

PATENT SPECIFICATION

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(54) PLASTICS DRUM WITH REMOVABLE COVER AND LOCKING RING

(71) We, GPG HOLDINGS LIMITED of Cranford, Blackdown, Leamington Spa, Warwickshire and THERMO PLASTICS LIMITED of Dunstable, Bedfordshire, both British Companies, 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:—

This invention relates to a container drum assembly comprising a plastics container having an outlet and a removable cover for closing the outlet, the cover being secured to the container by a retaining ring. The invention is particularly concerned with an improved arrangement for the engagement of the cover with the container and the manner in which the retaining ring is arranged in the assembly to firmly secure the cover.

According to the present invention there is provided a container drum assembly comprising a plastics container having a neck forming an outlet; a cover engaging the container and having a cap part which closes the outlet and a skirt which receives the neck; the skirt having a free end on an end portion of substantially castellated form to provide an array of recesses spaced around the periphery thereof and the neck having an array of outwardly extending projections spaced around the periphery thereof and located to extend through the recesses in the skirt, the portions of the skirt between said recesses having outwardly directed flanges and wherein the cover is secured to the container by a retaining ring which extends around the skirt end portion and is located to engage alternately with the projections on the sides thereof nearer to the free end of the skirt and with the flanges on the sides thereof further from the free end of the skirt.

Generally the neck of the container will be substantially cylindrical and is conveniently considered as such hereinafter. When the cover is engaged with the container a portion of the cover may be received within the neck and that portion, together with the skirt (which will usually be substantially cylindrical to correspond with the neck which it receives) may form a channel of substantially "U" shaped section. This channel may provide a seating within which is located a sealing ring which provides a seal between the end of the neck wall at the mouth of the neck and the cover. Although the neck may be regarded as being substantially cylindrical, it preferably has a peripheral bead which extends radially inwardly thereof while the cover is provided with a bung part which is received in the mouth of the neck of the container within the confines of the peripheral bead. The bung part is preferably cylindrical and is received within the confines of the peripheral bead coaxially of the neck as a relatively tight fit; the effect of such engagement between the bung part and the bead may alleviate distortions in the shape of the neck during tightening of the retaining ring or as a result of external forces which may be applied to the neck and cover assembly.

The sealing ring which is received in the "U" shaped channel as above mentioned may be circular, rectangular or other cross section and will generally be of metal or of an elastically deformable material such as rubber. Desirably the width of the sealing ring is slightly larger than the width of the channel at the portion within which it is located so that the sealing ring is under a slight amount of compression when initially located in the channel. During engagement of the cover with the neck, the neck is pushed as a sliding fit into the enclosure of the skirt until the leading edge

of the neck wall abuts against the sealing ring to urge this into further compression within its channel. The container is conveniently formed by a blow moulding technique whereby the aforementioned leading edge is obtained when the portion of the blown body which constitutes the container is severed from the remaining portion of the plastics; as such the leading edge of the neck will usually have an even and smooth finish to engage with the sealing ring.

By having the skirt as a tight sliding fit over the outer surface of the neck and locating the aforementioned peripheral bead (which abuts as a tight fit against the cover within the neck) at a position towards that end of the neck which abuts the sealing ring, it may be ensured that the sealing ring is retained in its channel of the cover by the end of the neck and the peripheral bead during distortions which may occur to the neck and cover as a result of normal stresses to which the assembly may be subjected in use.

Desirably the length of the skirt is greater than the length of the bung part which may be provided, and the length of the neck is greater than that of the skirt.

Preferably the castellations of the skirt are symmetrically disposed circumferentially as are the projections on the neck. Usually the recesses in the castellated portion of the skirt will be spaced circumferentially equidistant from each other and desirably the spacing of one recess to another is approximately equal to the circumferential width of a recess.

The flanges on the skirt will generally be located at the free end of the skirt and be formed integrally with the cover. Although it will be apparent that the flanges must be such as to permit the projections on the neck to be received within the skirt recesses during fitting of the cover, the circumferential length of each flange may project to circumferentially overlie the recesses in the skirt which are adjacent to respective flanges thereto. On this latter point the flanges may be of dove tail shape when viewed in the axial direction of the neck so that they are each provided with convergent side edges. The projections preferably correspond in shape and size to the recesses within which they are respectively received and may be provided with chamfered side edges which are located adjacent to, and substantially correspond with, the respectively adjacent convergent side edges of the flanges between which the projections are circumferentially located.

It is preferred that the surfaces of the projections with which the retaining ring engages substantially subtend acute angles

with the respectively adjacent surfaces of the flanges with which the retaining ring engages so that, when the cover is initially located on the neck of the container the convergent surfaces with which the retaining ring engages on the projections and flanges may be regarded as partly forming a circumferential groove within which the retaining ring may easily be located. By this arrangement, as the retaining ring is tightened, it contracts towards the neck and moves inwardly towards the apices of the acute angles. This movement of the retaining ring is arranged to cause the flanges to be urged away from the projections, in the axial direction of the neck and the cover to be drawn axially into engagement with the neck. As the cover is urged axially into engagement with the neck under increasing tension during tightening of the retaining ring, the sealing ring (when provided) is increasingly compressed between the end of the neck and the channel in the cover. Simultaneously with such axial movement of the cover the retaining ring urges the castellated portion of the skirt radially into firm engagement with the outer surface of the neck.

Advantageously the projections and flanges with which the retaining ring engages are so arranged relative to each other that, upon being tightened, the retaining ring is deformed into wave-shaped formation; to achieve this the locking ring, when pressed, is urged downwardly by the surfaces of the projection against which the ring abuts and urged upwardly by the surfaces of the flanges against which the ring abuts whereby a wave-shaped formation, as viewed radially of the container neck, is obtained; the surfaces of the projections and/or the flanges with which the retaining ring engages may be of convex shape to present a smooth curved profile to the ring which the latter follows in its wave deformation.

Retaining rings for container assemblies of the type with which the present invention is concerned are well known in the relevant art and generally comprise a spring steel wire (which may be, for example, of circular, triangular or oval section) the ends of which are connected together by a conventional clamping lock mechanism so that by operation of the lock mechanism the effective circumferential length of the steel wire is shortened. Upon being deformed into wave shape as abovementioned, it will be appreciated that the retaining ring may become, in effect, spring loaded and the energy so provided in the ring will maintain an axial spring force on the flanges to continually bias the cover axially into engagement with the neck and thereby main-

tain compression on the sealing ring (when provided) for a considerable period after the assembly has been secured. The spring pressure which may be provided by the wave deformed retaining ring to constantly urge the cover into engagement with the neck alleviates the likelihood of leakage between the cover and neck in the event of reasonable deformation of the assembly which may occur, for example by the container assembly being dropped, subjected to an impact or pressurised during storage. Furthermore, and possibly more importantly, the aforementioned spring pressure of the retaining ring may be such as to provide prolonged effective sealing between the cover and neck by compensating for cold flow which may occur in the plastics material of the container and of a plastics cover with which it may be provided.

A particular advantage which may be derived from the drum assembly of the present invention is the facility it affords to have a structure for the cover which is relatively rigid in comparison with conventional covers of the type having skirts which, on fitting or removal, are sprung onto or from the necks of their containers to engage or disengage, for example, with retaining flanges on such necks. By the present invention the cover may be fitted or removed with negligible distortion thereto solely by being pushed as a close sliding fit over the container neck until the castellated portion of the skirt appropriately engages with the projections on the neck or until the skirt is free of the neck.

One embodiment of a container drum assembly constructed in accordance with the present invention and having a substantially cylindrical neck will now be described, by way of example only, with reference to the accompanying illustrative drawings in which:

Figure 1 is a section of part of the assembly, the section being taken in a radial plane which includes the axis of the neck;

Figure 2 is a side elevation of the part of the assembly shown in Figure 1; and

Figure 3 is a plan view of the part of the assembly shown in Figure 2.

The container drum assembly comprises a plastics container 1 having a generally cylindrical neck 2 which forms an outlet of the container. Moulded in the wall of the neck 2 is a corrugation which provides a circumferential bead 3 which extends radially inwardly of the neck 2. Also moulded in the wall of the neck 2 are an array of projections 4 which extend radially outwardly of, and are circumferentially spaced around, the neck. The projections 4 are hollow (as indicated by the broken line in Figure 1) so that they form recesses which

communicate with the interior of the drum.

Mounted on the neck 2 is a plastics cover 6 having a cap part 5 which closes the mouth of the outlet and a cylindrical bung part 7 on the cap part which is received as a close fit within the confines of the bead 3. Integrally formed with the cap part 5 is an upwardly extending cylindrical rim which carries a cylindrical skirt 8 within the enclosure of which is closely received the neck 2. It will be noted that the upper end of the neck 2 is located within an annular channel 9 of substantially "U" shaped section formed between the skirt 8 and the bung part 7. Positioned within the channel 9 is an annular sealing ring 10 which is intended to be compressed, and form a tight seal between, the free end of the neck 2 and the cover engaging there-with.

The free end portion of the skirt 8 is of substantially castellated form to provide an array of recesses spaced around the circumference thereof; these recesses respectively receive, one each, the projections 4 and are shaped to substantially correspond with the periphery of the projections 4 which they receive (see Figure 2). The circumferentially spaced portions 11 of the skirt between the recesses and which extend substantially axially of the neck 2 between adjacent projections 4 each carry a flange 12 which is directed radially outwardly of the neck 2. The circumferentially spaced array of flanges 12 are located axially on the side of the projections 4 remote from the free end of the neck 2 and, when viewed in a radial plane which includes the axis of the neck 2 (as shown in Figure 1), subtend acute angles with respectively adjacent side faces of the projections 4. As shown in Figure 3 the flanges 12 are each of substantially dove-tail shape when viewed axially of the neck 1 to provide convergent side edges 14 and 15 while each projection 4 which is located circumferentially between a pair of convergent side edge 14 and 15 is provided with chamfered side edges which substantially correspond to the respectively adjacent side edges 14 and 15.

The cover 6 is secured to the container 1 by a spring steel locking ring 13 which extends around the skirt 8 over its portions 11 and is located to engage alternately with the projections 4 on the inclined side faces thereof which are adjacent to the free end of the skirt and with the flanges 12 on the sides thereof remote from the free end of the skirt.

The locking ring 13 is provided with a tightening mechanism (not shown) by which its circumferential length is reduced to draw the ring towards the wall of the neck 2. During its tightening, the locking

(12)

ring 13 slides radially inwardly over the flanges 12 and projections 4 towards the effective apices subtended by the surfaces thereof so urging the cover 6 into closer engagement with the neck 2 while the bung part 7 is drawn axially into the neck to compress the ring seal 10.

Preferably the container 1 and cover 6 are moulded from similar plastics material such as a polyolefin and with the wall thickness of the container substantially the same as that of the cover. By such an arrangement it is likely that the container and cover in the assembly will have substantially the same physical and mechanical properties and this should alleviate difficulties which have hitherto been encountered by having different materials for the aforementioned components as regards their thermal properties and mechanical carrying capabilities. It will be noted, in particular, that when the cover 6 is fitted to the container 1, the skirt 8 is merely pushed axially over the neck 2 as a close sliding fit until the portions 11 of the skirt are received between the projections 4; consequently there is negligible distortion to the natural shape of the skirt during fitting (and removal) and the cover may therefore be moulded to have a structure which is relatively rigid in comparison with conventional plastics covers of the type having skirts which on fitting are sprung on to the necks of their containers to engage, for example, over retaining flanges on such necks.

It will be apparent that when the locking ring 13 has been secured to the required tension the assembly is ready for use. It is preferred that the surfaces of the flanges 12 and projections 4 with which the ring 13 engages are so arranged relative to each other that, upon tightening, the locking ring 13 is deformed into a wave formation as it extends progressively over its circumferential length and which wave shaped deformation is progressive as the locking ring extends successively from engagement between a flange 12 and a projection 4. The effect of the wave shaped deformation in the locking ring is to maintain spring tension in this ring which constantly urges the cover 6 axially of the neck and into closer engagement with the neck 2. If required the surfaces of either or both the projections 4 and the flanges 12 with which the ring 13 engages can be of convex shape (as shown in Figure 2) to present a smooth curved profile to the ring which the latter may follow in its wave deformation.

WHAT WE CLAIM IS:—

1. A container drum assembly comprising a plastics container having a neck forming an outlet; a cover engaging the

container and having a cap part which closes the outlet and a skirt which receives the neck; the skirt having a free end on an end portion of substantially castellated form to provide an array of recesses spaced around the periphery thereof and the neck having an array of outwardly extending projections spaced around the periphery thereof and located to extend through the recesses in the skirt, the portions of the skirt between said recesses having outwardly directed flanges and wherein the cover is secured to the container by a retaining ring which extends around the skirt end portion and is located to engage alternately with the projections on the sides thereof nearer to the free end of the skirt and with the flanges on the sides thereof further from the free end of the skirt.

2. An assembly as claimed in claim 1 in which a portion of the cover is received within the neck and that portion together with the skirt forms a channel of substantially "U" shaped section, and wherein a sealing ring is located within the channel to engage with and form a seal between the end of the neck at the mouth thereof and the cover.

3. An assembly as claimed in either claim 1 or claim 2 wherein the neck has a peripheral bead extending radially inwardly thereof and the cover has a bung part which is received in the neck within the confines of the peripheral bead.

4. An assembly as claimed in any one of the preceding claims wherein the surfaces of the projections with which the retaining ring engages substantially subtend acute angles with the respectively adjacent surfaces of the flanges with which the retaining ring engages so that, during its tightening, said ring is drawn towards the neck and towards the apices of said acute angles to cause the flanges to be urged away from the projections in a direction substantially parallel with the neck and thereby the cover to be drawn into engagement with the neck in a direction substantially parallel to said neck.

5. An assembly as claimed in any one of the preceding claims wherein the projections and flanges with which the retaining ring engages are so arranged relative to each other that, upon tightening, the retaining ring is deformed into wave formation when viewed radially of the neck.

6. An assembly as claimed in claim 5 wherein the surfaces of the projections with which the retaining ring engages are of convex shape to present a smooth curved profile to the ring which the latter follows in its wave deformation.

7. An assembly as claimed in either claim 5 or claim 6 wherein the surfaces of

(12)



ring 13 slides radially inwardly over the flanges 12 and projections 4 towards the effective apices subtended by the surfaces thereof so urging the cover 6 into closer engagement with the neck 2 while the bung part 7 is drawn axially into the neck to compress the ring seal 10.

Preferably the container 1 and cover 6 are moulded from similar plastics material such as a polyolefin and with the wall thickness of the container substantially the same as that of the cover. By such an arrangement it is likely that the container and cover in the assembly will have substantially the same physical and mechanical properties and this should alleviate difficulties which have hitherto been encountered by having different materials for the aforementioned components as regards their thermal properties and mechanical carrying capabilities. It will be noted, in particular, that when the cover 6 is fitted to the container 1, the skirt 8 is merely pushed axially over the neck 2 as a close sliding fit until the portions 11 of the skirt are received between the projections 4; consequently there is negligible distortion to the natural shape of the skirt during fitting (and removal) and the cover may therefore be moulded to have a structure which is relatively rigid in comparison with conventional plastics covers of the type having skirts which on fitting are sprung on to the necks of their containers to engage, for example, over retaining flanges on such necks.

It will be apparent that when the locking ring 13 has been secured to the required tension the assembly is ready for use. It is preferred that the surfaces of the flanges 12 and projections 4 with which the ring 13 engages are so arranged relative to each other that, upon tightening, the locking ring 13 is deformed into a wave formation as it extends progressively over its circumferential length and which wave shaped deformation is progressive as the locking ring extends successively from engagement between a flange 12 and a projection 4. The effect of the wave shaped deformation in the locking ring is to maintain spring tension in this ring which constantly urges the cover 6 axially of the neck and into closer engagement with the neck 2. If required the surfaces of either or both the projections 4 and the flanges 12 with which the ring 13 engages can be of convex shape (as shown in Figure 2) to present a smooth curved profile to the ring which the latter may follow in its wave deformation.

WHAT WE CLAIM IS:—

1. A container drum assembly comprising a plastics container having a neck forming an outlet; a cover engaging the

container and having a cap part which closes the outlet and a skirt which receives the neck; the skirt having a free end on an end portion of substantially castellated form to provide an array of recesses spaced around the periphery thereof and the neck having an array of outwardly extending projections spaced around the periphery thereof and located to extend through the recesses in the skirt, the portions of the skirt between said recesses having outwardly directed flanges and wherein the cover is secured to the container by a retaining ring which extends around the skirt end portion and is located to engage alternately with the projections on the sides thereof nearer to the free end of the skirt and with the flanges on the sides thereof further from the free end of the skirt.

2. An assembly as claimed in claim 1 in which a portion of the cover is received within the neck and that portion together with the skirt forms a channel of substantially "U" shaped section, and wherein a sealing ring is located within the channel to engage with and form a seal between the end of the neck at the mouth thereof and the cover.

3. An assembly as claimed in either claim 1 or claim 2 wherein the neck has a peripheral bead extending radially inwardly thereof and the cover has a bung part which is received in the neck within the confines of the peripheral bead.

4. An assembly as claimed in any one of the preceding claims wherein the surfaces of the projections with which the retaining ring engages substantially subtend acute angles with the respectively adjacent surfaces of the flanges with which the retaining ring engages so that, during its tightening, said ring is drawn towards the neck and towards the apices of said acute angles to cause the flanges to be urged away from the projections in a direction substantially parallel with the neck and thereby the cover to be drawn into engagement with the neck in a direction substantially parallel to said neck.

5. An assembly as claimed in any one of the preceding claims wherein the projections and flanges with which the retaining ring engages are so arranged relative to each other that, upon tightening, the retaining ring is deformed into wave formation when viewed radially of the neck.

6. An assembly as claimed in claim 5 wherein the surfaces of the projections with which the retaining ring engages are of convex shape to present a smooth curved profile to the ring which the latter follows in its wave deformation.

7. An assembly as claimed in either claim 5 or claim 6 wherein the surfaces of

the flanges with which the retaining ring engages are of convex shape to present a smooth curved profile to the ring which the latter follows in its wave deformation.

- 5 8. An assembly as claimed in any one of the preceding claims in which the flanges are of substantially dove tail shape when viewed in a direction substantially parallel to the neck to provide convergent
- 10 side edges and wherein each projection which is located peripherally between a pair of convergent side edges of adjacent flanges is provided with chamfered side edges which substantially correspond to the
- 15 respectively adjacent convergent side edges of the flanges.

9. An assembly as claimed in any one of the preceding claims wherein the peripheral widths of the respective projections
- 20 substantially correspond to the peripheral widths of the recesses in the skirt within which they are respectively received.

10. An assembly as claimed in any one of the preceding claims wherein the shapes
- 25 of the portions of the projections which are received within the respective recesses sub-

stantially correspond to the shapes of those respective recesses.

11. An assembly as claimed in any one of the preceding claims wherein the cover 25 is moulded in a plastics material similar to that of the container and has a wall thickness substantially the same as that of the container.

12. A container drum assembly sub- 30 stantially as herein described with reference to the accompanying illustrative drawings.

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