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(54) **PLASTIC CONTAINER AND METHOD OF INTEGRALLY SECURING A NECK ATTACHMENT THERETO**

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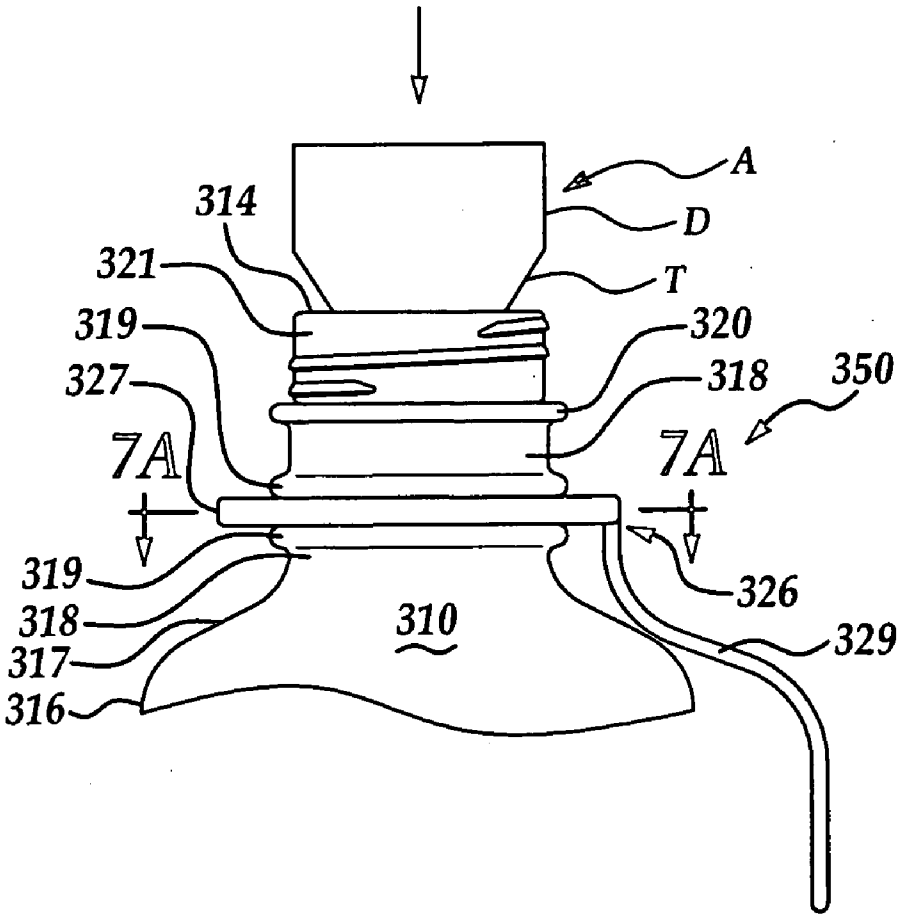
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(57) **ABSTRACT**

A method of making a container by providing a container having a neck, providing a container attachment having a circumferentially continuous ring, telescoping the ring over the neck, and radially expanding at least a portion of the neck to secure the attachment to the neck.



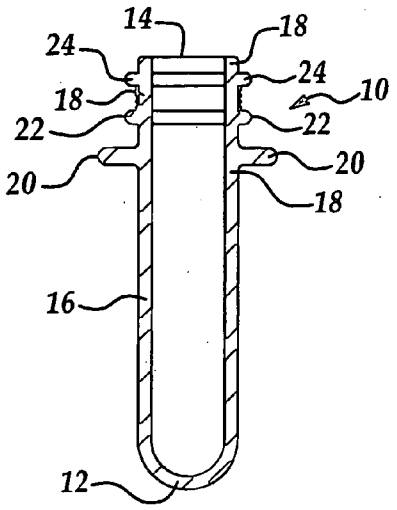


Figure 1

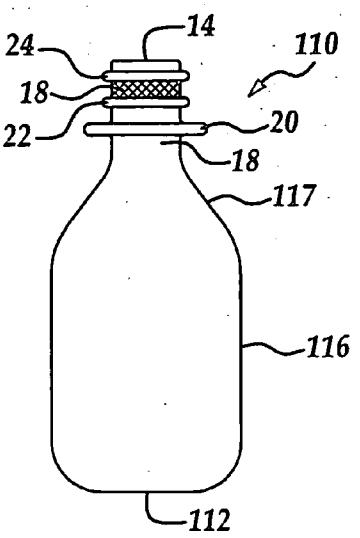


Figure 2

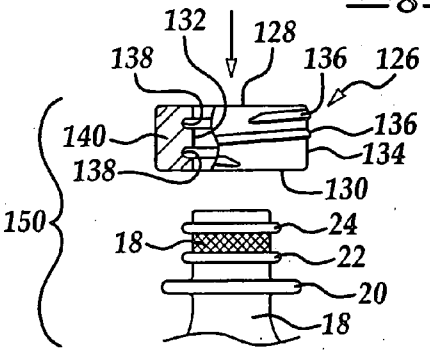


Figure 3

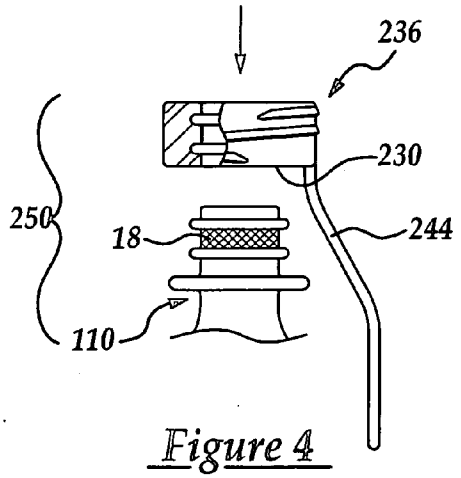


Figure 4

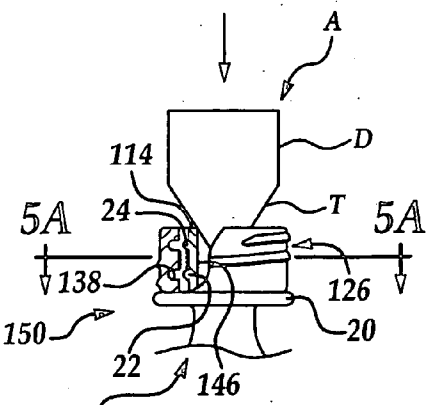


Figure 5

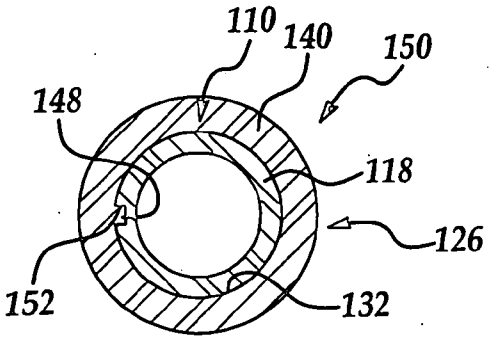


Figure 5A

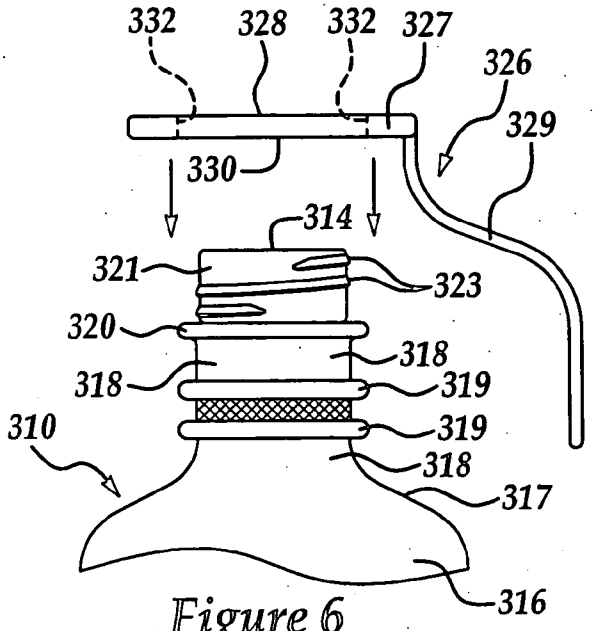


Figure 6

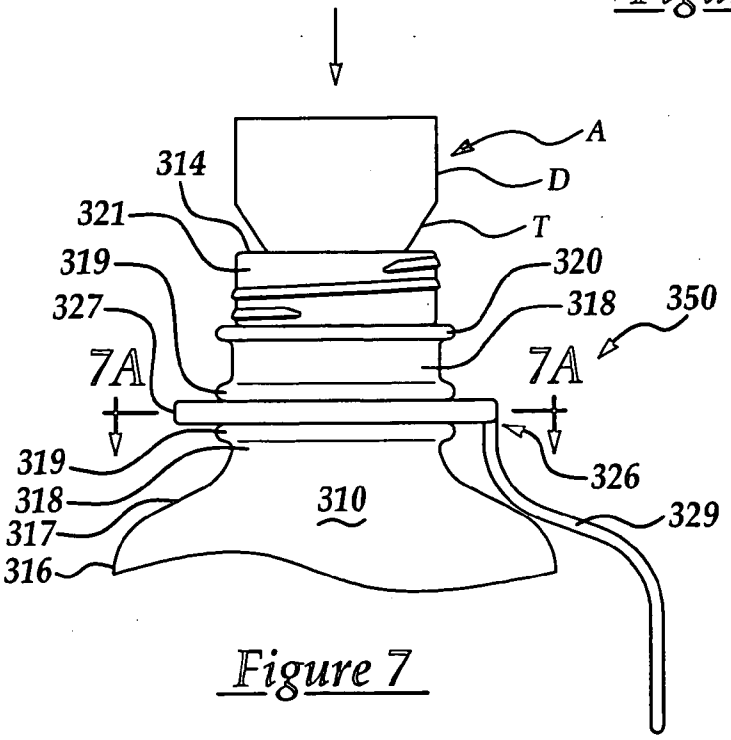


Figure 7

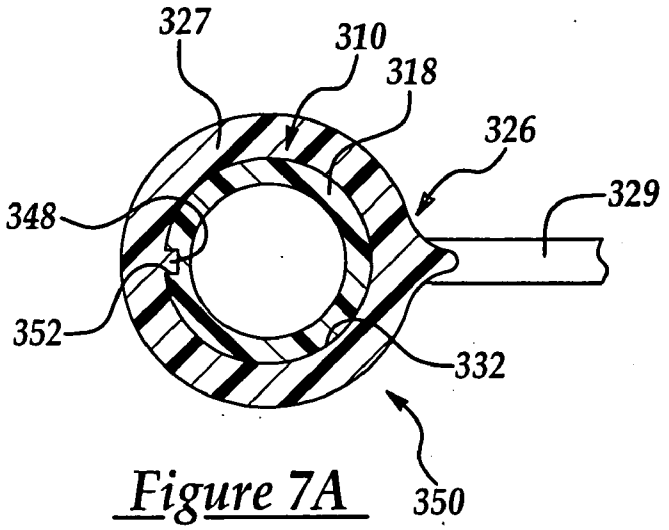


Figure 7A

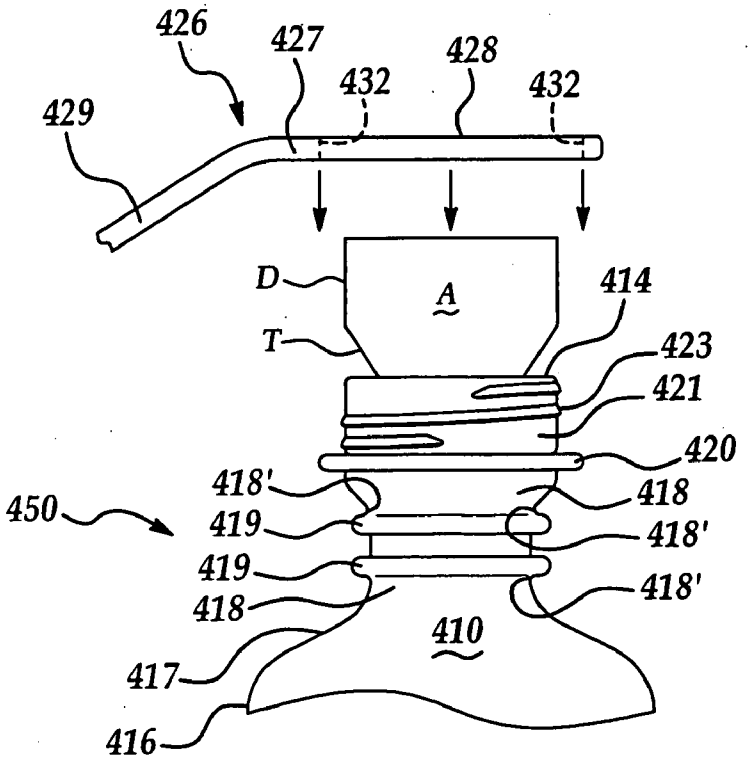


Figure 8

PLASTIC CONTAINER AND METHOD OF INTEGRALLY SECURING A NECK ATTACHMENT THERETO

[0001] The present invention is directed to manufacture of containers, and more particularly to the manufacture of plastic containers having components, such as finish rings and handles, assembled thereto.

BACKGROUND AND SUMMARY OF THE INVENTION

[0002] Containers for flowable products, such as liquids and granular products, have been formed of plastic by a variety of methods. For example, plastic containers have been blow molded from preforms to provide container bodies having integral neck finishes and handles. Also, plastic containers have been formed with a container body, including a neck finish integral with the container body, and a handle separately attached to the container. Other containers have been formed by positioning an injected molded handle and finish in a blow mold so that the handle and finish are incorporated into the container as it is blow molded.

[0003] In at least some instances, it may be desirable to form a container body separately from a neck finish and/or handle. One reason is that a neck finish that is integrally formed with a preform typically requires more accurate and stable dimensioning than the rest of body of the preform, which may limit the cycle time of the preform molding process. Another reason is that the blow molds used to form the container body can be more simple in design in that they do not require pockets to form or hold an integrally molded handle. It may also be desirable to use a different plastic material for strength, color, esthetics or cost issues, for example, wherein the handle and finish need not be made of the same material as the container body.

[0004] The invention includes a number of different aspects, which may be implemented separately from or, more preferably, in combination with each other.

[0005] A method in accordance with one aspect of the invention includes the steps of providing a container having a neck, providing a container attachment having a circumferentially continuous ring, telescoping the ring over the neck, and radially expanding the neck to secure the attachment to the neck.

[0006] In accordance with a second aspect of the invention, there is provided a method of making a handled container that includes the steps of providing a container having a neck, providing a handle having a circumferentially continuous ring, telescoping the ring externally over the neck, and radially expanding the neck to secure the handle to the neck.

[0007] In accordance with a third aspect of the invention, there is provided a method of making a handled container that includes the steps of pressure molding a preform having a body and a neck with at least one external engagement element, providing a handle having a circumferentially continuous attachment ring, blow molding the body of the preform to form the body of a container having the neck extending therefrom. Either prior to or subsequent to the blow molding step, the method further includes telescoping the ring of the handle over the neck of the container until the ring is adjacent to the at least one external engagement element, and then expanding at least a portion of the neck containing the at least one external engagement element radially outwardly into engagement with the ring to secure the handle to the neck.

[0008] In accordance with a fourth aspect of the invention, there is provided a container that includes a body, a neck extending from the body, and an attachment that includes an attachment ring encircling a portion of the neck, the portion of the neck being strain hardened by radial expansion against an inside diameter of the ring.

[0009] In accordance with a fifth aspect of the invention, there is provided an attachment for a container having a body and a neck extending from the body wherein the neck includes a pair of external engagement beads, the attachment includes a ring having an internal diametrical surface having at least one anti-rotational engagement feature, wherein the attachment is adapted for securement to the neck of the container between the pair of external engagement beads and further wherein the pair of external engagement beads axially restrain the ring and the at least one anti-rotational engagement feature rotationally restrains the ring from movement relative to the container.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The invention, together with additional objects, features, advantages and aspects thereof, will be best understood from the following description, the appended claims and the accompanying drawings, in which:

[0011] **FIG. 1** is a cross-sectional view of a preform for use with a method according to one exemplary embodiment of the present invention;

[0012] **FIG. 2** is an elevational view of a container blow-molded from the preform of **FIG. 1** and for use with a method according to one exemplary embodiment of the present invention;

[0013] **FIG. 3** is a fragmentary schematic illustration of a container assembly being produced from a separate finish ring attachment and the container of **FIG. 2**, according to an exemplary embodiment of the present invention;

[0014] **FIG. 4** is a fragmentary schematic illustration of a container assembly being produced from a separate, integrated finish ring and handle attachment and the container of **FIG. 2**, according to an exemplary embodiment of the present invention;

[0015] **FIG. 5** is an elevational view of a partially assembled version of the container assembly of **FIG. 3**, which illustrates a method step according to an exemplary embodiment of the present invention;

[0016] **FIG. 5A** is a cross-sectional view taken along line A-A of **FIG. 5**, after the method step is complete, wherein a neck of the container is radially expanded into engagement with an attachment such that the attachment is integrally secured to the neck;

[0017] **FIG. 6** is an elevational view that illustrates a method step for integrally attaching a handle to a container according to another exemplary embodiment of the present invention;

[0018] **FIG. 7** is an elevational view that illustrates another method step for integrally attaching the handle of

FIG. 6 to the container of **FIG. 6** according to another exemplary embodiment of the present invention;

[0019] **FIG. 7A** is a cross-sectional view of the completed container assembly of **FIG. 7** taken along line A-A thereof; and

[0020] **FIG. 8** is an elevational view that illustrates a method step for integrally attaching a handle to a container having a neck portion that is narrower at one end than at a finish end, according to yet another exemplary embodiment of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0021] **FIG. 1** illustrates a preform **10** that includes a closed end **12** and an oppositely disposed open end **14**. A body portion **16** extends from the closed end **12** toward the open end **14** and terminates in the form of a neck **18**. The neck **18** extends upward from the body portion **16** to include an integral annular support flange **20**, further extends upward to include integral first and second orienting beads or rings **22**, **24** and terminates at the open end **14**. For reasons that will be discussed below, the neck portion **18** of the preform **10**, particularly that portion between the orienting rings **22**, **24** inclusive, is preferably provided with knurling surface features. Knurling surface features are defined herein as a pattern of small ridges, beads, or cross-hatches provided on a surface to aid in gripping another surface to be placed in contact therewith. The preform **10** may be of monolayer construction, or may be of multilayer construction having an inner layer of barrier resin, for example, such as ethylene vinyl alcohol (EVOH) and outer layers composed of polyethylene terephthalate (PET) polyethylene naphthalate (PEN) or the like, or any other suitable container materials. The preform **10** may be produced by a pressure molding operation such as injection or compression molding. Subsequently, the preform **10** may be blow molded to form a blow-molded container **110** as shown in **FIG. 2**.

[0022] In **FIG. 2**, the container **110** shown includes a closed bottom end **112** and the oppositely disposed open end **14**. A body portion **116** extends from the closed end **112** toward the open end **14**, tapers in the form of a shoulder **1117**, and terminates in the form of the neck **18**. The neck **18** extends upward from the shoulder **117** to include integral annular support flange **20**, further extends upward to include integral first and second orienting beads or rings **22**, **24** and terminates at the open end **14**. Again, via the preform **10** of **FIG. 1**, knurling features are provided on the neck **18**, preferably between the orienting rings **22**, **24**.

[0023] **FIG. 3** schematically illustrates a method step in accordance with an exemplary embodiment of the present invention wherein an attachment in the form of a circumferentially continuous finish ring **126** is telescoped over the neck of the container **110**, as directionally depicted by the arrow. In other words, the finish ring **126** and container neck **18** are introduced together lengthwise or axially, with the container neck **18** entering the finish ring **126** as the result of the bringing together or collision of the container **110** and finish ring **126**. Preferably, the finish ring **126** is placed over the container neck **18** before the container **110** has cooled off from the blow molding step and, thus, while the container material is still relatively soft. It is also contemplated that this step could be completed after the container **110** has cooled. The finish ring **126** includes a top surface **128**, an oppositely disposed bottom surface **130** parallel to top surface **128**, and inner and outer diametrical surfaces **132**, **134** extending perpendicularly therebetween. The outer diametrical surface **134** include threads **136** or thread-like features or segments integrally formed thereon. The inner diametrical surface **132** includes annular recesses **138** formed therein, and further preferably includes knurling features disposed between the recesses **138**. The finish ring **126** is telescoped over the neck **18** until the bottom surface **130** of the finish ring **126** contacts a top surface **142** of the support flange **120**. The finish ring **126** may be injection or compression molded and composed of any desired material, particularly any material that is different from the material composition of the preform and container. In other words, the material and conditions of fabrication of the finish ring **126** may be selected separately from the material and fabrication conditions of the preform to achieve more optimal operating characteristics of the finish area of the container **110**. Thus, the preform and container **110** can be molded with relatively thinner wall sections without having to accommodate the flow of molten plastic material into a relatively thicker finish area, which reduces material cost and mold cycle time. Preferably, however, the finish ring **126** is composed of polypropylene (PP) or the like, or any other plastic material having sufficient resiliency to elastically expand and retract.

[0024] A finish ring **226** shown in **FIG. 4** is identical to the finish ring **126** of **FIG. 3**, except the finish ring **226** of **FIG. 4** is provided with an integrally extending handle **244** extending from a bottom surface **230** (or any other surface). Stated another way, the handle **244** has a circumferentially continuous member integrally attached thereto. In any case, the finish ring **226** is telescoped over the neck **18** of the container **110**, as described previously.

[0025] **FIG. 5** schematically depicts a securing step of a method of an exemplary embodiment of the present invention, wherein a mandrel or anvil A is inserted within the open end **14** of the container **110**. The anvil A, or a plurality of sequential anvils, may be used to stretch neck finishes of different containers to various desired sizes. The anvil A may be a single solid tool as shown, or may be a multipiece expandable tool such as an expanding mandrel or the like. The anvil A is driven into the container **110** such that a tapered surface T of the anvil A first works on the open end **14** and then an outer diameter D of the anvil A works on an inner surface **146** of the neck **118** so as to radially outwardly displace and plastically deform the neck **118** until the first and second rings **22**, **24** seat within their respective recesses **138** of the finish ring **126** and the corresponding knurling features of the container neck **18** and the finish ring **126** interengage under compression. Accordingly, at least a portion of the finish ring **126** is axially captured between the rings **22**, **24** of the container **110**. It is contemplated that the material for the container **110** and finish ring **126** be selected such that motion of the anvil A will significantly plastically deform the neck **118** of the container **110** and merely elastically deform the neck ring **126**. Preferably, however, this step is executed while the container **110** is still relatively warm from the preceding preforming and blow molding steps. It is contemplated that the neck **18** of the container **110** could be heated in any manner, to maintain the neck **18** in a relatively soft and flexible state. In any case, the finish ring **126** is not substantially radially expanded during the radial

expansion step. The resultant snug, interlocking fit between the rings **122**, **124** and the recesses **138** is provided to prevent relative axial movement between the container neck **18** and the finish ring **126**. Similarly, the interengagement of the knurling features provides added frictional resistance to rotational movement between the container neck **18** and the finish ring **126**.

[**0026**] In **FIG. 5A**, there is illustrated an additional or alternative feature. **FIG. 5A** illustrates an assembled version of **FIG. 5** taken in the form of a transverse cross-section along line A-A thereof. The finish ring **126** includes a radially extending lug **148** formed on the inner diametrical surface **132**, and the container **110** includes a radially extending pocket **152** formed in the neck **118** and which is adapted for receiving the lug **148** of the finish ring **126**. The interlocking lug **148** and pocket **152** are provided to prevent relative rotation between the container **110** and finish ring **126**.

[**0027**] **FIGS. 6 and 7** illustrate an alternative embodiment of the present invention. A container **310** includes a closed end (not shown) and an oppositely disposed open end **314**. A body portion **316** extends from the closed end toward the open end **314**, tapers in the form of a shoulder **317**, and terminates at a neck **318**. The neck **318** extends upward from the shoulder **317** to include a pair of retaining beads or rings **319**, extends upward further to include an integral annular support flange **320**, further extends upward to include an integral neck finish **321** and terminates at the open end **314**. The neck finish **321** includes one or more threads or thread segments **323** thereon for securing a closure member (not shown) to the container **310**. An attachment in the form of a handle **326** includes a circumferentially continuous ring **327** having a top surface **328** and an curved stem **329** integrally extending from a bottom surface **330** of the ring **327**. The handle **326** may be injection or compression molded and composed of any desired material, including even the same the material composition as the container **310**. Preferably, however, the handle **126** is composed of polypropylene (PP) or the like, having sufficient resiliency to elastically expand and retract. The handle **326** is shown being telescoped over the neck **318** of the container **310**, as depicted by the directional arrows. In other words, the ring **327** of the handle **326** and the container neck **318** are introduced together lengthwise or axially, with the container neck **318** entering the ring **327**. The ring **327** includes an inner diameter **332** that is provided just larger than the outer diametrical size of the support flange **320** such that the ring **327** passes freely thereover. The handle **326** is lowered until the ring **327** is axially located substantially between the retaining rings **319** of the container **310**.

[**0028**] **FIG. 7** schematically depicts an assembly step of a method of another exemplary embodiment of the present invention, wherein the anvil A is inserted within the open end **314** of the container **310**. The anvil A includes a tapered surface T and an outer diameter D that is sized just larger than the internal diameter of the neck **318**. The anvil A is driven into the container **310** such that the tapered surface T of the anvil A first works on the open end **314** and then the outer diameter D of the anvil A works on an inner surface (not shown) of the neck **318** so as to radially outwardly displace and plastically deform the neck **318** until the rings **319**, by virtue of the radial outward displacement thereof, capture the ring **327** of the handle **326** therebetween. It is contemplated that the materials for the components are selected such that motion of the anvil A will largely plastically deform the neck **318** of the container **310** and largely elastically deform the ring **327** of the handle **326**. The snug, entrapping fit of the ring **327** of the handle **326** between the rings **319** of the container **310** is provided to prevent relative axial movement between the container neck **318** and the handle **326**. Similarly, the interengagement of the knurling features provides added frictional resistance to rotational movement between the container neck **318** and the handle **326**.

[**0029**] In addition, **FIG. 7A** illustrates an assembled version of **FIG. 7** taken in the form of a transverse cross-section along line A-A thereof. In **FIG. 7A** it can be seen that the ring **327** of the handle **326** includes a radially extending lug **348** formed on the inner diametrical surface **332**, and that the container **310** includes a radially extending pocket **352** formed in the neck **318** and adapted for receiving the lug **348** of the ring **327**. The interlocking lug **348** and pocket **352** are provided to prevent relative rotation between the container **310** and handle **326**.

[**0030**] **FIG. 8** depicts another exemplary embodiment of the present invention. A container **410** includes a closed end (not shown) and an oppositely disposed open end **414**. A body portion **416** extends from the closed end toward the open end **414**, tapers in the form of a shoulder **417**, and terminates in the form of a neck **418**. The neck **418** extends forward from the shoulder **417** to include a reduced diameter portion **418'** having a pair of retaining rings **419**, extends forward further to include an integral annular capping flange **420**, further extends forward to include an integral neck finish **421**, and terminates at the open end **414**. The neck finish **421** includes one or more threads **423** thereon for securing a closure member (not shown) to the container **410**. Thus, the container **410** is largely the same as the container **310** shown in **FIGS. 6 and 7**, except that the neck finish **421** is provided in size as the desired final finish size and thus does not get stretched during the stretching operation, while the neck **418** includes the reduced diameter portion **418'** which does get stretched during the stretching operation.

[**0031**] Still referring to **FIG. 8**, an attachment in the form of a handle **426** includes a circumferentially continuous ring **427** having a top surface **428** and a stem **429** extending from the ring **427**. The handle **426** may be injection or compression molded and composed of any desired material, including even the same the material composition as the container **410**. Preferably, however, the handle **426** is composed of polypropylene (PP) or the like, having sufficient resiliency to elastically expand and retract. The handle **426** is shown being telescoped over the neck **418** of the container **410**, as depicted by the directional arrows. In other words, the ring **427** of the handle **426** and the container neck **418** are introduced together lengthwise or axially, with the container neck **418** entering the ring **427** as the result of collision therebetween. The ring **427** includes an inner diameter **432** that is sized to be just larger than the outer diameter size of the capping flange **420** such that the ring **427** passes freely thereover. The handle **426** is lowered until the ring **427** is axially located substantially between the retaining rings **419** of the container **410**.

[**0032**] **FIG. 8** also schematically depicts an assembly or securing step of a method of another exemplary embodiment

of the present invention, wherein the anvil A is inserted within the open end **414** of the container **410**. In contrast to the previous embodiment of **FIG. 7**, here the outer diameter D of the anvil A is smaller than the inner diameter of the integral neck finish **421** but is larger than the reduced diameter portion **418'**. The anvil A is driven into the container **410** such that the tapered surface T' of the anvil A' first works on the open end **414** and then an outer diameter D' of the anvil A' works on an inner surface (not shown) of the reduced diameter portion **418'** of the neck **418** so as to radially outwardly displace and plastically deform the reduced diameter portion **418'** of the neck **418** until the rings **419** entrap the ring **427** of the handle **426** therebetween.

[**0033**] Several advantages are provided with one or more of the embodiments of the present invention described above. For example, it is now possible to integrally secure an attachment or component to a neck of a container using the same machine or station that is used to stretch the neck finish to desired size, thereby adding value to a container product without adding capital costs. Simultaneously, the neck size of different preform designs can be produced to a common single diameter and thereafter expanded to a variety of desired sizes, thereby minimizing perso parts. Also, the present invention enables the integral securing of an attachment to a container neck using an integral compression fit, rather than the more cumbersome processes of gluing or swaging. It may also be possible to reduce the cost of container manufacture as a result of higher preform cavitation due to employing a smaller common neck size. Finally, the present invention also provides a simplified method of orienting a finish or handle to a container and minimizes undesired rotation of an attachment relative to a container neck.

[**0034**] There have thus been described a container, an attachment for a container, a method of making a container, and methods of making a handled container that fully satisfy all of the objects and aims previously set forth. The present invention has been disclosed in conjunction with presently preferred embodiments thereof, and a number of modifications and variations have been discussed. Other modifications and variations will readily suggest themselves to persons of ordinary skill in the art in view of the foregoing description. Directional words such as top, bottom, upper, lower, radial, circumferential, and the like are employed by way of description and not limitation. Indeed, the invention is intended to embrace all modifications and variations as fall within the spirit and broad scope of the appended claims;

1. A method of making a container that includes the steps of:

(a) providing a container having a neck,

(b) providing a container attachment having a circumferentially continuous ring,

(c) telescoping said ring over said neck, and

(d) radially expanding at least a portion of said neck to secure said attachment to said neck.

2. The method set forth in claim 1 wherein said attachment has at least one external thread segment.

3. The method set forth in claim 1 wherein said attachment includes a handle coupled to said ring.

4. The method set forth in claim 1 wherein said step (a) includes providing at least one external engagement element on said neck to engage said ring upon expansion of said neck in said step (d).

5. The method set forth in claim 4 wherein said step of providing at least one external engagement element includes providing spaced beads on said neck for engaging said ring.

6. The method set forth in claim 1 wherein at least one of steps (a) and (b) includes providing at least one anti-rotational feature on at least one of said neck and said ring.

7. The method set forth in claim 6 wherein said providing step includes providing knurling on at least one of said neck and said ring.

8. The method set forth in claim 6 wherein said providing step includes providing at least one lug on one of said neck and said ring and at least one corresponding pocket on the other of said neck and said ring such that said at least one lug engages said at least one corresponding pocket.

9. The method set forth in claim 1 wherein step (d) includes axially driving an anvil into said container to radially outwardly expand at least a portion of said neck into engagement with said attachment.

10. The method set forth in claim 9 wherein said step (a) includes providing at least one external engagement element on said neck to engage said ring upon expansion of said neck in said step (d), further wherein said anvil simultaneously expands a finish portion of said neck and said at least one external engagement element on said neck.

11. The method set forth in claim 9 wherein said step (a) includes providing at least one external engagement element on said neck to engage said ring upon expansion of said neck in said step (d), further wherein said anvil expands said at least one external engagement element on said neck but does not expand a finish portion of said neck.

12. A container produced by the method of claim 1.

13. A method of making a handled container that includes the steps of:

(a) providing a container having a neck,

(b) providing a handle having a circumferentially continuous ring,

(c) telescoping said ring externally over said neck, and

(d) radially expanding at least a portion of said neck to secure said handle to said neck.

14. The method set forth in claim 13 wherein said attachment ring includes at least external thread forming an externally threaded finish when said ring is secured to said neck in said step (d).

15. The method set forth in claim 13 wherein said neck includes at least one external thread, a capping flange, and a pair of spaced beads.

16. The method set forth in claim 15 wherein said neck and said pair of spaced beads are smaller in diameter than that of said capping flange and said at least one external thread, and wherein said step (d) includes expanding that portion of said neck having said spaced beads without expanding that portion of said neck having said capping flange or said at least one external thread.

17. The method set forth in claim 13 wherein at least one of steps (a) and (b) includes providing at least one anti-rotational feature on at least one of said neck and said ring of said handle.

18. The method set forth in claim 17 wherein said providing step includes providing knurling on at least one of said neck and said ring of said handle.

19. The method set forth in claim 17 wherein said providing step includes providing at least one lug on one of said neck and said ring and at least one corresponding pocket on the other of said neck and said ring such that said at least one lug engages said at least one corresponding pocket.

20. The method set forth in claim 13 wherein step (d) includes axially driving an anvil into an open end of said container to radially outwardly expand at least a portion of said neck into engagement with said ring of said handle.

21. A handled container produced by the method set forth in claim 1

22. A method of making a handled container that includes the steps of:

(a) pressure molding a preform having a body and a neck with at least one external engagement element,

(b) providing a handle having a circumferentially continuous attachment ring,

(c) blow molding said body of said preform to form a body of a container having said neck extending therefrom, and

(d) either prior to or subsequent to said step (c):

(d1) telescoping said ring of said handle over said neck of said container until said ring is adjacent to said at least one external engagement element, and then

(d2) expanding at least a portion of said neck containing said at least one external engagement element radially outwardly into engagement with said ring to secure said handle to said neck.

23. A handled container produced by the method set forth in claim 22.

24. A container that includes:

a body,

a neck extending from said body, and

an attachment that includes an attachment ring encircling a portion of said neck,

said portion of said neck being strain hardened by radial expansion against an inside diameter of said attachment ring.

25. An attachment for a container having a body and a neck extending from said body wherein said neck includes a pair of external engagement beads, said attachment includes a ring having an internal diametrical surface having at least one anti-rotational engagement feature, wherein said attachment is adapted for securement to said neck of said container between said pair of external engagement beads by radially outward expansion of said neck and further wherein said pair of external engagement beads axially restrain said ring and said at least one anti-rotational engagement feature rotationally restrains said ring from movement relative to said container.

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