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(54) **Can height control**

(57) A method of controlling the dimensions of a "finished" can for a shaped three piece can comprises forming a fully circumferential feature such as a bead (21) on the shaped cylinder (20) which comprises the side wall of the can body blank. The can body blank is subjected to an axial load which causes the bead to deform in a controlled manner in order to adjust the height (H2) of the shaped can body blank. The height of the blank (H3) is thus made compatible with standard machinery used to produce the finished can (23) and the finished shaped can is of the same level of dimensional quality as cylindrical cans made using the same standard machinery.

Fig.3(a).

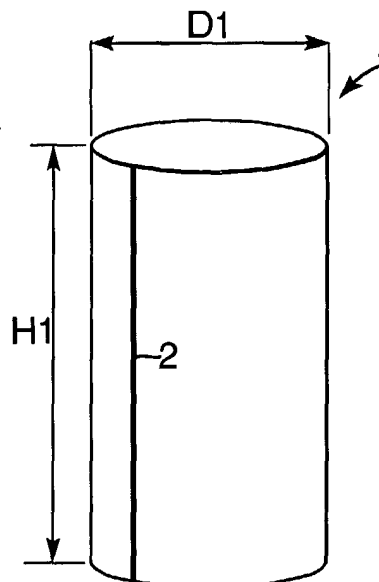


Fig.3(b).

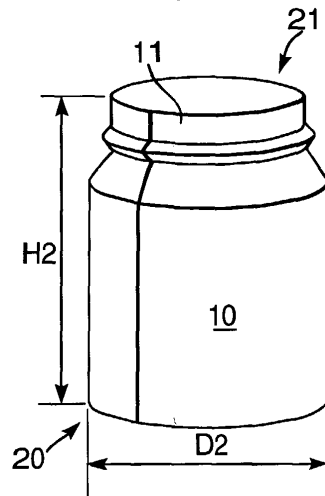


Fig.3(c).

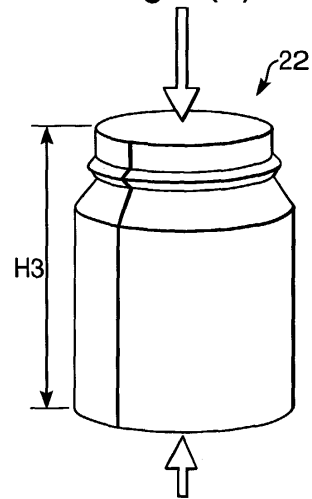
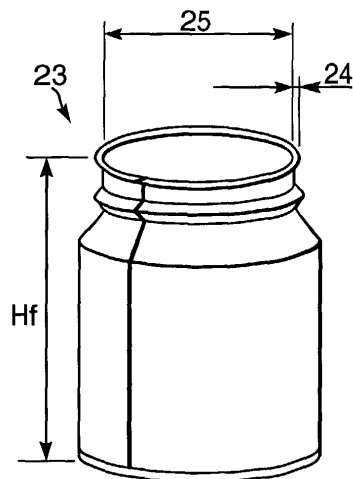


Fig.3(d).



Description

[0001] This invention relates to a method of controlling can height. In particular, but not exclusively, it relates to a method of controlling the height of a shaped three piece can in order to obtain the same dimensional tolerances as for a cylindrical can using standard production lines.

[0002] Three piece cans conventionally comprise a cylinder formed from sheet metal by welding along a side "seam". This cylinder is then formed into a can on the production line by a series of processes such as forming flanges on the open ends of the cylinder and fixing a can end to one end of the cylinder. The finished can is then filled with a food product, for example, and closed at its remaining open end by the customer (i.e. the filler).

[0003] In order for the initial cylinder to be compatible with the machinery used to form the "finished" can, tolerances are specified to control the operation. For the finished can to be closed by seaming after filling by the customer, typical specifications require the height to be within ± 0.5 mm, flange width within ± 0.2 mm and internal diameter within ± 0.1 mm.

[0004] For standard processed cans, meeting these tolerances does not present any problem. With the introduction of shaped cans into the market in recent years, however, the height of the finished can is particularly prone to variation outside the acceptable tolerance levels. This often arises if any variation in diameter by expansion or compression of the open ended cylinder is required, as this shaping is conducted after welding but prior to finishing the can production process.

[0005] The height of a shaped cylinder of tinplate, for example, after such expansion cannot be controlled accurately due to the anisotropy of the tinplate from which the can body blank (shaped cylinder) is formed. Variations in height of the can blank after shaping may be up to ± 1.5 mm. This variation is unacceptable as it is not compatible with the standard machinery used in the subsequent operations to form the finished can. Furthermore, the can formed at the end of the process cannot be guaranteed to be within the usual tolerances for finished can height, diameter and flange width (see above).

[0006] This invention seeks to provide a solution to these problems which will be acceptable to the customer and reduce the quantity of scrap from can body blanks or finished cans which are outside acceptable tolerance levels.

[0007] According to the present invention, there is provided a method of forming a can body for a three piece can, the method comprising: forming a can body blank comprising a cylinder of sheet metal; shaping the can body blank by expansion or compression at one or more positions along the side wall of the cylinder; and producing a finished can body from the can body blank; characterised by forming a feature which extends

around the full circumference of the side wall of the cylinder; and calibrating the height of the can body blank by axially compressing the blank along its longitudinal axis so as selectively to deform the feature at one or more positions around the blank.

[0008] The terms "cylinder" and "circumference" above are intended herein to encompass any tube including those which are polygonal in cross-section, as desired. Generally the fully circumferential feature comprises a bead.

[0009] The calibration step may include measuring the height of the blank around the whole circumference prior to or during axial loading. By using a fully circumferential feature such as a bead in order to calibrate can height, it is possible to produce a wide variety of can shapes which can be finished, by necking/flanging and by having ends seamed to both ends of the tubular can body, using standard can making lines. Although in theory special lines built with special machines could be used for different shapes of can, in practice the investments involved would not be compatible with the promotional markets generally involved.

[0010] Preferably, the calibrating step takes place on the shaped can body prior to finishing. By calibrating can height after shaping, any height variations due to the expansion (or compression) process are absorbed prior to the standard production process. As a result, the same level of dimensional quality can be achieved for shaped cans as for conventional cylindrical cans.

[0011] The axial compression may comprise applying an axial load to an open end of the can body blank such that the load is transmitted axially along the side wall of the can body. The axial load can be varied around the circumference of the blank, according to the required height adjustment. As the height of the shaped can may vary around the circumference of the can, the ability to vary the applied load can compensate not only for variations between cans but also around the circumference of an individual can.

[0012] Typically, the fully circumferential feature is formed in a region of smallest diameter such as a neck. The profile and size of the fully circumferential feature may be selected for optimum axial flexibility during calibration. It is easier to provide a bead on the smallest diameter portion, particularly where the shaping is by expansion, as this region will have been subjected to less thinning of the metal, which may arise during expansion.

[0013] The step of forming a fully circumferential feature may be carried out as part of the shaping step, or as a separate forming or beading operation.

[0014] The step of axially compressing the blank may be carried out as an independent step or as part of another operation which requires the blank to be compressed.

[0015] A preferred embodiment of the invention will now be described, by way of example only, with reference to the drawings, in which:

Figure 1 is a diagrammatic representation of the standard production process for making cylindrical cans;

Figure 2 is a diagrammatic representation of a standard production process for making shaped cans; and

Figure 3 diagrammatic representation of a process for making shaped cans according to the invention.

[0016] The standard production process for making cylindrical three piece cans is shown in figure 1. A blank of sheet metal is first formed into a cylinder 1 and joined, for example by welding along a side seam 2. In figure 1 (a), the welded cylinder has a height H1 and a diameter D1. Standard canmaking machinery is used to produce a finished can 3 having finished height Hf, base 4 seamed onto the cylindrical side wall 5 and open end 6 with flanged edge 7. The initial height H1 of the welded cylinder is very precise (within ± 0.1 mm tolerance) so that the critical parameters for the open end of the "finished" can 3 are well within the prescribed tolerance of ± 0.5 mm for Hf, ± 0.2 mm for flange width 8 and ± 0.1 mm for internal diameter 9.

[0017] In figure 2, the welded cylinder 1 undergoes a shaping process (figure 2(b)) to expand the cylinder along a region of its lower side wall 10 such that the lower side wall diameter D2 is larger than the diameter D1 of the upper side wall 11. This results in a change in the height H2 of the expanded cylinder 12. Due to the standard anisotropy of the tin plate from which the cylinder is made, this height H2 after expansion cannot readily be controlled. For example, variations in H2 can often be ± 1.5 mm. This variation is not compatible with the standard machinery used to finish the can where good height control is necessary, for example, to produce a neck and flange. Furthermore, the open end dimensions (diameter 14, flange width 15 and height 15) of finished can 13, are often outside specified tolerance such that the finished can must be scrapped.

[0018] A method according to the present invention is shown schematically in figure 3. Starting with a cylinder 1, typically of tin plate, with a welded side seam 2 as in figures 1 and 2, the cylinder is shaped into a can blank 20 by expanding its lower side wall 10 (figure 3(a)). As part of this shaping operation as shown, or as a separate beading step, a fully circumferential bead 21 is formed in the upper side wall 11.

[0019] The profile and size of this "technical bead" 21 is defined to give axial flexibility to the shaped cylinder 20. The radius of the bead should be as small as possible to obtain optimum flexibility. The selected parameters are dependent on thickness, temper and control of operations which are not carried out by the manufacturer. The manufacturer may specify maximum seaming load to be applied by a customer applies if it is the customer who fills and closes the can but will be unable to control this in all instances.

[0020] A unique process step in the present invention

is shown in figure 3(c), in which the shaped can body blank 20 is compressed axially as demonstrated by the arrows in bold. During this compression, the shape of the bead changes, depending on the difference in height it has to absorb. If necessary, the axial load applied may vary around the circumference of the can body blank so that can height can also be adjusted circumferentially.

[0021] Although shown as an independent step, this calibration operation may be incorporated in a separate operation such as a die-flanging operation. At the end of the axial loading, the can body blank comprises a shaped cylinder 22 having height variations H3 which fall within the acceptable dimensional tolerances to allow good finishing of the can using standard machinery. The dimensional tolerance of open end features of the finished can 23 such as finished can height Hf, flange width 24 and diameter 25 can also be guaranteed due to the calibration of the shaped can body blank.

Claims

1. A method of forming a can body, the method comprising:

forming a can body blank comprising a cylinder of sheet metal;
shaping the can body blank by expansion or compression at one or more positions along the side wall of the cylinder; and
producing a finished can body from the can body blank;

characterised by:

forming a feature which extends around the full circumference of the side wall of the cylinder; and
calibrating the height of the can body blank by axially compressing the blank along its longitudinal axis so as selectively to deform the feature at one or more positions around the blank.

2. A method according to claims 1, in which the calibrating step takes place on the shaped can body prior to finishing the can body.
3. A method according to claim 1 or claims 2, in which the axial compression comprises applying an axial load to an open end of the can body blank, said load varying around the circumference of the blank, according to the required height adjustment.
4. A method according to any one of claims 1 to 3, in which the fully circumferential feature is formed in a region of smallest diameter.
5. A method according to any one of claims 1 to 4, in

which the profile and size of the fully circumferential feature are selected for optimum axial flexibility during calibration.

6. A method according to any one of claims 1 to 5, in which the step of forming a fully circumferential feature is carried out as part of the shaping step. 5
7. A method according to any one of claims 1 to 5, in which the step of forming a fully circumferential feature is carried out as a separate forming or beading operation. 10
8. A method according to any one of claims 1 to 7, in which the step of axially compressing the blank is carried out as an independent step. 15
9. A method according to any one of claims 1 to 7, in which the step of axially compressing the blank is carried out as part of another operation which requires the blank to be compressed. 20

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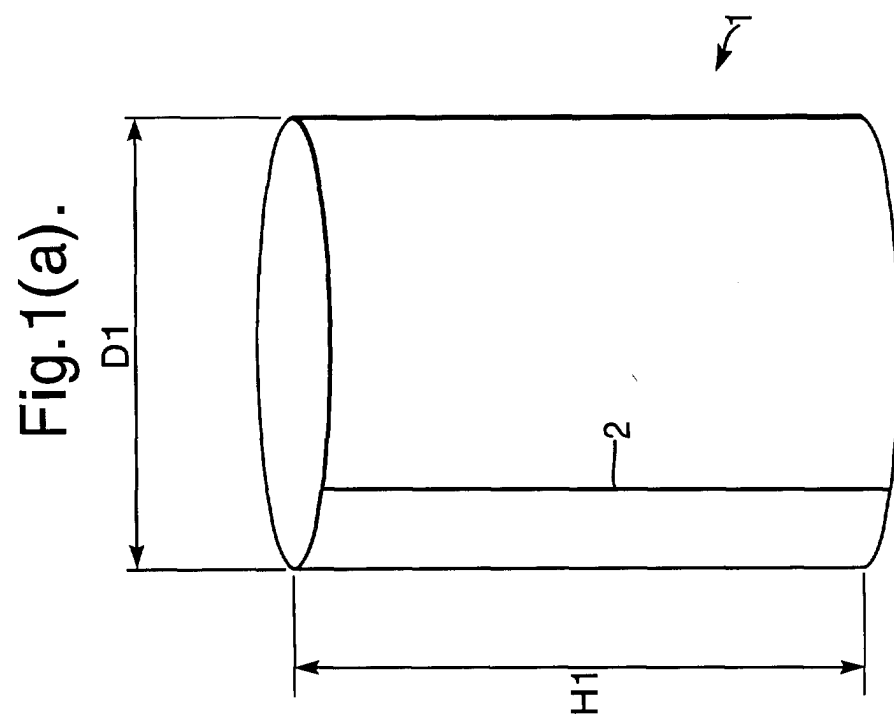
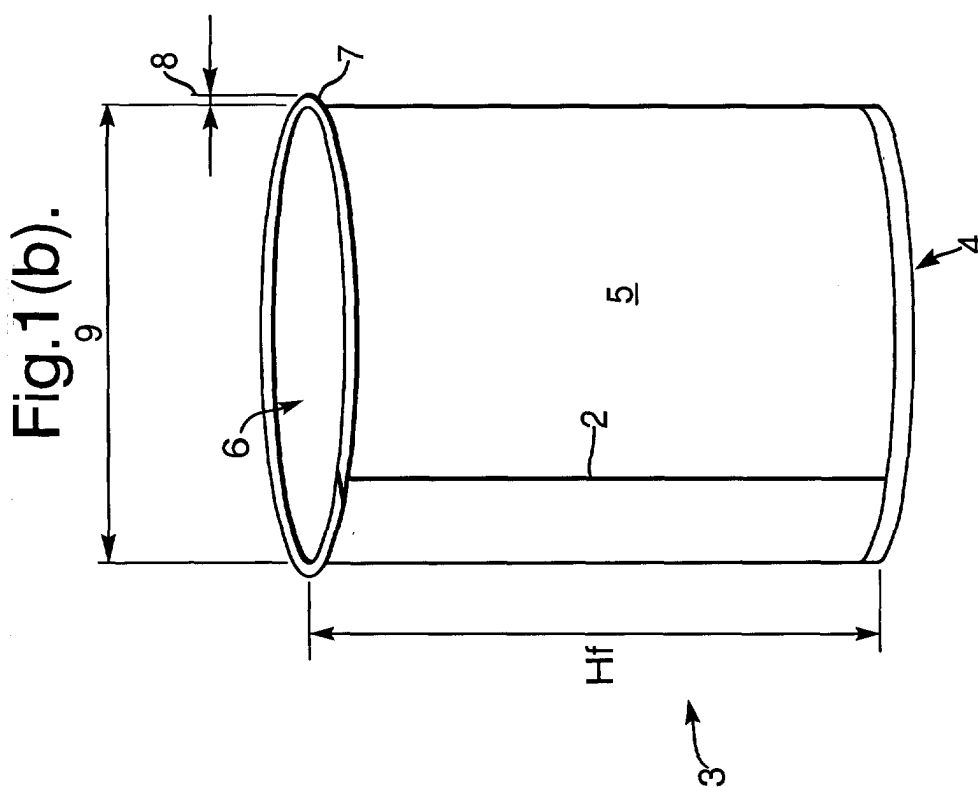
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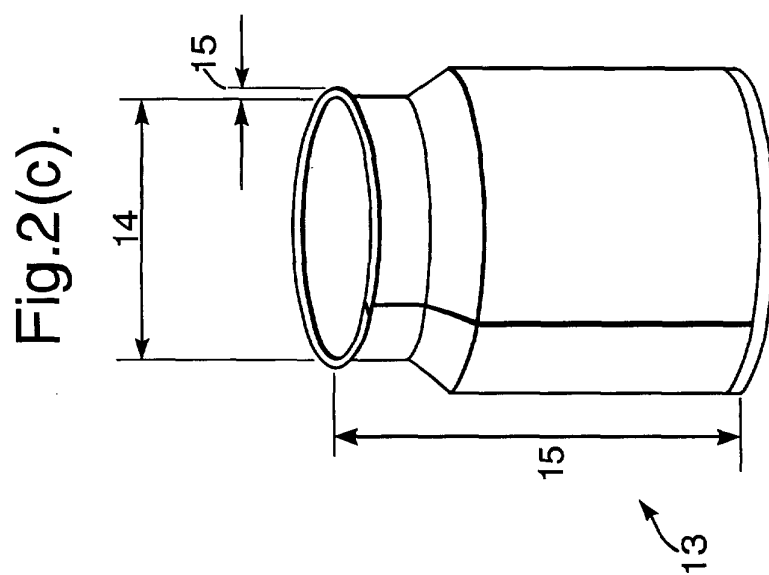
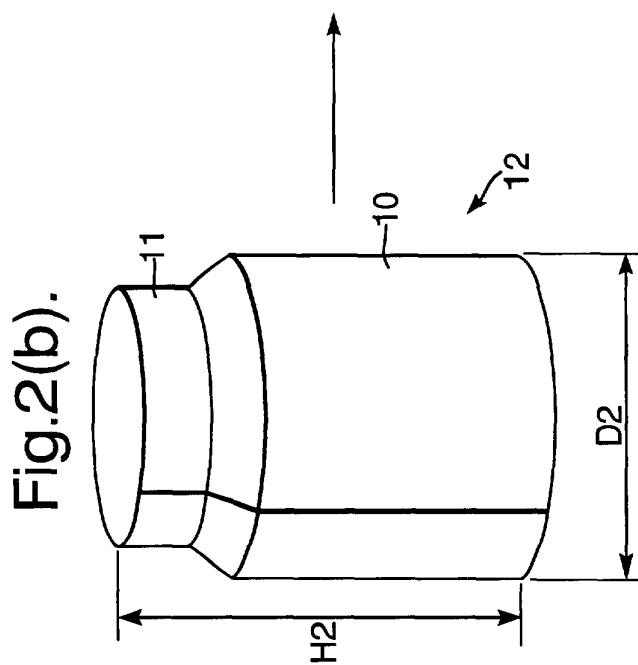
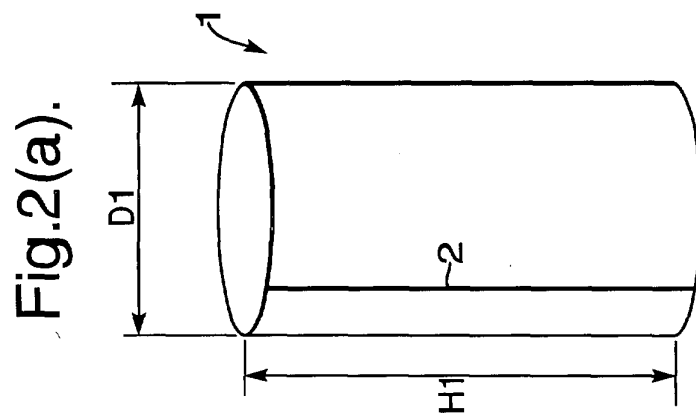
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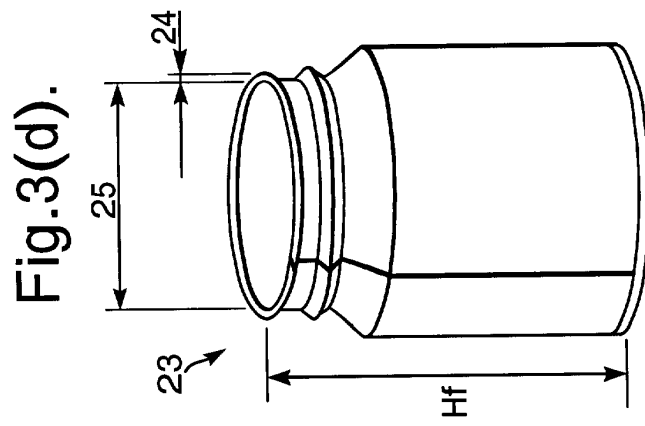
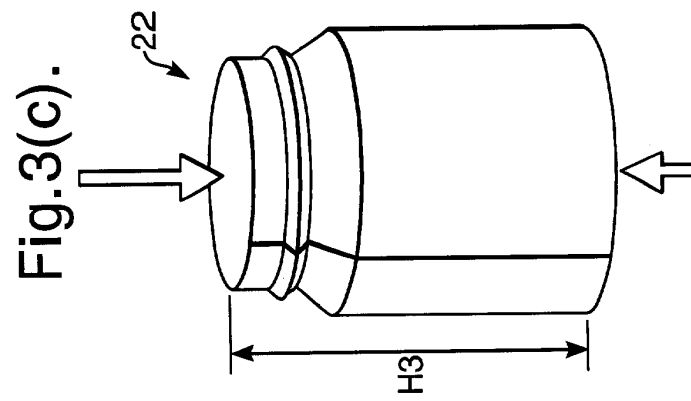
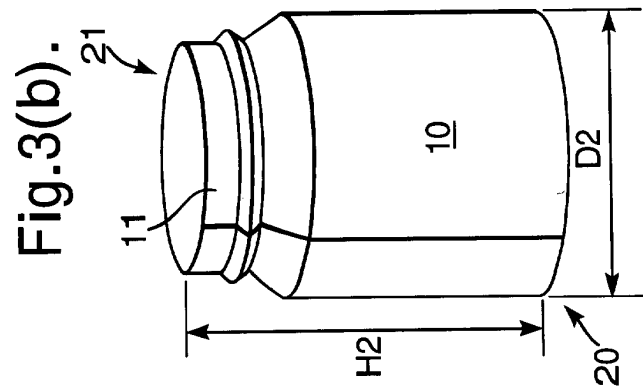
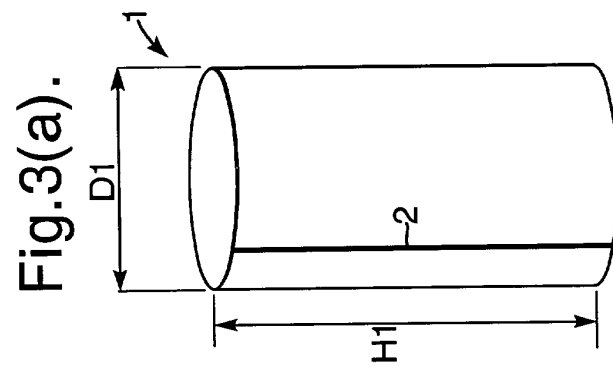
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EUROPEAN SEARCH REPORT

Application Number
EP 03 02 3380

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The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 18 November 2003	Examiner Meritano, L
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