

CAN BODIES

The invention relates to metal can bodies for beverage cans. Such can bodies are adapted to be closed by a can end seamed to the open end of the can body to form a closed can.

Known can bodies for beverage cans are made by drawing and ironing sheet metal to comprise a bottom end wall and a generally cylindrical side wall; the side wall comprising a bottom portion of circular cross section connected to the bottom wall, a central portion of constant wall thickness extending above the bottom portion, and a top portion of circular cross section extending above the central portion and terminating in an open end; wherein the top portion and bottom portion are of greater wall thickness than the central portion and are respectively connected to the central portion through upper and lower cylindrical zones of reducing wall thickness. Such can bodies are described in GB 1320061 and US3,989,159.

During handling of can bodies small dents may be made in the cylindrical wall and these dents provide localised points of weakness which can lead to creasing during necking and flanging of the neck of the can body, and filling double seaming of the can end onto the can body during which the can body is subjected to an axial load. It has been found that the provision of a plurality of parallel longitudinally extending outwardly convex ribs in the central portion of the can body will reduce or eliminate the effect of such dents and give axial strength to the can. EP-A-0425124 (published after the priority date of the present application) describes a metal can body for a beverage can made by drawing and ironing sheet metal to comprise a bottom end wall and a generally cylindrical side wall; the side wall comprising

a cylindrical bottom portion connected to the bottom wall, a central portion of constant wall thickness extending above the bottom portion, and a cylindrical top portion extending above the central portion and terminating in an open end; wherein the top portion and bottom portion are of greater wall thickness than the central portion and are respectively connected to the central portion through upper and lower cylindrical zones of reducing wall thickness; and wherein the side wall is provided with a plurality of parallel sided panels each formed to the next by an externally convex longitudinal rib, said ribs and panels being equally spaced around the circumference of the can body.

In the can body of EP-A-0425124 the panels are formed entirely in the central portion of constant wall thickness.

It has now been found that the optimum performance of the can body is achieved when the ribs and panels terminate in the zones of reducing wall thickness and thus connect the portions of greater wall thickness together.

Accordingly the invention provides a metal can body for a beverage can made by drawing and ironing sheet metal to comprise a bottom end wall and a generally cylindrical side wall; the side wall comprising a bottom portion of circular cross section connected to the bottom wall, a central portion of constant wall thickness extending above the bottom portion, and a top portion of circular cross section extending above the central portion and terminating in an open end; wherein the top portion and bottom portion are of greater wall thickness than the central portion and are respectively connected to the central portion through upper and lower cylindrical zones of reducing wall thickness; characterised in that the side

wall is provided with a plurality of parallel sided panels each joined to the next by an externally convex longitudinal rib, said ribs and panels being equally spaced around the circumference of the can body; and in that the ribs and panels terminate at either end within the zones of reducing wall thickness.

According to a second aspect, the invention provides a method of forming a can body for a beverage can comprising the steps of

a) drawing and wall ironing sheet metal to form a can body comprising a bottom end wall and a generally cylindrical side wall; the sidewall comprising a bottom portion of circular cross-section connected to the bottom end wall, a central portion extending above the bottom portion, and a top portion of circular cross-section extending above the central portion and terminating in an open end; wherein the top portion and bottom portion are formed to have a greater wall thickness than the central portion and are respectively connected to the central portion through upper and lower cylindrical zones of reducing wall thickness;

the method being characterised by the subsequent step of

b) forming a plurality of parallel sided panels in the sidewall, each joined to the next by an externally convex longitudinal rib; said ribs and panels being equally spaced around the circumference of the can body; wherein the ribs and panels terminate at both their ends within the zones of reducing wall thickness.

Embodiments of the invention are described below with reference to the accompanying drawings in which:-
Figure 1 shows a partial section of a can body prior to provision of the longitudinal ribs;

Figure 2 shows a partial section of a can body after provision of the longitudinal ribs;

Figure 3 shows a side view of a can body, partially in section after provision of the ribs and after necking and flanging;

Figure 4 is a graph representing the wall thickness of the can body of Figure 3 against height;

Figure 5 is a side view of a can body;

Figure 6 is a horizontal section of the can body of Figure 5 taken on lines VI-VI;

Figures 7 and 8 are similar views to those of Figures 5 and 6 of an alternative embodiment of can body;

Figure 9 is a radial cross section through a mandrel for forming ribs in a can body; and

Figure 10 is an axial section through a mandrel for forming a can body.

Referring to Figures 1-4 it will be seen that the can body 1 comprises a bottom end wall 2, which in this case is domed, and a side wall 3. The side wall 3 comprises a bottom portion 4 connected to the bottom end wall, a central portion 5 and a top portion 6 terminating in an open end. The top portion 6 and bottom portion 4 are of greater wall thickness than the central portion 5 and are respectively connected to the central portion 5

through upper and lower cylindrical zones 7,8 which have a wall thickness which reduces towards the central portion 5. Typically the wall thickness of the top portion will be about 0.15mm (.0060 inches), central portion about 0.1mm (.0040 inches), and bottom portion about 0.3mm (.0120 inches). The can body of Figure 1 is formed by blanking a disc from sheet metal, drawing a cup from the disc to form a bottom end wall and a side wall, and wall ironing the side wall. Figure 2 shows the can body after the provision of a plurality of parallel longitudinally extending convex ribs 10 equally spaced around the circumference. The ribs 10 terminate in the zones 7, 8. Adjacent ribs define elongate panels 11 therebetween. Each panel 11 has semi-elliptical shaped end areas formed within the zones 7,8. The ribs and panels extend into the zones 7,8 to optimize the can body performance by providing strengthening columns connecting the upper and lower portions 4, 6 of relatively great wall thickness.

Figure 3 shows the can body after necking and flanging of the top portion 6 in readiness for receiving a can end to be seamed to the flange 12 in known manner.

Figure 4 shows the thickness profile of the side wall as it varies through the height of the can body.

Figures 1-4 show a can body provided with only 24 ribs 10 and panels 11. It is believed that can bodies

having from about 24 to about 45 ribs are useful for beverage cans. If the number of ribs is less than about 24 there is a significant reduction in the volume of the finished can.

Figures 5 and 6 show a can body having 30 ribs 10 and panels 11. Each rib is outwardly convex having a radius P and lies on a circle of radius R where R is the radius of the can body in the middle of the central portion prior to formation of the ribs. The panels 11 are outwardly concave and have a radius U . The concavity of the panels 11 has been exaggerated in Figures 5 and 6. The ratio of $U:P$ is preferably at least 20:1. Typically the rib radius P will be about 1mm. The perimeter of the can body in the central portion after forming of the ribs is the same as it was beforehand and the radii R , P and U are related by the equation $R=U+2P$. In this manner, stretching of the can wall during formation of the ribs is avoided.

In a further embodiment shown also in Figures 7 and 8, also having 30 ribs 10, the panels are substantially flat. In this case the ribs 10 will lie on a circle whose radius is very slightly greater than the radius R prior to formation of the ribs and panels. As a result of the wall ironing process for forming the can body, however, the top and bottom portions 6 and 4 have a

slightly greater radius than the central portion and the radius of the central portion of the can body after formation of the ribs will be no greater than the radius of the top and bottom portions. This is important in handling since the can body must roll truly.

Figures 9 and 10 show a mandrel 20 used in formation of the ribs and panels. The can body is located over the mandrel which is then rolled along an external forming rail (not shown). The ribs are formed prior to necking of the can body but nevertheless the mandrel must be of smaller radius than the can body so that it can be extracted from the can body. To this end it is formed with less ribs than the can body. In the example shown the mandrel 20 has 29 ribs 21 for forming a can body with 30 ribs. Between the ribs 21 on the mandrel are panels 22 which are outwardly concave. The profiles of the panels 22 will determine the profiles of the panels 11 in the can body. The mandrel shown in Figs. 9 and 10 is for forming the can body of Figs. 7 and 8 having substantially flat panels 11. During formation, the side wall of the central portion of the can body is locally deformed to the profile of the mandrel 20 but due to the natural resilience of the material the panels of the can body will subsequently spring back to a substantially flat profile. If a can body as shown in Figs. 5 and 6 is required, the panels 22

of the mandrel 20 are formed more deeply concave. The depth of the panel must, however, be relatively shallow to avoid excessive loss of volume and to prevent the panels from reversing when subjected to internal pressure as would be experienced when the can is filled with a carbonated drink.

The improved performance of can bodies as a result of the panelling may be used to increase the axial load strength, or to allow a reduction of the wall thickness of the central portion 5 without loss of axial strength. Comparative tests have shown that the performance of panelled can bodies having a wall thickness in the central portion of 40×10^{-4} inches is comparable to that of unpanelled can bodies of wall thickness 43×10^{-4} inches. Considering the large number of can bodies made, this represents a very significant saving.



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CLAIMS

1. A metal can body for a beverage can made by drawing and ironing sheet metal to comprise a bottom end
5 wall (2) and a generally cylindrical side wall (3); the side wall comprising a bottom portion (4) of circular cross section connected to the bottom wall, a central portion of constant wall thickness extending above the bottom portion, and a top portion of circular cross-
10 section (6) extending above the central portion and terminating in an open end; wherein the top portion and bottom portion are of greater wall thickness than the central portion and are respectively connected to the central portion through upper and lower cylindrical zones
15 of reducing wall thickness (7, 8); characterised in that the side wall is provided with a plurality of parallel sided panels (11) each joined to the next by an externally convex longitudinal rib (10), said ribs and panels being equally spaced around the circumference of the can body; and in that the ribs and panels terminate at either end
20 within the zones of reducing wall thickness (7, 8).
2. A metal can body as claimed in Claim 1 wherein each panel has semi-elliptical shaped end areas formed within the zones of reducing wall thickness.
- 25 3. A metal can body as claimed in Claim 2 wherein the panels are outwardly concave.
4. A metal can body as claimed in Claim 2 wherein the panels are substantially flat.
5. A metal can body as claimed in any preceding
30 claim wherein the number of panels is from 24 to 45.
6. A metal can body as claimed in Claim 5 wherein the number of panels is about 30.
7. A method of forming a can body for a beverage can according to Claim 1 comprising the steps of
35 a) blanking a disc from sheet metal, drawing a



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cup from the disc to form a bottom end wall and a side wall, and wall ironing the side wall to form a can body comprising a bottom end wall (2) and a generally
5 cylindrical side wall (3); the sidewall comprising a bottom portion (4) of circular cross-section connected to the bottom end wall, a central portion (5) extending above the bottom portion, and a top portion (6) of circular cross-section extending above the central portion and
10 terminating in an open end; wherein the top portion (6) and bottom portion (4) are formed to have a greater wall thickness than the central portion (5) and are respectively connected to the central portion through
15 upper and lower cylindrical zones (7,8) of reducing wall thickness;

the method being characterised by the subsequent step of

b) forming a plurality of parallel sided
panels (11) in the sidewall, each joined to the next by an
20 externally convex longitudinal rib (10); said ribs and panels being equally spaced around the circumference of the can body; wherein the ribs and panels terminate at both their ends within the zones (7,8) of reducing wall thickness.

25 8. A metal can body substantially as described herein with reference to the accompanying drawings.

9. A method of making a metal can body substantially as described herein.
