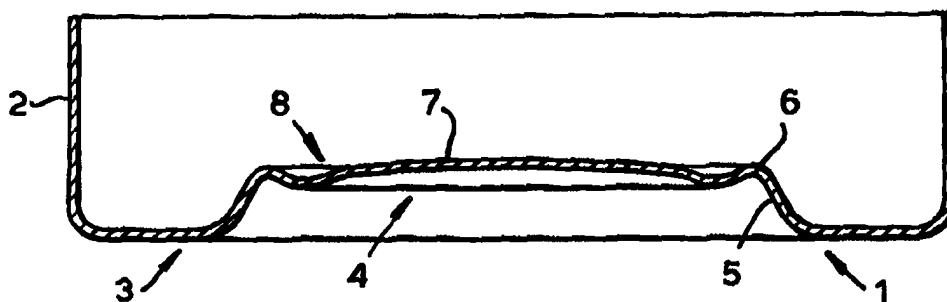


INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : B21D 22/30, 51/26, 22/22	A1	(11) International Publication Number: WO 98/43757 (43) International Publication Date: 8 October 1998 (08.10.98)
(21) International Application Number: PCT/GB98/00774 (22) International Filing Date: 16 March 1998 (16.03.98) (30) Priority Data: 9706385.3 27 March 1997 (27.03.97) GB (71) Applicant (for all designated States except LS US): CROWN CORK & SEAL TECHNOLOGIES CORPORATION [US/US]; 11535 S. Central Avenue, Alsip, IL 60803-2599 (US). (71) Applicant (for LS only): CARNAUDMETALBOX PLC [GB/GB]; Downsview Road, Wantage, Oxfordshire OX12 9BP (GB). (72) Inventor; and (75) Inventor/Applicant (for US only): PORUCZNIK, Paul [GB/GB]; 192A Upper Road, Kennington, Oxford OX1 5LR (GB). (74) Agent: GADSDEN, Robert, Edward; Carnaudmetalbox plc, Downsview Road, Wantage, Oxfordshire OX12 9BP (GB).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>

(54) Title: FORMING DRAWN CONTAINER BODIES



(57) Abstract

A metal container body is formed by drawing a metal cup (1) having a side wall (2) and a base wall (3). The base wall has a generally transverse central portion (4) surrounded by an annular wall portion (5). The central portion (4) has a locating feature such as a trough (8) adapted to receive and locate the nose of an ironing punch (9). The punch reforms the cup by rolling the metal in the annular wall portion (5) upwardly with respect to the central portion to form the generally frustoconical wall portion (14) of a drawn container. The trough (8) ensures that the rolling of the metal in the annular wall takes place in a consistent and controlled manner.

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"FORMING DRAWN CONTAINER BODIES"

This invention relates to the forming of drawn container bodies, such as those produced by drawing a cup and subsequently reforming the cup into a metal container body. The reforming of the cup may be by way of a redraw
5 step (the draw redraw process) or a wall ironing step (the DWI process).

It has been proposed to use a cup in which the base of the cup is provided with an inwardly facing recess or boss (see for example US5522248). This recess has an
10 annular side wall which is subsequently reformed into the frustroconical outer wall portion of the base of the finished container.

With the use of the above described cups, problems have been experienced in the occurrence of cracking of
15 the material in the base, and even "tear-offs" where the base is partially or completely removed by the reform tool. These problems can be alleviated by the use of a different shape of reform cup as described below.

Accordingly there is provided a method of forming a
20 metal container body comprising the steps of drawing a metal cup having a side wall and a base wall, the base wall having a stepped portion comprising a generally transverse central portion surrounded by an annular wall portion, the generally transverse central portion
25 including a locating feature adapted to receive the nose portion of a reform tool, and contacting the base with a reform tool so as to reform it by rolling the metal in the annular wall portion upwardly with respect to the generally transverse central portion to form a generally
30 frustroconical annular wall portion between the central portion and the side wall of the redrawn cup.

Reform cups with the locating feature on a "plain base" have previously been proposed, (see US4685322). However, even though these proposals were from the same company, the benefits of using locating features on a recessed base have only been appreciated by the present applicants. The feature serves to locate a reforming tool such as an ironing punch, and also acts as a guide to the material of the cup to urge it to deform in a regular and consistent manner. The shape of the locating feature is selected so as to assist the cup material in following the shape of the nose of the reforming tool.

Preferably the locating feature comprises at least one bead in the generally transverse central portion of the base wall. Conveniently the at least one bead is an inwardly projecting bead, in which case the nose of the ironing punch can contact the side of the bead so as to be precisely located with respect to the reform cup. Alternatively the at least one bead is an outwardly projecting bead, in which case the nose of the ironing punch may be received within the bead. Preferably, the at least one bead is an annular bead. According to a preferred embodiment the central portion of the base wall presents a generally convex surface to the reform tool. This arrangement, in addition to locating the reforming tool and cup one against the other, provides a relatively rigid base structure for the cup, yet one which is curved so as to be able to be deformed further by the reforming tool in a controlled rolling motion.

The stepped portion is preferably an inwardly projecting recess, providing an upwardly extending side wall which is reformed by the tool into the downwardly

extending frustroconical outer wall portion of the base of the finished container.

The invention further resides in a drawn cup adapted to be redrawn and formed into a metal container body, the cup comprising a side wall and a base wall, the base wall having a stepped portion comprising a generally transverse central portion surrounded by an annular wall portion, the generally transverse central portion including a locating feature adapted to receive the nose of a reform tool.

The invention will now be further described, by way of example only, with reference to the accompanying drawings, in which;

Figure 1 is a schematic sectional view of a drawn cup according to the present invention;

Figures 2 to 5 are schematic sectional views of apparatus for reforming the cup of Figure 1 shown at various stages of the reforming process; and

Figure 6 is a schematic sectional view of the apparatus of Figures 2 to 5 shown in combination with a doming station for forming the bottom profile of a finished can.

Referring to Figure 1 a metallic cup is shown generally at 1 and comprises cylindrical side wall 2 and a base wall 3, the base wall having a stepped configuration consisting of a central panel 4 surrounded by an annular wall portion 5. Central panel 4 comprises an annular bead 6 and a slightly convex centre portion 7. Between the annular bead 6 and the convex portion 7 is an annular trough 8 of a dimension such as to receive the nose of an ironing punch.

Figure 2 shows the cup 1 positioned in apparatus to reform it into a container body. The apparatus comprises an ironing punch 9 reciprocating in a redraw sleeve 10 and having a shaped nose 11. The ironing punch and redraw sleeve cooperate with a redraw die at 12 having a central orifice 13 in which the punch 9 is received. The cup 1 is held between the sleeve 10 and redraw die 12, with the nose 11 of the punch being received in the annular trough 8 provided in the central panel of the cup.

Figures 3 to 5 show the sequence of events as the ironing punch 9 moves into the orifice 13 of the redraw die 12. In Figure 3 the punch is starting to reform the cup, rolling the annular portion 5 downwardly as the nose 11 of the punch advances. In Figures 4 & 5 the punch has advanced to a position where the wall portion 5 has been almost completely reversed to form the outer wall portion of the bottom profile of the container body. In Figure 6 the reversal of the annular wall portion is complete to form the outer wall portion at 14. A doming station, shown generally at 15, completes the forming of the base of the container body. The doming station comprises a doming die 16 for forming the domed base of the container, and a draw die 17 for completing the formation of the outer wall portion 14.

The profile of the cup 1, with its bead 6, trough 8 and convex portion 7, ensures that the rolling of the metal in the annular wall takes place in a consistent and controlled manner. By controlling the flow of metal, and locating a punch and cup in a more consistent manner, the incidence of base cracking and "tear-offs" can be reduced.

CLAIMS:

1. A method of forming a metal container body comprising the steps of drawing a metal cup having a side wall and a base wall, the base wall having a stepped portion comprising a generally transverse central portion surrounded by an annular wall portion, the generally transverse central portion including a locating feature adapted to receive the nose portion of a reform tool, and contacting the base wall with a reform tool so as to reform it by rolling the metal in the annular wall portion upwardly with respect to the generally transverse central portion to form a generally frustroconical annular wall portion between a central portion and a side wall of the redrawn cup.
2. A method according to claim 1 wherein the locating feature comprises at least one bead in the generally transverse central portion of the base wall.
3. A method according to claim 2 wherein the at least one bead is an inwardly projecting bead.
4. A method according to claim 2 wherein the at least one bead is an outwardly projecting bead.
5. A method according to claim 3 or claim 4, wherein the at least one bead is an annular bead.

6. A method according to any of claims 1 to 5 wherein the central portion of base wall presents a generally convex surface to the reform tool.

7. A method according to any of claims 1 to 6 wherein the stepped portion is an inwardly projecting recess.

8. A drawn cup adapted to be redrawn and formed into a metal container body, the cup comprising a solid wall and a base wall, the base wall having a stepped portion comprising a generally transverse central portion surrounded by an annular wall portion, the generally transverse central portion including a locating feature adapted to receive the nose of a reform tool.

9. A drawn cup according to claim 8 wherein the locating feature comprises at least one bead in the generally transverse central portion of the base wall.

10. A drawn cup according to claim 9 wherein the at least one bead is an inwardly projecting bead.

11. A drawn cup according to claim 9 wherein the at least one bead is an outwardly projecting bead.

12. A drawn cup according to claim 10 or claim 11, wherein the at least one bead is an annular bead.

13. A drawn cup according to any of claims 8 to 12 wherein the central portion of the base wall presents a generally convex surface to the reform tool.

14. A drawn cup according to any of claims 8 to 13 wherein the stepped portion is an inwardly projecting recess.

1/2

Fig.1.

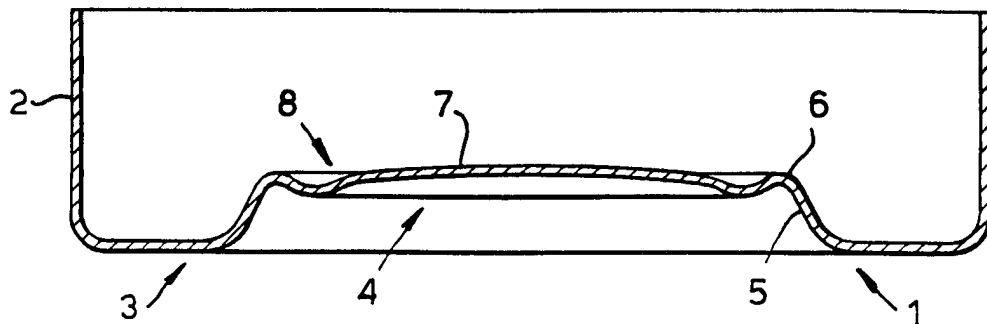


Fig.2.

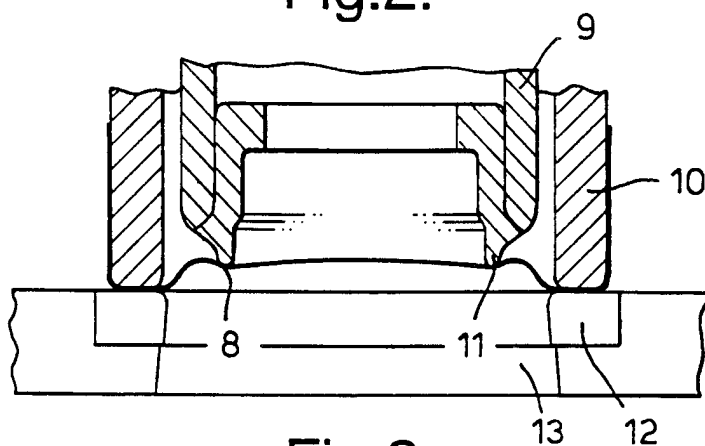


Fig.3.

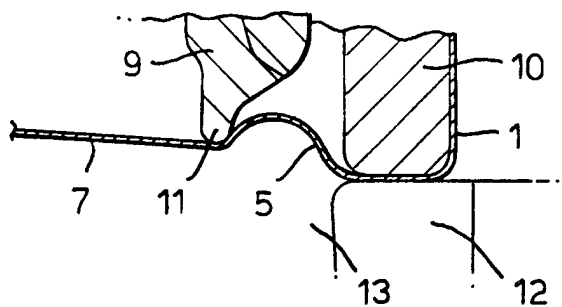


Fig.4.

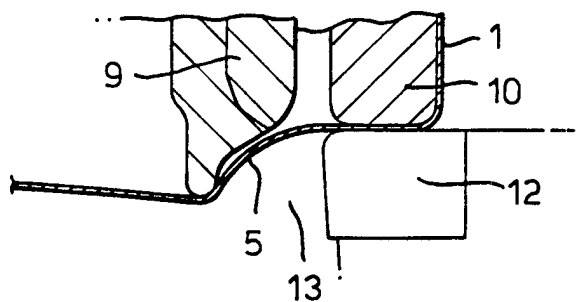


Fig.5.

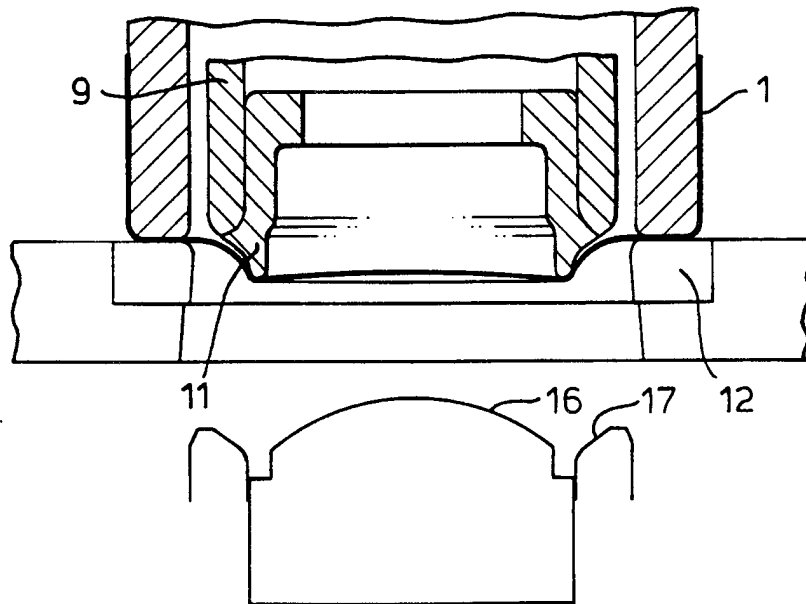
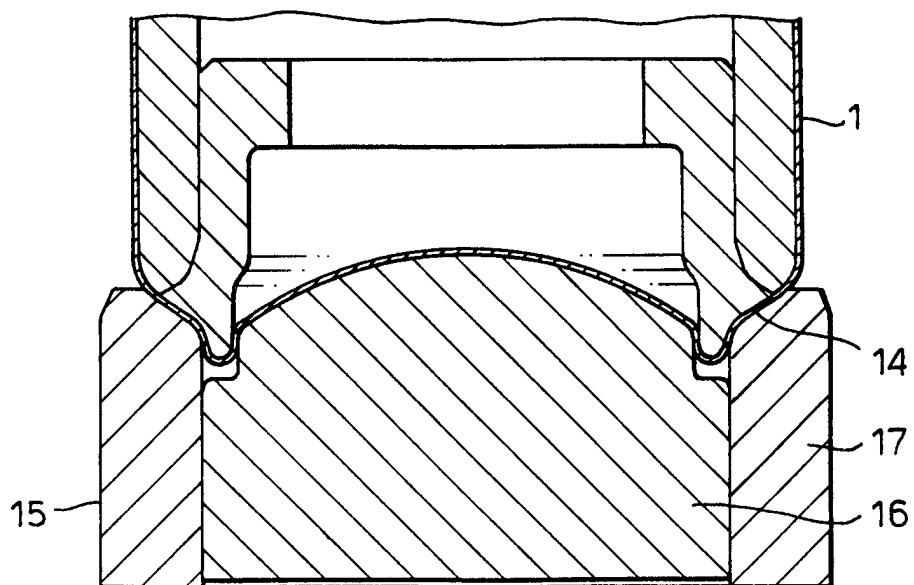


Fig.6.



INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 98/00774

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 B21D22/30 B21D51/26 B21D22/22

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 B21D B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category ^o	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4 685 322 A (ALUMINIUM COMPANY OF AMERICA) 11 August 1987 cited in the application see the whole document ---	1-14
Y	US 5 522 248 A (ALUMINIUM COMPANY OF AMERICA) 4 June 1996 cited in the application see the whole document ---	1-14
X	US 4 151 927 A (REYNOLDS METALS COMPANY) 1 May 1979 see figures 3,6 ---	8-14
X	US 3 951 296 A (NATIONAL STEEL CORPORATION) 20 April 1976 see figure 6 --- -/--	8-14



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

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26 June 1998

Date of mailing of the international search report

06/07/1998

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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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A	US 5 016 463 A (COORS BREWING COMPANY) 21 May 1991 see the whole document -----	1-14

INTERNATIONAL SEARCH REPORT

Information on patent family members

In tional Application No

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