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This invention relates to a method of beading a container. More particularly, but not exclusively, it relates to a method of manufacturing a can body provided with a beading zone and an improvement in the beading operation itself.

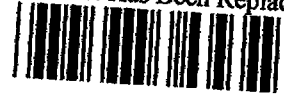
In the manufacture of a "three piece" cylindrical can, two longitudinal edges of a rectangular blank are typically welded together or seamed so as to form a sleeve to which two ends are attached, usually by a double seam, to form the completed container. Annular beading of the sleeve has been used in order to increase the radial strength of the can but this can only be achieved by a compromise involving a loss in the axial strength. The inclusion of a beading zone thus increases the radial strength of a metal container but reduces resistance to axial loads.

Beading of this type is known in which a number of circumferential beads are impressed in the form of grooves which are parallel to each other and regularly spaced to
20 create an annular beading zone. The beading zone is generally located in the central part of the can body, between two smooth annular zones.

Similarly, for a "two piece" can, it is known to use the same beading technique on a can body which has been
25 drawn and to which a single end is seamed.

According to the present invention, there is provided a method of beading a cylindrical metal can body comprising impressing grooves which form a predetermined number of annular beads substantially parallel to and
30 regularly spaced from each other, the beads providing an annular beading zone which is located between two smooth zones, characterised by impressing at least one bead at the end of the beading zone less deeply than the other beads.

35 The provision of one or more shallow beads at the end
of the beading zone has been found by the Applicant to



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improve the performance of the container when axially loaded. Furthermore, two types of deformation described below which give rise to weak points in the can and can be a source of collapse are alleviated or completely
5 eliminated by the inclusion of these shallow beads. The removal of these deformations thus significantly improves the performance of the can when axially loaded.

The present invention has the advantage that the axial strength of the can is improved without any
10 reduction in the radial strength. This radial strength is not reduced in comparison with a can having a traditional beading zone formed with equal depth grooves. The gain in mechanical performance when axially loaded over a can having nominally deep beading (0.4mm) has been shown to be
15 of the order of 15%. Thus the performance of the can when axially loaded is greatly increased without decreasing the radial strength.

The first deformation which the provision of at least one shallower groove at the extremity of the beading
20 zone has been found to eliminate completely is the problem of "springback". Springback is attributed to radial shrinkage of the metal after beading and leads to a more accentuated corrugation than foreseen, the corrugation projecting outwards at each extremity of the beading zone.

25 Any slight overall deformation, known as "en diablo" of the can body is very greatly reduced by the provision of shallow beading in accordance with the present invention. This deformation results in curvature of the beading zone which decreases the can performance, in
30 particular the ability of the can to withstand axial loads. Even where some slight curvature remains in the beading zone, the axial load performance is greatly improved by the use of shallow beads.

In one embodiment there may be a plurality of beading
35 zones. Preferably, at least two shallower beads are provided, usually one at each extremity of the or each



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beading zone. Alternatively, a plurality of shallower beads may be provided at each end of the or each beading zone.

According to the form and type of can body, between 5 two and four beads may advantageously be provided at each extremity of the or each beading zone. In a further embodiment, where several shallower beads are impressed, these may typically increase in depth with distance from the adjacent smooth annular zone.

10 According to a further aspect of the present invention, there is provided a metal container having a cylindrical body which is stiffened radially by parallel annular beads which are regularly spaced relative to each other, the beads forming at least one annular beading zone 15 located between two smooth annular zones, characterised in that at least one bead at the end of the or each beading zone is less deep than the others.

A preferred embodiment of container beading will now be described, by way of example only, with reference to 20 the drawings, in which:

Figure 1 is a side view of a can body according to the invention;

Figure 2 is an enlarged partial side section of the area II of Figure 1 showing the beading of the present 25 invention; and

Figure 3 is an enlarged section of beading apparatus and can side wall, illustrating the beading of a cylindrical sleeve with a smooth wall.

Figure 1 shows a cylindrical can body 11, here formed 30 from a rectangular blank which has had its two longitudinal edges joined and then welded or seamed to form a sleeve. The join is not shown in figure 1. The two extremities 12, 13 of the sleeve have been flanged so as subsequently to form double seams with respective can 35 ends.

In order to increase mechanical strength,



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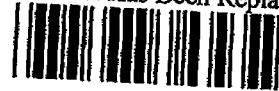
particularly in the radial direction, the can body has been beaded around its circumference. Shock-resistant beads 15 in the vicinity of the two extremities of the sleeve are shown but do not form part of the present invention.

An annular beading zone 17 is provided in the central portion with a number of circular beads 18 in the form of grooves, which are parallel and regularly spaced relative to each other. Consequently, this beading zone 10 is located between two smooth annular zones 19, 20 where the initially cylindrical can body has not undergone any deformation.

In the example shown in the drawings, which corresponds to a typical type of can, the beading zone 15 comprises nineteen beads 18, which have been obtained by rotating the can whilst squeezing the can body between a roll 21 and a fixed member 22, as shown in figure 3. Each bead comprises corrugations of adapted dimensions and shapes. In figure 3, the apparatus is shown prior to 20 bringing the roll 21 and fixed member 22 together to bead the can body.

In accordance with the invention, at least one bead 18a is impressed less deeply than are the others, this bead being situated at the end of the beading zone. In 25 the examples represented, two such shallower beads 18a, 18b have been impressed at each end of the beading zone with different depths increasing from each neighbouring smooth annular zone. Clearly a different number of shallower beads can be provided according to the form of 30 the can.

By way of example, in the case specifically described, the beads are grooves with inclined sides, so that the side section of the sleeve as shown in figure 2 appears to be approximately sinusoidal in its beading 35 zone. The nominal depth of each bead is $d_0 = 0.4\text{mm}$, with the bead nearest the smooth annular zone having a depth of



$d_1 = 0.3\text{mm}$ and the second bead from the smooth zone having a depth of $d_2 = 0.35\text{mm}$.

As noted above, any projection at the junction of the beading zone and each smooth zone has been eliminated and
5 the can body maintains a substantially cylindrical shape after the beading has been formed.

It will be appreciated that the invention has been described above by way of example only, and that changes may be made without departing from the scope of the
10 invention as defined by the claims.



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CLAIMS

1. A method of beading a cylindrical metal can body comprising impressing grooves which form a predetermined number of annular beads substantially parallel to and regularly spaced from each other, the beads providing an
5 annular beading zone which is located between two smooth zones, characterized by impressing at least one bead at each extremity of the beading zone less deeply than the other beads, whereby axial loading performance is increased without decreasing radial strength of the can.
- 10 2. A method according to claim 1, characterised by impressing a plurality of shallower beads at each extremity of the beading zone.
3. A method according to claim 1 or claim 2, characterised by impressing a plurality of shallower beads
15 which increase in depth with distance from the adjacent smooth zone.
4. A metal container having a cylindrical body which is stiffened radially by substantially parallel annular beads which are regularly spaced relative to each other, the
20 beads forming an annular beading zone located between two smooth annular zones, characterised in that at least one bead at each extremity of the beading zone is less deep than the others, whereby axial loading performance is increased without decreasing radial strength of the can.
- 25 5. A container according to claim 5 characterised by a plurality of shallower beads at each end of the beading zone.
7. A container according to claim 5 or claim 6, characterised by a plurality of shallower beads, with
30 depths increasing from the or each neighbouring smooth annular zone.