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(54) **METHOD AND APPARATUS FOR PROCESSING CONTAINERS.**

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Description

This invention relates generally to two-piece container constructions, and more particularly to a method and apparatus for processing such containers to increase the strength thereof, as well as improve the appearance.

Background Prior Art

Two-piece cans are the most common type of metal container used in the beer and beverage industry, as well as for aerosol and food packaging. The two-piece container consists of a unitary body, including a side wall open at one end with an integral end wall at the other end. The integral end wall is usually formed to a domed-shaped configuration to increase the overall strength of the container. An annular portion is usually formed to a special configuration between the center dome panel of the bottom wall and the side wall that defines a reduced diameter support for the container and also provides a nesting feature for nesting with the end of an adjacent container, which is seamed to the open end thereof.

An exemplary bottom profile for a drawn and ironed container that has achieved a remarkable degree of commercial success is disclosed in U.S. Patent No. 4,685,582. The container disclosed therein also includes an upper end portion that has a reduced neck so that a second end panel or end having a smaller diameter can be utilized to enclose the open-ended drawn and ironed container.

In most cases, containers that are used for beer and carbonated beverages are formed from a flat aluminum disc to an outside diameter of 2-11/16th inch (referred to as a "211-container") and the upper open end is reduced in diameter to form a 209-neck (2-9/16th inch) or any other smaller diameter, such as a 207$\frac{1}{2}$-neck, a 206-neck, and even a 204-neck or smaller so that smaller diameter ends can be utilized in the finished package.

An important competitive objective in the packaging industry is to reduce the total can weight as much as possible, while maintaining its strength and performance, in accordance with industry requirements. For pressurized contents, such as soft drinks or beer, the integral bottom end wall of the container usually has the same metal thickness gauge as the initial disc and the side wall is reduced through a drawing and ironing process to a thickness approaching one-third of the thickness of the original metal disc. Accordingly, to minimize overall weight, the can top or end panel that forms the second piece of the two-piece can is made as diametrically small as possible, while still maintaining the structural integrity of the container, the functionality thereof, and an aesthetically-pleasing appearance.

In the manufacture of containers of this type, a sheet of stock material of predetermined thickness is fed to a cupping press, wherein circular discs are cut from the stock material and are transformed into cups having a diameter which is considerably larger than the ultimate diameter of the finished container.

The preformed cups are then transferred to a container-forming apparatus, commonly referred to as a "bodymaker", wherein the cup is aligned with a punch carried on a reciprocable ram which cooperates with a plurality of spaced ironing dies and a doming mechanism located at the end of the path of the punch. During the forming process, the punch initially cooperates with a redraw assembly in which the shallow cup is redrawn to a smaller diameter that has an internal diameter approximately equal to the internal diameter of the ultimately-finished container and a height that is greater than the height of the original cup.

Each cup then passes through a series of ironing dies having progressively reduced diameters so that the side wall of the container is progressively reduced in thickness, while the height of the container increases. At the end of the stroke for the punch or ram, the end of the container is forced into a predetermined configuration to form an integral end wall that has a central inwardly-domed panel and a specially-configured peripheral annular bead or support portion. The drawn and ironed container is then trimmed to a selected height and coated and labeled, and a reduced tapered neck is produced on the open end.

To produce a container that can be price competitive and yet meet the rigid industry requirements, particularly for pressurized contents, such as beer and carbonated beverages, the Assignee of the present invention has developed a die necking operation for sequentially reducing the upper open end of the container to a smooth die neck configuration. This is done through a plurality of steps until the desired reduction for an end, such as a 206- or 204-end, is achieved. This process is disclosed in U.S. Patent No. 4,774,839, incorporated herein by reference. A container of the type having a bottom profile, such as disclosed in U.S. Patent No. 4,685,582, and a smooth die neck configuration illustrated in the above-referenced patent has increased strength characteristics and the overall aesthetic appearance has been enhanced.

In order to further enhance the overall appearance of the two-piece drawn and ironed container, it has also been proposed to deform the container side wall to produce a fluted appearance, such as disclosed in U.S. Patent Nos. DES 283,011 and DES 290,688.

According to the present invention there is provided a method of furthering production of a container, having a longitudinal axis and a side wall which is integral with a bottom having a center domed portion, and a countersink having an annular, substantially longitudinal inner wall and an outer annular wall comprising the step of reforming the bottom characterized by:

supporting said container in a jig, said jig having a bottom peripheral profile portion substantially corresponding in shape to said outer annular wall of said container;

mating the bottom peripheral profile portion of said jig with said outer annular wall; and

bringing a reforming roller into engagement with said inner wall, said reforming roller rotating along said inner wall and about an arcuate path in substantially radial alignment with said mating of said jig and said outer annular wall.

The invention includes apparatus, according to claim 5.

WO83/02577 (Claydon, et. al.) which forms the base of the preambles of claims 1 and 5 discloses various embodiments for reforming the bottom countersink of a container. According to Claydon, the container 10 is supported at its open end by a rotatable pad and at its closed end by various configurations of a support chuck. In each embodiment of Claydon, the support chuck is positioned within the bottom countersink of the container. A work roll is then moved radially inwardly to engage the outer annular wall of the container.

The container produced by the method of the present invention can be formed from a stock material, preferably an aluminum flat disc having a thickness of less than 0,0305 cm (0.0120 inch) and meet the minimum crush and buckle requirements of 1110 N (250 pounds) and 1,6 N/mm^2 (90 psi), respectively.

The container, which is formed from a flat metal disc, preferably aluminum, includes a bottom wall that has a thickness substantially equal to the thickness of the stock material and a reduced side wall thickness that is on the order of 1/3 the thickness of the stock material, with the bottom wall having a central inwardly-domed panel connected to the side wall through a countersink that has outer and inner, generally flat, substantially vertical walls.

Brief Description of the Drawings

Figure 1 is a fragmentary cross-sectional view showing the apparatus utilised for reforming the container bottom wall;

Figure 2 is an enlarged fragmentary cross-sectional view similar to Fig. 1.

Detailed Description

According to the invention, the container that has been formed in accordance with known teachings has even more significantly improved performance characteristics by reforming the bottom end wall of the container from the initial configuration, as disclosed in the above-mentioned '582 patent. Thus, as shown in Figs 1 and 2, after the fluted container has been necked and flanged and has been internally spray coated and externally printed the bottom profile, more specifically the countersink or chime area of the bottom wall, is reshaped by reforming the inner wall of the countersink to further improve buckle resistance and decrease can growth. This particular process would also allow further reduction in stock metal thickness without any change in the cut edge diameter of the initial disc.

Thus, as shown in Fig 1, the finished drawn and ironed container is supported in a suitable jig 150 that has an internal opening 152 which corresponds to the outer peripheral diameter of the container C. The jig has a lower profile portion 154 that conforms to the countersink wall portion of the bottom wall of the container, as orginally formed in accordance with the process disclosed in the '582 patent.

A plug 156 is inserted into the upper end of the opening and securely held in the top of the container. The bottom peripheral profile 154 of the jig 150 is in extended contact with the container bottom 137. A reforming roller 160 is brought into engagement with the outside of the domed end 162 of the container and is supported on a shaft 164 that is designed to be rotated along an arcuate path around the center axis for the container C. The roller has a peripheral configuration 166 which defines a substantially vertical upwardly and outwardly tapered wall having a generally arcuate upper portion 168 so that the inner wall 170 of the countersink is reformed to a more vertical profile while the dome 162 is stretched to a small degree. The outer wall 172 is held to its original configuration. Alternatively, the outer wall could also be reformed with the inner wall.

It has been found that this reforming operation significantly improves buckle resistance and decreases the amount of can growth, i.e., the amount that the bottom end wall is elongated when pressure is applied internally of the container.

Thus, in summary, the container produced according to the method and apparatus of the present invention has significantly less container growth during internal pressurization, and also has improved buckle resistance. The container constructed in accordance with the present invention has been found to be capable of being produced from

stock flat disc material having a significantly reduced thickness.

Claims

1. A method of furthering production of a container, having a longitudinal axis and a side wall (129) which is integral with a bottom (137) having a center domed portion (162), and a countersink having an annular, substantially longitudinal inner wall (170) and an outer annular wall (172) comprising the step of reforming the bottom (137) characterised by:

   supporting said container in a jig (150), said jig (150) having a bottom peripheral profile portion (154) substantially corresponding in shape to said outer annular wall (172) of said container;

   mating the bottom peripheral profile portion (154) of said jig (150) with said outer annular wall (172); and

   bringing a reforming roller (160) into engagement with said inner wall (170), said reforming roller (160) rotating along said inner wall (170) and about an arcuate path in substantially radial alignment with said mating of said jig (150) and said outer annular wall (172).

2. The method of claim 1, said reforming roller (160) being rotated about an arcuate path equidistant from said longitudinal axis.

3. The method of claim 1, wherein said inner wall (170) is reformed to a more vertical position.

4. The method of claim 1, wherein said roller (160) has a peripheral configuration (166) which defines a substantially vertical upwardly and outwardly tapered wall having a generally arcuate portion (168).

5. An apparatus for furthering production of a container having a longitudinal axis and a side wall (129) which is integral with a bottom (137) having a center domed portion (162), and a countersink having an annular, substantially longitudinal inner wall (170) and an outer annular wall (173) by reforming the bottom (137), said apparatus being characterized by :

   a jig (150) having a bottom peripheral profile portion (154) substantially corresponding in shape to said outer annular wall (172) of said container;

   means for supporting said container in said jig (150);

   means for bringing a reforming roller (160) into engagement with said inner wall (170);

   means for rotating said reforming roller (160) along said inner wall (170) and about an arcuate path in substantially radial alignment with said bottom profile (154) of said jig (15) and said outer annular wall (172).

6. The apparatus of claim 5, including means for rotating said reforming roller (160) about an arcuate path equidistant from the axis of the container.

Patentansprüche

1. Verfahren zum Fördern der Herstellung eines Behälters mit einer Längsachse und einer Seitenwand (129), die integral (einstückig) mit einem Boden (137), der einen mittleren gewölbten Bereich (162) aufweist, ausgebildet ist, und mit einer Einsenkung, die eine ringförmige, im wesentlichen längsgerichtete innere Wand (170) und eine ringförmige Außenwand (172) aufweist mit dem Schritt des Verformens des Bodens,
   gekennzeichnet durch
   Halten des Behälters in einem Futter (150), das einen Bodenumfangsprofilbereich (154) aufweist, der im wesentlichen der Form der ringförmigen Außenwand (172) des Behälters entspricht,
   Anpassen des Bodenumfangsprofilbereichs (154) des Futters (150) an die ringförmige Außenwand (172), und
   Inkontaktbringen einer Umformrolle (160) mit der inneren Wand (170), wobei die Umformrolle entlang der inneren Wand (170) und um einen bogenförmigen Weg in einer im wesentlichen radialen Ausrichtung mit der Anpassung des Futters (150) und der ringförmigen Außenwand (172) rotiert.

2. Verfahren nach Anspruch 1, wobei die Umformrolle (160) um einen bogenförmigen weg mit gleichem Abstand zu der Längsachse rotiert.

3. Verfahren nach Anspruch 1, bei dem die innere Wand (170) in eine senkrechtere Stellung umgeformt wird.

4. Verfahren nach Anspruch 1, bei dem die Rolle (160) eine Umfangsausbildung (166) aufweist, die eine im wesentlichen vertikal nach oben und nach auswärts geschrägte Wand mit einem allgemein bogenförmigen Bereich (168) definiert.

5. Vorrichtung zum Fördern der Herstellung eines Behälters mit einer Längsachse und einer Seitenwand (129), die integral (einstückig) mit ei-

nem Boden (137), der einen mittleren gewölbten Bereich (162) aufweist, ausgebildet ist, und mit einer Einsenkung, die eine ringförmige, im wesentlichen längsgerichtete innere Wand (170) und eine ringförmige Außenwand (172) aufweist durch Umformen des Bodens (137),
gekennzeichnet durch
ein Futter (150) mit einem Bodenumfangsprofilbereich (154), der in seiner Form im wesentlichen der ringförmigen Außenwand (172) des Behälters entspricht;
Mittel zum Bringen einer Umformrolle (160) in Kontakt mit der inneren Wand (170),
Mittel zum Rotieren der Umformrolle (160) entlang der inneren Wand (170) und um einen bogenförmigen Weg in einer im wesentlichen radialen Ausrichtung mit dem Bodenprofil (154) des Futters und der ringförmigen Außenwand (172).

6. Vorrichtung nach Anspruch 5 mit Mitteln zum Rotieren der Umformrolle um einen bogenförmigen Weg mit gleichem Abstand zu der Achse des Behälters.

Revendications

1. Procédé de reprise dans la fabrication d'un récipient possédant un axe longitudinal, une paroi latérale (129) qui est d'un seul tenant avec un fond (137) ayant une partie centrale (162) bombée en dôme, et une emboîture ayant une paroi annulaire intérieure (170) sensiblement longitudinale et une paroi annulaire extérieure (172), comprenant la phase consistant à corriger la forme du fond (137), caractérisé par les étapes consistant à :

placer ledit récipient dans un montage (150), ledit montage (150) ayant une partie de profil périphérique inférieur (154) qui correspond sensiblement par sa forme à ladite paroi annulaire extérieure (172) dudit récipient ;

accoupler la partie de profil périphérique inférieur (154) dudit montage (150) avec ladite paroi annulaire extérieure (172) ; et

mettre un galet correcteur de forme (160) en prise avec ladite paroi intérieure (170), ledit galet correcteur de forme (160) tournant le long de ladite paroi intérieure (170) et selon une trajectoire courbe située sensiblement dans l'alignement radial de la zone dudit accouplement dudit montage (150) avec ladite paroi annulaire extérieure (172).

2. Procédé selon la revendication 1, dans lequel ledit galet correcteur de forme (160) est mis en rotation le long d'une trajectoire courbe qui est à distance constante dudit axe longitudinal.

3. Procédé selon la revendication 1, dans lequel ladite paroi intérieure (170) est corrigée pour prendre une position plus verticale.

4. Procédé selon la revendication 1, dans lequel ledit galet (160) possède une configuration périphérique (166) qui définit une paroi à peu près verticale, en pente vers le haut et vers l'extérieur, ayant une portion (168) de forme générale arrondie.

5. Machine destinée à effectuer une reprise dans la fabrication d'une boîte ayant un axe longitudinal, une paroi latérale (129) qui est d'une seule pièce avec un fond (137) ayant une partie centrale (162) bombée en dôme, et une emboîture ayant une paroi annulaire intérieure (170) sensiblement longitudinale et une paroi annulaire extérieure (173), en corrigeant la forme du fond (137), ladite machine étant caractérisée par :

un montage (150) ayant une partie de profil périphérique inférieur (154) qui correspond sensiblement par sa forme à ladite paroi annulaire extérieure (172) dudit récipient ;

des moyens servant à donner appui audit récipient dans ledit montage (150) ;

des moyens servant à mettre un galet correcteur (160) en prise avec ladite paroi intérieure (170) ;

des moyens servant à faire tourner ledit galet correcteur (160) le long de ladite paroi intérieure (170) et selon une trajectoire courbe située sensiblement dans l'alignement radial dudit profil inférieur (154) dudit montage (15) et de ladite paroi annulaire extérieure (172).

6. Machine selon la revendication 5, comprenant des moyens servant à faire tourner ledit galet correcteur (160) le long d'une trajectoire courbe à distance constante de l'axe du récipient.

FIG. 1

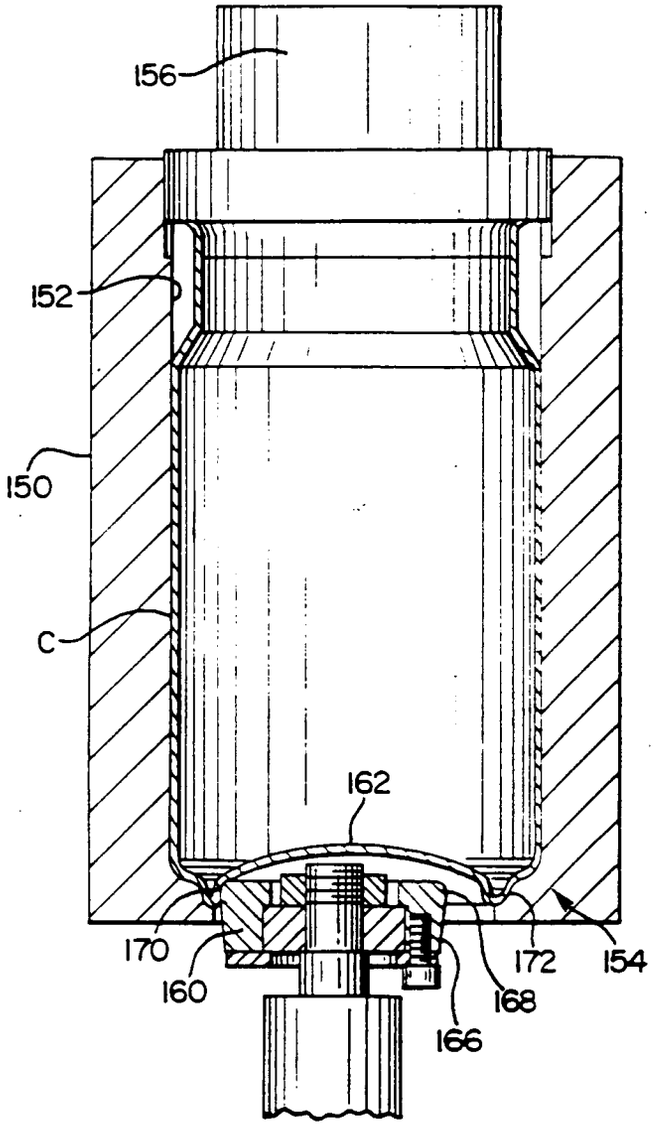
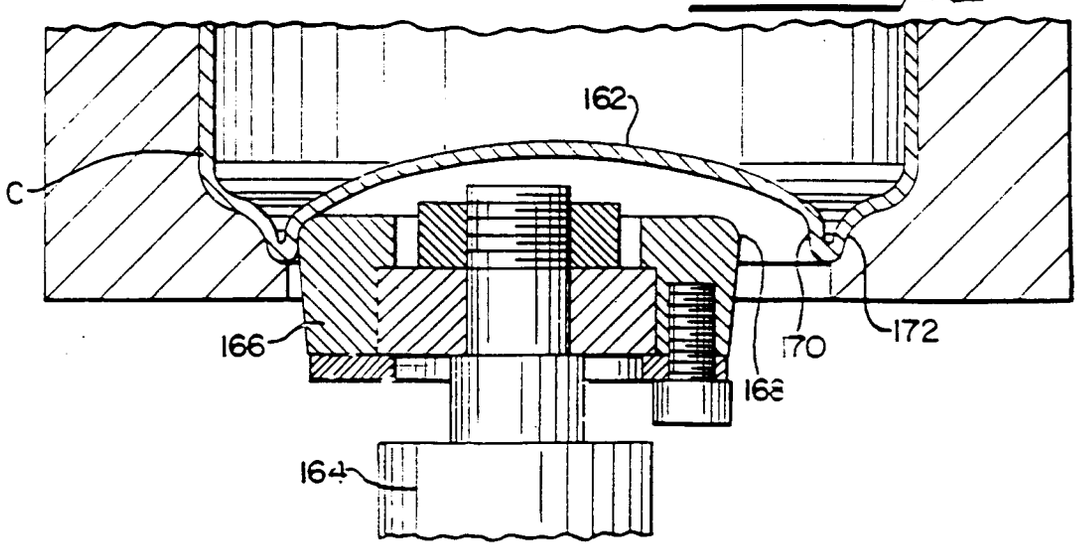

156
152
150
C
162
170
160
166
168
172
154

FIG. 2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