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(54) **Title:** CONTAINER ASSEMBLIES INCLUDING METAL CLOSURES AND THERMOPLASTIC CONTAINERS AND METHODS OF HOT-FILLING FOOD AND BEVERAGE PRODUCTS

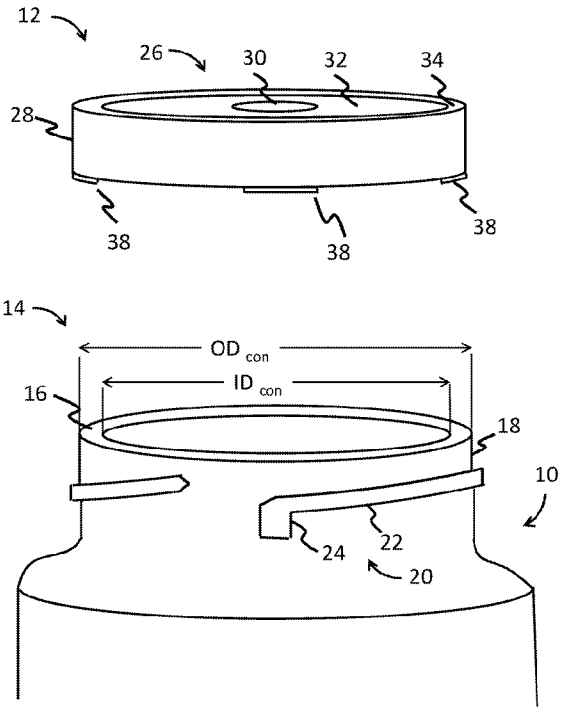

Fig. 1

(57) **Abstract:** Container assemblies are described herein that include a metal closure and a container including a plastic finish. The container assemblies may be characterized by improved performance including reproducibility of force needed to remove the closure. Furthermore, the container assemblies described herein may be compatible for use with hot-fill packaging processes.

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[Continued on next page]

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CONTAINER ASSEMBLIES INCLUDING METAL CLOSURES AND THERMOPLASTIC CONTAINERS AND METHODS OF HOT-FILLING FOOD AND BEVERAGE PRODUCTS

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Patent Application No. 15/590,647 filed May 9, 2017, which claims the benefit of U.S. Provisional Patent Application No. 62/334,209 filed May 10, 2016, each of the disclosures of which are incorporated herein by reference.

FIELD

[0002] The present application relates to container assemblies including metal closures and containers that include a plastic finish and to methods of hot-filling food and beverage products.

BACKGROUND

[0003] Many different packaging options have been developed for food and beverage products. Included among the most important criteria for selecting a packaging option are packaging material cost and durability. Accordingly, plastics, including thermoplastic materials, such as polyethylene terephthalate (PET), are among the most common materials used in packaging of food and beverage products. However, limitations are found when using plastic materials together with some food and beverage processing steps and/or in combination with some closures. For example, a metal closure may sometimes grip in an inconsistent manner with plastics, making it difficult to provide container assemblies that may be opened by consumers in a repeatable manner. In addition, some thermoplastic materials may soften or deform under conditions used during some hot-fill processes that may commonly be used to minimize the growth or presence of bacteria or other contaminants in food and beverage products. Softening of thermoplastics may further exacerbate problems associated with use of metal closures in combination with plastic containers.

[0004] Accordingly, there is a need for improved packaging materials that include plastic containers and metal closures and for improved methods of hot-filling food and beverage products using container assemblies that include thermoplastic containers and metal closures.

SUMMARY

[0005] In some embodiments, a container assembly may comprise a plastic container including an opening and a finish, the finish including a plastic material that is softer than glass; wherein the finish includes one or more threads; and a metal closure including four lugs; wherein the lugs are configured to engage the one or more threads when the metal closure is placed and rotated on the plastic container and pull the plastic container and the metal closure together. In some embodiments, metal closures may include lugs that include one or more flattened sides.

[0006] In some embodiments, a beverage product may comprise a beverage sterilized using a hot-fill packaging process; and a container assembly including a metal closure and a container that includes a thermoplastic finish. In some embodiments, the container assembly may include an opening and a metal closure including four lugs. In some embodiments, lugs may further include one or more flattened sides.

[0007] In some embodiments, a method of packaging a food or beverage product may include treating a food or beverage product to a condition that includes application of an elevated temperature greater than about 50°C; partially cooling the food or beverage product; adding the food or beverage product to a container including a thermoplastic finish having at least one thread; capping the food or beverage product in the container by rotating a metal closure onto the finish, the metal closure including four lugs engaged with the at least one thread sufficient to provide an air-vacuum tight seal; maintaining the food or beverage product and the container at a hold temperature less than the elevated temperature; and further cooling the food or beverage product and the container.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. 1 is a perspective view of a container assembly including a metal closure and part of a container including a finish.

[0009] FIG. 2A is a bottom plan view of the metal closure of Fig. 1.

[0010] FIG. 2B is a top plan view of the metal closure of Fig. 1.

[0011] FIG. 3 is a partial cross-sectional view taken along section A-A of Fig. 2A.

[0012] FIG. 4A is a detailed cross-sectional view of Detail B of Fig. 3.

[0013] FIG. 4B is a detailed cross-sectional view of an alternative embodiment of a lug.

[0014] FIG. 4C is a detailed cross-sectional view of another alternative embodiment of a lug.

[0015] FIG. 5 is a flowchart illustrating a method of packaging a food or beverage product.

DETAILED DESCRIPTION

[0016] The following terms as used herein should be understood to have the indicated meanings.

[0017] When an item is introduced by "a" or "an," it should be understood to mean one or more of that item.

[0018] "Comprises" means includes but is not limited to.

[0019] "Comprising" means including but not limited to.

[0020] Where a range of values is described, it should be understood that intervening values, unless the context clearly dictates otherwise, between the upper and lower limits of that range and any other stated or intervening value in other stated ranges may be used within embodiments herein.

[0021] This disclosure is directed to container assemblies that include a metal closure and a plastic container and to methods of packaging food and beverage products using the container assemblies described herein. Apparatuses and methods described herein may include metal closures and plastic containers, including those that may be relatively soft or that may be difficult to use together with hot-fill processes. For example, some plastic containers as described herein may be softer than common glass containers. In some embodiments, plastics described herein may be thermoplastics which may include plastics that may soften, deform or experience structural changes at temperatures at or below temperatures that may be used in hot-fill processing of food and beverage products.

[0022] For example, containers described herein may be made of one or more plastic materials, including but not limited to polyethylene terephthalate (PET). The containers may be sized to contain various food and beverage products, including, for example, sodas, juices, juice cocktails, sauces, dairy products or the like. The closures described herein may be metallic and may be made of any suitable metallic material, including, for example, aluminum, tin, or steel. For example, in some embodiments, container assemblies described herein may include metallic closures with a diameter of about 38 mm.

[0023] Fig. 1 shows a perspective view of a container assembly including a

top portion of a container 10 and a closure 12. Closure 12 may be configured for engagement with a finish 14 of container 10 and may be used to form an air-vacuum tight seal. In some embodiments, container 10 may be sized for engagement with a closure 12 having an inner diameter (ID_{cap}) (see Fig. 2A) of about 38 mm. For example, in some embodiments, container 10 may include a finish with an inner diameter (ID_{con}) of about 28 mm to about 32 mm, or about 30.5 mm. In some embodiments, container 10 may include a finish with an outer diameter (OD_{con}) of about 33 mm to about 37 mm, or about 35 mm. Finish 14 may include a top edge 16, cylindrical sidewall 18, and one or more threads 20. Threads 20 may include a bottom thread surface 22. Threads 20 may sometimes include a thread stop 24 which may prevent over rotation of closure 12 during opening and closing of the container assembly. Closure 12 may include a top panel 26, a cylindrical sidewall 28, and a plurality of lugs 38. Top panel 26 may be substantially flat or may be curved as further shown, for example, in Fig. 3. Top panel 26 may include a raised or center portion 30, annular recessed portion 32, and an annular edge portion 34. In some embodiments, top panel 26 may operate as a vacuum-indicating panel wherein when the container assembly is vented a loss of vacuum pressure may be indicated to a consumer.

[0024] In some embodiments, top panel 26 may be shaped so that the closure 12 may have an increased degree of flexibility as compared to a level of flexibility accorded if the top panel 26 was flat. To encourage engagement of closure 12 and the finish 14, a top edge 16 of finish 14 and/or an adjacent or nearby surface of finish 14 may be forced against gasketing material 36 (see Fig. 3) when the closure 12 is subjected to a downward force as may occur when closure 12 is rotated onto finish 14. For example, threads 20 may be angled downward such that when the closure 12 is rotated onto the container 10, lugs 38 cooperate with threads 20 to pull the closure 12 and container 10 together. Gasketing material 36 may have a thickness D of about 0.9 mm, or other suitable thickness.

[0025] Closure 12 is further shown in Fig. 2A and Fig. 2B. Fig. 2A shows a bottom plan view of the closure 12. Fig. 2B shows a top plan view of closure 12. As shown in Fig. 2A, closure 12 may include a circular rim 40 at a lower edge of sidewall 28. Circular rim 40 may help to guide or assist rotation of the closure 12 on container 10. In some embodiments, circular rim 40 may include four lugs 38. In some embodiments, the lugs 38 may be spaced about equidistant from each other,

such as about 90 degrees apart, or the lugs 38 may have other suitable spacing. Closure 12 may be characterized by an inner lug diameter (ID_{lug}). The inner lug diameter refers to the diameter of a circle which intersects the innermost point of each of the lugs 38. The inner lug diameter may be smaller than an inner diameter of the closure (ID_{cap}). The inner diameter of the closure refers to the diameter of a circle defined by the inner surface of the rim 40 in regions that do not include the lugs 38. As shown in Fig. 2B, closure 12 may further be characterized by an outer diameter (OD_{cap}). For example, in some embodiments, the inner lug diameter ID_{lug} may be about 35.3 mm, the inner diameter of the closure ID_{cap} may be about 37 mm, and the outer diameter of the closure OD_{cap} may be about 41.9 mm.

[0026] A portion of closure 12 is shown in Fig. 3. In some embodiments, the closure 12 may have an inner diameter ID_{cap} (see Fig. 2A) of about 38 mm. For closures that have an inner diameter ID_{cap} of about 38 mm, it had been customary to use a total of three lugs 38. However, in some embodiments described herein, a closure 12 including four lugs 38 may exhibit significantly improved performance over the previously used three-lug configurations. Lugs 38 may be characterized by a lug width (W) of about 3.3 mm. The lug width W may be defined herein as the distance between an outer surface of cylindrical sidewall 28 and an inner side (e.g., inner side of portions 60, 64, 94 as shown in Figs. 4A-4C) of lugs 38. In some embodiments, a lug width W may be from about 3.0 mm to about 3.5 mm or about 3.2 mm to about 3.4 mm. Closure 12 may further be characterized by a height (H) and by a dimension (LH) corresponding to the distance between an outer surface of top panel 26 (which may be measured at annular edge portion 34) and top sides (e.g., top sides of portions 58, 62, 92 as shown in Figs. 4A-4C) of lugs 38.

[0027] As shown in Fig. 4A, in some embodiments lug 38 may have a generally rounded profile. As shown in Figs. 4B and 4C, in some embodiments lug 38 may have a profile wherein one or more portions may be flattened. For example, lug profile 50 of Fig. 4A is shown to include a rounded lug top portion 58 and a rounded lug inner portion 60. Lug profile 54 of Fig. 4B is shown to include a flattened top portion 62 and a flattened inner portion 64. Lug profile 90 of Fig. 4C is shown to include a flattened top portion 92 and a rounded inner portion 94. Of course, other lug embodiments may include a flattened inner portion and a rounded top portion. Top portions 58, 62, 92 and inner portions 60, 64, 94 may respectively engage with the bottom thread surface 22 and cylindrical side wall 18 of finish 14 when closure 12

is engaged with container 10. During engagement, interaction between the closure 12 and finish 14 may be influenced by frictional interaction between the lugs 38 and either or both of the bottom surface 22 of threads 20 and/or cylindrical sidewall 18, which may, at least in part, be influenced by the shape of the lugs 38 and/or threads 20.

[0028] Container assemblies described herein may be used with food and beverage products packaged using either of cold-fill or hot-fill processes. Hot-fill processes may be preferred or necessary for some food and beverage products. For example, hot-filled processes may be used to sterilize some beverage products and may be necessary to achieve a desired product shelf-life. In addition, where a head-space volume is present in a product, following product fill, gas contained in the head-space may cool which may result in a concomitant reduction in the head-space pressure. The resultant vacuum may sometimes be used with vacuum-indicating panels to provide assurance to a consumer that the product has not been tampered with or otherwise inadvertently opened.

[0029] As used herein, a hot-fill process may refer to a process wherein a food or beverage product is treated at a temperature of greater than about 50 °C. For example, some hot-fill processes may include heating a food or beverage product to a temperature of greater than or equal to about 60 °C, about 65 °C, or about 75 °C, or about 100 °C. Also by way of example, some hot-fill processes may include heating a food or beverage product to a temperature of no greater than about 100 °C, about 95 °C, or about 90 °C. Hot-fill processing may include holding a food or beverage in a holding cell at such elevated temperature for a period of time such as about 10 seconds to about 30 seconds. In some embodiments, following this initial high temperature treatment, a food or beverage product may be at least partially cooled to a still elevated temperature (e.g., such as a temperature of between about 65°C to about 90 °C). The food or beverage product may then be added to a container in a fill process and sealed by engaging the container with a closure. In some embodiments, the product fill temperature may be about 82 °C to about 85 °C. In some embodiments, the filled container assembly may be maintained at the still elevated temperature for an "in-package" hold step, which may sometimes last for several minutes. The filled container assembly may then be cooled and further processed for distribution.

[0030] Some embodiments described herein may provide particular

advantages and solve problems associated with use of thermoplastic containers in hot-fill processes. For example, PET is a thermoplastic that may start to soften at a temperature of about 76 °C. Accordingly, in most hot-fill processes suitable for use with a majority of food and beverage products, deformation of PET, as well as some other thermoplastic containers, may occur to at least some degree. This deformation may be problematic for several reasons. For example, proper engagement of threads 20 and lugs 38 may be disrupted if this deformation is too severe. For example, a removal torque or force necessary to open a container assembly may become highly variable when a thermoplastic is deformed during hot-fill processing. For example, in other container assemblies, some product samples may only be opened by adding an amount of force that is greater than may be readily applied by some consumers. The container assemblies and methods described herein may alleviate or remove this concern.

[0031] In some embodiments, by increasing the number of lugs in bottles sized with an opening of about 38 mm from three to four, the force necessary to open a container assembly may be more reproducibly controlled. In addition, in some embodiments, the shape of lugs 38 and/or threads 20 may be modified to reduce sample-to-sample variation of a force necessary to open a container assembly.

[0032] For example, in some embodiments, one or more sides of the lugs 38 may be shaped to possess a profile that is more flattened than used in prior lug designs. For example, referring back to Fig. 4B, either or both of top portion 62 or inner portion 64 of lugs 38 may be flattened. As described herein, a flattened portion of a lug refers to a portion of a lug wherein a radius of curvature of the portion is greater than about 1.5 mm. In some embodiments, one or more lugs may have a flattened top portion characterized by a radius of curvature of greater than about 2.5 mm, about 3.0 mm, or about 3.5 mm, or between about 2.5 mm and about 3.5 mm. In some embodiments, one or more lugs may have a flattened inner portion characterized by a radius of curvature of greater than about 1.5 mm, about 2.0 mm, or about 2.5 mm, or between about 1.5 mm and about 2.5 mm.

[0033] In Fig. 5, a method 74 of packaging a food or beverage product using the container assemblies described herein is shown. In a step 76 a food or beverage product may be treated to conditions that include application of high temperature. For example, in methods that include hot-filling of a beverage, a temperature of between about 60 °C to about 100 °C may be applied. Heat may be added with or without

application of other forms of energy or pressure suitable to help sterilize or reduce one or more product contaminants such as bacteria. In some embodiments, as shown in a step 78, the food or beverage product may be at least partially cooled. For example, in some embodiments, a trim cooler may be used to reduce the temperature of a food or beverage product. In a step 80, the food or beverage product may be added to a container including a thermoplastic finish. In a step 82, the now filled container may be capped by engaging the container with a metal closure as described herein. In a step 84, the filled and capped container assembly may be held at a hold temperature for a desired hold time. For example, in some embodiments, the filled container assembly may be held at a temperature of about 65 °C to about 90 °C for about 1 minute to about 3 minutes. In a step 86, the filled container assembly may be cooled to make a packaged food or beverage product available for further processing and/or distribution to consumers.

[0034] Although the compositions and methods disclosed herein and their advantages have been described in detail, it should be understood that various changes, substitutions and alterations can be made herein without departing from the invention as defined by the appended claims. Moreover, the scope of the present application is not intended to be limited to the particular embodiments of the process, machine, manufactures, composition, or matter, means, methods and steps described in the specification. Among other things, any feature described for one embodiment may be used in any other embodiment, and methods described and shown in the figures may be combined. Use of the word "include," "including," or "having," for example, should be interpreted as the word "comprising" would be, i.e., as open-ended. As one will readily appreciate from the disclosure, processes, machines, manufactures, compositions of matter, means, methods, or steps presently existing or later to be developed that perform substantially the same function or achieve substantially the same result as the corresponding embodiments described herein may be utilized. Accordingly, the appended claims are intended to include within their scope such processes, machines, manufactures, compositions of matter, means, methods or steps.

CLAIMS

What is claimed is:

1. A container assembly comprising:

a plastic container including an opening and a finish, said finish including a plastic material that is softer than glass;

wherein said finish includes one or more threads; and

a metal closure including four lugs;

wherein said lugs are configured to engage said one or more threads when said metal closure is placed and rotated on said plastic container to pull said plastic container and said metal closure together;

wherein one or more of said lugs include a top portion and an inner portion;

wherein at least one of said top portion and said inner portion is flattened.

2. The container assembly of claim 1 wherein said top portion has a radius of curvature of between about 2.5 mm and about 3.5 mm.

3. The container assembly of claim 1 wherein said inner portion has a radius of curvature of between about 1.5 mm and about 2.5 mm.

4. The container assembly of claim 1 wherein said plastic material is a thermoplastic material.

5. The container assembly of claim 1 wherein said plastic material is polyethylene terephthalate.

6. The container assembly of claim 1 wherein said lugs are evenly spaced about said metal closure.

7. The container assembly of claim 1 wherein said metal closure comprises an inner diameter of about 38 mm.

8. The container assembly of claim 1 wherein said finish comprises an inner diameter of about 28 mm to about 32 mm.

9. The container assembly of claim 1 wherein said finish comprises an outer diameter of about 33 mm to about 37 mm.

10. The container assembly of claim 1 wherein said metal closure comprises a cylindrical sidewall.

11. The container assembly of claim 1 wherein said metal closure comprises a gasketing material configured for sealing engagement with a top edge of said finish.

12. A beverage product comprising:

a beverage sterilized using a hot-fill packaging process; and

a container assembly in which said beverage is disposed and including a metal closure sealingly engaged on a container that includes a thermoplastic finish.

13. The product of claim 12 wherein said container includes an opening of about 28 mm to about 32 mm; and

wherein said metal closure includes four lugs.

14. The product of claim 13 wherein one or more of said lugs include a top portion and an inner portion;

wherein at least one of said top portion and said inner portion is flattened.

15. The product of claim 13 wherein one or more of said lugs include a top portion and an inner portion;

wherein said top portion has a radius of curvature of between about 2.5 mm and about 3.5 mm.

16. The product of claim 13 wherein one or more of said lugs include a top portion and an inner portion;

wherein said inner portion has a radius of curvature of between about 1.5 mm and about 2.5 mm.

17. A method of packaging a food or beverage product comprising:

treating a food or beverage product to a condition that includes application of an elevated temperature greater than about 50°C;

partially cooling the food or beverage product;

adding the food or beverage product to a container comprising a thermoplastic finish having at least one thread;

capping the food or beverage product in said container by rotating a metal closure onto said finish, said metal closure comprising four lugs engaged with said at least one thread sufficient to provide an air-vacuum tight seal;

maintaining the food or beverage product and the container at a hold temperature less than said elevated temperature; and

further cooling the food or beverage product and the container.

18. The method of claim 17 wherein said elevated temperature is no greater than about 100°C and wherein said hold temperature is between about 65°C to about 90°C.

19. The method of claim 17 wherein said metal closure comprises a vacuum-indicating top panel.

20. The method of claim 17 wherein said capping further comprises engaging

said lugs with a sidewall of said finish;

wherein each of said lugs comprises a top portion and an inner portion; and

wherein at least one of said top portion and said inner portion is flattened.

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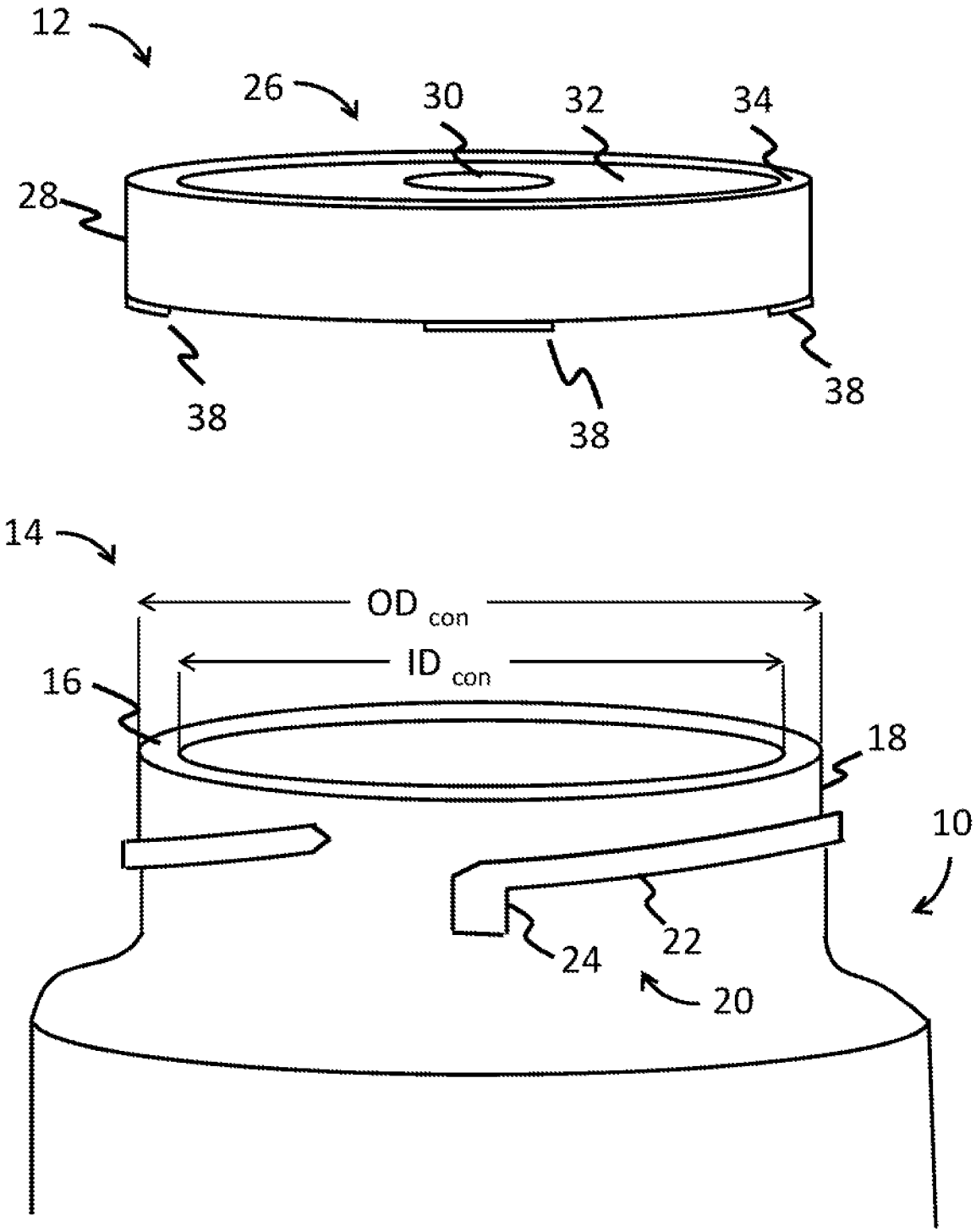

Fig. 1

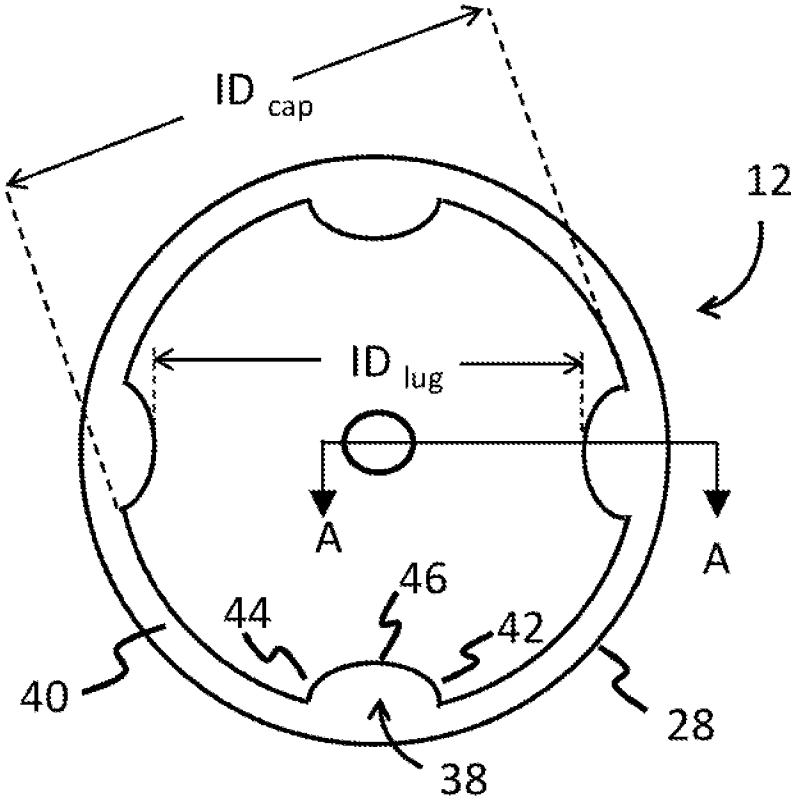

Fig. 2A

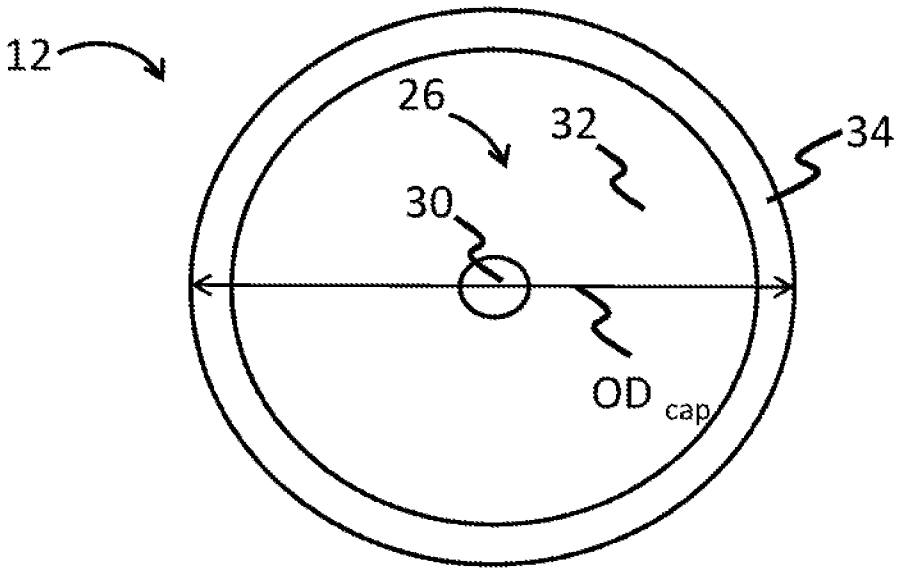

Fig. 2B

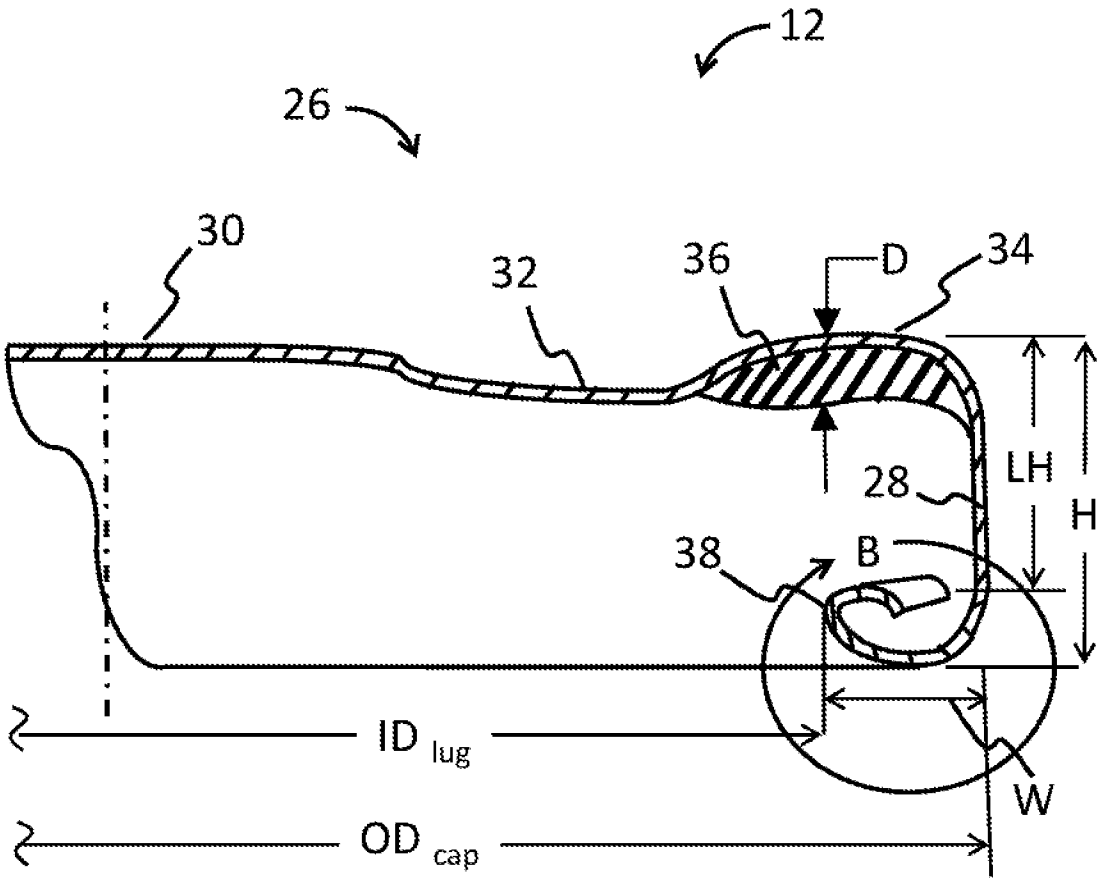

Fig. 3

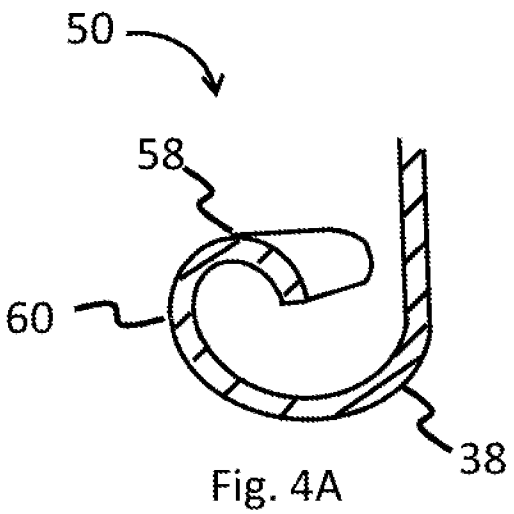

Fig. 4A

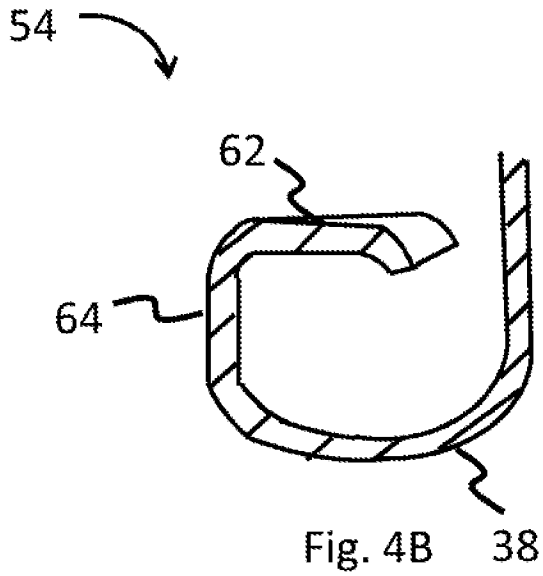

Fig. 4B

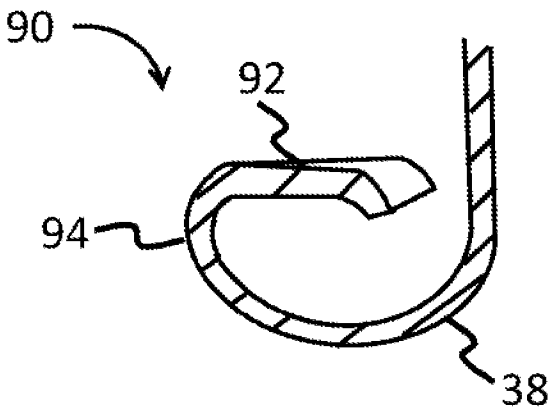

Fig. 4C

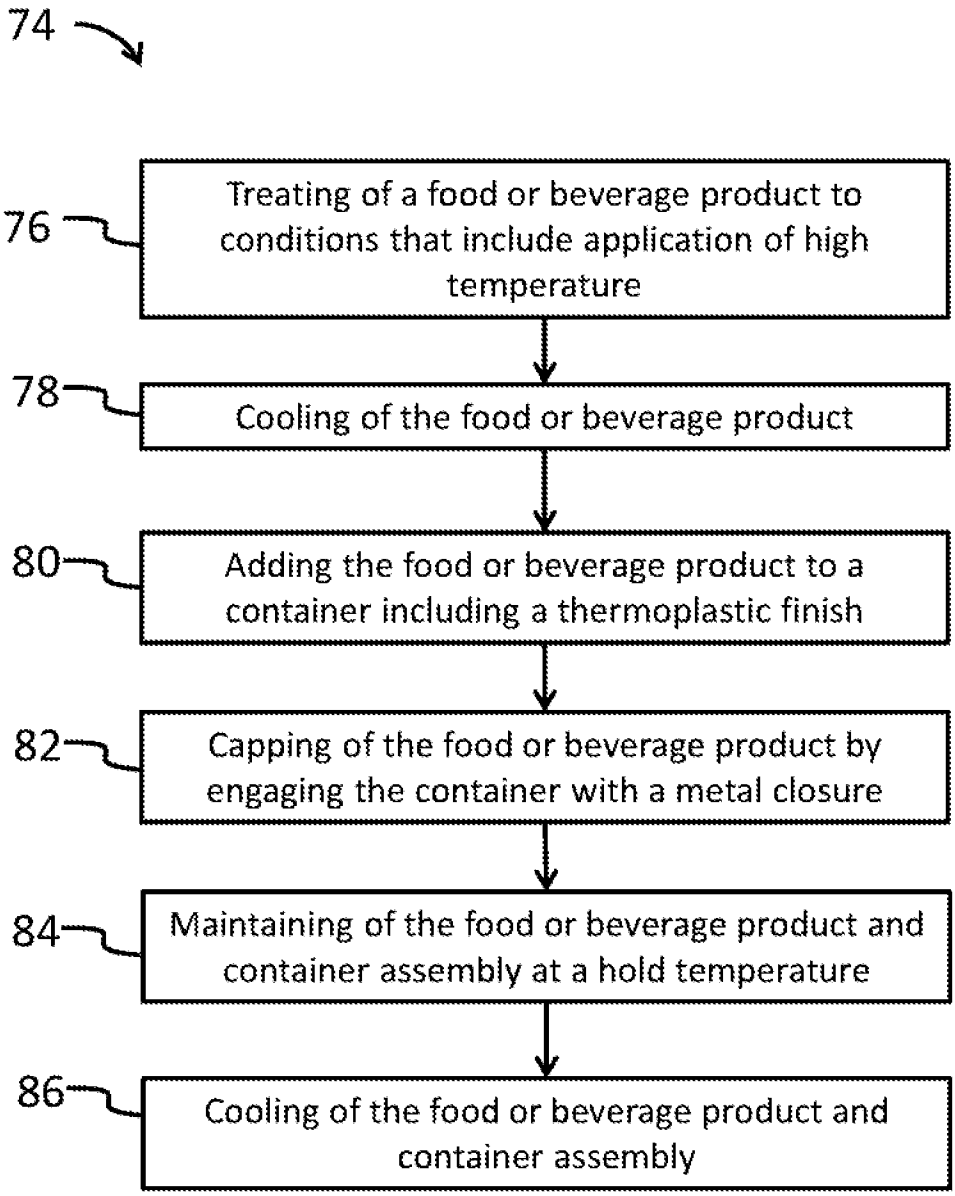
74
76
Treating of a food or beverage product to conditions that include application of high temperature
78
Cooling of the food or beverage product
80
Adding the food or beverage product to a container including a thermoplastic finish
82
Capping of the food or beverage product by engaging the container with a metal closure
84
Maintaining of the food or beverage product and container assembly at a hold temperature
86
Cooling of the food or beverage product and container assembly

Fig. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US17/31973

A. CLASSIFICATION OF SUBJECT MATTER
IPC - B65D41/04, B65D41/06, B65D43/02 (2017.01)
CPC - B65D41/0407, B65D41/0471, B65D41/06, B65D41/065, B65D43/0231

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)
See Search History document

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2015/0375887 A1 (Plastipak Bawt Sarl) 2015.12.31; figures 1-4, 7; paragraphs [0014], [0031]-[0037], [0043], [0054], [0058], [0060], [0069]	1, 4-11
X	US 2012/0074157 A1 (Dunwoody, P.) 2012.03.29; abstract; figures 1a, 1b, 3, 4, 6, 8, 17c; paragraphs [0012], [0014], [0027], [0045]-[0047], [0053]	1-3, 6, 10, 11
A	US 2,063,157 A (Gray, D.) 1936.12.08; entire document	1-11
A	US 3,516,565 A (Hatkevich, A.) 1970.06.23; entire document	1-11
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A	US 5,693,036 A (Kilgour, R.) 1997.12.02; entire document	1-11

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"E" earlier application or patent 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
08 September 2017 (08.09.2017)	22 SEP 2017
Name and mailing address of the ISA/ Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	Authorized officer Shane Thomas PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US17/31973

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
-***-Please See Within the Next Supplemental Box-***-

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-11

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/US17/31973

-***-Continued from Box No. III Observations where unity of invention is lacking -***-

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I: Claims 1-11 are directed toward a container assembly comprising: a plastic container including an opening and a finish, said finish including a plastic material that is softer than glass, wherein one or more of said lugs include a top portion and an inner portion; wherein at least one of said top portion and said inner portion is flattened.

Group II: Claims 12-16 are directed toward a beverage product comprising: a beverage sterilized using a hot-fill packaging process.

Group III: Claims 17-20 are directed toward a method of packaging a food or beverage product comprising: treating a food or beverage product to a condition that includes application of an elevated temperature greater than about 50°C; partially cooling the food or beverage product; and maintaining the food or beverage product and the container at a hold temperature less than said elevated temperature; and further cooling the food or beverage product and the container.

The inventions listed as Groups I-III do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons.

The special technical features of Group I include said finish including a plastic material that is softer than glass (which is not present in Groups II or III); wherein said finish includes one or more threads; and a metal closure including four lugs; wherein said lugs are configured to engage said one or more threads when said metal closure is placed and rotated on said plastic container (which is not present in Group II) to pull said plastic container and said metal closure together; wherein one or more of said lugs include a top portion and an inner portion; wherein at least one of said top portion and said inner portion is flattened (which is not present in Groups II or III).

The special technical features of Group II include a beverage sterilized using a hot-fill packaging process (which is not present in Groups I or III); and a container assembly in which said beverage is disposed and including a metal closure sealingly engaged on a container (which is not present in Group I).

The special technical features of Group III include treating a food or beverage product to a condition that includes application of an elevated temperature greater than about 50°C; partially cooling the food or beverage product (which is not present in Groups I or II); adding the food or beverage product to a container (which is not present in Group 1) having at least one thread (which is not present in Group II); capping the food or beverage product in said container (which is not present in Group 1) by rotating a metal closure onto said finish, said metal closure comprising four lugs engaged with said at least one thread (which is not present in Group II) sufficient to provide an air-vacuum tight seal; maintaining the food or beverage product and the container at a hold temperature less than said elevated temperature; and further cooling the food or beverage product and the container (which is not present in Groups I or II).

The common technical features of Groups I, II, and III include a plastic container including an opening and a finish; wherein said finish includes one or more threads; and a metal closure including four lugs; wherein said lugs are configured to engage said one or more threads when said metal closure is placed and rotated on said plastic container in which said beverage is disposed.

These common technical features are disclosed by US 2015/0375887 A1 (PLASTIPAK): a plastic container (plastic container; paragraph [0001]) including an opening (100; abstract; figure 1) and a finish (neck finish 10; figure 1; paragraph [0058]); wherein said finish includes one or more threads (12a; figure 1; paragraph [0058]); and a metal closure (metal lid 2; paragraphs [0054], [0058]) including four lugs (four lugs 21; figure 7; paragraph [0058]); wherein said lugs are configured to engage said one or more threads (lugs 21 cooperate with thread portions 12a; paragraph [0057]) when said metal closure is placed and rotated on said plastic container (as shown; figures 7-9; paragraphs [0026]-[0028]) in which said beverage is disposed (filled with hot product including beverages; paragraphs [0013], [0044]).

Because the common technical features are disclosed by PLASTIPAK, the inventions are not so linked as to form a single general inventive concept. Therefore, Groups I-III lack unity.