July 8, 1969 O. L. BROWN ET AL 3,454,185

EASY OPENING CAN END

Filed Aug. 31, 1967 Sheet 1 of 2

Fig. 1

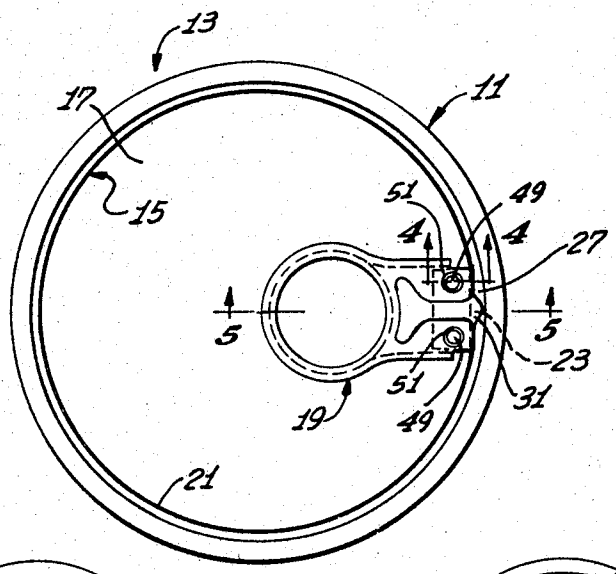


Fig. 2

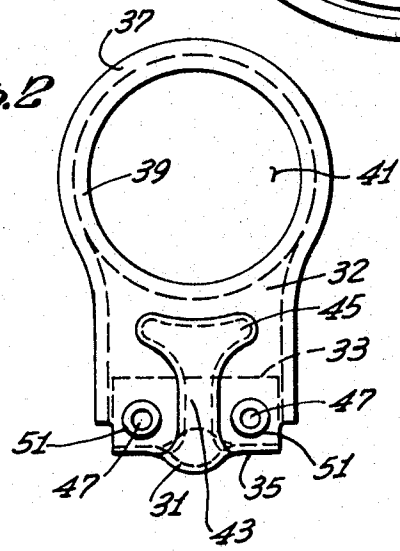


Fig. 3

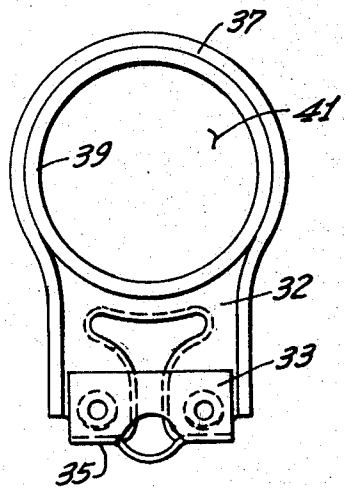
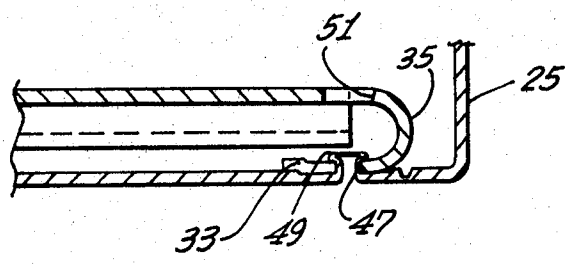


Fig. 4



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Fig. 5

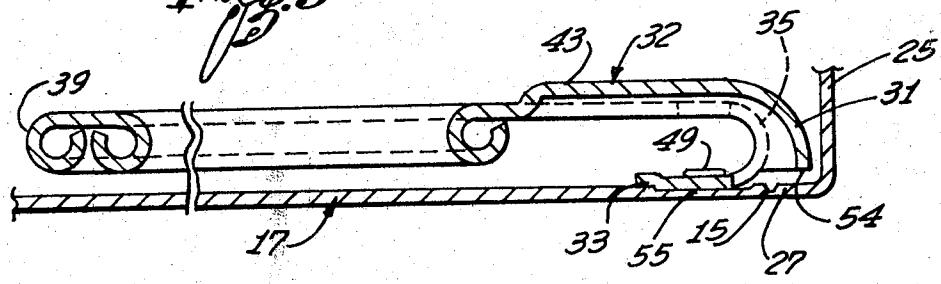


Fig. 6

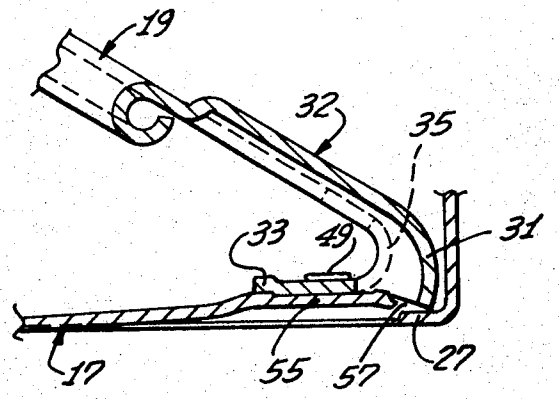


Fig. 8

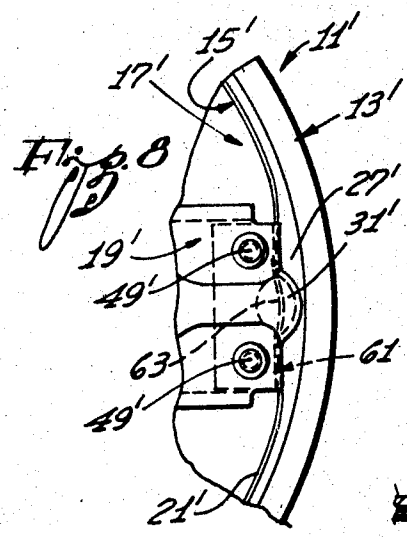
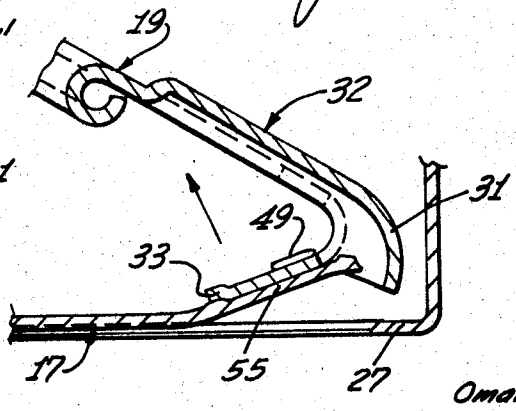


Fig. 7



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EASY OPENING CAN END

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U.S. Cl. 220—54 7 Claims

ABSTRACT OF THE DISCLOSURE

This disclosure describes an easy opening container including a container wall of sheet material having a line of weakness therein defining a removable wall segment at least partially removable from the container wall. A tab is attached to the removable wall segment and at least a section of the nose end of the tab extends across the line of weakness and overlies a relatively rigid wall segment of the container wall adjacent the line of weakness. The tab is operable as a lever to cause the nose end thereof to forcibly bear on the rigid wall segment to apply an outward lifting force to the removable wall segment to initiate rupture of the line of weakness. The removable wall segment is then removable from the container wall by the application of a pulling force to the tab.

BACKGROUND OF THE INVENTION

As is well known, an easy opening container includes a container wall with a line of weakness such as a score line therein defining a removable wall segment or tear portion. A tab is connected to the tear portion to remove the tear portion from the container wall. If the tab is of the front-opening type, the nose end thereof bears on the tear portion and upon manipulation of the tab, initiates severance of the tear portion from the container wall.

Front-opening tabs are commonly used in easy opening containers of the full panel pull-out type. In full panel pullouts, the score line defines a removable panel which covers a major portion of the container wall and the tab is secured to and overlies the panel. The panel can be removed in a two step operation. First, the tab is pivoted to cause the nose end thereof to forcibly bear on the panel adjacent the score line to initiate rupture of the score line, by bending a paddle portion of the panel inwardly. Secondly, an outwardly directed pulling force is applied to the tab to remove the panel from the container wall.

Full panel pull-outs are often used to package vacuum packed products such as various types of nuts. When the tab is lifted during the first phase of tab operation, the score line is ruptured and a relatively large portion of the panel, commonly referred to as a paddle, is bent inwardly into the container to form a relatively large opening therein. Air now rushes into the container through such opening. As continuing the rupturing of the score requires only a little force, the differential air pressure acting on the removable panel coupled with the inward air movement are oftentimes sufficient to pull at least a portion of the panel and the tab into the container. This effect, which is known as implosion occurs rapidly and often results in frightening the user and disruption or destruction of the product within the container. Furthermore, the pulling of the removable panel into the container may make the second phase of panel removal more difficult.

SUMMARY OF THE INVENTION

The present invention eliminates the problem of implosion in easy opening containers by locking the can end against movement into the container. This invention teaches that the locking feature can be provided by securing the tab to the removable panel and allowing a portion of the tab to overhang the score line and bear on the can end.

Specifically, a container wall is provided with a line of weakness or score line, which defines a removable wall segment or panel, and a tab is attached to the removable panel with the nose end thereof overhanging the line of weakness and a relatively rigid wall segment of the can end immediately adjacent the line of weakness. To remove the removable wall segment, the end of the tab remote from the nose end is lifted in conventional fashion to force the nose end of the tab downwardly to bear firmly against the rigid wall segment. The rigid wall segment has substantial resistance to bending so that it supports the nose end of the tab as the tab is being manipulated and is not bent inwardly into the container. As the rigid wall segment forms a support for the nose end of the tab, continued pivotal movement of the tab causes a lifting force to be applied to the removable panel through the attachment means which interconnects the tab and the removable panel. This lifting force is nearly a pure shearing force and as such facilitates rupture of the line of weakness. Ultimately, this lifting force initiates rupture of the line of weakness to form what may be described as a pressure equalizing opening in the container wall. At this instant, air may flow through this opening into the interior of the container. The rush of air into the container and the pressure differential act on the removable panel and tend to force the latter into the container. However, the rigid wall segment continues to support the nose end of the tab to prevent implosion. Thus, the rigid wall segment serves as a latch or lock to prevent drawing of the removable panel into the container and secondly as a relatively rigid support for the nose end of the tab to thereby allow the tab to initiate severance of the line of weakness through a lifting action on the removable wall segment.

The tab should provide a pivotal lever portion and also be quite strong in order to cause rupture of the line of weakness through a lifting action on the removable wall segment. Preferably, the tab is constructed of sheet metal and includes an attachment portion and a lever portion joined by a hinge to allow the lever portion to pivot relative to the attachment portion. The lever portion has a lifting or handle end and a nose end. The attachment portion is preferably connected to the removable wall with an integral rivet.

In a preferred embodiment, two rivets are utilized to connect the attachment portion to the removable panel to prevent pivotal movement of the tab relative to such wall segment. Preferably, the attachment portion and lever portion are joined by a fold portion which allows the lever portion to overly the attachment portion. A tab having these features has been found to be strong and well suited for removal of even the large panels.

Although the present invention is applicable to the use of front-opening tabs generally, it is particularly adapted to be embodied in a full panel pullout. In a full panel pullout, the score line defining the removable panel lies closely adjacent the peripheral attaching flange of the container. The region of the container wall between the score line and the peripheral attachment flange is too narrow to adequately support the nose end of the tab. The present invention teaches altering the shape of a portion of the score line to widen the region radially to form a ledge of sufficient size to support the nose end of the tab. Although the ledge must be large enough to support the nose of the tab, it should be kept to a minimum size so that as much of the container wall as possible can be removed. To this end the score line may have a major portion in the form of a substantially complete circle and a minor portion extending between the ends of the major portion and forming, in effect, a chord of the major portion. The minor portion and the adjacent section of the attaching

flange define the ledge. To further minimize ledge size, the nose end of the tab which bears on the ledge is preferably narrower than the body of the tab.

It is well known that the second phase of removal of a removable panel, during which an outward pulling force is applied to the tab, is substantially facilitated if the panel is curled outwardly. This is so because when the panel is curled an almost pure shearing force is applied to the score line to make continued severence thereof very easy. Another advantage of the present invention is that the outward lifting force supplied to the removable panel tends to curl the panel outwardly in a manner to substantially facilitate the second phase of panel removal.

The invention, both as to its organization and method of operation together with further features and advantages thereof may best be understood by reference to the following description taken in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of an easy opening container wall embodying the teachings of the present invention.

FIG. 2 is a top plan view of a preferred form of tab for opening the easy opening container wall.

FIG. 3 is a bottom plan view of the tab.

FIG. 4 is an enlarged fragmentary sectional view taken along line 4—4 of FIG. 1 and showing how the tab is attached to the container wall.

FIG. 5 is an enlarged fragmentary sectional view taken along line 5—5 of FIG. 1 and showing the nose end or rupturing portion of the tab overhanging the score line.

FIG. 6 is an enlarged fragmentary sectional view similar to FIG. 5 showing the formation of the small pressure equalizing opening as a result of pivoting of the tab.

FIG. 7 is a view similar to FIG. 6 at the beginning of the second phase of panel removal.

FIG. 8 is an enlarged fragmentary plan view showing a second embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings and in particular to FIG. 1 thereof, reference numeral **11** designates an easy open container wall constructed in accordance with the teachings of this invention. Although other configurations are possible, the container wall **11** is circular in plan and has an attachment flange **13** for attaching the container wall to a can body (not shown) in a conventional manner. The container wall **11** has a line of weakness or score line **15** which lies closely adjacent the flange **13** and defines a removable panel **17** which covers substantially all of the area in plan of the container wall. A tab **19** is suitably secured to the panel **17** and is movable to remove the panel **17** from the container wall **11**.

More particularly, the score line **15** has a major or circular portion **21** which substantially completely surrounds the panel **19** and a relatively short minor portion or chord portion **23** which interconnects the ends of the circular portion. In the embodiment shown in FIG. 1, the chord portion is a substantially straight line. The peripheral attaching flange **13** has a wall **25** (FIG. 4) which is generally perpendicular to the panel **17** and lies closely adjacent the major portion **23** of score line **15**. The region of the container wall **11** between chord portion **23** of the score line **15** and the wall **25** defines a relatively rigid wall segment or ledge **27**. The ledge is narrow radially and has a minimum circumferential dimension.

Tabs of various designs may be used with the present invention. In the embodiment illustrated, the tab **19** is constructed of sheet material such as sheet aluminum and has a handle portion **29** at one end thereof and a nose end **31** at the other end thereof extending across the chord portion **23**. More particularly, the tab **19** has an upper layer or lever portion **32** (FIGS. 2–5) of sheet material and a lower layer or attachment portion **33** of sheet material interconnected by a fold portion **35**. The fold portion or a section thereof is sufficiently pliable to define a transverse hinge or hinge line to allow the lever portion **32** to pivot relative to the attachment portion. A peripheral region of the lever portion **32** is curled inwardly to form a peripheral reinforcing bead **37** and an adjacent circular region is curled outwardly to form an inner bead **39** which surrounds a finger opening **41** in the tab. The lever portion **32** is longitudinally rigid and is strengthened by a longitudinal rib **43** and a transverse rib **45**.

The attachment portion **33** has a pair of apertures **47** (FIG. 4) therein which are located closely adjacent the fold portions **35** and through which hollow rivets **49** (FIGS. 4 and 5) pass to secure the tab **19** to the container wall **11**. Use of the two rivets **49** prevents turning of the tab relative to the wall **11**. The lever portion **32** has a pair of apertures **51** which are in registry with the apertures **47** therebelow to allow the insertion of a tool for staking the rivets **49**. To facilitate removal of the panel **17** it is preferred that the rivets **49** be located as closely as possible to the score line **15**. Accordingly, the apertures **47** are preferably positioned as closely to the fold portion **45** as the geometry of the tab will permit, and the rivets **49** are preferably of very small diameter, e.g. $\frac{1}{16}$" outside diameter. It has been found that by positioning the rivets **49** as closely as possible to the score line that the tendency of the panel **17** to curl upwardly in response to pulling of the tab is significantly increased. Such curling of the panel **17** causes the panel **17** to be easily sheared from the container wall **11**.

The sheet metal of the tab **19** is lanced and formed to extend the longitudinal rib **43** forwardly to form the nose end **31** of the tab. As shown in FIGS. 2–3 the nose end **31** is much narrower than the remainder of the tab **19** and progressively narrows as it extends forwardly. As shown in FIG. 5, the nose end **31** curves downwardly and may be spaced slightly above the ledge **27** to allow some swinging movement of the tab **19** before it encounters the ledge **27**. The nose end **31** has a lower face **54** which is engageable with the ledge **27**. The rupturing portion **31** extends across the score line **15** and overlies the ledge **27**.

Upon lifting of the handle portion **29** of the lever portion **32**, the lever portion pivots about the transverse hinge which may lie adjacent the juncture of the fold portion **35** and the layer **33**, while the lever **32** of the tab remains longitudinally rigid. As the handle portion **29** is swung upwardly, the nose end **31** pivots downwardly to cause the surface **54** to engage the ledge **27** and forcibly bear thereon. The ledge **27** is relatively rigid and not subject to inward bending in ordinary use of the easy-opening container wall **11**. Accordingly, the ledge **27** rigidly supports the nose end **31** of the tab **19**.

As the handle portion **29** of the tab is lifted an additional amount, the nose end **31** bears with ever increasing force on the ledge **27** which continues to remain relatively rigid. As the nose end **31** of the tab is supported by the ledge **21** and the handle portion **29** is lifted further, the tab applies an outward lifting force on a section **55** of the panel **17** to which the attachment portion **33** of the tab is connected. That is, the tab applies a lifting force to the section **55** through the attachment portion **33** and the rivets **49**. During this time, the ledge **27** deflects downwardly or inwardly only slightly and thus can be accurately said to remain substantially rigid. It should be noted that the attachment portion **33** and the rivet **49** apply a generally directly upwardly force to the panel **17** while the rupturing portion **33** applies a downward force to the ledge **27** and thus the section of the score line **15** intermediate the nose end **31** and the attachment portion **33** is subjected to substantially pure shearing force, which is highly effective in initiating rupture of the sheet material along the score line.

When the upward lifting of the handle end **29** of the tab **19** applies a sufficient force to the sheet metal along the score line, the severance of the panel **17** from the can end **11** is initiated and a pressure equalizing opening **57** is formed substantially as shown in FIG. 6. It should be noted that the section **55** of the panel **17** tends to curl or fold outwardly along the ruptured length of the score line **15**. Thus, during the second phase of panel removal during which an outward pulling force is applied to the tab **19** as shown in FIG. 7, the panel **17** curls outwardly away from the can end **11** to thereby minimize the resistance to this second phase of removal of the panel.

The ledge **27** serves two very important functions. First, in the event that the can end **11** is utilized on a container having less than atmospheric pressure therein, the pressure equalizing opening **57** can be formed without danger of having the panel **17** and the tab **19** forcibly and suddenly drawn into the container. This is so because the ledge **27** supports the nose end **31** and serves, in effect, as a latch to lock the tab and panel **17** against inward movement into the container as a result of the pressure differential on opposite sides of the panel **17**. Secondly, because the ledge **27** rigidly supports the nose end **31**, the tab **19** is caused to apply an outward or upward lifting force on the section **55** of the panel **17** to thereby initiate the desirable outward curling of the panel during the initial phase of panel removal in which the lever portion **32** of the tab **19** is pivoted as shown in FIG. 6.

FIG. 8 shows a modification of the form of the invention shown in FIGS. 1–7 in which corresponding elements are designated with corresponding primed reference characters. As shown in FIG. 8 an easy opening container wall **11'** has a score line **15'** defining a removable panel **17'**. A tab **19'**, which is identical to the tab **19**, is secured to the panel **17'** by a pair of rivets **49'**. The score line **15'** has a major portion **21'** which forms almost a complete circle and a chord portion **61** which interconnects the ends of the major portion **21** to define, along with an attachment flange **13'**, a ledge **27'**. As shown in FIG. 8, the chord portion **61** curves inwardly slightly from the ends of the major portion **21'** and then curves smoothly outwardly slightly beneath the nose end **31** of the tab **19** to form a small projection **63** in the panel **17'**. The ledge **27'** is identical to the ledge **27** except that the inner edge thereof which is defined by the chord portion **61** is curved slightly as shown in FIG. 8 rather than being straight as shown in FIG. 1. The rupturing portion **31'** of the tab **19'** extends across the chord portion **61** and overlies the ledge **27'**. Thus, the modification of FIG. 8 illustrates another way in which a suitable ledge may be provided for cooperation with the rupturing portion of the tab. The modification of FIG. 8 is operable as described above in connection with FIGS. 5–7.

Although exemplary embodiments of the invention have been shown and described, many changes, modifications, and substitutions may be made by one having ordinary skill in the art without necessarily departing from the spirit and scope of this invention.

We claim:

1. In an easy opening container, the combintion of:

a container wall of sheet material having peripheral means for attaching the container wall to the container, said peripheral means being generally circular in plan;

a line of weakness in said container wall defining a panel removable from said container wall to define an opening in said container wall, said removable panel covering substantially all of said container wall, said line of weakness having a major portion forming a substantially complete circle and lying closely adjacent said peripheral means and a minor portion joining the ends of said major portion and generally forming a chord of said major portion, said minor portion and said peripheral means defining a small narrow ledge therebetween, said ledge having substantial resistance to inward bending;

a sheet metal tab having a lever portion and an attachment portion integrally joined by a fold portion with the sheet material of the tab between said lever and attachment portions being pliable to define a hinge to allow the lever portion to pivot about said hinge line relative to said attachment portion, said lever portion having a nose end and a handle end, said lever portion overlying at least a section of said attachment portion and including a peripheral reinforcing bead to stiffen the lower portion against bending about a transverse axis; and

means for joining said attachment portion to said panel with the nose end of the tab overlying said ledge and with said tab except for said nose end lying substantially completely within the perimeter of said panel whereby lifting of the handle end of the tab pivots the lever portion about said hinge and forces the nose end against said ledge to thereby exert an outward force on said panel to initiate rupture of said line of weakness to thereby form a pressure equalizing opening, said ledge supporting said nose end of the tab to thereby lock said tab and said container wall against being pulled into the container following formation of the pressure equalizing opening.

2. A combination as defined in claim **1** wherein said means for joining attaches said attachment portion to said panel at two spaced regions of said attachment portions to thereby prevent pivoting of the tab about said means for joining.

3. A combination as defined in claim **1** wherein said nose end of said tab is in the form of a narrow projection of progressively decreasing width as it extends forwardly, said narrow projection allowing said ledge to cover a minimum area of the container.

4. In an easy opening device adapted for vacuum packaging, the combination of:

a substantially fluid-tight container having a pressure therein less than atmospheric, said container having a container wall which is urged inwardly by atmospheric pressure acting on the exterior surface thereof;

a line of weakness in said container wall defining a removable wall segment removable from said container wall to define an opening in said container wall, atmospheric pressure acting on the exterior of the container wall tending to urge the container wall inwardly into the interior of the container;

said container wall having a wall section outside of said removable wall segment and contiguous a section of said line of weakness, said wall section having substantial resistance to complete inward bending;

a tab having a lever portion, said lever portion having a nose end and a lifting end at opposite ends of the lever portions;

attachment means for joining said tab intermediate said ends to said removable wall segment with the nose end of the tab overhanging said wall section and with the lever portion overlying at least a portion of the removable wall segment so that lifting of the lifting end of the tab pivots the lever portion to bring the nose end into forcible engagement with said wall section and to apply an outward lifting force on the removable wall segment to thereby initiate rupture of said line of weakness and form a pressure equalizing opening in the container wall; and

said nose end bearing on said wall section throughout the formation of said opening and said wall section being sufficiently rigid to form a stop for preventing the inward rush of air into the container from drawing the container wall and the tab into the container.

5. A combination as defined in claim **4** wherein said tab is integrally constructed of sheet metal and includes

an attachment portion which is secured to said removable wall segment by said attachment means and which is integrally joined to said lever portion by a fold portion, said lever portion overlying at least a section of said attachment portion with at least a portion of the sheet metal of the tab between said lever and attachment portions being sufficiently pliable to define a hinge to allow the lever portion to pivot about said hinge relative to said attachment portion.

6. A combination as defined in claim 4 wherein said removable wall segment defines a removable panel which covers a major portion of the area of said container wall.

7. A combination a defined in claim 4 wherein said container includes a container body and said container wall is a circular end wall having circular peripheral

means for attaching said end wall to said container body, said line of weakness includes a major arcuate portion concentric with said peripheral means and lying closely adjacent said peripheral means and a minor portion extending between the ends of said major portion and defining with said peripheral means said wall section.

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