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(54) BEVERAGE CAN END WITH OUTWARDLY EXTENDING REINFORCING BEAD

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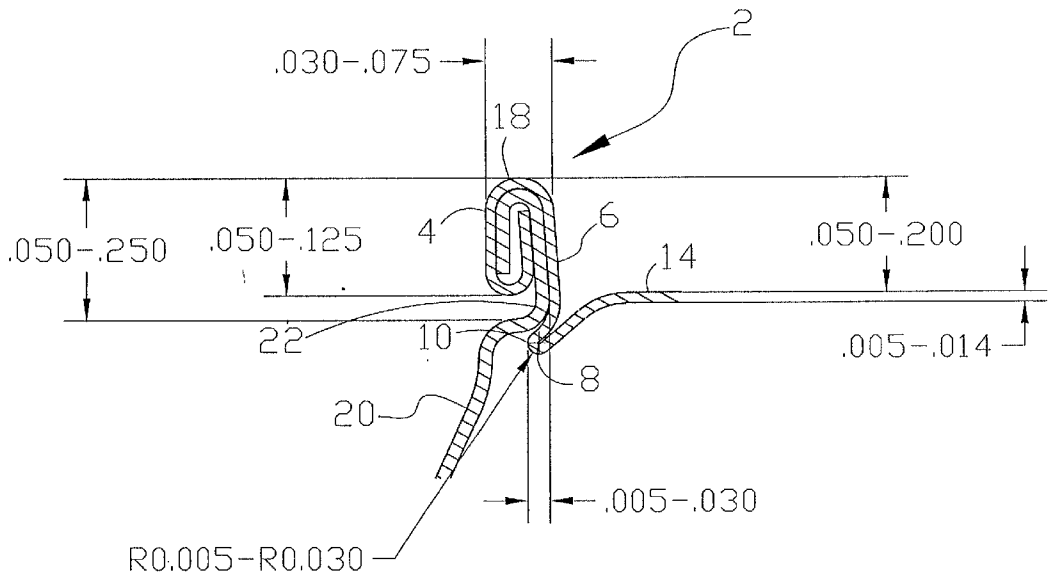
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(57) **ABSTRACT**

The present invention discloses a beverage can end having an outwardly concave reinforcing bead with an upper lip which extends outwardly beyond a substantially vertical plane defined by a downwardly extending chuck wall.



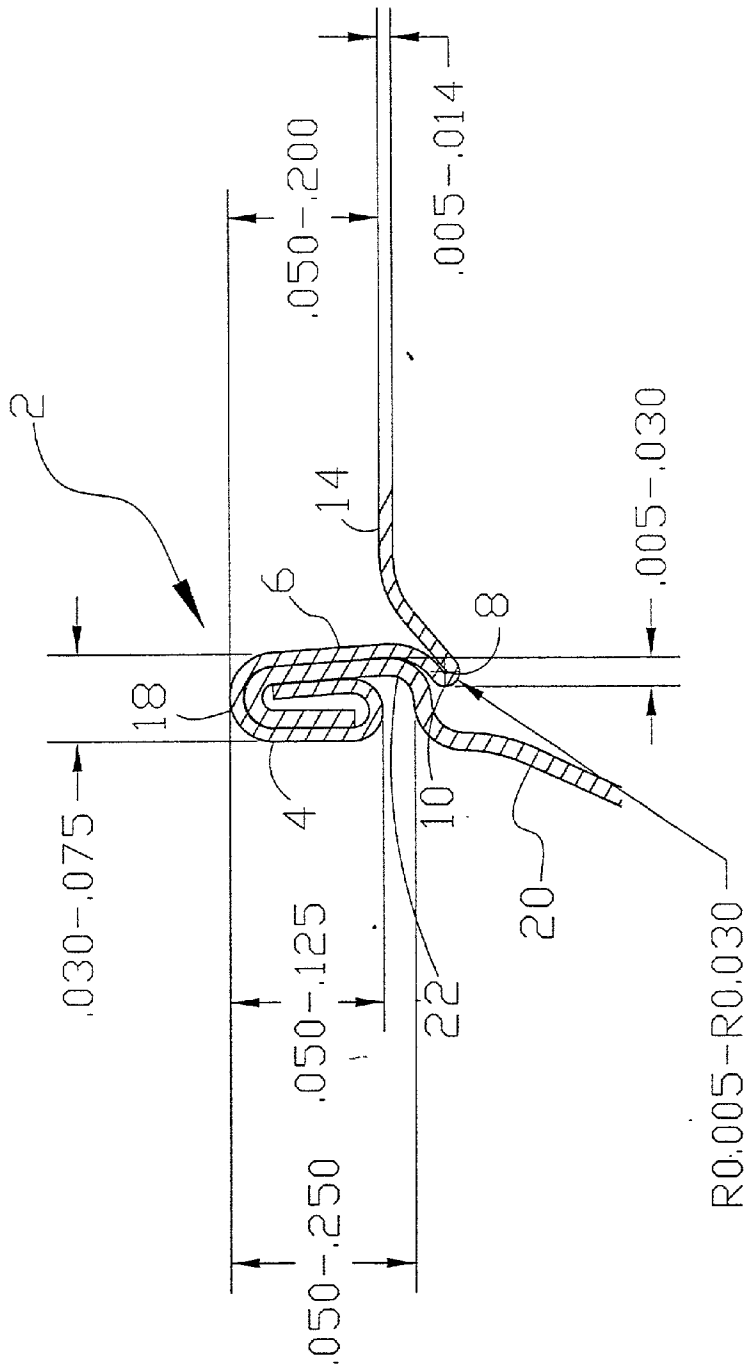

.050-.200
.005-.014
.005-.030
2
14
6
8
18
4
10
20
22
.030-.075
.050-.125
.050-.250
R0.005-R0.030

FIG. 1

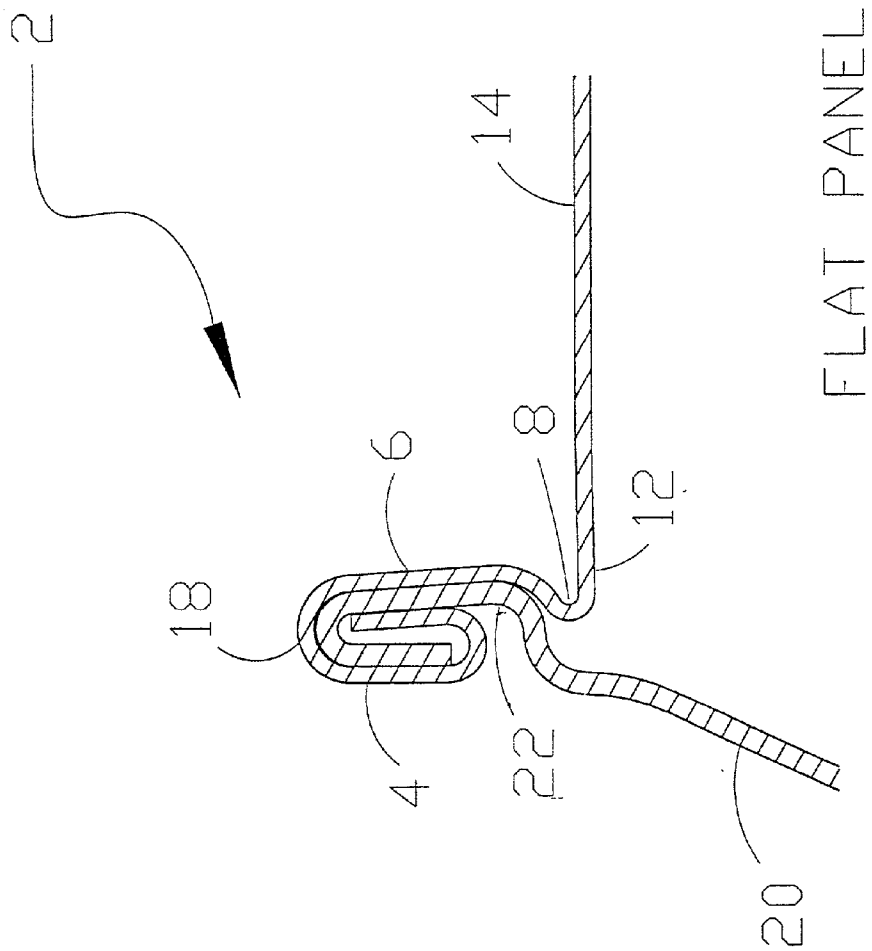


FIG. 2

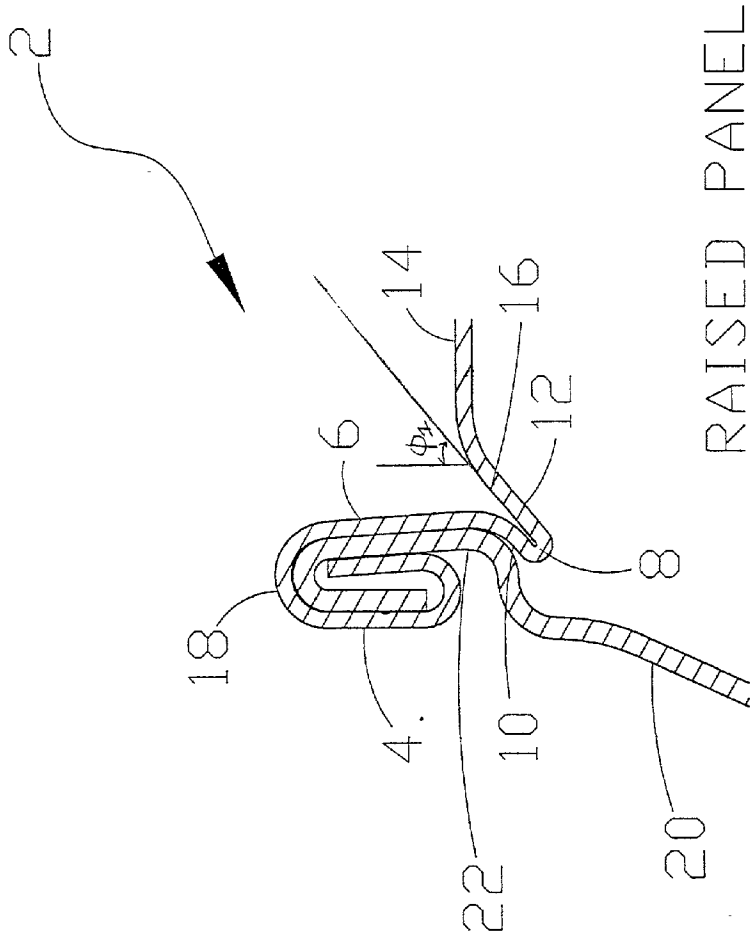


FIG. 3

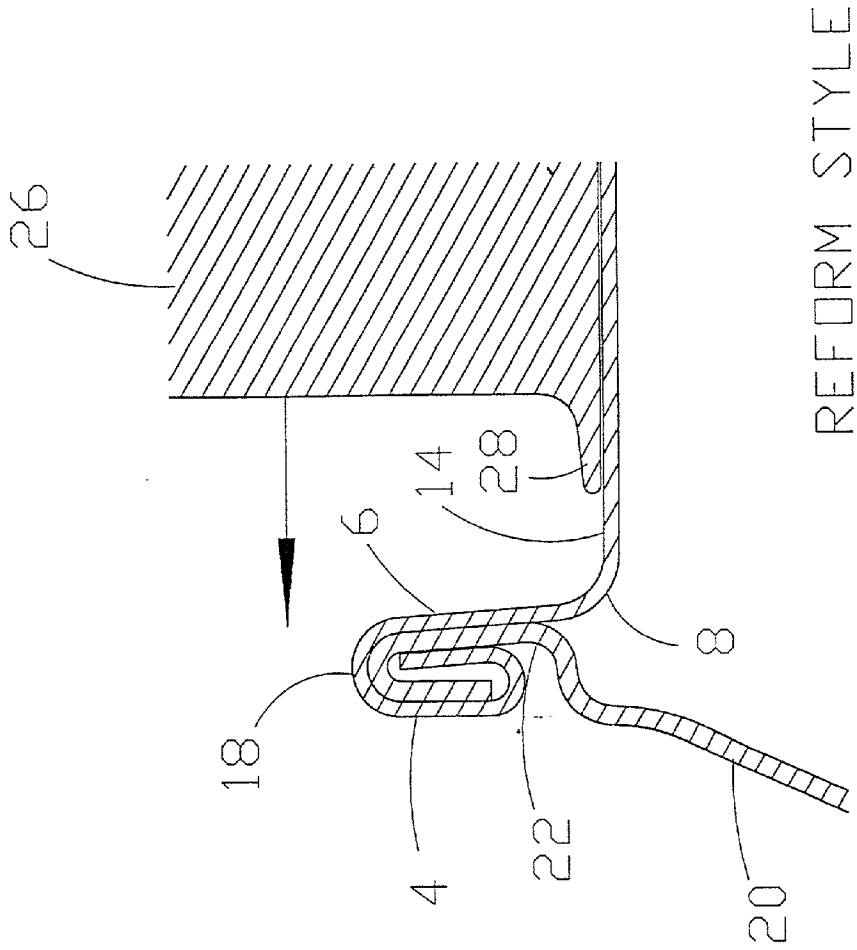


FIG. 4

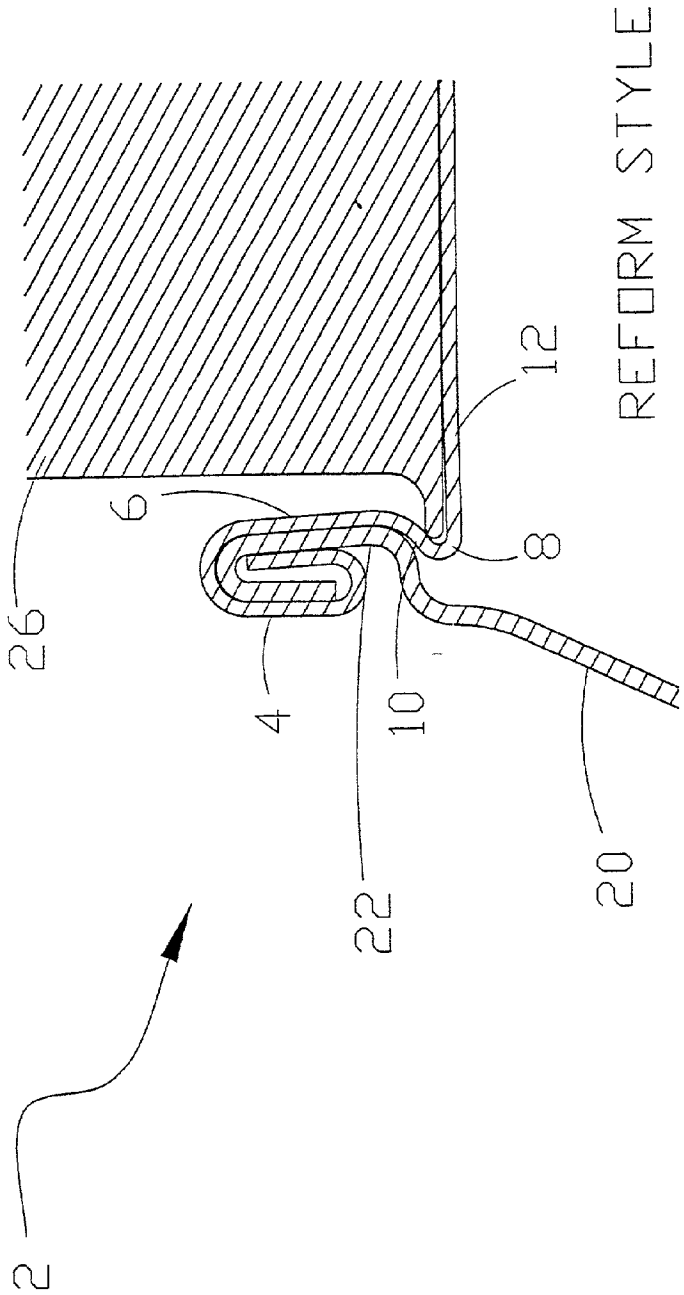
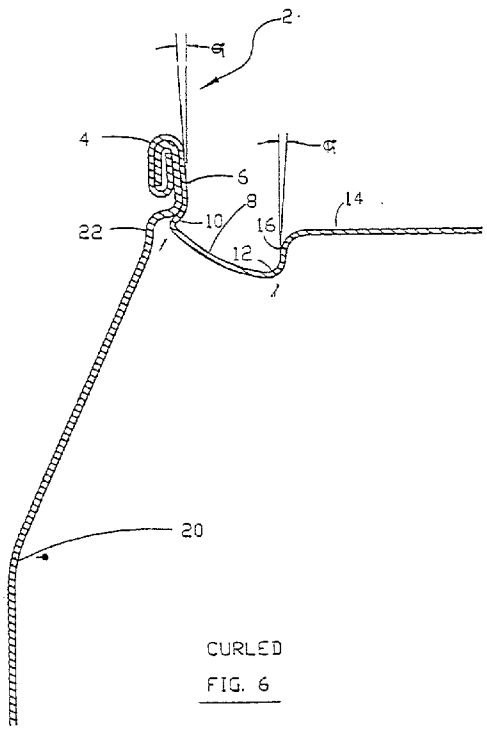
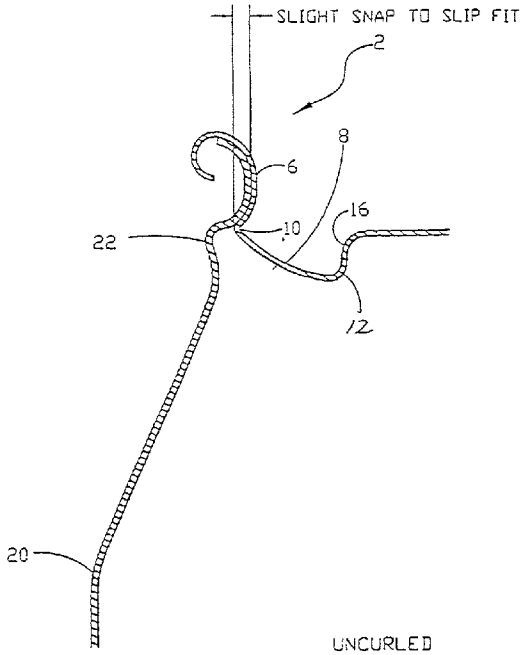


FIG. 5



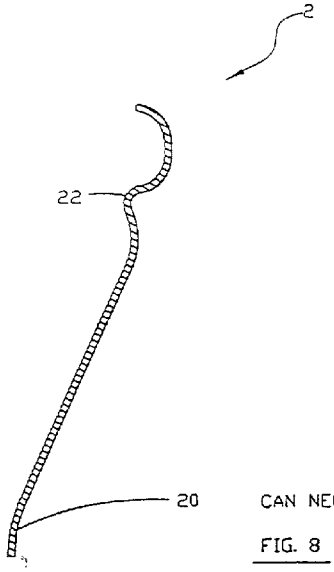
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FIG. 6



UNCURLED

FIG. 7



CAN NECK

FIG. 8

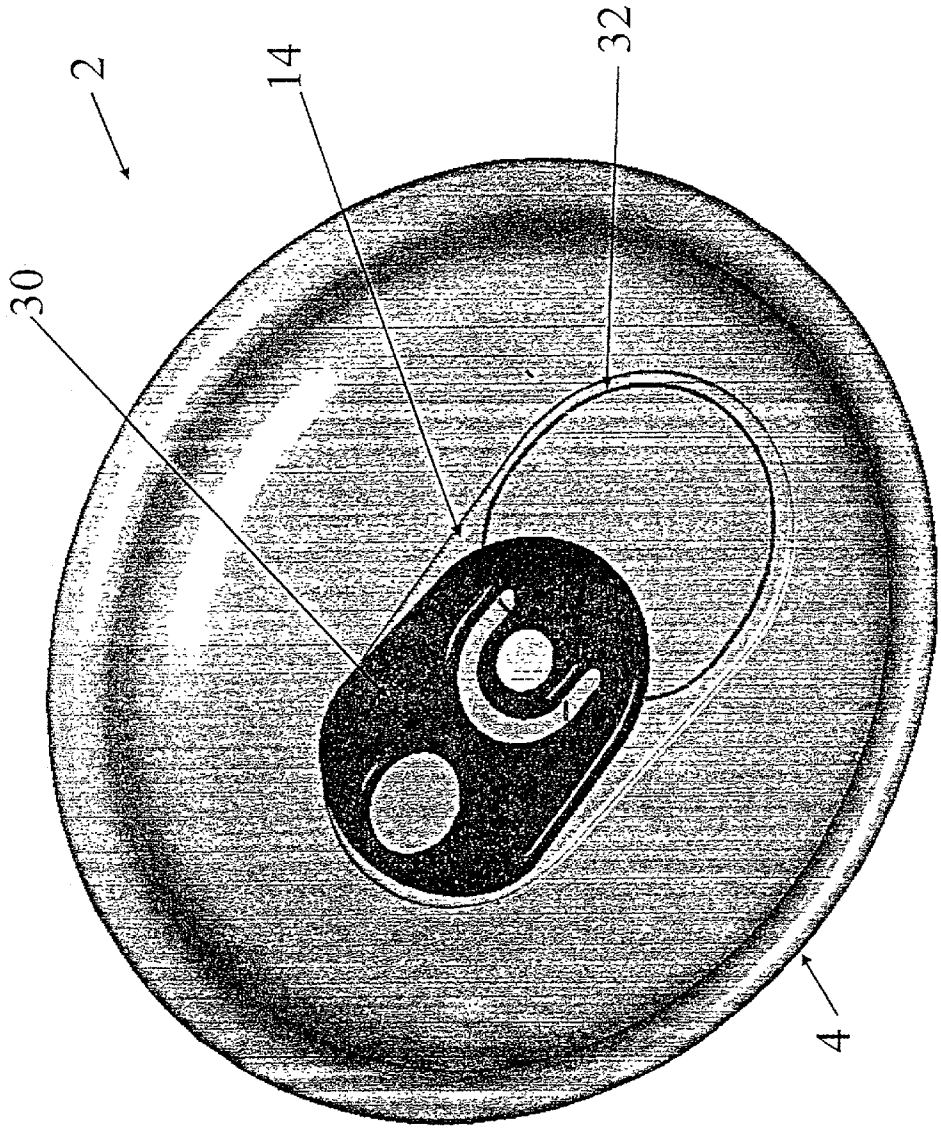


Fig. 9

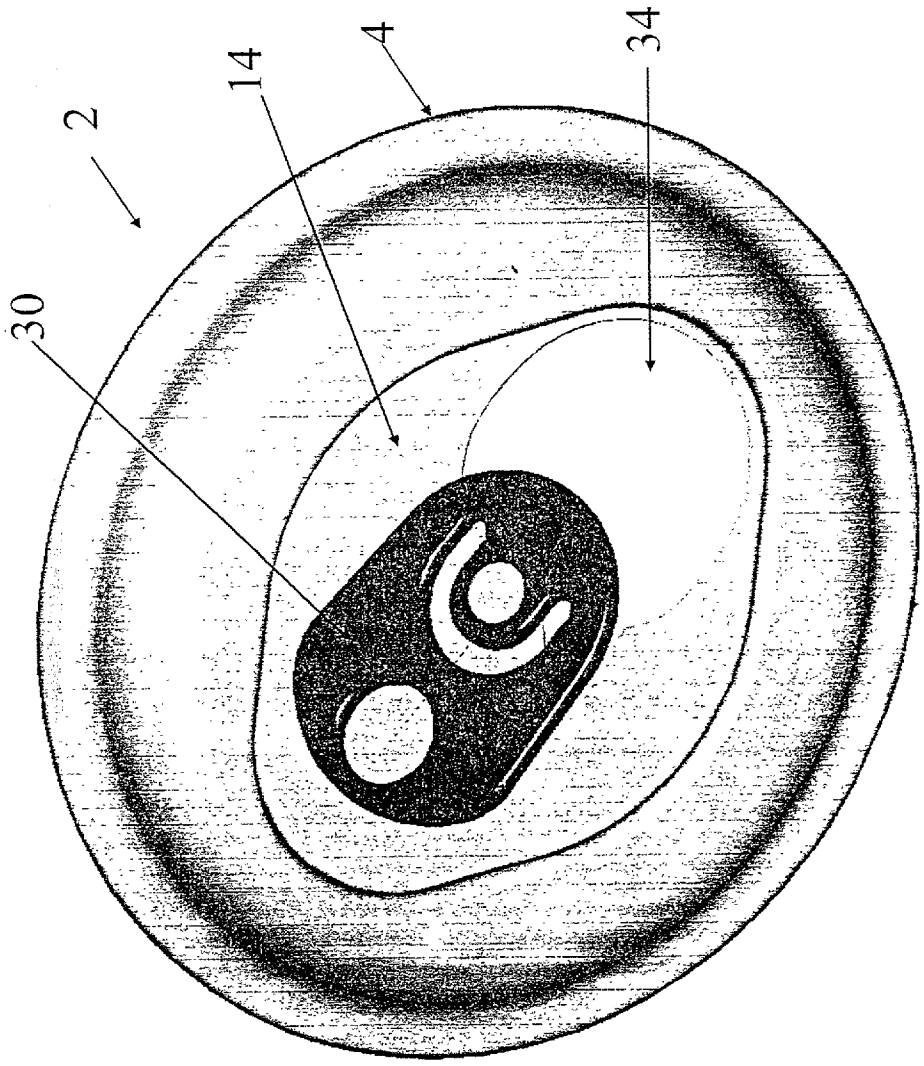


Fig. 10

BEVERAGE CAN END WITH OUTWARDLY EXTENDING REINFORCING BEAD

[0001] This application claims priority of U.S. provisional patent application Serial No. 60/271,629 having a filing date of Feb. 26, 2001 and is incorporated herein in its entirety by reference.

FIELD OF THE INVENTION

[0002] The present invention generally relates to beverage can ends, and more specifically metallic beverage can ends used for interconnection to a beverage can body.

BACKGROUND OF THE INVENTION

[0003] Beverage cans and more specifically metallic beverage cans are typically manufactured by interconnecting a beverage can end on a beverage container body. In some applications, one end may be interconnected on a top side and one end interconnected on a bottom side of a can body. More frequently, however, a beverage can end is interconnected only on a top end of a beverage can body which has been drawn and ironed from a flat sheet of blank material such as aluminum. Due to the potentially high internal pressures generated by carbonated beverages, both the beverage can body and the beverage can end are typically required to sustain internal pressures of up to 95 psi without catastrophic and permanent deformation. Further, depending on various environmental conditions such as heat, over fill, high CO2 content, and vibration, the internal pressure in a beverage can may have excessive internal pressures approaching or exceeding 100 psi.

[0004] Thus, the beverage can ends must be durable to withstand high internal pressures, yet manufactured with extremely thin metallic materials such as aluminum to decrease the overall cost of the manufacturing process and weight of the finished product. Accordingly, there exists a significant need for a durable beverage can end which can withstand the high internal pressures created by carbonated beverages, as well as the external forces applied during shipping, yet which is made from durable, lightweight and extremely thin metallic materials. Further, a need exists to create a durable beverage can end with an improved design which utilizes commonly used equipment in a beverage can plant. The following patent application describes an improved beverage can end which is adapted for interconnection to a beverage can body and which has an improved countersink reinforcing bead configuration which saves material costs, yet can withstand significant internal pressures.

SUMMARY OF THE INVENTION

[0005] It is thus one aspect of the present invention to provide a metallic beverage can end which can withstand significant internal pressures approaching 100 psi yet saves between 3% and 18% of the material costs associated with manufacturing a typical beverage can end. A further aspect of the present invention is to provide a beverage can end which can be easily and quickly double seamed to a neck of a beverage can body.

[0006] In another aspect of the present invention, a beverage can end is provided which is manufactured with conventional manufacturing equipment and thus eliminates the need for expensive new punches and presses required to make the beverage can end. Thus, existing and well known manufacturing equipment and processes can be implemented to quickly and effectively initiate the production of an improved beverage can end in an existing manufacturing facility.

[0007] It is yet another aspect of the present invention to provide a method for forming a beverage can end which results in a can end with at least a portion of an outwardly concave reinforcing bead which extends outwardly beyond a substantially vertical plane defined by a chuck wall. More specifically, the method for manufacturing generally comprises a two-step process, wherein a conventional can end "pre-shell" is first formed and then captured between two opposing tools, where a spinner forming tool with a lower "hoop" is positioned on top of the pre-shell. The spinner reforming tool contains the desired countersink geometry, and more specifically an outwardly concave reinforcing bead. The pre-shell is then pushed into the reforming tool, which forces the spinner forming tool against the pre-shell, thus taking the panel tool shape and creating the preferred geometric shape.

[0008] It is another aspect of the present invention to provide a beverage can end which saves significant material costs by reducing the size of the blank as opposed to utilizing thinner materials which are susceptible to failure. Thus, the integrity and strength of the beverage can end is not compromised, while material costs are significantly reduced as a result of the blank reduction.

[0009] Thus, in one aspect of the present invention, a metallic beverage can end is provided which comprises:

[0010] a peripheral cover hook adapted for interconnection to an upper end of a can body;

[0011] a chuck wall dependent from an interior of the cover hook, and extending downward in a substantially vertical direction;

[0012] an outwardly concave annular reinforcing bead extending radially inwards from said chuck wall and having an upper lip which extends outwardly beyond a linear plane defined by said chuck wall; and

[0013] a lower lip extending upwardly from said outwardly concave annular reinforcing bead and interconnected to a central panel.

[0014] Thus, in one aspect of the invention an outwardly concave annular reinforcing bead is provided which has a non-linear arcuate shape extending between an upper lip and a lower lip and which extends inwardly toward the neck of the beverage container body. In one embodiment, the reinforcing bead is substantially creased, wherein a first upper portion is positioned substantially parallel to a second lower position, and thus is oriented substantially 180 degrees in an opposite direction.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] **FIG. 1** is a cross-sectional elevation view of one embodiment of the present invention;

[0016] **FIG. 2** is a cross-sectional front elevation view of an alternative embodiment of the present invention;

[0017] **FIG. 3** is a cross-sectional front elevation view of the invention shown in **FIG. 1**;

[0018] **FIG. 4** is a cross-sectional front elevation view of one embodiment of the present invention and prior to a reforming tool being used to form the reinforcing bead;

[0019] **FIG. 5** is a cross-sectional front elevation view of the embodiment shown in **FIG. 4** and identifying the positioning of the reforming tool during manufacturing and just prior to removal;

[0020] **FIG. 6** is a cross-sectional front elevation view of an alternative embodiment of the present invention showing the beverage can end interconnected to a can body;

[0021] **FIG. 7** is a cross-sectional front elevation view of the embodiment shown in **FIG. 6** with the beverage can end positioned on the can body and just prior to interconnection;

[0022] **FIG. 8** is a cross-sectional front elevation view of one portion of the can body and can neck;

[0023] **FIG. 9** is an upper front perspective view of one embodiment of the present invention and further identifying the central panel and pull tab; and

[0024] **FIG. 10** is an upper front perspective view of an alternative embodiment of the present invention and further identifying a pull tab and opening of the beverage can.

DETAILED DESCRIPTION

[0025] Referring now to **FIG. 1, a** cross-sectional front elevation view of one embodiment of the present invention is provided herein. More specifically, a beverage can end **2** is shown interconnected to a beverage can body **20**, and which further comprises a beverage can neck **22**. The beverage can end **2** generally has a peripheral cover hook **4** which is used to secure the beverage can end **2** to the beverage can end neck **22**. The peripheral cover hook **4** is integrally interconnected to a chuck wall **6** which extends downwardly in a substantially vertical manner. In some embodiments, the chuck wall **6** may be oriented at an angle θ_1, which is preferably between about 0-6 degrees, and more preferably about 4 degrees.

[0026] The chuck wall **6** is interconnected on a lower end to a reinforcing bead **8** which is comprised of a reinforcing bead upper lip **10** on an upper end and a reinforcing bead lower lip **12** on a lower end. The reinforcing bead lower lip **12** extends upwardly and is integrally interconnected to a central panel **14**. Alternatively, an inner panel wall **16** may be provided which extends upwardly at an angle ϕ_1. The chuck wall **6** is interconnected to the reinforcing bead upper lip **10**, which extends outwardly at a lowermost portion towards the can body **20**, and beyond a longitudinal plane defined by the chuck wall **6**. As a result of the internal pressure of the can, the inner panel wall **16** and the reinforcing bead lower lip **12** is pushed outwardly against the reinforcing bead upper lip **10** and which is positioned against the can neck **22**. This geometric configuration has been found to significantly reduce bulk material requirements from between about 3% and 18%, and provides additional resistance to internal buckling.

[0027] Referring now to the beverage can end provided in **FIG. 1**, various dimensional ranges are provided herein, although none of the particular embodiments are necessarily limited to those specific dimensions. More specifically, in one embodiment of the present invention, a crown **18** is shown which represents the uppermost portion of the beverage can end **2**. Preferably the distance from the crown **18** to the uppermost portion of the central panel **14** is between about 0.050 to 0.200 inches. Further, the height between the crown **18** and the uppermost portion of the can body is preferably between about 0.050 to 0.250 inches. Likewise, the distance from the crown **18** to the lowermost portion of the curled peripheral cover hook is between about 0.050 to 0.125 inches. As additionally seen in **FIG. 1**, the total thickness of the peripheral cover hook when it is double seamed to the beverage can end neck **22** is between about 0.030 to 0.075 inches. Further, the radius of the reinforcing bead **8** is preferably between about 0.005 inches to 0.030 inches, while the total outwardly divergence of the reinforcing bead upper lip **10** from the vertical plane defined by the chuck wall **6** is between about 0.005 to 0.030 inches. In this particular embodiment, the material thickness of the central panel is between about 0.005 to 0.014 inches.

[0028] As shown in **FIG. 1** and **FIG. 3**, in one embodiment of the present invention the reinforcing bead **8** is comprised of an upper portion which is oriented downward toward the beverage can neck **22**, and a lower portion which is substantially parallel to the upper portion and which extends upwardly toward the central panel **14**. Thus, the upper portion and lower portion of the reinforcing bead **8** are oriented in a substantially parallel geometric configuration. Thus, as the internal pressure in the can increases, the upper portion and lower portions of the reinforcing bead **8** may come in contact.

[0029] Referring now to **FIG. 2, a** cross-sectional view of an alternative embodiment of the beverage can end **2** is provided herein. More specifically, in this particular embodiment the central panel **14** is not raised above the reinforcing bead **8** or the reinforcing bead upper lip **10**. Rather, there is no inner panel wall **16** extending upwardly from the lowermost portion of the reinforcing bead **8**. Thus, in this particular embodiment the central panel **14** is positioned on substantially the same horizontal plane as the lowermost portion of the reinforcing bead, as opposed to many of the other embodiments where the central panel **14** is raised above the lowermost portion of the reinforcing bead **8**.

[0030] Referring now to **FIG. 3**, an alternative embodiment of the present invention is provided herein and which closely resembles the drawing shown in **FIG. 1**. As depicted in this particular illustration, as pressure is applied internally to the beverage can **20**, the reinforcing bead **8** is forced against the can neck **22** and/or can body **20**. In this embodiment, the central panel **14** is raised above the lowermost portion of the reinforcing bead **8** and identifies an inner panel wall **16** which extends upwardly at an inner panel wall angle ϕ_1.

[0031] Referring now to **FIG. 4, a** cross-sectional front elevation view of a pre-shell conventional can end is shown with the peripheral cover hook **4** interconnected to the beverage can neck **22**. A spinner forming tool **26** is shown positioned on top of the central panel **14**, just prior to being spun to form the beverage can end **2**. As shown, the spinner forming tool **26** additionally has a forming tool hoop **28** which when spun is driven into the lowermost portion of the beverage can end chuck wall **6** proximate to the reinforcing

bead **8**. As shown in **FIG. 5**, as the spinner forming tool hoop **28** is driven outwardly into the reinforcing bead **8**, the reinforcing bead **8** is pushed beyond the vertical plane defined by the chuck wall **6**. This further drives the reinforcing bead upper lip **10** into a lower portion of the can neck **22** and against the can body **20**. In this particular embodiment, the central panel **14** is not raised and is substantially flat with respect to a lowermost portion of the reinforcing bead **8**.

[**0032**] Referring now to FIGS. **6-7**, an alternative embodiment of the present invention is shown herein. More specifically, **FIG. 7** is a cross-sectional elevation view of the embodiment shown in **FIG. 6** but prior to the peripheral cover hook **4** being double seamed to the beverage can neck **22**. In this particular embodiment, the reinforcing bead **8** has a substantially arcuate shape which extends significantly inwards towards the beverage can body **20**, but utilizes a smaller diameter central panel as opposed to the embodiments shown in FIGS. **1-5**. In this embodiment, the chuck wall angle θ_1 is preferably between about 0 degrees and 5 degrees, while the inner panel wall ϕ_1 is preferably between about 0 degrees and 20 degrees. Further, the reinforcing bead upper lip **10** is positioned outside of the longitudinal plane defined by the chuck wall **6**, and extends inwardly therein to rest adjacent the beverage can neck **22** below the double seam. The reinforcing bead **8** further has a reinforcing bead lower lip **12** which is interconnected to the inner panel wall **16**, which extends upwardly and is interconnected to the central panel **14**.

[**0033**] The arcuate shape of the reinforcing bead is believed to provide additional strength to the can end **2** due to its non-linear shape and geometric orientation with respect to the chuck wall **6** as opposed to prior art beverage can ends. The reinforcing bead **8** shown in the beverage can end of FIGS. **6-7** is believed to have a radius of curvature of between about 0.050 and 0.375 inches. Alternatively, the reinforcing bead may be substantially linear. Further, the reinforcing bead **8** preferably has a total horizontal length between the upper lip **10** and lower lip **12** of between about 0.050 and 0.250 inches, depending on the beverage can diameter and the diameter of the central panel **14**. As additionally seen in **FIG. 8, a** cross-sectional front elevation view of a typical can body **20** is provided herein and which identifies the can body **20** and can neck **22** prior to the interconnection to the beverage can end **2**.

[**0034**] Referring now to **FIGS. 9 and 10**, a front perspective view of two different embodiments of the present invention are provided herein. More specifically, in **FIG. 9** the central panel **14** is raised in a given geometric position and which further identifies a pull tab **30** which is used to open the beverage can along a score line **32**. **FIG. 10** represents an alternative embodiment of the beverage can end shown in FIGS. **1-9**, with the central panel **14** raised in a distinctive shape. Further, the beverage can end opening **34** is shown after the score line **32** has been broken by force being applied on the pull tab **30**. As appreciated by one skilled in the art and as described in the earlier drawings, various embodiments of the present invention may be provided where the central panel **14** is not raised as shown in **FIGS. 9 and 10**, but instead extend substantially along the same horizontal plane as the lowermost portion of the reinforcing bead **8**.

[**0035**] For clarity, the following list of components and associated numbering found in the drawings are provided herein:

No.	Components
2	Beverage can end
4	Peripheral cover hook
6	Chuck wall
8	Reinforcing bead
10	Reinforcing bead upper lip
12	Reinforcing bead lower lip
14	Central panel
16	Inner panel wall
18	Crown
20	Can body
22	Can neck
24	Double seam
26	Spinner forming tool
28	Forming tool hoop
30	Pull tab
32	Score line
34	Opening
θ_1	Chuck wall angle
ϕ_1	Inner panel wall angle

[**0036**] It should be appreciated that the present invention as described herein may be modified or adapted in applying the principals of the invention to different embodiments and situations. Accordingly, the embodiments described herein should not be taken as a limitation on the scope of the present invention but rather the invention should only be interpreted in accordance with the following claims and as supported by the specification.

What is claimed is:

1. A metallic beverage can end comprising:

a peripheral cover hook adapted for interconnection to an upper end of a beverage can body;

a chuck wall dependent from an interior of the cover hook, and extending downwardly at a chuck wall angle θ_1;

an outwardly concave annular reinforcing bead extending radially inwards from a lower end of said chuck wall and having an upper lip which extends outwardly beyond a plane defined by said chuck wall angle θ_1; and

a lower lip extending upwardly from said outwardly concave annular reinforcing bead and interconnected to a central panel.

2. The can end of claim 1, wherein said outwardly concave annular reinforcing bead has an arcuate shape extending substantially between said upper lip and said lower lip.

3. The can end of claim 1, wherein said outwardly concave annular reinforcing bead has a radius of curvature of between about 0.005 inches and 0.030 inches.

4. The can end of claim 1, wherein said upper lip extends outwardly from said linear plane defined by said chuck wall at least about 0.005 inches.

5. The can end of claim 1, wherein said outwardly concave annular reinforcing bead has a length of between about 0.005 inches and 0.030 inches.

6. The can end of claim 1, wherein said central panel is elevated above a lowermost portion of said lower lip at least about 0.030 inches.

7. The can end of claim 1, wherein said central panel is positioned at a height substantially between said lower lip and said upper lip.

8. The can end of claim 1, wherein said raised central panel has a circular shape.

9. The can end of claim 1, wherein said raised central panel has an oval shape.

10. The can end of claim 1, wherein said raised central panel has a non-concentric shape.

11. The can end of claim 1, wherein said upper lip is driven into an opposing neck portion of the can body when a given internal pressure is present within said can body, wherein said can end is resistant to failure.

12. The can end of claim 1, further comprising a means for opening said metallic beverage can end.

13. The can end of claim 1, wherein said means for opening comprises a pull tab.

14. The can end of claim 1, wherein said upper lip and said lower lip are substantially parallel.

15. The can end of claim 1, wherein said upper lip and said lower lip define an upper portion and a lower portion of said reinforcing bead which are oriented in substantially opposite directions.

16. A metallic beverage can end, comprising:

a peripheral cover hook adapted for interconnection to a beverage can body;

a chuck wall integrally interconnected to said peripheral cover hook and extending downward at a chuck wall angle θ_1 to define a chuck wall plane;

a reinforcing bead having an upper lip on an upper end and a lower lip on a lower end, said upper lip interconnected to a lower end of said chuck wall, wherein said reinforcing bead has at least a portion which extends outwardly beyond said chuck wall plane toward a side wall of the beverage can; and

a central panel interconnected to said lower lip of said annular reinforcing bead.

17. The beverage can end of claim 16, wherein said reinforcing bead has an outwardly concave shape.

18. The beverage can end of claim 16, wherein said reinforcing bead has a length of about 0.005 and 0.030 between said upper lip and said lower lip.

19. The beverage can end of claim 16, wherein said central panel is vertically raised above said lower lip.

20. The beverage can end of claim 19, wherein said central panel is raised above said lower lip at least about 0.030.

21. The beverage can end of claim 16, wherein said reinforcing bead has an arcuate shape with a radius of curvature of about 0.015 inches.

22. The beverage can end of claim 16, wherein said lower lip is positioned about 0.030 vertical distance from said upper lip.

23. The beverage can end of claim 16, wherein said upper lip is adapted to engage an opposing interior surface of the beverage can body when there is internal pressure within the beverage can body.

24. The beverage can of claim 16, further comprising a pull tab positioned within said central panel, wherein said metallic beverage can may be selectively opened.

25. The beverage can of claim 16, wherein said upper lip and said lower lip define an upper portion and a lower portion of said reinforcing bead which are substantially parallel.

26. A beverage can end, comprising:

a substantially circular end wall adapted for interconnection to a beverage can body;

a chuck wall integrally interconnected to said substantially circular end wall and extending downward at a chuck wall angle θ, as defined from a substantially vertical plane;

a reinforcing bead having an upper lip on an upper end and a lower lip on a lower end, said upper lip interconnected to a lower end of said chuck wall and having at least a portion which extends outwardly beyond said substantially vertical plane and toward a side wall of the beverage can;

a central panel interconnected to said lower lip of said reinforcing bead; and

an opening means interconnected to said central panel for selectively opening said beverage can end.

27. The beverage can end of claim 26, wherein said reinforcing bead is outwardly concave with a radius of curvature of between about 0.005 inches and 0.030 inches.

28. The beverage can end of claim 26, wherein said upper lip is positioned substantially below a double seam of said beverage can end and said beverage can body.

29. The beverage can end of claim 26, wherein said reinforcing bead has a horizontal length between said upper lip and said lower lip of at least about 0.050 inches.

30. The beverage can end of claim 1, wherein said opening means comprises a pull tab.

* * * * *