

PATENT SPECIFICATION

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DRAWINGS ATTACHED

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(54) COMPOSITE CONTAINERS

(71) We, OWENS-ILLINOIS, INC., a Corporation organised under the laws of the State of Ohio, United States of America, of 405, Madison Avenue, Toledo, State of Ohio, United States of America, (assignee of RICHARD ALLEN HEATON), do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a composite construction container for bottling liquids under conditions of elevated pressures and/or temperatures, comprising a single-walled glass body (as hereinafter defined) having a mouth opening which, when the body is disposed in an upright position, is at the upper extremity thereof, the body having a seamless, relatively thin wall of substantially uniform thickness and distribution which is substantially continuously convexly arcuate in an axial section along a bottom portion of substantial extent to produce a body which is highly unstable when unsupported in an upright position; and a generally cup-shaped base member of yieldable material substantially less frangible than that of the body secured to the continuously convexly curved arcuate portion of the body bottom portion, the base of the cup-shaped member having a level portion to support the glass body with stability in an upright position. The term "single-walled glass body" as used in the foregoing sentence and the remainder of this specification is intended to mean a body defined by one wall rather than the spaced double or multiple walled vessels which are sometimes employed in, for example, vacuum flasks. A composite construction container as described above is claimed in claim 1 of our patent specification No. 1,185,901 and will hereinafter be referred to as a container of the type described.

[Price 25p]

According to the present invention, there is provided a composite construction container of the type described in which the body is circular in any section perpendicular to an axis of rotational symmetry and comprises, in addition to the substantially continuously convexly arcuate bottom portion, a cylindrical portion contiguous with said bottom portion and having an axial extent substantially equal to that of the bottom portion and a diameter equal to the maximum diameter of the body, and a convexly tapering portion extending between the cylindrical portion and a concavely curved minimum diameter neck portion and having an axial extent substantially equal to the combined axial extents of the bottom portion and the cylindrical portion, the neck portion having a flared portion terminating in a finished lip constituting said mouth opening.

The invention will be described further, by way of example, with reference to the accompanying drawings, in which:—

Fig. 1 is an elevational view, partly in section, of a composite container of the present invention;

Fig. 2 is a partial sectional view, drawn to an enlarged scale, of the lower portion of the base member shown in Fig. 1;

Fig. 3 is a bottom plan view taken along line III-III of Fig. 1; and

Fig. 4 is an elevational view, partly in section, showing two containers of the invention stacked one on top of the other.

As shown in Fig. 1, the body 51 of a container of the invention has a substantially hemispherical bottom portion 51a which merges into a substantially cylindrical intermediate portion 51b. Extending upwardly from the cylindrical portion 51b is a convexly tapering portion 51c that is convexly curved towards the axis of the body 51. The curvature of this portion is continuously convex until the narrowest section

(in a horizontal plane), i.e. the minimum diameter section, of the body is reached at the neck 52. Above the neck 52 the body flares outwardly along the segment 53 and terminates in an annular finished lip or rim 54. This rim in its preferred form is a so-called bead-type finish which occurs in finish forming the glass body 51.

It will be noted from Fig. 1 that the axial extent of the hemispherical bottom portion 51a is substantially equal to the axial extent of the cylindrical portion 51b. However, the tapering portion 51c is substantially longer and has an axial extent substantially equal to the combined axial extents of the bottom portion 51a and the cylindrical portion 51b. Thus, the maximum diameter horizontal section of the body 51 lies in the lower vertical half of the body when disposed in an upright position. The major volume or capacity of the container is below its vertical midpoint and the centre of gravity is substantially below this point, thereby improving the stability of the container.

In the manufacture of the glass body, the glass is attached to a glass "ribbon" from which the body is formed. In the moulding of the body 51, a moile portion is formed intermediate the edge or rim at 54 and the glass ribbon. This body 51 and its moile portion (not shown) are separated at the ribbon by a suitable well-known crack-off technique. The remaining article and moile are subsequently separated and the finish rim 54 formed thereby when the moile is "burned-off" from the body 51. This burn-off operation is known and practised in the art of forming glass tumblers and tableware.

A base 70, which is preferred to the various forms of base shown in our Patent Specification No. 1,185,901 is shown in Fig. 1. This base 70 has a cylindrical vertical wall 71 which extends to the portion of the glass body 51 at or above the maximum diameter of the bottom portion 51a. The base 70 thereby prevents sideways glass-to-glass contact between adjacent containers and prevents such abrasive contact thereat so as to preserve strength of the glass. The size of the cylindrical wall 71 is such that it tightly engages the glass in the upper region of the base and a suitable means of securing the base 70 onto the glass body 51 is provided, for example by heat shrinking the base onto the body or using an epoxy resin as an adhesive as described in patent specification No. 1,185,901. Base 70 has a lower level surface 72 which is the lowermost surface of an annulus or ring as shown in Fig. 1, but may assume other configurations near the outer edge of the base. This is the level surface on which the composite container rests.

Radially inwardly of the level surface 72 is an upwardly, inwardly directed wall 73 which is spaced from the wall 71. This wall 73 extends to an inner, conforming, spherically-contoured bottom support wall 74 which provides a yieldable bearing support inside the base for the body 51. This bottom support wall 74 also provides a nesting surface for the bottom end portion of the glass body 51. Along bottom support wall 74 may be provided an annular arrangement of channels 74d in the wall 74 which are arcuate grooved portions when viewed from above and form downwardly directed, convex protuberances or ribs 74a when viewed from below, as seen in Fig. 2. Ribs 74a are in an interrupted circular array as shown in Fig. 3. Intermediate the arcuate ribs 74a are spanning wall sections 74c appearing as radially extending webs (Fig. 2). Webs 74c reinforce the channeled, protruding ribs without thickening their wall portions. As such, the moulding of the base 70 is made easier and less material need be used as compared with other structures of comparable strength. This construction distributes the load of the body 51 in base 70 and eliminates point loading which may be undesirable in crowning or capping operations of the container. The lower edges of the ribs 74a are disposed below the interior radial centre of the support wall structure immediately surrounding vent apertures 74b. As the glass body is top loaded, the walls 71 and 73 will be deflected and the ribs 74a will ultimately engage the underlying support surface. Because the ribs are semi-circular in cross-section, the wall of hollow ribs 74a will flex inwardly under the top load to distribute the load in substantially annular configuration before the end point of the spherical bottom end of the glass body is bottomed on the under support surface and point loading occurs. This feature of the base member's structure is very advantageous in capping the container.

Base 70, in its assembly with glass body 51 (Figs. 1-3), should be vented in the region illustrated by means of the vent holes 74b. After the glass body is pressed into assembly with the base to the relationship shown in Fig. 1, vent holes 74b may be sealed. This can be accomplished by spotting dots or spots of adhesive on the lower outer surface of the bulbular body 51a in substantial register with the vents. A suitable hot melt adhesive or polyvinyl acetate-polyvinyl alcohol type polymer adhesive may be used. One well-known example of such material is sold presently by Borden and Company under the trade mark "Elmer's Glue".

If desired, the base 70 may be adhesively secured to the glass body 51 by placing a

band of the hot melt adhesive, as shown in the phantom outline at 75 in Fig. 1. The two adhesive applications may be made jointly or severally to attach the elements of the composite container. It is preferred in the invention that the base 70 and the body 51 not be readily detachable by the user for obvious reasons.

A further embodiment of the invention is illustrated in Fig. 4. In this embodiment, the base 80 is formed similarly to the base 70 in that it has a cylindrical vertical wall 81 which merges with a lower level surface 82 for supporting the composite container on a flat support. Inwardly of the surface 82 is an upwardly, inwardly sloping wall 83 which merges with a radial inner bottom supporting wall having a span 84. This span of the bottom supporting wall has a conforming contour 84a which nestingly supports the bottom end, spherical surface of the glass body. The span 84 in this instance has a substantially flat lower surface for bearing support on an underlying container at its upper end closure 58. Thus, the base 80 provides a stacker bottom for stacking closed composite containers (51, 58 and 80 collectively) in vertical array.

In the foregoing structures of bases 70 and 80, the bearing support 74 or 84 for the glass body is a push-up segment maintaining the lower end of the glass body in spaced relationship to the support surface (such as a shelf surface) when the composite container is supported by its respective surfaces 72 or 82. The bearing support surface is yieldable through the tapering walls 73, 74 or 83, 84 respectively, to absorb shock or headloads on the glass part of the container, as pointed out in patent specification No. 1,185,901.

The advantage of a composite construction container formed in accordance with the present invention is that it enables the glass body to be formed of a wide variety of known glass compositions including the relatively inexpensive soda lime glass compositions used in forming conventional glass bottles and jars and other glass containers. However, the wall of the glass body may be substantially thinner than the wall of even the lightweight glass containers nowadays used in non-returnable beer bottles and the distribution of glass in the wall is considerably more uniform. For example, it is highly desirable and entirely feasible for the average wall thickness of the body of the container to be in the range of 0.025 to 0.075 inches when the body is formed of soda lime glass composition. Such bodies may be economically formed at high speed by the ribbon forming process used in the formation of electric light bulbs as generally disclosed in United States patent specification No. 1,790,397

and on page 356 of "Handbook of Glass Manufacture" by S. V. Tooley, published in 1953. This process is a paste mould process in which the glass heat content is removed by means of a steam layer at a lower rate than in a hot iron mould process. This lower heat transfer rate reduces the formation of stresses in the formed article. The reduced and more uniform wall thickness further imparts improved thermal shock resistance to the glass body as compared with prior art glass containers even when the glass body is formed as a glass of comparable coefficient of thermal expansion.

WHAT WE CLAIM IS:—

1. A composite construction container of the type described, in which the body is circular in any section perpendicular to an axis of rotational symmetry and comprises, in addition to the substantially continuously convexly arcuate bottom portion, a cylindrical portion contiguous with said bottom portion and having an axial extent substantially equal to that of the bottom portion and a diameter equal to the maximum diameter of the body, and a convexly tapering portion extending between the cylindrical portion and a concavely curved minimum diameter neck portion and having an axial extent substantially equal to the combined axial extents of the bottom portion and the cylindrical portion, the neck portion having a flared portion terminating in a finished lip constituting said mouth opening.

2. A container as claimed in claim 1, which further comprises a closure member for sealing the container after introduction of the contents.

3. A container as claimed in claim 1 or claim 2, in which the cup-shaped base member has a cylindrical side wall extending to the cylindrical portion of the body thereby surrounding the maximum diameter portion of the body, and preventing glass-to-glass contact when similar containers are positioned adjacent one another.

4. A container as claimed in any preceding claim, in which the base member is secured to the glass body by means of an adhesive.

5. A container as claimed in claim 1, 2 or 3, in which the base member is made of a heat shrinkable material and is secured onto the glass body by a heat shrinking process.

6. A container as claimed in claim 3 and any claim appendant thereto, in which venting means are provided within the base member in order to facilitate introduction therein of the glass body.

7. A container as claimed in claim 6, in which said venting means are sealed after insertion of the glass body into the base

band of the hot melt adhesive, as shown in the phantom outline at 75 in Fig. 1. The two adhesive applications may be made jointly or severally to attach the elements of the composite container. It is preferred in the invention that the base 70 and the body 51 not be readily detachable by the user for obvious reasons.

A further embodiment of the invention is illustrated in Fig. 4. In this embodiment, the base 80 is formed similarly to the base 70 in that it has a cylindrical vertical wall 81 which merges with a lower level surface 82 for supporting the composite container on a flat support. Inwardly of the surface 82 is an upwardly, inwardly sloping wall 83 which merges with a radial inner bottom supporting wall having a span 84. This span of the bottom supporting wall has a conforming contour 84a which nestingly supports the bottom end, spherical surface of the glass body. The span 84 in this instance has a substantially flat lower surface for bearing support on an underlying container at its upper end closure 58. Thus, the base 80 provides a stacker bottom for stacking closed composite containers (51, 58 and 80 collectively) in vertical array.

In the foregoing structures of bases 70 and 80, the bearing support 74 or 84 for the glass body is a push-up segment maintaining the lower end of the glass body in spaced relationship to the support surface (such as a shelf surface) when the composite container is supported by its respective surfaces 72 or 82. The bearing support surface is yieldable through the tapering walls 73, 74 or 83, 84 respectively, to absorb shock or headloads on the glass part of the container, as pointed out in patent specification No. 1,185,901.

The advantage of a composite construction container formed in accordance with the present invention is that it enables the glass body to be formed of a wide variety of known glass compositions including the relatively inexpensive soda lime glass compositions used in forming conventional glass bottles and jars and other glass containers. However, the wall of the glass body may be substantially thinner than the wall of even the lightweight glass containers nowadays used in non-returnable beer bottles and the distribution of glass in the wall is considerably more uniform. For example, it is highly desirable and entirely feasible for the average wall thickness of the body of the container to be in the range of 0.025 to 0.075 inches when the body is formed of soda lime glass composition. Such bodies may be economically formed at high speed by the ribbon forming process used in the formation of electric light bulbs as generally disclosed in United States patent specification No. 1,790,397

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WHAT WE CLAIM IS:—

1. A composite construction container of the type described, in which the body is circular in any section perpendicular to an axis of rotational symmetry and comprises, in addition to the substantially continuously convexly arcuate bottom portion, a cylindrical portion contiguous with said bottom portion and having an axial extent substantially equal to that of the bottom portion and a diameter equal to the maximum diameter of the body, and a convexly tapering portion extending between the cylindrical portion and a concavely curved minimum diameter neck portion and having an axial extent substantially equal to the combined axial extents of the bottom portion and the cylindrical portion, the neck portion having a flared portion terminating in a finished lip constituting said mouth opening.

2. A container as claimed in claim 1, which further comprises a closure member for sealing the container after introduction of the contents.

3. A container as claimed in claim 1 or claim 2, in which the cup-shaped base member has a cylindrical side wall extending to the cylindrical portion of the body thereby surrounding the maximum diameter portion of the body, and preventing glass-to-glass contact when similar containers are positioned adjacent one another.

4. A container as claimed in any preceding claim, in which the base member is secured to the glass body by means of an adhesive.

5. A container as claimed in claim 1, 2 or 3, in which the base member is made of a heat shrinkable material and is secured onto the glass body by a heat shrinking process.

6. A container as claimed in claim 3 and any claim appendant thereto, in which venting means are provided within the base member in order to facilitate introduction therein of the glass body.

7. A container as claimed in claim 6, in which said venting means are sealed after insertion of the glass body into the base



(12)

member so as to prevent entry of contaminants into the base member after assembly of the composite container.

8. A container as claimed in claim 7,
5 in which the venting means comprise holes in portions of the base member which contact the glass body in the assembled state of the composite container, the holes being sealed during assembly of the container by
10 applying to the glass body spots of adhesive for filling the said holes after introduction of the body into the base member.

9. A container as claimed in any preceding claim, in which the base member
15 has an inwardly sloping frusto-conical wall imparting to the container a degree of elasticity for preventing direct transmission of shocks to the glass body.

10. A container as claimed in claims 2
20 and 9 in which the sloping wall extends up to a central portion for supporting the glass body, which central portion has a lower surface complementary to the upper surface

of the closure member for enabling similar containers to be stacked in a vertical array. 25

11. A container as claimed in any preceding claim, in which the glass in the body consists essentially of soda lime glass.

12. A container as claimed in any preceding claim, in which the average thickness
30 of the wall of the glass body is 0.025 to 0.075 inches.

13. A container of the type described constructed substantially as hereinbefore particularly described with reference to and
35 as illustrated in Figs. 1, 2 and 3 or Fig. 4 of the accompanying drawings.

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