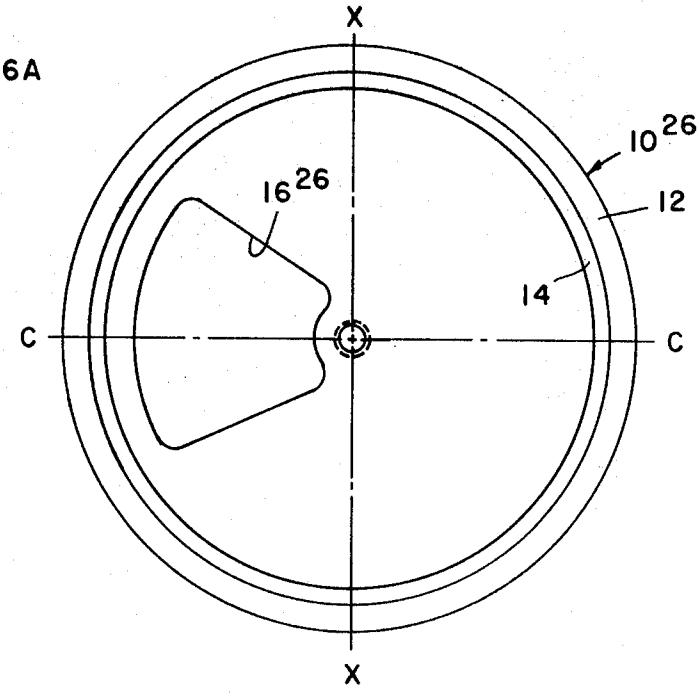
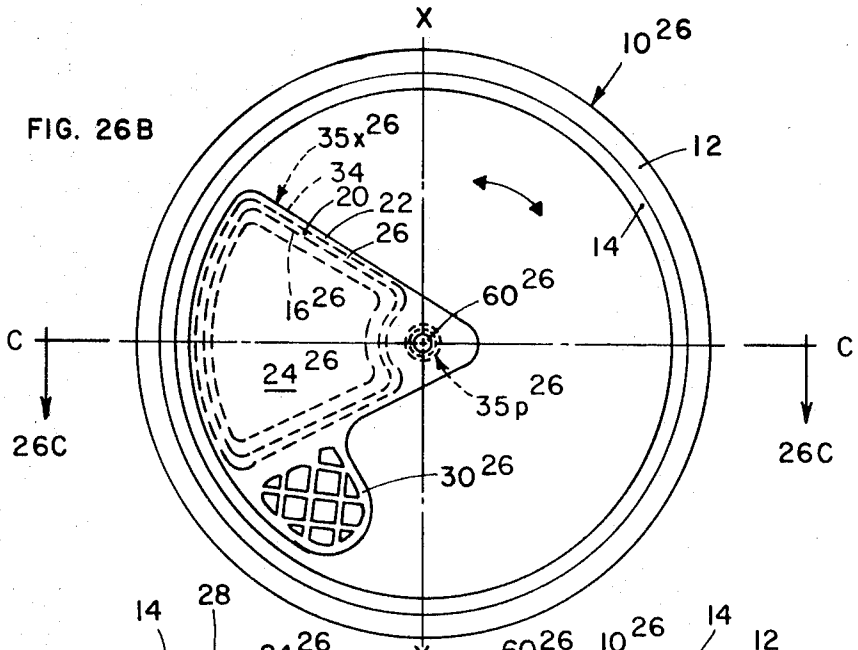


FIG. 26B



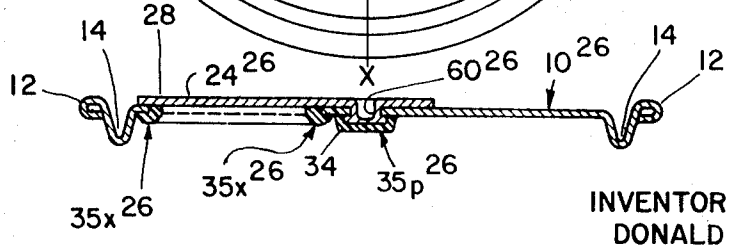


FIG. 26C

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DONALD L. DOUTY
BY

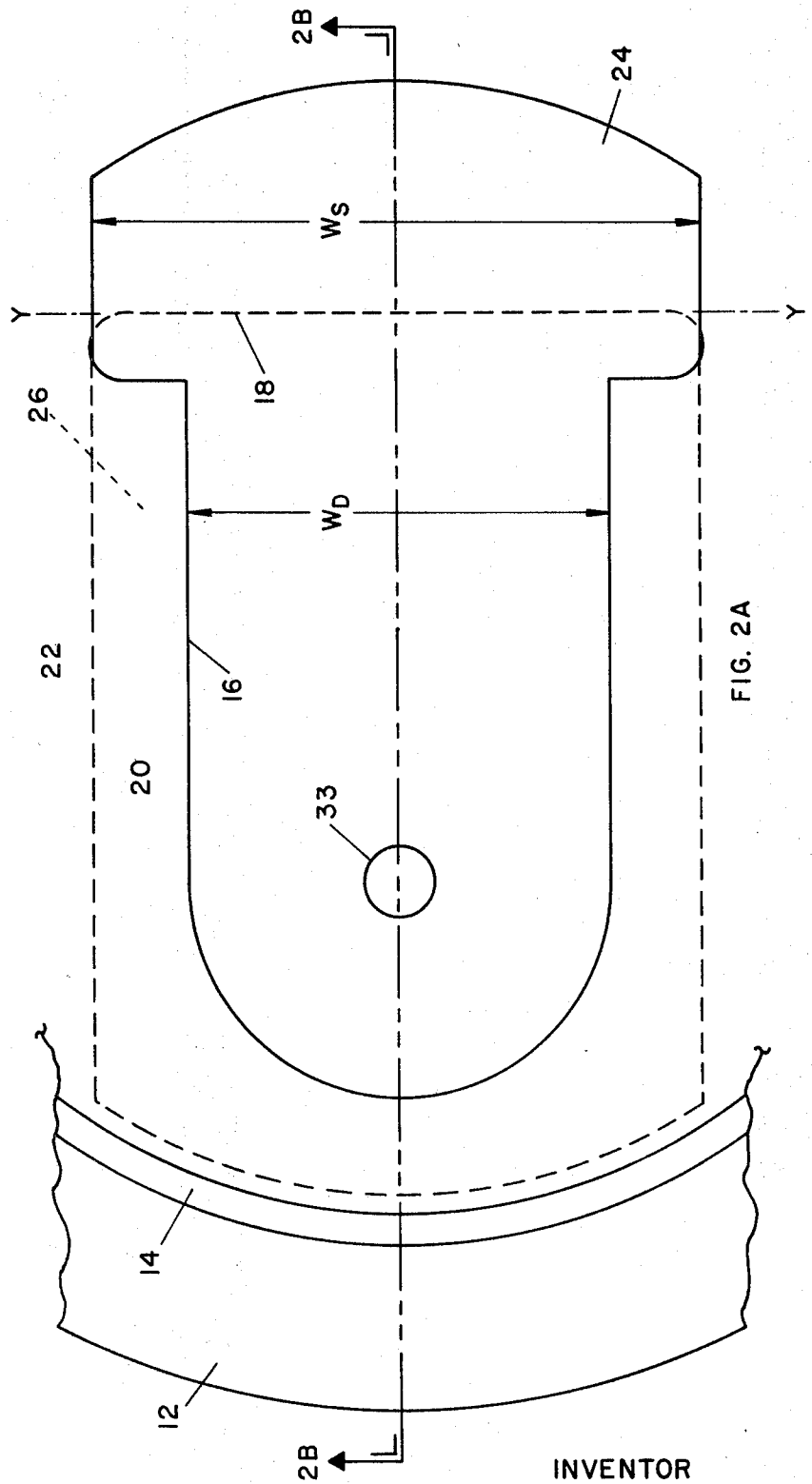


FIG. 2A

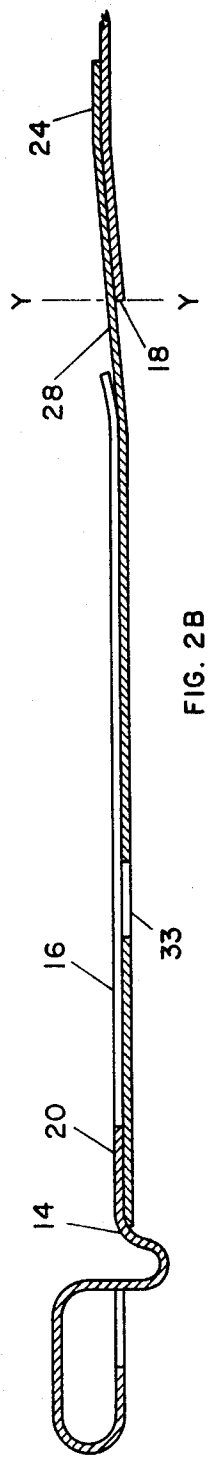


FIG. 2B

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DONALD L. DOUTY
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CAN END WITH BONDED SEAL SLIDE

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 end 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 at 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	Do.
1,687,179	10/9/28	Peterson	Bottle or Jar Cover	Do.
2,682,360	1/15/52	Sheridan	Container having Slidable Closure	Do.
2,606,686	8/12/52	Barranco	Cooking Utensil Cover	Do.
2,757,859	8/7/56	Holland	Chewing Gum Disposer	Do.
3,236,409	2/22/66	Cross et al	Push-in-can-end Closure with Holding Means.	U.S. Steel Corp.
3,808,986	3/14/67	Balocca et al	Plasticol Coatings for easy Open Container Ends.	American Can Co.
3,326,406	6/20/67	Brown	Easy Opening Can End	Dayton Reliable Tool & Mfg. Co.
3,363,798	1/16/68	Garangiotis	Sliding Closure, etc	None.
3,371,818	3/5/68	Bozek	Plastic Tab and Inner Tape, etc	Continental 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.	Continental Can. Co.
3,420,398	1/7/69	Sungwoo Chun.	Beverage Can Top, etc	None.
3,425,590	2/4/69	Duross, Jr.	Elongated Hinged Container and Method of Forming Same	Bishop and Simon.
3,473,692	10/21/69	Moller	Easy Opening Container With Protective Bead.	Continental 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 tap 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.

I. A can end is disclosed which 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 having 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 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 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 band 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 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 and on such pressure barrier material as a guide to uncover the pour opening.

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 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.

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 the 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 tap 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 on 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 the 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 FIGS. IN THE DRAWINGS

For a better understanding of the present invention, reference should be made to the accompanying drawings wherein like numerals of reference 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 along 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 to 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. 12–12 are plan views similar to FIG. 1 of alternative embodiments of the pour opening, namely a generally circular pour opening, a teardrop pour opening and a fishmouth 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 pushbutton-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 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 wraparound slide tap 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 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 hold 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 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_D (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_D. 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 Produces Corp., East Providence, R.I., 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, Ky. 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, N.J. 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 **35***x* between the pressure barrier material **34** and the slide lapping portion **26** and the can end sealing portion **22**; (2) a seal **35***y* between the pressure barrier material **34** and the plane of bulge strength Y—Y and the slide sealing portion **28**; and (3) a seal **35***r* 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 the 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 FIG. **5**, thereby causing the pressure portion **36** to break the bond or seal **35***x* (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 **34***x* (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 **35***y* (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** 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 **35***y* (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 a 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 **35***r* 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 **38***a* having a stationary member **40***a* in engagement with, for example, the pull tab **30** and a movable pinlike member **42** (FIG. **4A**) in engagement with the slide **24**. Further, as shown in FIG. **4A**, the engaging means **38***b* may comprise the stationary platelike member **40***b* in engagement with the can end lapping portion **20** and the slide **24** and a pinlike movable member **42***b* 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 **35***x*, **35***y*, **35***r*.

FIG. **7A** shows a pull tab 30^7 which is integral for the slide 24^7. The plane of weakness Z^7—Z^7 is disposed at the outboard edge **18***a* of the entry aperture **18**. As the pull tab 30^7 is rotated from the generally horizontal position shown in FIG. **7A** to the position shown in FIG. **7B**, such movement of the pull tab 30^7 away from the plane of bulge strength Y—Y breaks the seal **35***b* between the pressure barrier material **34** adjacent such plane of bulge strength Y—Y and the inboard portions of the can end 10^7. Thereafter, as shown in FIG. **7C**, the longitudinal movement of the pull tab 30^7 and the slide 24^7 (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 **35***a* adjacent the can end sealing portion **22** and the slide lapping portion **26** so that the slide 24^7 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 24^7 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 24^7, 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 24^8 and is peened over the pull tab 30^8;

FIG. **8B** shows a rivet 32^{8B} carried by the pull ring 30^8 and peened over the slide 24^8;

FIG. **8C** shows a separate rivet 32^{8C} for connecting the pull tab 30^{8C} to the slide 24^8. Such rivet 32^{8C} is embedded in the pressure barrier material **34** associated with the seal **35***b* between the plane of the bulge strength Y—Y and the slide 24^8;

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 36^9. Such pressure portion 36^9 has the above described pressure portion **36** and a pair of legs **36***a*, **36***b* on either side of the above-described pressure portion **36**. The legs **36***a*, **36***b* project from the body of the pull tab 30^9 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, Pa.;

Referring again particularly to FIGS. 9A, 9B, the pressure portion 36^9 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 10^9 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 material seals 35*a*, 35*r*. The plane of weakness Z_L—Z_L of the locking tab 37 permits breakage of these pressure barrier seals 35*a*, 35*r* by the pressure portion 36^9 at the desired time.

FIGS. 10A and 10B show an alternative embodiment of the pull tab, namely the pull tab 30^{10} having a pivot plane P—P through the centerline of the connection or rivet 32. In addition, the pull tab 30^{10} has a cantilever beam strength, which cantilever beam strength of the tab 30^{10} is greater than the cantilever beam strength in foot lbs. of the slide 24^{10}. To further reinforce the rivet pull tab 30^{10}, such pull tab 30^{10} is provided with a reinforcement rib or shoulder 50 extending substantially the length of the pull tab 30^{10};

FIGS. 11A and 11B show another alternative embodiment of the can end 10^{11} wherein the pour opening 16^{11} is chordal in nature and spaced the difference D^{11} from a centerline C—C of the can end 10. The pour opening 16^{11} 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 16^{11}. 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 10^{11}, provides a well for the pressure barrier material 34 as it is applied to the can end 10^{11} and provides an upward projection around the pour opening 16^{11} for improved pouring from the pour opening 16^{11}.

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

a. a microcrystalline 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 nonstick coats may be used:

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

For motor oil filling (i.e., nonfood-type applications) the primers are eliminated and the base metal may be tin-free steel, tinplate or blackplate.

FIG. 11C shows a downwardly extending embossment 52*a* for use in vacuum sealing.

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 teardrop-type pour opening 16^{12B} and FIG. 12C shows a fishmouth-type pour opening 16^{12C}. It will be understood that the generally circular pour opening 16^{12A} may be elliptical, hyperbolical, parabolical, 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 14^{14} is provided with a generally circular pour opening 16 surrounded by an embossment 52 and is provided with the entry aperture 18. As shown particularly in FIGS. 14A–14C, a slide 24^{14} is pivoted at 60 and is adapted to move the open position shown in FIG. 14A to the closed position shown in FIG. 14B. The closure portion 82 of the slide 24^{14} (FIGS. 14A–14D) has sides provided with radii R_2 and R_3 (FIG. 14A) to adapt such closure portion 82 to pass through the pour opening 16 as shown in FIG. 14B. The pull tab 30^{14} is disposed opposite to the pivot 60 as an earlike portion of the slide 24^{14}. For the purpose of adapting the slide 24^{14} to follow the bulge contours of the can end 10^{14} when such slide 24^{14} is in the closed position shown in FIG. 14B and 14C, such slide 24^{14} is provided with a curve of bulge weakness 64. The means utilized to strengthen the slide 24^{14} 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 30^{14} is moved by the operator from the position shown in FIG. 14A to the position shown in FIG. 14B, the tab 30^{14} moves on a radius R_1 (shown in FIG. 14B) to move the slide 24^{14} and in particular, the closure portion 82 into the embossment 52 on the can end 10^{14}. The closure movement of the closure portion 82 of the slide 24^{14} is limited by engagement of the closure portion 82 with the embossment 52 at A_1 and B_2 (FIG. 14C). As shown solely in FIG. 14C, the closure portion 82 of the slide 24^{14} is provided with a locking tab 37^{14}, which locking tab 37^{14} 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 10^{14} to provide the seal $35p^{14}$; the pressure barrier material 34 is formed about the can end sealing portion 22 and the slide lapping portion 26 to form the seal $35x^{14}$; the pressure barrier material 34 is formed about the rivet 68 to form the seal $35r^{14}$; 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 $35y^{14}$.

Refer now to FIG. 14E, the can end 10^{14E} is provided with a pair of vent apertures 70*a* and 70*b*. 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 70*b* and engage such vent aperture 70*b* into intimate contact preparatory for the sealing of the vent closure portion 72 to the vent aperture 70*b* 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 70*a* 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 70*a*. 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 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 10^{15} is provided with a pour opening 16 having an entry aperture 18 (FIGS. 15A, 15B). The slide 24^{15} is provided with a generally centrally located dish 78 (FIGS. 15A–15C) and has its for-

ward or outer portions as viewed in FIG. 15A connected by pull tab legs 80 to a pull of the expansion type 30^{15}. The slide 24^{15} 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 30^{15} is provided with a pull tab vent closure portion 72^{15} which is adapted to enter a vent aperture 70^{15} in the can end 10^{15}. When both the slide 24^{15} and the pull tab vent closure portion 72^{15} are disposed in the closed position (FIGS. 15A, 15C), pressure barrier material 34 is applied to form the seals $35v$ about the vent aperture 70^{15}; 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 10^{16} (FIGS. 16A–16B) has a linear-type slide 24^{16} of the parallel chordal movement type. The slide 24^{16} has a pour opening closure portion 82 adapted to close and be sealed to the pour opening 16 in the can end 10^{16} and a slide vent closure portion 74^{16} similarly adapted to close and be sealed to the vent aperture 70^{16} as hereinbefore explained. The expansion type pull tab 30^{16} is operable to move the slide 24^{16} in the direction of the arrows shown along the centerline C—C of the can end 10^{16}.

Referring now to FIGS. 17A and 17B, and the linear chordal type of slide 24^{17} shown therein, such slide 24^{17} moves inwardly toward the centerline C—C of the can end 10^{17} away from the entry aperture 18 of the pour opening 16. Simultaneously, with such movement of the slide 24^{17} by the expansion-type tab 30^{17}, the pull tab vent closure portion 72^{17} moves in the same direction out of the vent aperture 70^{17} to break the seal at $35v^{17}$ between the pressure barrier material 34 and the vent aperture 70^{17}. During this above described movement, the slide 24^{17} and in particular the pour opening closure portion 82^{17} of such slide 24^{17} breaks the bonds at $35y^{17}$ (between the plane of bulge strength Y—Y and the slide sealing portion 28) and the seal or bond at $35x^{17}$ 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 30^{17} engaging the embossment 52 (FIG. 17B) or by a stop 46^{17} on the pour opening closure portion 82^{17} engaging the entry portion 18 of the pour opening 16.

In FIGS. 18A, 18B, the pour opening closure portion 82^{18} of the slide 24^{18} and the slide vent portion 74^{18} are disposed on opposite sides of the slide pivot 60^{18}. In order to break the seal $35y^{18}$ between the pressure barrier material and the side sealing portion 28 and the plane of bulge strength Y_1—Y_1, the seal $35x^{18}$between the pressure barrier material 34 and the slide lapping portion 26 and can end sealing portion 22, the seal $35V1^{18}$ between the pressure barrier material 34 and the slide vent closure sealing portion 28V and the plane of bulge strength Y_2—Y_2; and the seal $35V2^{18}$ between the pressure barrier material 34 and the vent closure lapping portion 26B and the can end sealing portion 22V adjacent the vent aperture 70^{18}, the slide 24^{18} 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 24^{19} has an expansion-type, ring-type pull tab 30^{19} disposed between either a pull tab vent closure portion 72^{19} or a slide vent closure portion 74^{19} and a pour opening closure portion 82^{19}, so that when the pull ring 30^{19} is pulled upwardly from the slide 24^{19} 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 30^{19}. When the whole pull tab 30^{19} is then moved upwardly away from the can end 10^{19}, both the vent closure portions 72^{19} or 74^{19} and the pour opening closure portion 82^{19} move inwardly in the direction of the arrows of FIG. 19A to uncover both the vent aperture 70^{19} and the pour opening 16. As shown in FIGS. 19A, 19B, the upward bond-breaking movement of the pull tab 30^{19} is limited by a rivet-type stop 86 attached to the pull tab 30^{19} extending through the can end 10^{19}. Such rivet stop 86 is sealed by the pressure barrier material 34 through the interior side of the can end 10^{19} to form the stop seal $35S_2$. Referring now to FIGS. 20A–20E, the rotary-type slide 24^{20} is pivotably connected at 60^{20} to the can end 10^{20} of the can C. Pressure barrier material 34 (FIG. 20E) forms the seal $35p^{20}$ between the pivot 60^{20} and the can end 10^{20}. In this case, the pull tab 30^{20} 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 30^{20} is provided with a connection 32^{20} for connection to the slide 24^{20} through a connection hole 33 shown in FIGS. 20B, 20D.

In order to break the seals $35x^{20}$ and possible the seal $35r^{20}$ (FIG. 20E), the pull ring 30^{20} is moved upwardly about 90° away from the can end 10^{20} so that the pressure portion 36^{20} moves about the plane of weakness Z—Z of the pull tab 30^{20} to break the score line 88 and break these seals $35x^{20}$ and possibly the seal $35r^{20}$. This upward movement is indicated by the arcuate arrow marked No. 1 in FIG. 20C. Thereafter, in order to break the seal $35y^{20}$ (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 30^{20} and the slide 24^{20} 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 $35y^{20}$ 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 10^{21} has an opening 90 of generally circular shape and a can end sealing portion 22. A rotary slide 24^{21} is disposed against an embossment 52 surrounding the opening 90 and the slide 24^{21} is provided with a first pour opening 16^{21}. A stationary member, suitably a stationary disk 94 or the like, is disposed against the movable slide 24^{21}, and the stationary member 94 is provided with a second pour opening $16a^{21}$ and the stationary member sealing portion 96 (FIG. 21B). The slide 24^{21} has a slide sealing portion 28 (FIG. 21B) adjacent the second pour opening $16a^{21}$ and is movable to a sealing position shown in FIGS. 21A and 21B where the first pour openings 16^{21} does not overlap the second pour opening $16a^{21}$. A pull tab 30^{21} may have a connection (not shown) to the slide 24^{21} or such pull tab 30^{21} may be an integral part of such slide 24^{21}, 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 $16a^{21}$. The pressure barrier material is bonded to the first stationary member 94 adjacent the second pour opening $16a^{21}$ with a first predetermined shear strength and to the slide sealing portion 28^{21} with a second predetermined shear strength less than such first predetermined shear strength. The pull tab 30^{21} 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 $16a^{21}$. The pull tab 30^{21} is then movable to cause the first pour opening 16^{21} to overlap the second pour opening $16a^{21}$ to uncover the second pour opening $16a^{21}$.

The slide 24^{21} is provided with a first vent aperture $70a^{21}$ when the stationary member 94 is adapted to cover such first vent aperture $70a^{21}$, when the slide 24^{21} is in the sealing position shown in FIG. 21A. The stationary member 94 is provided with a second vent aperture $70b^{21}$. The pressure barrier material 34 is adapted to seal the second vent aperture $70b^{21}$ to the slide 24^{21} at seal $35v^{21}$ with the above mentioned second predetermined shear strength. The slide 24^{21} is operable during movement of the slide 24^{21} away from the sealing position shown in FIGS. 21A and 21B to break the bond $35v^{21}$ between said stationary member 94 adjacent said second vent aperture $70b^{21}$. Thereafter, the slide 24^{21} is operable to move the first vent opening $70a^{21}$ into lapping engagement with the second vent opening $70b^{21}$ to uncover the second vent opening $70b^{21}$.

As shown in FIG. 21B, the seal $35s^{21}$ is formed by the pressure barrier material 34 and the stationary member sealing portion 96 and the can end sealing portion 22. The seal $35v^{21}$ is between the pressure barrier material 34, the slide 24^{21} and the portion 97 of the stationary member 94 adjacent the second vent opening $70b^{21}$. The seal 35s1 is between the pressure barrier material 34 and the slide 24^{21} and the portion 95 of the stationary member 94 adjacent the second pour opening $16a^{21}$.

In FIGS. 22A, 22B, the can end 10^{22} is provided with an opening 90^{22} and a can end sealing portion 22^{22}. A slide 24^{22} is disposed against an embossment 52 surrounding the hole 90. A stationary member 94^{22} is disposed against the movable slide 24^{22} and is provided with a pour opening $16a^{22}$ and a stationary member sealing portion 96^{22}. The slide 24^{22} has a slide sealing portion 28 adjacent the pour opening $16a^{22}$ and is movable to a sealing position shown in FIGS. 22A, 22B where the pour opening $16a^{22}$ in the stationary member 94^{22} is covered by the slide 24^{22}. A pull tab 30^{22} is integral with the slide 24^{22}. 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 96^{22} to form the seal $35s^{22}$. Additionally, the pressure barrier material 34 seals the slide sealing portion 28 to a portion 95 of the stationary member 94^{22} adjacent the pour opening $16a^{22}$ to form the seal $35s^{22}$. As described in the embodiment, this pressure barrier material 34 is bonded to the portion 95 of the stationary member 94^{22} adjacent the pour opening $16a^{22}$ 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 30^{22} is movable from the generally horizontal position shown in FIGs 22A and 22B upwardly abut 90° to break the bond $35s^{22}$ between the slide sealing portion 28 and the pressure barrier material 34 adjacent the pour opening $16a^{22}$. The pull tab 30^{22} is movable down the embossment 52 to uncover the pour opening $16a^{2}$. It will be noted from a consideration of FIGS. 22A and 22B that the pull tab 30^{22} is provided with a zone of weakness Z—Z. As the vent hole or aperture $70b^{22}$ is disposed on the outboard side of the plane of weakness Z—Z, the first upward movement of the pull tab 30^{22} breaks the bond $35v1^{22}$ between the pressure barrier material 34, the slide 24^{22} and the stationary member 94^{22} adjacent the first vent hole $70b1^{22}$. If the vent aperture $70b2^{22}$ is disposed on the inboard side of the plane of weakness Z—Z, the bond or seal $35v2^{22}$ is broken by the simultaneous movement of the slide 24^{22} to break the seal $35s^{22}$ between the stationary member sealing portion 96^{22} and the can end sealing portion 22.

FIGS. 23A, 23B show a can end 10^{23} having a rectangular-shaped opening 90^{23} surrounded by an embossment 52. The slide 24^{23} is provided with a first pour opening 16^{23} which does not contact a second pour opening $16a^{23}$ in the stationary member 94^{23}. Pressure barrier material 34 is disposed about the stationary member sealing portion 96^{23} and the can end sealing portion 22^{23} to form the seal $35s^{23}$. The pressure barrier material 34 is simultaneously disposed about the slide sealing portion 28^{23} and the portion of the stationary member 94^{23} adjacent the second pour opening $16a^{23}$ to form the seal $35sl^{23}$.

In FIGS. 24A, 24B, the can end 10^{24} has a sector-type opening 90^{24} surrounded by the usual peripheral embossment 52. The stationary plane 94^{24} is provided with a pour opening $16a^{24}$ and the slide 24^{24} carries a pull tab 30^{24}. The pressure barrier material 34 forms the seal $35s^{24}$ about the stationary member sealing portion 96^{24} and the can end sealing portion 22. In addition, the pressure barrier material 34 is also sealed at $35s1^{24}$ about the slide sealing portion 28 and the portion 95 of the stationary member 94^{24} adjacent the pour opening $16a^{24}$.

The can end 10^{25} has a linear-type slide 24^{25}. The slide 24^{25} (FIGS. 25A, 25B), is provided with another pour opening 16^{25}. The linear type slide 24^{25} is operable after the bond breaking operation to cause the pour opening 16^{25} in the side 24^{25} to open the pour opening $16a^{25}$ in the stationary member 94^{25} (FIG. 25B). The pull tab 30^{25} engages the can end 10^{25} at the pressure points P_1, P_2 to press the can end 10^{25} and the slide sealing portion 28^{25} against the stationary member sealing portion 96^{25}. It will be noted from a consideration of FIGS. 25A and 25B that the slide 24^{25} is provided with a dish portion 78^{25}, shown only in FIG. 25A for purposes of clarity. This dish portion 78^{25} functions as a pour lip when the slide 24^{25} is in the pour opening uncovering position (not shown in FIGS. 25A and 25B).

In FIGS. 25A, 25B the stationary member 94^{25} (FIG. 25B) is provided with a vent aperture $70b^{25}$ and the slide 24^{25} is adapted to cover the vent aperture $70b^{25}$ when the slide 24^{25} is in the sealing position shown in FIGS. 25A, 25B. The pressure barrier material 34 is adapted to seal the stationary member 94^{25} adjacent the vent aperture $70b^{25}$ to the slide 24^{25} to form the seal $35v^{25}$ with the above mentioned second predetermined shear strength. The slide 24^{25} is then operable upon the movement of the slide 24^{25} away from the sealing position shown in FIGS. 25A, 25B to break the bond $35b^{25}$ between the portion 95^{25} of the stationary member 94^{25} adjacent the vent aperture $16a^{25}$ and the slide 24^{25}.

In FIGS. 26A–26C, a can end 10^{26} is provided with a pour opening 16^{26}. The can end 10^{26} has a can end lapping portion 20 adjacent the pour opening 16^{26}. A slide 24^{26} has a pivot 60^{26} on the can end 10^{26}. In addition, the slide 24^{26} 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 24^{26} is in the pour opening closure position shown in FIG. 26B, a pull tab 30^{26} (shown only in FIG. 26B) is integral with the slide 24^{26}. 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 $35x^{26}$.

The slide 24^{26} is rotatable by the pull tab 30^{26} in either a clockwise or counterclockwise direction, as shown by the arcuate arrows in FIG. 26B, about the pivot 60^{26} to break the seal $35x^{26}$ between the slide lapping portion 26 and the pressure barrier material 34 adjacent the can end lapping portion 20 to uncover the pour opening 16^{26}.

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 10^{26} (FIGS. 26A–26C);

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

2. which have pull tabs 30 (FIGS. 1–6) through 30^{26} (FIGS. 26A–26C) which are an integral portion of the can end 10 (FIGS. 1–6) through 10^{26} (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 10^{26} (FIGS. 26A–26C);

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

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

6. wherein the connection used to connect the pull tab 30 (FIGS. 1–6) through 30^{26} (FIGS. 26A–26C) also serves as a stop to prevent removal of such pull tab and slide 24 (FIGS. 1–6) through 24^{26} (FIGS. 26A–26C) from the can end 10 (FIGS) 1–6) through 10^{26} (FIGS. 26A–26C);

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

8. which have a pull tab **30** (FIGS. 1–6) through **30**[26] (FIGS. 26A–26C) which move in a rotary direction on such can lid **10** (FIGS. 1–6) through **10**[26] (FIGS. 26A–26C);

9. which have a rotary pull tab **30**[26] (FIGS. 26A–26C) which can be opened in either counterclockwise or clockwise direction; and

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

While in accordance with the patent statues, 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 and a slide sealing portion,

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,

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 and a pressure portion on the other side of said connection,

g. said pull tab being movable away from said can end about said plane of weakness to cause said pressure portion to break the bond between said slide lapping portion and said pressure barrier material adjacent said can end sealing portion so that said pressure barrier material adjacent said can end sealing portion now functions as an exit and reclosure slide guide, and

h. said pull tab then being movable to break the bond between said pressure barrier material adjacent said plane of bulge strength and said slide sealing portion and to cause said slide to move through said entry aperture on said pressure barrier material adjacent said plane of bulge strength as a guide to uncover said pour opening.

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

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

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

5. 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.

6. The combination recited in claim 1 wherein said engaging means is said pull tab engaging said can end lapping portion.

7. 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.

8. The combination recited in claim 1 wherein said connection is within said pour opening.

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

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

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

12. The combination recited in claim 1 wherein said connection engages said entry aperture and functions as a stop to prevent said slide from leaving said entry aperture.

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

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

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

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

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

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

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

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

21. The combination recited in claim 20 wherein said embossment is upward.

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

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

24. The combination recited in claim 23 wherein said locking tab has a locking tab plane of weakness.

25. 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 exposed.

26. 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.

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

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

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

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

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

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

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

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

35. 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.

36. The combination recited in claim 35 wherein said vent aperture is provided with a vent entry aperture.

37. The combination recited in claim 36 wherein said vent entry aperture is a slot.

38. The combination recited in claim 36 wherein said vent entry aperture is a slit.

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

40. The combination recited in claim 36 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.

41. The combination recited in claim 35 wherein said one vent closure portion has a bulge strength measured in pounds per square inch equal to or greater than the bulge strength of said can end.

42. The combination recited in claim 35 wherein said vent aperture is radial.

43. The combination recited in claim 35 wherein said vent aperture is chordal.

44. The combination recited in claim 35 wherein said can end has an embossment around said vent aperture embossment.

45. The combination recited in claim 44 wherein said vent aperture embossment is upward.

46. The combination recited in claim 44 wherein said vent aperture embossment is downward for vacuum seals.

47. The combination recited in claim 35 wherein said one vent closure portion has locking tab for engaging said can end.

48. The combination recited in claim 35 wherein said vent aperture has substantially straight sides.

49. The combination recited in claim 35 wherein said vent aperture has arcuate sides.

50. The combination recited in claim 35 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.

51. The combination recited in claim 35 having magnetic-type vent closure engaging means.

52. The combination recited in claim 35 wherein said one vent closure portion is integral with either said slide or said pull tab.

53. The combination recited in claim 35 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.

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

55. 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.

56. The combination recited in claim 35 wherein said pull tab is of the expansion type.

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