(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
2 November 2006 (02.11.2006)

PCT

(10) International Publication Number
WO 2006/114558 A1

(51) International Patent Classification:
B65D 43/02 (2006.01)

(21) International Application Number:
PCT/GB2005/001624

(22) International Filing Date: 28 April 2005 (28.04.2005)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant *(for all designated States except US)*: **CARBONITE CORPORATION** [PA/PA]; El Dorado Building, 2nd Floor, 52nd & Elvira Mendez Street, P.O. Box 1358 WTC, Panama (PA).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **SMITH, Matthew, Eric** [GB/GB]; Ballacurn Cottage, Ballaugh, Isle of Man IM7 5EU (GB). **MONDSZEIN, Karl** [GB/GB]; 7 West Bank Lea, Mansfield, Nottinghamshire NG19 7BY (GB).

(74) Agents: **JENNINGS, Nigel, Robin** et al.; Kilburn & Strode, 20 Red Lion Street, London WC1R 4PJ (GB).

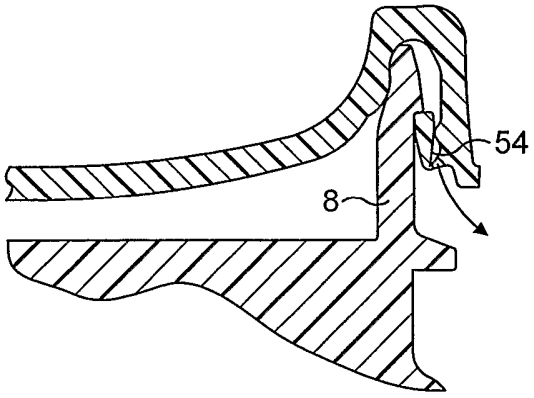
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: BEVERAGE CONTAINERS



(57) Abstract: A beverage container comprises a bottle (2) which has a central axis and is sealed by a lid (6) of resilient material. The bottle has a neck (8) defining an opening and the lid (6) includes a closure plate (30, 32), integral with which is a depending skirt (18) extending around the outer surface of the neck. The skirt (18) carries an annular flange (20) which is in sealing engagement with the underside of a downwardly directed shoulder (14) on the outer surface of the neck. The annular flange (20) is connected to the skirt (18) by a resilient hinge connection (22). The annular flange (20) is elongate in axial sectional view, the end surface of the free end of the flange (20) is in sealing engagement with the underside of the shoulder (14). The internal surface of the skirt (18) carries an annular protuberance (52) which is in sealing engagement with one side surface of the flange (20). The other side surface of the flange is in sealing engagement with the outer surface of the neck (8), whereby an annular chamber (54) is defined by the inner surface of the skirt, the said one side surface of the annular flange, the protuberance and the hinge. A gas passage (50) is provided which extends between the annular chamber (54) and atmosphere.

WO 2006/114558 A1

BEVERAGE CONTAINERS

The present invention relates to containers for beverages, particularly carbonated beverages, and is concerned with that type of container which is described in International Patent Application No. PCT/GB2005/000986, which does not form part of the state of the art. The invention is particularly, though not exclusively, concerned with such containers which have a wide mouth, that is to say with a diameter in excess of about 25 mm or more, preferably in excess of about 38 mm or 45 mm.

Beverage bottles typically have a narrow mouth with a diameter in the region of only 28mm or less. Numerous ways of sealing the bottle top to the neck of the bottle are known but it will be appreciated that the problem of producing a seal on a container for a carbonated beverage increases exponentially as the diameter of the mouth increases because the area of the underside of the cap or top increases in accordance with the square of the radius. If the container cap or its seal should fail, the gas pressure will be released and the cap may even be projected explosively into the air with the resultant loss of the beverage and potential injury to bystanders. Similar sealing problems can arise also with uncarbonated beverages because if the container is subjected to an elevated temperature, e.g. it is exposed to direct sunlight, the gas pressure in the head space of the container will increase and if the container is inadequately sealed this will result in the leakage of gas to the atmosphere. This is not of itself inherently problematic, but when the container cools again, a subatmospheric pressure may be produced in the head space which results in the induction of atmospheric oxygen. This can result in oxidation of the container contents

rendering them undrinkable.

The beverage container described in PCT/GB2005/00986 will be described below with reference to Figures 1 to 6 of the accompanying diagrammatic drawings, in which:-

Figure 1 is a vertical sectional view of a first embodiment of a beverage bottle with the lid in an intermediate position whilst being applied to the bottle;

Figure 2 is a vertical sectional view of the container lid before application to the bottle;

Figure 3 is a scrap sectional view of the upper portion of the bottle showing the lid in the applied and sealed position;

Figure 4 is a side view of the upper portion of the bottle as seen in Figure 3;

Figure 5 is a scrap view from below of part of the lid showing the rupturing tab; and

Figure 6 is a scrap view of the lid and bottle in accordance with a second embodiment.

As seen in Figure 1, the bottle 2 is of generally cylindrical shape with an axis 3 and at least one portion 4 of increased size whose diameter is greater than that of the lid 6, for reasons which will be explained below. The bottle is in this case moulded from plastic material and it has a wide mouth, with a diameter of

greater than 28mm defined by the neck 8 of the bottle. The neck 8 terminates at a rim portion which is defined by an internal surface 10, which is inclined upwardly and outwardly with respect to the axis 3, and an external surface 12, which is inclined upwardly and inwardly with respect to the axis 3. The surfaces 10 and 12 thus converge and the external diameter of the bottle, specifically of its rim portion, thus initially increases from the top downwards. However, it then decreases abruptly at a downwardly directed annular shoulder 14 extending substantially perpendicular to the axis 3. The internal diameter of the rim portion, however, initially decreases from the top downwards.

As best seen in Figure 2, the lid comprises a one-piece component, preferably integrally moulded from resilient plastic material, such as polypropylene. It comprises a shaped closure plate, integral with which is a web 16 which extends, when the lid is connected to the bottle, over the rim of the bottle. Integral with the web 16 is a depending skirt 18, which extends downwardly around the exterior of the upper portion of the bottle. Integrally connected to the lower edge of the skirt 18 or to the inner surface of the skirt at a position adjacent its lower edge is an annular retaining flange 20. The flange 20 is elongate in axial sectional view and is connected to the skirt 18 by a resilient connecting web 22, which is of reduced thickness and thus constitutes an annular line of weakness or predetermined breaking point. Connected to the lid at one circumferential position is a rupturing tab 24 which extends downwardly below the lower edge of the skirt 18. This tab is connected to the skirt 18 at its side by two lines of weakness 26, i.e. regions of reduced thickness.

The closure plate of the lid is concave and thus extends into the neck of the bottle, when it is connected to the bottle. The closure plate comprises a wall

portion 30 which extends generally downwardly and inwardly and merges at its lower edge with a base portion 32, which is downwardly arcuate, that is to say is of downwardly curved convex shape.

The lid is shown in Figure 2 in the configuration in which it is moulded. In this configuration, the flange 20 extends downwardly and inwardly and the diameter of its lower edge is less than that of the upper edge of the rim of the bottle whilst the diameter of its upper edge is greater than that of the upper edge of the rim of the bottle.

The lid is fastened and sealed to the bottle by a simple snap-fit procedure. This is effected simply by lowering the lid into the rim of the bottle and then applying pressure. As the lid is lowered, the lower edge of the flange 20 comes into contact with the rim. This causes the flange to rotate inwardly about the web 22. As downward movement of the lid continues, the flange 20 moves downwardly in contact with the surface 12, as shown in Figure 1, and the increasing diameter of this surface in the downward direction results in the rotation of the flange continuing, thus moving it ever closer to the inner surface of the skirt 18. The underside of the web 16 then contacts the upper surface of the rim of the bottle. However, the pressure on the cap is maintained and this results in slight deformation of the web 16. The cap and bottle are so dimensioned that the slight further downward movement of the cap caused by the deformation of the web 16, is sufficient to permit the free end of the flange 20 to move past the shoulder 14. It is then rotated in the opposition direction, i.e. inwardly, by the resilience of the web 22 and thus becomes locked behind the shoulder, as shown in Figure 3. The lid is now retained in position on the bottle and cannot be removed without damaging or deforming it. The tension

maintains the underside of the web 16 in engagement with the upper surface of the rim with a contact pressure sufficient to ensure that a first gas seal is formed along the annular line of contact. The tension in the skirt 18 also maintains the free end of the flange 20 in engagement with the surface of the shoulder 14 with a contact pressure sufficient to ensure that a second gas seal is formed along the annular line of contact. Furthermore, the resilience of the connecting web 22 forces the side surface of the free end of the flange 20 into contact with the side surface of the bottle and the contact pressure is preferably sufficient to form a third gas seal. The integrity of the first gas seal may be further enhanced, if required, by the provision of an annular bead or flange 17, which is shown in phantom lines only on the left-hand side in Figure 2 and which will engage the side surface of the rim of the bottle and constitute an additional lip seal. This bead 17 is positioned and dimensioned so that it is deformed laterally by contact with the rim of the bottle and thus urged by its resilience into contact with the side surface of the rim and thus forms a further seal. If the pressure in the bottle should rise to a high value sufficient to deform the cap away from the rim of the bottle, thereby breaking the first gas seal, pressurised gas will flow into the space defined by the outer surface of the rim, the skirt 18 and the flange 20. This pressure will act on the flange 20 to press it yet more firmly against the side surface of the rim, thereby increasing the integrity of the third gas seal.

If yet further sealing integrity is required, yet a further gas seal may be provided, as in the illustrated embodiment, between the surface 10 of the rim and the opposed surface 34 of the wall portion 30. Thus in this embodiment, these two surfaces are formed as complementary sealing surfaces in sealing engagement with one another. If the pressure in the bottle should become super-atmospheric, either as a result of the liberation of carbon dioxide from a

carbonated beverage or as a result of the expansion of gas in the head space of the bottle due to an increase in temperature, the centre of the concave base portion 32 will be deformed upwardly and this will inherently result in the outer edge of the base portion 32 and thus the lower edge of the wall portion 30 moving slightly outwards. This will result in an increase in the contact pressure between the sealing surfaces 10 and 34 and thus in an enhancement to the integrity of this further gas seal. The beverage container in accordance with the invention therefore not only has both primary and secondary gas seals but also has a further gas seal. The integrity or sealing ability of this further seal increases as the gas pressure within the container increases.

When it is desired to open the bottle, the user merely grasps the lower edge of the rupture tab 24 and pulls it outwardly. The lines of weakness 26 immediately rupture or stretch and the upper edge of the tab 24, which is connected to the web 16, rotates, thereby breaking the second and third gas seals. This rotation is transmitted to the web 16, which thus moves away from the rim of the bottle, thus breaking the first gas seal. This movement of the web 16 also causes the sealing surfaces 10 and 34 locally to move apart, thereby also breaking the further gas seal. The container is thus depressurised. The outward movement of the tab 24 initiates tearing of the thin connecting web 22, and once tearing has started it is a simple matter to keep it going by exerting upward and outward pressure on the tab 24 until the lid is completely disconnected from the flange 20, which remains in position around the neck of the bottle. The lid may now be discarded and the contents of the bottle dispensed or drunk.

As mentioned above, the body of the bottle has one or more protuberances 4 whose contour extends beyond that of the lid, when viewed in the axial

direction. This means that when a number of such bottles are packaged together side by side, they will contact one another only at the protuberances and the lids of adjacent bottles will not contact one another, thereby eliminating the risk that the lids may inadvertently become dislodged, thereby venting the interior of the associated containers. The base of the bottle also has a shape which is complementary to that of the upper surface of the lid so that bottles may be simply and securely stacked on top of one another.

In the modified embodiment illustrated in Figure 6, the outer surface of the wall portion 30 carries an annular protuberance 40, which engages the surface of a recess in the internal surface of the rim. If the gas pressure within the bottle should increase to a level sufficient to deform the lid upwardly to an extent sufficient to break the first gas seal, as is illustrated, the contact pressure of the upper portion of the protuberance with the surface of the recess will be increased, thereby increasing the integrity of the further gas seal, and compensate for the loss of the first gas seal. The protuberance could also be carried by the inner surface of the rim, in which case the recess will be formed in the wall portion 30. If the gas pressure in the container should increase substantially, it will be the contact pressure of the lower portion of the protuberance which will increase.

Although the container described in the prior application is extremely effective and products a reliable gas seal, it is believed that failure may still be possible if the container is heated to an excessive temperature, e.g. as a result of being left in the sunshine, particularly if the beverage within it is carbonated. In this event, the gas pressure in the headspace of the container may rise to such a high level that the closure plate may be deformed upwardly by a significant distance.

This deformation could result in significant deformation of the depending skirt resulting in its moving a significant distance away from the neck of the container. The resilience of the integral hinge will then cause the annular sealing flange to rotate with respect to both the depending skirt and the container until the position illustrated in the scrap diagrammatic view of one half of the top portion of the container shown in Figure 7 is reached. Any further movement beyond that point will result in the sealing flange being impulsively rotated downwardly by the substantial gas pressure acting on its upper surface and thus in explosive depressurisation of the container, possibly associated with projection of the lid into the air by the gas pressure. Quite apart from the risk of injury to passers-by, the contents of the container will be rendered unusable and very possibly forcibly expelled from the container.

It is therefore the object of the invention to provide a beverage container, particularly of wide mouthed type, with a reliably sealed lid which can contain the pressure normally generated by a carbonate beverage, even under relatively high ambient temperature conditions, but which, if an exceptionally high internal pressure should be generated, will vent the interior of the container to a lower pressure which can readily be contained, without loss of the lid or the container contents and without permitting the pressure to drop to atmospheric.

According to the present invention a beverage container comprises a receptacle which has a central axis and is sealed by a lid of resilient material, the receptacle including a neck defining an opening and the lid including a closure plate, integral with which is a depending skirt extending around the outer surface of the neck, the skirt carrying an annular flange, which is in sealing engagement with the underside of a downwardly directed annular shoulder on

the outer surface of the neck, characterised in that the annular flange is connected to the skirt by a hinge connection, that the annular flange is elongate in axial sectional view, that the end surface of the free end of the annular flange is in sealing engagement with the underside of the shoulder, that the internal surface of the skirt carries an annular protuberance which is in sealing engagement with one side surface of the annular flange, the other side surface being in sealing engagement with the outer surface of the neck, whereby an annular chamber is defined by the inner surface of the skirt, the said one side surface of the annular flange, the protuberance and the hinge, and that a gas passage is provided which extends between the annular chamber and atmosphere.

Thus the container in accordance with the present invention is substantially the same as that in the prior application but includes two additional features. The first of these is the annular protuberance or ridge on the internal surface of the depending skirt which is dimensioned and positioned such that it is urged into contact with the outer side surface of the sealing flange and thus forms a gas seal with it. This will enhance the sealing integrity of the container yet further. Furthermore, the pressure exerted by the protuberance on the outer surface of the sealing flange will further increase the contact pressure between the inner surface of the sealing flange and the outer surface of the neck, thereby still further enhancing the integrity of the seal of the container. The provision of the annular protuberance which forms a seal with the annular sealing flange also inherently means that an annular chamber is defined by the inner surface of the skirt, the outer side surface of the annular sealing flange, the protuberance and the hinge. This chamber is normally sealed from the interior of the container but is in communication with the atmosphere via one or more gas passages.

The gas passage(s) can be provided in any of the components defining the annular chamber but are preferably provided in the form of one more small holes in the integral hinge. If the gas pressure within the container should rise to an excessive level resulting in the depending skirt moving away from the neck of the container, in which event the lid will necessarily also have moved out of contact with the neck of the container, the protuberance on the interior of the skirt will move out of contact with the sealing flange and the annular chamber will come into communication with the interior of the chamber. However, the chamber is also in communication with the atmosphere and the interior of the container will therefore be vented to the atmosphere. The container pressure will therefore start to fall but once it reaches a certain lower level, the resilience of the lid will result in the various seals being recreated and, in particular, in the annular protuberance recreating its seal with the sealing flange. Venting of the container will then be terminated and the pressure within the container will be maintained, though at a lower and more acceptable level, and the risk of loss of the container lid or contents is eliminated.

It is preferred that the integral hinge is resilient and its resilience urges its said other side surface against the outer surface of the neck. It is preferred that the closure plate is downwardly concave and thus extends into the neck and includes a base portion, integral with which is an upwardly extending wall portion, which is connected to the depending skirt. It is also preferred that the upwardly extending wall portion is connected to the depending skirt via an annular web, the underside of which extends over the surface of the neck and is retained in sealing engagement with it.

Further features and details of the invention will be apparent from the following

description of one specific embodiment which is given by way of example with reference to Figures 8 and 9 of the accompanying drawings, in which:

Figure 8 is a diagrammatic view similar to Figure 6 of one half of the lid of the container; and

Figure 9 is a similar diagrammatic view of one half of the lid, when applied to the container.

The container and lid in accordance with the present invention are substantially the same as those described with reference to Figures 1 to 6 and the description will therefore not be repeated. However, there are two major differences.

Firstly, the integral hinge 22 has one or more small holes 50 formed in it. Secondly, an annular ridge or protuberance 52 is integrally formed on the inner surface of the depending skirt 18. When the lid is snap-fitted to the container it is rotated upwardly through nearly 180° into the configuration shown in Figure 9. The protuberance 52 is forced into contact with the outer surface of the sealing flange 20 and forms a seal with it. The force applied by the protuberance to the sealing flange also results in an increase in the contact pressure of the inner surface of the sealing flange against the outer surface of the neck 8 and the seal of the container is therefore enhanced in two separate areas simultaneously. Furthermore, an annular chamber 54 is defined by the protuberance 52, the sealing flange 20, the integral hinge 20 and the depending skirt 18. This chamber communicates with atmosphere through the hole(s) 50 but is normally sealed from the interior of the container. If, however, the pressure within the container should rise to an exceptionally high level, the lid

is deformed by the pressure and the seals at the top surface and internal surface of the neck of the container are broken. The skirt 18 is also deformed outwardly and the seal between the protuberance 52 and the sealing flange 20 is thus broken also. The interior of the container therefore communicates with atmosphere through the hole(s) 50 and is thus vented. The pressure then drops until it has reached a level at which the resilience of the lid is sufficient to restore its shape against the reduced pressure of the gas within the container. The various seals are then recreated and venting of the interior of the container is terminated with the container gas pressure still at a significant level. The contents of the container are thus maintained in the container and are still usable.

CLAIMS

1. A beverage container comprising a receptacle which has a central axis and is sealed by a lid of resilient material, the receptacle including a neck defining an opening and the lid including a closure plate, integral with which is a depending skirt extending around the outer surface of the neck, the skirt carrying an annular flange, which is in sealing engagement with the underside of a downwardly directed annular shoulder on the outer surface of the neck, characterised in that the annular flange is connected to the skirt by a hinge connection, that the annular flange is elongate in axial sectional view, that the end surface of the free end of the annular flange is in sealing engagement with the underside of the shoulder, that the internal surface of the skirt carries an annular protuberance which is in sealing engagement with one side surface of the annular flange, the other side surface being in sealing engagement with the outer surface of the neck, whereby an annular chamber is defined by the inner surface of the skirt, the said one side surface of the annular flange, the protuberance and the hinge, and that a gas passage is provided which extends between the annular chamber and atmosphere.

2. A container as claimed in any one of the preceding claims in which the gas passage comprises one or more holes formed in the integral hinge.

3. A container as claimed in any one of the preceding claims in which the integral hinge is resilient and its resilience urges its said other side surface against the outer surface of the neck.

4. A container as claimed in any one of the preceding claims in which the closure plate is downwardly concave and thus extends into the neck and includes a base portion, integral with which is an upwardly extending wall portion, which is connected to the depending skirt.

5

5. A container as claimed in Claim 4 in which the upwardly extending wall portion is connected to the depending skirt via an annular web, the underside of which extends over the surface of the neck and is retained in sealing engagement with it.

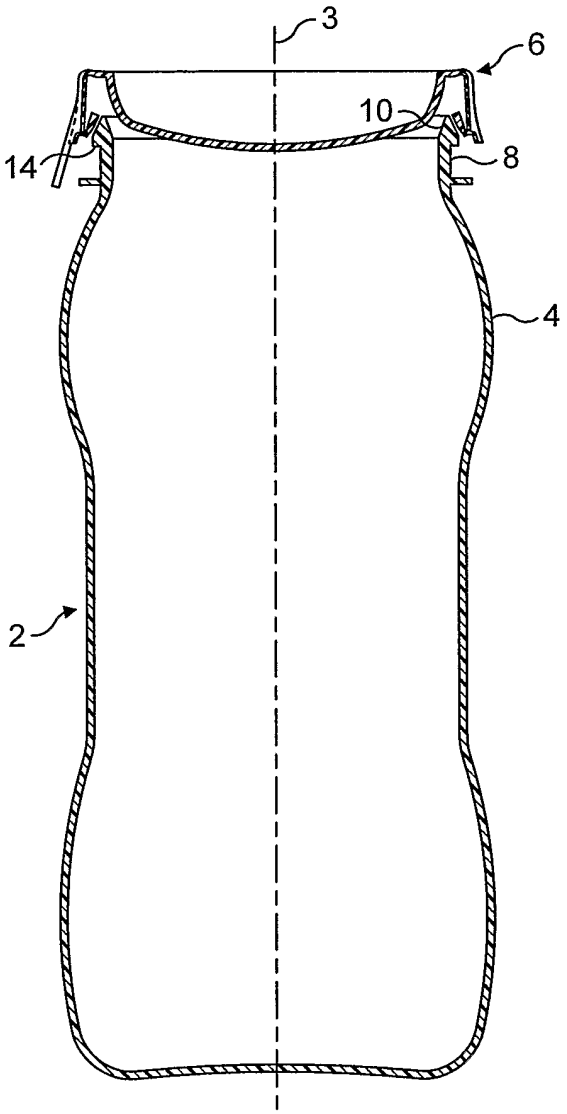


FIG. 1

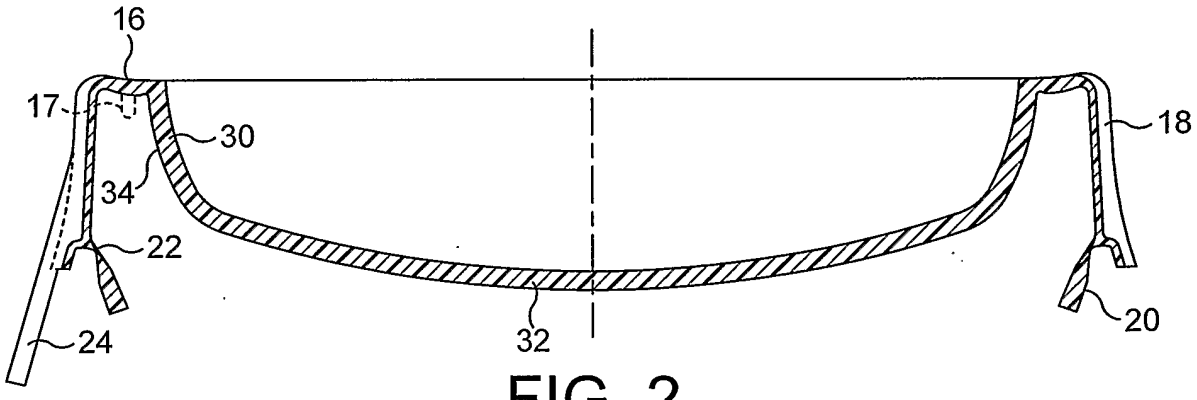


FIG. 2

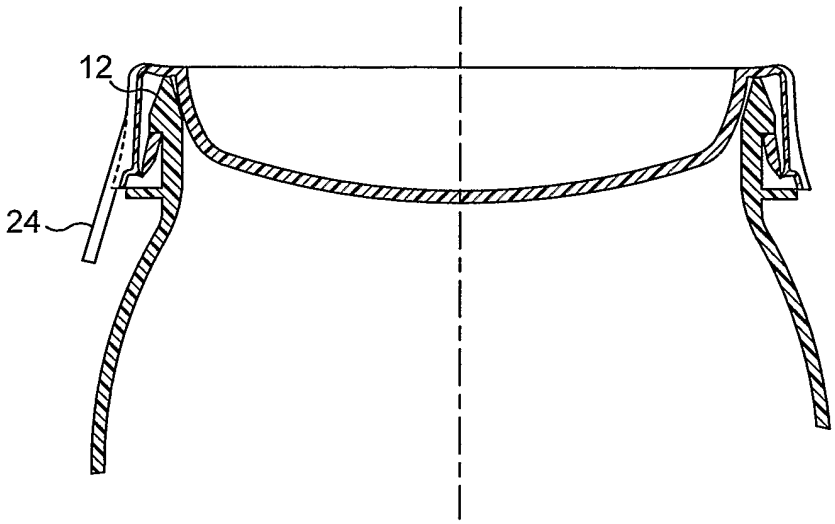


FIG. 3

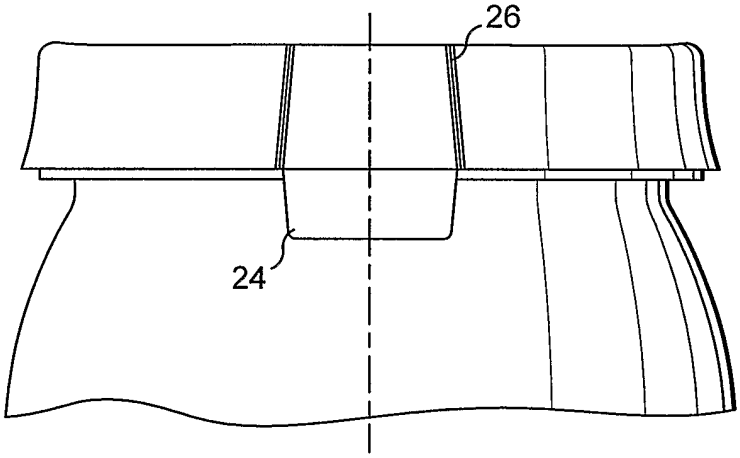


FIG. 4

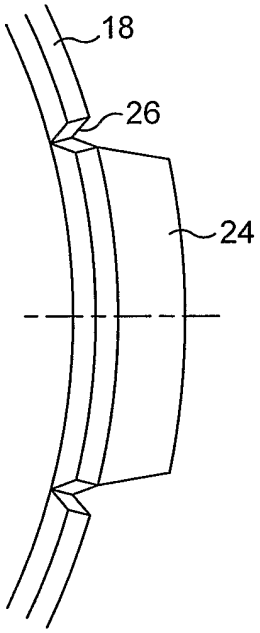


FIG. 5

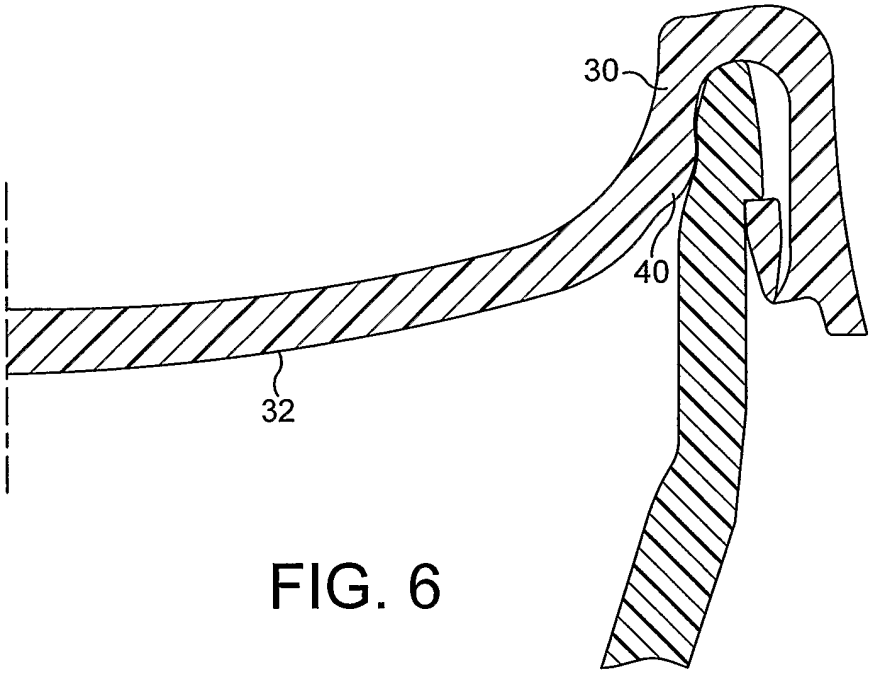


FIG. 6

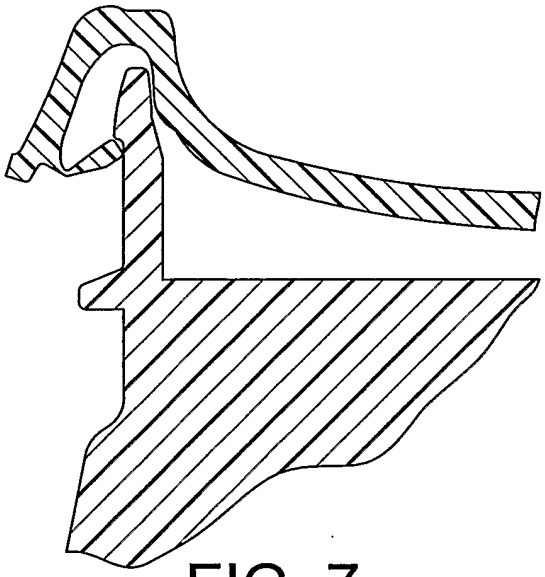


FIG. 7

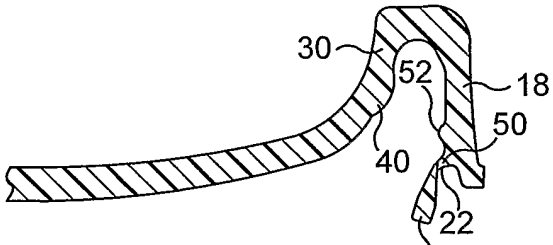


FIG. 8

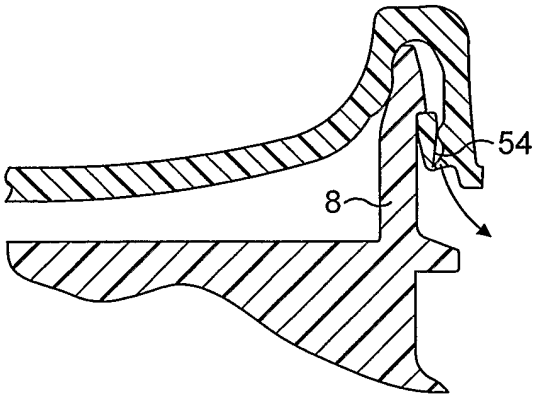


FIG. 9

INTERNATIONAL SEARCH REPORT

Application No
/GB2005/001624

A. CLASSIFICATION OF SUBJECT MATTER
B65D43/02

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)
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)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 640 435 A (DUTT ET AL) 3 February 1987 (1987-02-03) column 7, line 25 - column 8, line 31; figures 1-4	1
A	WO 96/19388 A (AMCOR LIMITED; BAYLY, PETER, KINGSLEY; BAYLY, MARK, SIMON) 27 June 1996 (1996-06-27) page 6, line 29 - line 33 page 7, line 7 - line 33; figure 1	1
A	US 5 271 517 A (BOWERS ET AL) 21 December 1993 (1993-12-21) column 3, line 5 - column 4, line 3; figures 1,2	1

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
15 December 2005	28/12/2005

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Wartenhorst, F

3

Form PCT/ISA/210 (second sheet) (January 2004)

INTERNATIONAL SEARCH REPORT

Application No
/GB2005/001624

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 657 153 A (HAYES ET AL) 14 April 1987 (1987-04-14) column 2, line 3 - column 3, line 21; figures 1-4,7	1
A	US 5 540 342 A (RATHBUN ET AL) 30 July 1996 (1996-07-30) column 2, line 59 - column 3, line 28; figures 10,11	1
E	WO 2005/092732 A (CARBONITE CORPORATION; SMITH, MATTHEW, ERIC; MONDSZEIN, KARL) 6 October 2005 (2005-10-06) abstract; figure 6	1

3

INTERNATIONAL SEARCH REPORT

Information on patent family members

Application No
/GB2005/001624

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4640435 A	03-02-1987	AU 6756087 A EP 0232036 A2	30-07-1987 12-08-1987
WO 9619388 A	27-06-1996	NONE	
US 5271517 A	21-12-1993	NONE	
US 4657153 A	14-04-1987	CA 1292444 C	26-11-1991
US 5540342 A	30-07-1996	NONE	
WO 2005092732 A	06-10-2005	NONE	