

[54] **EASY-OPENING DEVICE FOR SHEET
METAL CONTAINERS AND THE LIKE AND
METHOD OF PRODUCING SUCH DEVICES**

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[22] Filed: **Jan. 7, 1972**

[21] Appl. No.: **216,181**

[52] **U.S. Cl.** **113/121 C**, 220/27

[51] **Int. Cl.** **B21d 51/00**

[58] **Field of Search** 113/121 C, 1 F, 116 BB;
220/27, 48, 54

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Primary Examiner—

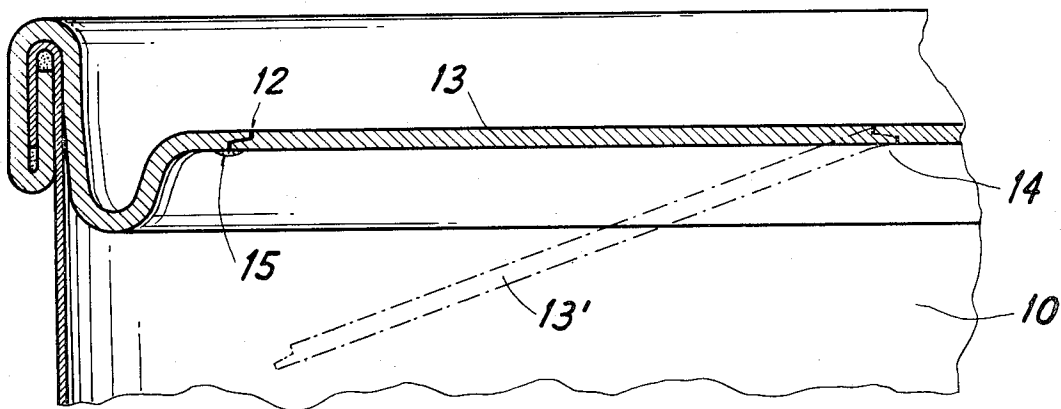
Assistant Examiner—M. J. Keenan

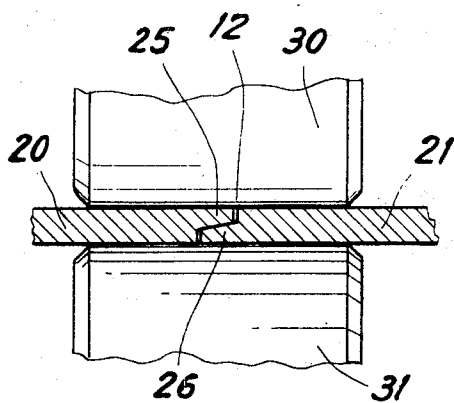
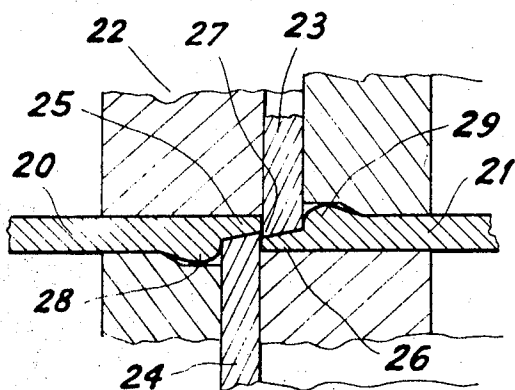
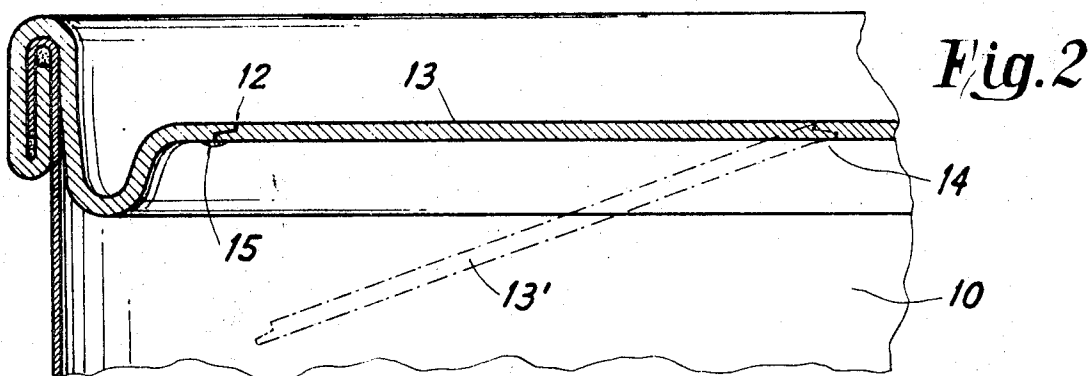
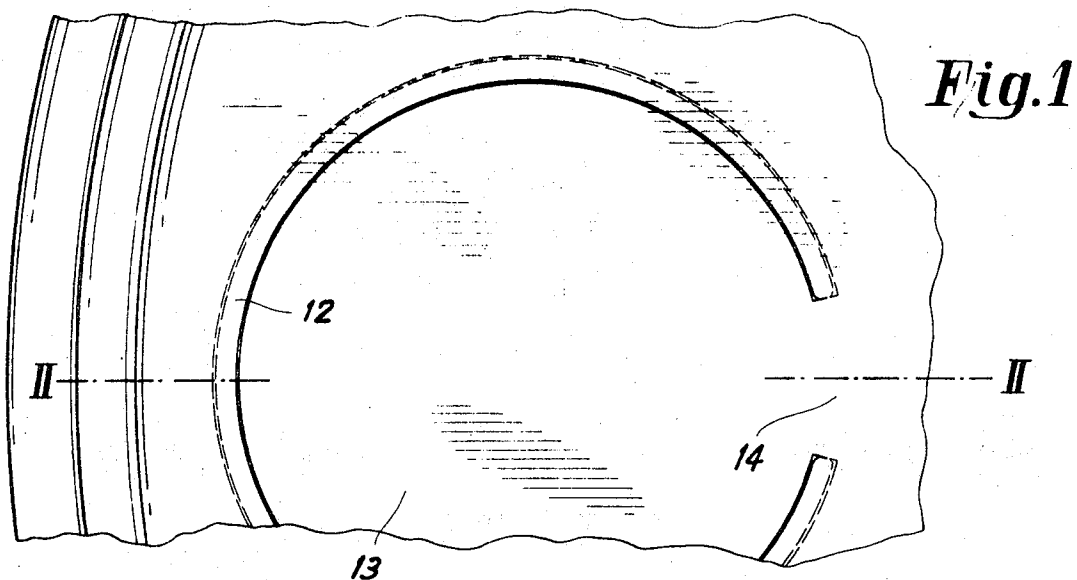
Attorney—Joseph A. Geiger

[57] **ABSTRACT**

An easy-opening device for sheet metal containers and the like where a wall panel covering an intended opening in a sheet metal wall is arranged to be easily removable from the opening, a cut through the sheet metal wall along a major portion of the contour of the intended opening separating the wall panel from the adjacent aligned sheet metal wall and forming a bending hinge at the uncut portion; and where an overlap configuration on the cut limits the removability of the wall panel to a one-way pivoting motion around the hinge. The intended opening is prepared by cutting and deforming the wall along the opening contour into an overlap configuration with the adjacent wall portions remaining substantially aligned.

15 Claims, 11 Drawing Figures





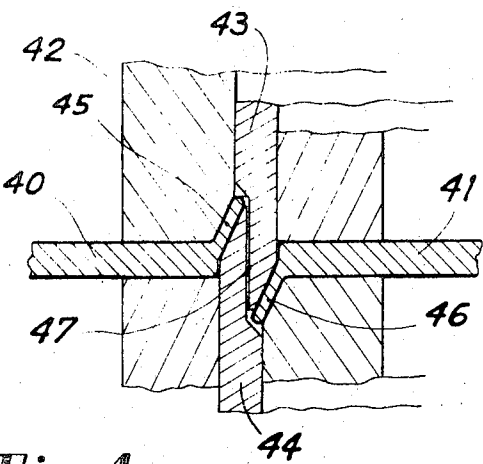


Fig. 4a

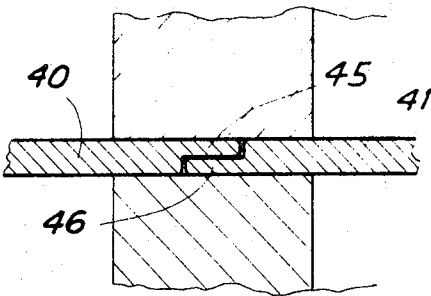


Fig. 4b

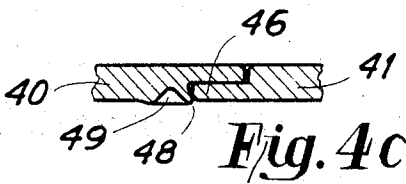


Fig. 4c

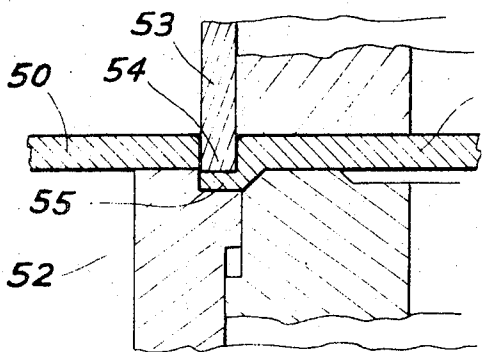


Fig. 5a

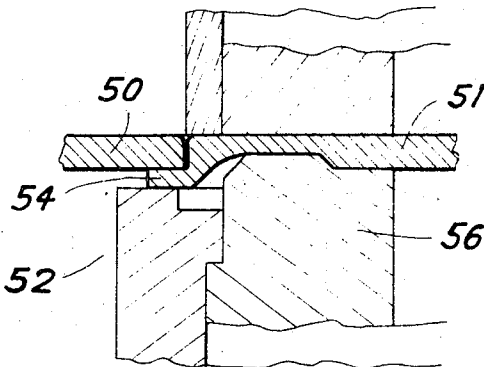


Fig. 5b

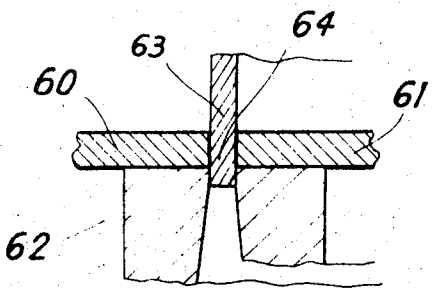


Fig. 6a

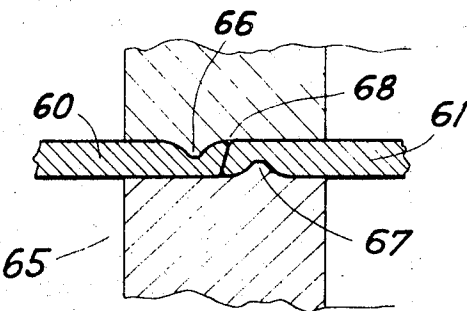


Fig. 6b

EASY-OPENING DEVICE FOR SHEET METAL CONTAINERS AND THE LIKE AND METHOD OF PRODUCING SUCH DEVICES

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to easy-opening devices for sheet metal containers and the like, and in particular to easy-opening devices and methods of producing them, where a cut or other weakening is provided along a line in the sheet metal wall so as to define an intended opening covered by an easily removable wall panel.

2. Description of the Prior Art

The prior art of easy-opening devices for containers includes a large number of so-called pull-tab devices, where a pull-tab is attached to a removable wall panel which is surrounded by a score line. The pull-tab serves as a lever for the initiation of the panel severance on the score line and for the complete removal of the panel from the opening. Because of the widespread use of these devices for the packaging of canned beverages, a general problem has developed with regard to the disposal of the removed pull-tabs and attached wall sections, the latter being often carelessly discarded in places where they represent both a hazard and an eyesore.

It has therefore already been suggested that these convenience containers should have easily removable wall sections which, instead of having to be torn from the container, are arranged to be pushed into the container. One such solution is suggested in U.S. Pat. No. 3,362,569, where the depressable wall portion is defined by a weakening line obtained through a partial shearing of the wall. This solution requires very precise tools and has the additional shortcoming that it requires a considerable amount of opening pressure or some means to apply leverage to the movable wall portion.

Another solution suggests a completely sheared wall around the depressable wall section, the latter than being radially expanded to create an offset overlap configuration with the adjacent container wall. This overlap configuration withstands internal gas pressure and deformation and it permits easy opening of the container by finger pressure. One of the shortcomings of this solution is the creation of a sharp-cornered recess which is difficult to clean of dust or dirt before opening. Another shortcoming resides in the fact that, in the absence of internal gas pressure against the depressable wall section, the latter is held closed only by the adhesiveness of the soft sealant which is applied around the cut in order to seal the latter against leakage.

SUMMARY OF THE INVENTION

It is a primary objective of the present invention to propose an easy-opening device for sheet metal containers and the like in which the earlier-mentioned prior art shortcomings are eliminated. In order to attain this objective, the invention suggests a device which comprises in combination a wall panel which covers the intended opening in the sheet metal wall and which constitutes an integral portion of the sheet metal wall — which latter may be the end section of a container, for example — the wall panel being separated from the adjacent sheet metal wall by a transverse cut through the wall along a major portion of the contour of the intended opening, whereby the uncut portion of the con-

tour defines a bending hinge for the wall panel. The adjacent marginal wall portions on opposite sides of the cut have a peripheral ledge extending from at least one of these marginal wall portions toward the other so as to create an overlap configuration around the cut. This overlap configuration limits the removability of the wall panel to a one-way pivoting motion around the bending hinge.

The device of the invention is preferably so arranged that the transverse cut in the wall is substantially closed and that at least one side of the sheet metal wall — for example, the outer side in the case of a container lid which incorporates the device — presents a substantially continuous surface across the transverse cut, in order to facilitate the cleaning of this surface.

In a further development of the invention a pre-loaded friction lock is provided in the overlap configuration along the contour of the intended opening, in order to prevent accidental destruction of the seal. This friction lock may be restricted to one or several discrete points on the opening contour.

The invention also suggests a method of producing the device of the invention by cutting the sheet metal wall to create a narrow gap along the contour of the intended opening without upsetting the surface alignment of the adjacent wall portions, and by shaping and laterally shifting at least one of the marginal wall portions to form a peripheral ledge which extends toward the other wall portion in an overlap configuration.

BRIEF DESCRIPTION OF THE DRAWINGS

Further special features and advantages of the invention will become apparent from the description following below, when taken together with the accompanying drawings which illustrate, by way of examples, several embodiments of the invention, represented in the various figures as follows:

FIG. 1 is a plan view of an easy-opening device embodying the invention;

FIG. 2 shows the embodiment of FIG. 1 in an elevational cross section taken along the line II—II of FIG. 1;

FIGS. 3a and 3b show, by way of schematic, enlarged partial cross sections, two stages in the method of producing the device of FIG. 1 as a first embodiment of the invention;

FIGS. 4a and 4b show in a similar way two stages of a second embodiment of the method of the invention;

FIG. 4c shows a modification of the second embodiment illustrated in FIGS. 4a and 4b;

FIGS. 5a and 5b show two stages of a third embodiment of the method of the invention; and

FIGS. 6a and 6b show two stages of a fourth embodiment of the method of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIGS. 1 and 2 is illustrated a preferred embodiment of the invention as applied to a beverage container 10. The lid 11 of the container has in its wall a circular cut 12 which defines a removable wall panel 13 covering an intended opening. The cut 12 does not extend over the entire circle, but leaves an uncut portion which serves as a hinge 14, when the wall panel 13 is opened as shown at 13' in FIG. 2. Due to an overlap configuration in the cut 12, the container can only be opened by pivoting the wall panel 13 toward the inside

of the container. This overlap configuration in the cut thus assures that the wall panel 13 remains safely closed, even under internal pressure and deformation, caused by carbonation or heat, for example. At the same time it permits effortless opening of the container, by applying finger pressure against the outside of the panel 13, for example. A bead 15 of soft sealant may be applied to the inside of the cut 12.

FIGS. 3a and 3b show details of the overlap configuration around the cut 12 and schematically illustrate a method of producing this configuration. The marginal wall portions 20 and 21 are clamped in a die 22 (FIG. 3a), while two oppositely moving shear-type punches 23 and 24 penetrate into and sever the wall, thereby producing thinned ledges 25 and 26 on opposite sides of a gap 27. The displaced wall material forms raised beads 28 and 29. In a subsequent operation the beads 28 and 29 are pressed back into their respective marginal wall portions by means of a simple compression die, or by means of rollers 30 and 31 as shown in FIG. 3b. This operation causes the marginal wall portions 20 and 21 to shift toward one another until the gap 27 is closed, as the ledges 25 and 26 contact one another in an overlap configuration. In order to avoid the creation of a firm mechanical interlock across the cut under conditions of varying material thickness and tool tolerances, it may be desirable to leave a small clearance in the vertical portions of the cut 12.

A second embodiment of the invention is illustrated in FIGS. 4a-4c. It suggests an alternate method of producing a cut in an overlap configuration which is similar to that of FIG. 2. The marginal wall portions 40 and 41 are again clamped in a die 42 (FIG. 4a), while two oppositely moving shear-type punches 43 and 44 cut through the wall. The wall material in the path of the punches 43 and 44 is bent away and extruded into thin ledges 45 and 46, respectively. These extruded ledges extend at an angle from their respective marginal wall portions, leaving a relatively wide gap 47 between them. The ledge thickness is approximately one-half the thickness of the wall, and the ledge width is approximately the same as the width of the gap 47. In the closing operation (FIG. 4b) the two ledges 45 and 46 are simply bent into alignment with their marginal wall portions 40 and 41, thus closing the gap 47 in the desired overlap configuration. This operation may be performed in a simple die or by means of rollers.

FIG. 4c shows, as an additional feature of the invention, a preloaded friction lock which prevents inadvertent or accidental opening of the container. The lock preferably consists of a localized slight material interference 48 between the marginal wall portion 40 and the lower ledge 46 at the inner end of the cut, the material interference being the result of a cone-shaped indentation 49 in the marginal wall portion 40. Several of these indentations may be provided on the contour of the removable wall portion. The method step of producing the indentation 49 can be conveniently combined with the closing operation of FIG. 4b. Although not specifically shown here, it should be understood, of course, that this type of friction lock, or equivalent preloaded holding means, may be incorporated in any other embodiment of the invention.

The third embodiment shown in FIGS. 5a and 5b suggests a different type of cut between the adjacent marginal wall portions 50 and 51. The die 52 has only one moving punch 53 which, while cutting a gap 54 into the

wall, shapes the wall material in its path into a single offset ledge 55 (FIG. 5a). The latter extends from the periphery of the removable wall panel, represented by the marginal wall portion 51, and it is offset toward the inside of the container by at least the amount of the wall thickness. The die 52 also performs the closing operation (FIG. 5b). A movement of the swaging punch 56 against the marginal wall portion 51 causes the latter to expand in diameter so that its ledge 54 comes to overlap the edge of the marginal wall portion 50, while the gap 54 is substantially closed.

In a fourth embodiment of the invention, shown in FIGS. 6a and 6b, the marginal wall portions 60 and 61 are cut by a simple die 62 whose punch 63 cuts a straight gap or slot 64 into the wall by removing the wall material situated in its path. In the closing operation both marginal wall portions 60 and 61 are swaged in a die 65 which, by impressing oppositely oriented V-shaped grooves 66 and 67 into the walls near the gap 64, causes the two flanks of the slot to close against one another in an overlap configuration around an inclined cut 68.

It may be desirable, as already mentioned, to apply a soft sealant to the cut, in order to prevent leakage of the container contents. The sealant may be applied to the inside end of the cut, in a last step following the closing operation (FIG. 2). However, the sealant may also be applied to the gap of the cut prior to closing, in which case the sealant also serves as a lubricant in the closing operation. Where rollers are used in the closing operation, as in FIG. 3b, for example, the application of the sealant can be conveniently combined with the travel of the rollers along the contour of the cut.

I claim:

1. An easy-opening device for the quick creation of an opening in a container, especially a pressure-resistant beverage can, comprising in combination:

a container wall whose surface area includes the intended opening;

a wall panel initially constituting an integral portion of the container wall and covering the intended opening;

a transverse cut separating the wall panel from the adjacent container wall along a major portion of the intended opening contour, with an uncut contour portion defining a bending hinge for the wall panel; the transverse cut being so arranged that the peripheral marginal wall portion of the wall panel and the marginal container wall portion around the intended opening remain aligned and substantially contiguous so as to present a substantially continuous, step-free surface on at least the outer side of the container;

a peripheral ledge constituted as an integral part of the wall panel and extending from its periphery toward the adjacent container wall in such a manner that an overlap configuration is created in the area of the transverse cut, the overlap permitting easy removal of the wall panel through an inward pivoting motion around the bending hinge, while maintaining the container closed and preventing an outward pivoting motion under internal container pressure.

2. An easy-opening device as defined in claim 1, wherein the container wall is part of an end closure of a beverage container, and

the intended opening is located near the periphery of the end closure and has a generally circular contour, its bending hinge being provided in a portion of the contour which is near the center of the closure.

3. An easy-opening device as defined in claim 1, wherein

the cut through the container wall presents an offset, step-shaped cross-sectional outline, both of the adjacent marginal wall portions including similar peripheral ledges in the overlap configuration.

4. An easy-opening device as defined in claim 1, wherein

the ledge extending from the peripheral marginal wall portion of the wall panel is inwardly offset from the outer side of the container wall by a distance approximately equal to the wall thickness and extends from the wall panel to form an overlap configuration with the marginal wall portion surrounding the intended opening, the offset ledge thus covering the transverse cut.

5. An easy-opening device as defined in claim 1, wherein the cut in the sheet metal wall has an inclined cross-sectional orientation so that each of the adjacent marginal wall portions includes a generally triangle-shaped ledge in the overlap configuration.

6. An easy-opening device as defined in claim 1, further comprising:

means to hold the removable wall panel in its closed position so that a predetermined opening force in the direction of panel removal is required in order to overcome the holding means.

7. An easy-opening device as defined in claim 6, wherein

the holding means are arranged to create a preloaded friction lock between adjacent portions of the removable wall panel and the wall surrounding the intended opening.

8. An easy-opening device as defined in claim 6, wherein

the holding means are provided on one or more discrete points on the contour of the intended opening in the form of material interferences between the adjacent marginal wall portions.

9. A method of producing an easy-opening device by preparing an intended opening in a sheet metal wall covered by an easily removable wall panel, comprising the steps of:

cutting the sheet metal wall along a line which defines at least a major portion of the contour of an easily removable wall panel so as to create a narrow gap in the wall, while

maintaining the surface alignment between the sheet metal wall and the removable wall panel on either side of the cut;

shaping at least one of the marginal wall portions to form a peripheral ledge which extends toward the other wall portion; and

deforming at least one of the marginal wall portions so that its peripheral ledge shifts in the direction toward the other marginal wall portion, thereby closing the gap and creating an overlap configuration which restricts the removability of the wall panel to one direction only.

10. A method as defined in claim 9, wherein the steps of cutting and shaping include the steps of

penetrating into the sheet metal wall from both sides thereof with cutting tools which operate in the manner of shears, while

clamping the wall portions adjacent to the cutting tools so as to maintain the adjacent wall surfaces in alignment; and

shaping both peripheral marginal wall portions into ledges of reduced thickness, thereby displacing the wall material situated in the path of the tools toward the clamped wall portions so as to form oppositely located raised beads;

the step of deforming including the step of flattening the raised beads and thereby displacing the peripheral ledges toward one another until the gap is substantially closed and the ledges contact one another in an overlap configuration.

11. A method as defined in claim 9, wherein the steps of cutting and shaping include the steps of cutting through the sheet metal wall from both sides thereof with cutting tools which operate in the manner of shears, while

clamping the wall portions adjacent to the cutting tools so as to maintain the adjacent wall surfaces in alignment; and

shaping both peripheral marginal wall portions into ledges, thereby bending and stretching the wall material situated in the path of the tools away from its original location so as to form a gap, the ledges thus formed on both sides of the gap being of reduced thickness and correspondingly lengthened;

the step of deforming including the step of bending the peripheral ledges into alignment with the adjacent wall surfaces, thereby substantially closing the gap and creating an overlap configuration.

12. A method as defined in claim 9, wherein the steps of cutting and shaping include the steps of

cutting the sheet metal wall from one side thereof with a punch-type cutting tool so as to sever the wall material along the outer flank of the tool; and shaping the marginal wall material situated in the path of the tool into an offset ledge which extends outwardly from the removable wall panel;

the step of deforming including the step of laterally expanding the removable wall panel, thereby shifting its peripheral margin and its ledge toward the outer marginal wall portion, whereby the gap created by the cut is substantially closed and an overlap configuration is created.

13. A method as defined in claim 9, wherein the step of cutting is performed with a die punch which cuts a narrow gap into the sheet metal wall by removing the wall material situated in the path of the punch;

the steps of shaping and deforming including the step of

impressing oppositely oriented, generally V-shaped grooves into the adjacent marginal wall portions on either side of the gap, whereby the spaced flanks of the gap are displaced toward one another and inclined so that the gap is substantially closed and an overlap configuration is created.

14. A method as defined in claim 9, further comprising the step of

locally indenting at least one of the marginal wall portions to create a preloaded controlled material interference between the removable wall panel and the surrounding wall portion.

15. A method as defined in claim 9, further comprising the step of

lubricating the marginal wall portions adjacent to the gap for the deforming step by applying a sealant to the gap before the latter is closed.

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