



(51) International Patent Classification:
B65D 41/34 (2006.01)

(21) International Application Number:
PCT/US2020/060875

(22) International Filing Date:
17 November 2020 (17.11.2020)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
62/948,144 13 December 2019 (13.12.2019) US
17/097,904 13 November 2020 (13.11.2020) US

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN,

HR, HU, ID, IL, IN, IR, IS, IT, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:
— with international search report (Art. 21(3))

(54) Title: TETHERED CONTAINER CLOSURE

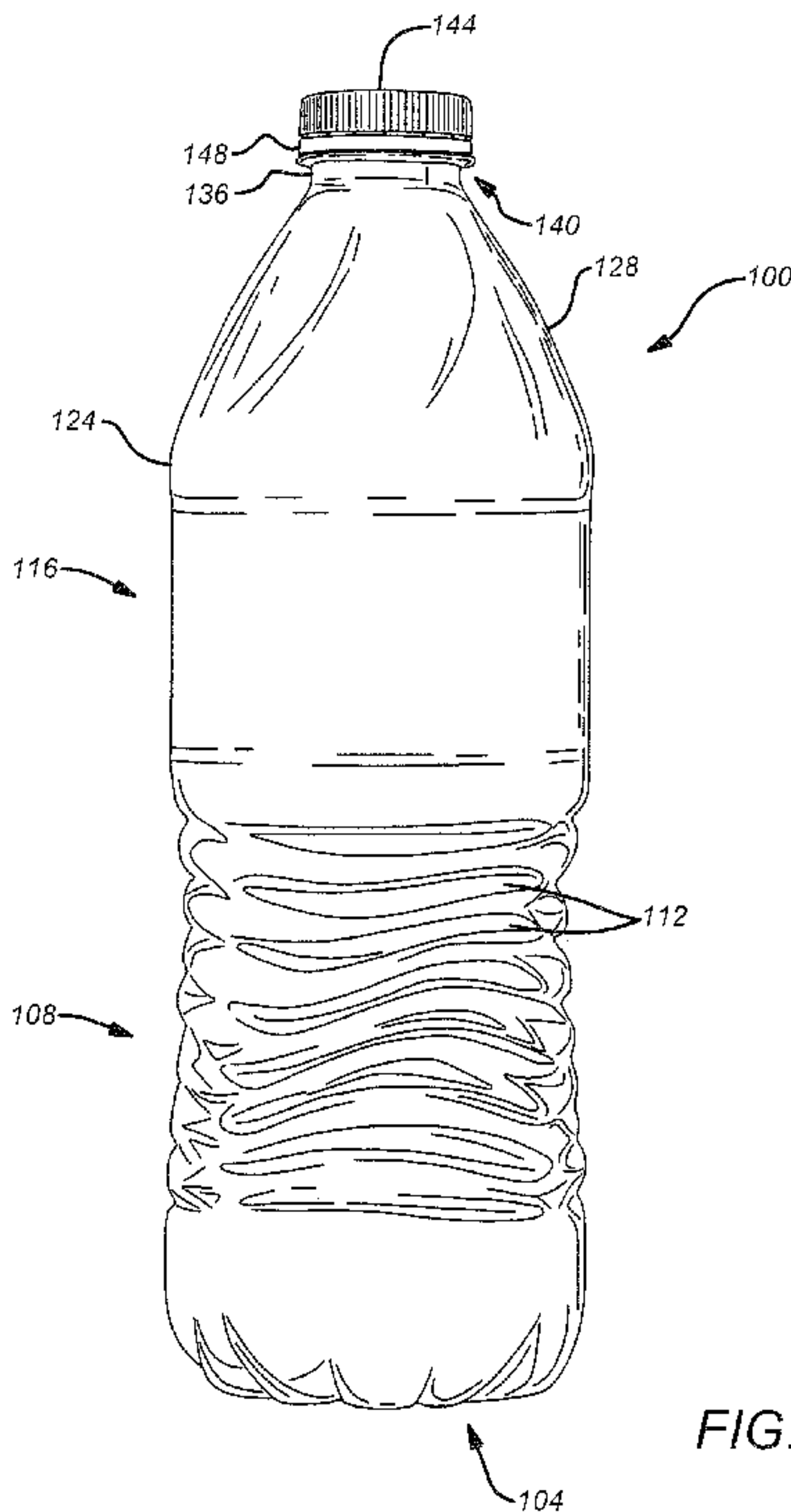


FIG. 1

(57) Abstract: An apparatus and methods are provided for a container closure that includes a tether that keeps the closure coupled with a plastic container after the closure has been unsealed to access contents within the container. The container closure comprises a closure portion coupled to a tamper evidence band by a tether bridge. The closure portion threadably engages with a finish portion of the container and seal contents in an interior of the container. The tamper evidence band remains engaged with the finish portion when the closure portion is removed from the finish portion. A multiplicity of thin connections between the tamper evidence band and the closure portion break apart when the closure portion is untightened from the finish portion. The tether bridge remains unbroken and is configured to allow the closure portion to be tilted away from the finish portion by an end-user.

TETHERED CONTAINER CLOSURE

PRIORITY

[0001] This application claims the benefit of and priority to U.S. Patent Application No. 17/097,904 filed on November 13, 2020 and U.S. Provisional Application, entitled “Tethered Container Closure,” filed on December 13, 2019 and having application serial number 62/948,144, the entirety of said application being incorporated herein by reference.

FIELD

[0002] Embodiments of the present disclosure generally relate to the field of plastic bottles and preforms. More specifically, embodiments of the disclosure relate to an apparatus and methods for a container closure that includes a tether configured to keep the closure coupled with a plastic container after the closure has been unsealed to access contents within the container.

BACKGROUND

[0003] Plastic containers have been used as a replacement for glass or metal containers in the packaging of beverages for several decades. The most common plastic used in making beverage containers today is polyethylene terephthalate (PET). Containers made of PET are transparent, thin walled, and have the ability to maintain their shape by withstanding the force exerted on the walls of the container by their contents. PET resins are also reasonably priced and easy to process. PET bottles are generally made by a process that includes the blow-molding of plastic preforms which have been made by injection molding of the PET resin.

[0004] Advantages of plastic packaging include lighter weight and decreased breakage as compared to glass, and lower costs overall when taking both production and transportation into account. Although plastic packaging is lighter in weight than glass, there is still great interest in creating the lightest possible plastic packaging so as to maximize the cost savings in both transportation and manufacturing by making and using containers that contain less plastic.

[0005] A plastic container for storing liquid contents typically includes a base that extends up to a grip portion suitable for affixing a label, as well as providing a location for grasping the container. The grip portion generally transitions into a shoulder, which connects to a bell. The bell has a diameter that generally decreases as the bell extends upward from the shoulder to a neck

and a finish. The finish is adapted to receive a closure, such as a bottle cap, to seal the contents within the interior of the plastic container.

[0006] In many instances, the closure includes a tamper evidence band that is disposed around the perimeter of the finish. The tamper evidence band generally remains positioned on the finish when an end-user loosens the closure to access the contents within the container. As such, the tamper evidence band and the finish cooperate to indicate to the end-user whether or not the closure has been previously loosened after being installed by the manufacturer.

[0007] Advantages of plastic containers include lighter weight and decreased breakage as compared to glass, and lower costs overall when taking both production and transportation into account. As such, there is a continuous interest in creating the lightest possible plastic container so as to maximize cost savings in both transportation and manufacturing by making and using containers that contain less plastic.

[0008] One difficulty that may be associated with closures typically installed onto plastic containers is that once the closure is removed from the container, the closure is separable from the container. This may result in the closure being misplaced or lost after being removed from the container, thus hindering resealing unfinished liquid contents within the container. In some instances, misplaced or lost closures may contribute to plastic waste littering the environment. As such, there is a desire to attach or tether closures to plastic containers so as to reduce the environmental impact of misplaced closures while maintaining the convenience and enjoyment often associated with drinking beverages by way of plastic containers. Embodiments disclosed herein provide container closures that include tethers configured to keep the closures coupled with plastic containers after the closures have been unsealed to access contents within the containers.

SUMMARY

[0009] An apparatus and methods are provided for a container closure that includes a tether that keeps the closure coupled with a plastic container after the closure has been unsealed to access contents within the container. The container closure comprises a closure portion coupled to a tamper evidence band by a tether bridge. The closure portion is configured to threadably engage with a finish portion of the container and seal contents in an interior of the container. The tamper evidence band is adapted to remain engaged with the finish portion when the closure portion is

removed from the finish portion. A multiplicity of thin connections between the tamper evidence band and the closure portion are configured to break apart when the closure portion is untightened from the finish portion. The tether bridge remains unbroken and is configured to allow the closure portion to be tilted away from the finish portion by an end-user.

[0010] In an exemplary embodiment, a closure for sealing contents within an interior of a container and remaining coupled with the container after being unsealed from the container comprises: a closure portion for threadably engaging with a finish portion of the container; a tamper evidence band for engaging with the finish portion; and a tether bridge for keeping the closure portion attached to the tamper evidence band.

[0011] In another exemplary embodiment, a multiplicity of thin connections attach the tamper evidence band to closure portion and are configured to break apart when the closure portion is untightened from the finish portion. In another exemplary embodiment, the tamper evidence band is configured to remain engaged with the finish portion when the closure portion is removed from the finish portion, thereby causing the thin connections to break apart and allow the closure portion to separate from the tamper evidence band. In another exemplary embodiment, the tether bridge is configured such that only the thin connections break apart during loosening of the closure portion. In another exemplary embodiment, the tether bridge is formed during injection-molding by allowing material comprising the closure to remain disposed between a pair of adjacent thin connections. In another exemplary embodiment, the tether bridge is formed after injection-molding by using a blade to create spaces between the thin connections and avoiding cutting at the location of the tether bridge.

[0012] In another exemplary embodiment, the tether bridge comprises a single piece of material that extends between the tamper evidence band and the closure portion. In another exemplary embodiment, the tether bridge comprises two or more portions of material joining the tamper evidence band and the closure portion. In another exemplary embodiment, the tether bridge is configured to keep the closure portion attached to the finish portion after the closure portion is unsealed from the finish portion. In another exemplary embodiment, the tether bridge is configured to flex while the closure portion is tilted with respect to the tamper evidence band. In

another exemplary embodiment, the tether bridge comprises a relatively thick portion of plastic that is configured to resist breaking during tilting the closure portion away from the finish portion.

[0013] In an exemplary embodiment, a method for a closure to seal contents within an interior of a container and remain coupled with the container after being unsealed from the container comprises: configuring a closure portion for threadably engaging with a finish portion of the container; configuring a tamper evidence band for engaging with the finish portion; and joining the closure portion and the tamper evidence band by way of a tether bridge.

[0014] In another exemplary embodiment, joining includes configuring the tether bridge to keep the closure portion attached to the finish portion after the closure portion is unsealed from the finish portion. In another exemplary embodiment, joining includes configuring the tether bridge to flex when the closure portion is tilted with respect to the tamper evidence band. In another exemplary embodiment, joining includes extending a single piece of material comprising the tether bridge between the tamper evidence band and the closure portion. In another exemplary embodiment, joining includes coupling the tamper evidence band and the closure portion by way of two or more portions of material comprising the tether bridge. In another exemplary embodiment, joining includes coupling the closure portion and the tamper evidence band by way of a multiplicity of thin connections configured to break apart when the closure portion is untightened from the finish portion. In another exemplary embodiment, joining includes configuring the tether bridge such that only the thin connections break apart during loosening of the closure portion. In another exemplary embodiment, configuring the tether bridge includes injection-molding such that material comprising the closure fills one or more spaces between adjacent thin connections.

[0015] In an exemplary embodiment, a method for a closure comprises: loosening a closure portion threaded onto a finish portion of the container; breaking a multiplicity of thin connections disposed between the closure portion and a tamper evidence band engaged with the finish portion; and bending a tether bridge disposed between the closure portion and a tamper evidence band by tilting the closure portion away from the finish portion.

[0016] These and other features of the concepts provided herein may be better understood with reference to the drawings, description, and appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] The drawings refer to embodiments of the present disclosure in which:

[0018] Figure 1 illustrates a side view of an exemplary container suitable for storing liquid contents, including pressurized contents;

[0019] Figure 2 a side plan view of an exemplary embodiment of a preform suitable for being blow-molded to form a container in accordance with the present disclosure;

[0020] Figure 3 illustrates a side plan view of an exemplary embodiment of a tethered closure that is configured to remain coupled with a container after the tethered closure is unsealed from the container by an end-user;

[0021] Figure 4 illustrates an exemplary embodiment of a tethered configuration of the tethered closure of Fig. 3 that may occur upon the tethered closure being loosened from a container by an end-user; and

[0022] Figure 5 illustrates an exemplary-use environment wherein an exemplary embodiment of a tethered closure has been installed onto a finish portion of a container and then subsequently untightened from the finish portion.

[0023] While the present disclosure is subject to various modifications and alternative forms, specific embodiments thereof have been shown by way of example in the drawings and will herein be described in detail. The invention should be understood to not be limited to the particular forms disclosed, but on the contrary, the intention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the present disclosure.

DETAILED DESCRIPTION

[0024] In the following description, numerous specific details are set forth in order to provide a thorough understanding of the present disclosure. It will be apparent, however, to one of ordinary skill in the art that the invention disclosed herein may be practiced without these specific details. In other instances, specific numeric references such as “first bottle,” may be made. However, the specific numeric reference should not be interpreted as a literal sequential order but rather interpreted that the “first bottle” is different than a “second bottle.” Thus, the specific details set

forth are merely exemplary. The specific details may be varied from and still be contemplated to be within the spirit and scope of the present disclosure. The term “coupled” is defined as meaning connected either directly to the component or indirectly to the component through another component. Further, as used herein, the terms “about,” “approximately,” or “substantially” for any numerical values or ranges indicate a suitable dimensional tolerance that allows the part or collection of components to function for its intended purpose as described herein.

[0025] In general, there is a desire to attach or tether closures to plastic containers so as to reduce the environmental impact of misplaced closures while maintaining the convenience and enjoyment often associated with drinking beverages by way of plastic containers. One difficulty typically associated with closures installed onto plastic containers is that once the closure is removed from the container, the closure may be misplaced or lost. Lost closures hinder resealing unfinished liquid contents within containers and may contribute to plastic waste littering the environment. Embodiments disclosed herein provide container closures that include tethers configured to keep the closures coupled with plastic containers after the closures have been unsealed to access contents within the containers.

[0026] Figure 1 illustrates a side view of an exemplary container 100 typically used for storing liquid contents, such as water, juice, and particularly carbonated contents. The container 100 comprises a base 104 that extends up to a grip portion 108. In some embodiments, the base 104 may be of the petaloid variety, although other configurations of the base may be incorporated into the container 100, without limitation. The grip portion 108 comprises a plurality of grip portion ribs 112 (i.e., sidewall ribs). As illustrated in Fig. 1, the plurality of grip portion ribs 112 generally vary in depth, and swirl or angulate around the grip portion 108. A label portion 116 is connected to the grip portion 108 and comprises one or more label panel ribs (not shown). The label panel portion 116 transitions into a shoulder 124, which connects to a bell 128.

[0027] In the embodiment illustrated in Fig. 1, the bell 128 comprises a plurality of design features 132. In other embodiments, however, the bell 128 may include various other design features, or may be smooth and generally unornamented. The bell 128 connects to a neck 136, which connects to a finish 140. As shown in Fig. 1, the bell 128 comprises a diameter that generally decreases as the bell 128 extends upward from the shoulder 124 to the neck 136 and the

finish 140. The finish 140 is adapted to receive a closure, such as by way of non-limiting example, a container cap or closure 144, so as to seal contents within the container 100. The finish 140 generally defines an opening that leads to an interior of the container 100 for containing a beverage, or other contents, such as any of a variety of carbonated soft drinks. The finish 140 may be of the Carbonated Soft Drink (CSD) variety, or may be configured to receive closures suitable for sealing noncarbonated contents within the interior of the container 100.

[0028] As shown in Fig. 1, a tamper evidence closure 144 may be threadably engaged with the finish 140 of Fig. 3. The closure 144 generally includes interior threads that are configured to engage with threads disposed on the finish 140, as described herein. During tightening of the closure 144 onto the finish 140, a plug seal of the closure 144 extends into the opening of the container 100 and enters into a pressed relationship with the finish 140 whereby contents may be sealed in the interior of the container 100.

[0029] As further shown in Fig. 1, the closure 144 includes a tamper evidence band 148 to provide an indication of whether or not the closure 144 has been loosened after being installed by a manufacturer. In some embodiments, the tamper evidence band 148 may be attached to the closure 144 by a multiplicity of thin connections. The tamper evidence band 148 may include a cam that is configured to fixedly engage with a tamper evidence ledge disposed on the finished 140 during loosening of the closure 144. Once the closure 144 is installed onto the finish 140 by a manufacturer and later an end-user loosens the closure 144, the cam engages the tamper evidence ledge, breaking the thin connections between tamper evidence band 148 and the closure 144. The tamper evidence band 148 remains positioned on the tamper evidence ledge after the closure 144 is removed from the container 100. As such, the tamper evidence band 148 cooperates with the tamper evidence ledge to indicate to the end-user whether or not the closure 144 has been previously loosened after being installed by the manufacturer.

[0030] Figure 2 illustrates an exemplary embodiment of a preform 160 suitable for being blow-molded to form a plastic bottle, such as the container 100, according to the present disclosure. The preform 160 preferably is made of material approved for contact with food and beverages such as virgin PET or recycled PET and can be of any of a wide variety of shapes and sizes. The preform 160 shown in Fig. 2 is of the type which will form a 12-16 oz. beverage bottle, but as will be

understood by those skilled in the art, other preform configurations may be used depending upon the desired configuration, characteristics and use of the final article. The preform 160 may be made by injection molding methods, without limitation.

[0031] The preform 160 includes a finish portion 164 and a body portion 168, formed monolithically (i.e., as a single, or unitary, structure). Advantageously, the monolithic arrangement of the preform 160, when blow-molded into a bottle, provides greater dimensional stability and improved physical properties in comparison to a preform constructed of separate neck and body portions that are bonded together.

[0032] The finish portion 164 begins at an opening 172 to an interior of the preform 160 and extends to and includes a tamper evidence ledge 176. The finish portion 164 is further characterized by the presence of one or more threads 180 configured to provide a means to fasten the closure 144 (see Fig. 1) onto the container 100 produced from the preform 160. As such, the threads 180 are configured to rotatably engage with similar threads disposed within the closure 144 to provide a way to seal contents within the container 100. In the embodiment illustrated in Fig. 2, each of the threads 180 generally extends along a section of the circumference of the finish portion 164 and approaches the tamper evidence ledge 176. Thus, when the threads of the closure 144 are engaged with the threads 180, and the closure 144 is rotated in a clockwise direction, the closure 144 advances toward the tamper evidence ledge 176.

[0033] With continuing reference to Fig. 2, each of the one or more threads 180 begins at a thread start 184 and extends along an angular section of the finish portion 164 to a thread end 188. The thread start 184 is configured to guide a thread comprising the closure 144 into a space, or a valley 190, between adjacent threads 180 so as to threadably engage the closure 144 with the finish portion 164. Further, the threads 180 generally are disposed adjacently to one another, separated by valleys 190, and are spaced uniformly around the circumference of the finish portion 164. In some embodiments, wherein three threads 180 are disposed around the finish portion 164, the thread starts 184 of adjacent threads 180 are spaced at substantially 120-degree intervals around the perimeter of the finish portion 164. As will be appreciated, however, more or less than three threads 180 may be incorporated into the finish portion 164 without deviating beyond the scope of the present disclosure.

[0034] In some embodiments, a plurality of gaps (not shown) may be disposed in the threads 180 and positioned uniformly around the perimeter of the finish portion 164. Preferably, the gaps of adjacent threads 180 are vertically aligned so as to form channels extending longitudinally along the finish portion 164. The channels advantageously operate to relieve pressure within the container 100 when the closure 144 is loosened. As will be appreciated, the channels may provide a direct route for gases escaping the interior of the container 100, rather than the gases being forced to travel around the finish portion 164 between adjacent threads 180.

[0035] The body portion 168 includes a neck portion 192 that extends to a tapered portion 196 of the body portion 168. The tapered portion 196 comprises a smooth transition from a diameter of the neck portion 192 to a relatively smaller diameter of a cylindrical portion 200 of the preform 160. The cylindrical portion 200 is a generally elongate member that culminates in an end cap 204. In some embodiments the body portion 168 may be generally cylindrical, and the end cap 204 may be conical or frustoconical and may also be hemispherical, and the very terminus of the end cap 204 may be flattened or rounded.

[0036] In some embodiments, a wall thickness of the cylindrical portion 200 may be substantially uniform throughout the cylindrical portion 200 and the end cap 204. A wall thickness of the tapered portion 196, however, generally decreases from the wall thickness of the cylindrical portion 200 to a relatively thinner wall thickness of the neck portion 192. As will be appreciated, the wall thickness of the cylindrical portion 200 is relatively greater than the wall thickness of the neck portion 192 so as to provide a wall thickness at the desired dimensions of a finished product after the preform 160 is blow-molded into the shape and size of a bottle. As such, the wall thickness throughout most of the body portion 168 will depend upon the overall size of the preform 160 and the wall thickness and overall size of the resulting container.

[0037] With continuing reference to Fig. 2, the tamper evidence ledge 176 comprises a rounded upper portion 232 and a substantially flat lower portion 236. As will be appreciated, the rounded upper portion 232 facilitates passing the tamper evidence band 148 of the closure 144 over the tamper evidence ledge 176 during assembly of the closure 144 onto the container 100. The flat lower portion 236 is configured to retain the tamper evidence band 148 positioned below the tamper evidence ledge 176 during loosening of the closure 144. For example, when the closure

144 is initially installed onto the container 100 by a manufacturer, the tamper evidence band 148 easily passes over the tamper evidence ledge 176 due to the rounded upper portion 232. When an end-user later loosens the closure 144, the flat lower portion 236 retains the tamper evidence band 148 below the tamper evidence ledge 176, causing the tamper evidence band 148 to break loose from the closure 144. Thus, the flat lower portion 236 of the tamper evidence ledge 176 and the tamper evidence band 148 of the closure 144 cooperate to indicate to the end-user that the closure 144 has not been previously loosened after being installed by the manufacturer. It should be understood, however, that the tamper evidence ledge 176 is not limited to being coupled with tamper evidence bands, as described above, but rather the tamper evidence ledge 176 may be configured to operate with any of various devices for indicating whether or not the container has been previously opened.

[0038] Disposed between the tamper evidence ledge 176 and the threads 180 is a handling valley 240 that extends circumferentially around the finish portion 164. The handling valley 240 comprises a portion of the finish portion 164 that has a wall thickness and a diameter that are substantially similar to the wall thickness and diameter of the neck portion 192, below the tamper evidence ledge 176. As such, the handling valley 240 and the neck portion 192 advantageously enable gripping fingers to engage with and support the container 100 during air-conveying the container 100 along a manufacturing assembly. For example, a first pair of gripping fingers can extend into the handling valley 240 to support the container 100 at a first station of a manufacturing line. Then, upon being conveyed to a second station, a second pair of gripping fingers can extend around the neck portion 192, below the tamper evidence ledge 176, while the first pair of gripping fingers are removed from the handling valley 240. Similarly, upon arriving at a third station, a third pair of gripping fingers can engage with the handling valley 240 while the second pair of gripping fingers are removed from the neck portion 192. Thus, the container 100 can be transported along the manufacturing line by alternately engaging gripping fingers with the handling valley 240 and the neck portion 192.

[0039] As will be appreciated, the handling valley 240 provides a separation between the tamper evidence ledge 176 and the threads 180 suitable for receiving the pair of gripping fingers, as described above. In general, the separation must be large enough to allow the gripping fingers to easily pass between the tamper evidence ledge 176 and the threads 180. As such, any of various

separations, greater than the width of the gripping fingers, may be disposed between the tamper evidence ledge 176 and the threads 180, without limitation and without deviating beyond the scope of the present disclosure.

[0040] As described herein, once the preform 160 has been blow-molded to form the container 100 and then the container 100 has been filled with liquid contents, the closure 144 is installed onto the finish portion 164, by way of suitable equipment, to seal the contents in the interior of the container 100. In general, the threads 180 disposed around the finish portion 164 are engaged with similar threads comprising the closure 144 and then the closure 144 is rotated in a clockwise direction to advance the closure 144 toward the tamper evidence ledge 176. The closure 144 preferably is tightened until the tamper evidence band 148 is pushed over the tamper evidence ledge 176 and a plug seal comprising the closure 144 extends into the opening 172 of the finish portion 164, thereby sealing the liquid contents within the container 100.

[0041] Turning now to Fig. 3, a side plan view of an exemplary embodiment of a tethered closure 244 is shown. The tethered closure 244 generally is configured to remain coupled with a plastic container, such as the container 100, after the tethered closure 244 has been unsealed from the finish portion 164 by an end-user to access contents within the container 100. The illustrated embodiment of the tethered closure 244 includes a closure portion 248 that is coupled with a tamper evidence band 252 by way of a tether bridge 256. Upon the closure portion 248 being removed from the container 100, the tamper evidence band 252 remains fixed to the finish portion 164 while the tether bridge 256 couples the closure portion 248 with the tamper evidence band 252. As such, the tether bridge 256 keeps the closure portion 248 attached to the container 100 after the closure portion 248 is unsealed from the finish portion 164 to access the contents within the container 100.

[0042] With continuing reference to Fig. 3, the closure portion 248 is configured to be threadably engaged with the finish portion 164 shown in Fig. 2. The closure portion 248 includes interior threads that are configured to engage with the threads 180 of the finish portion 164, as described herein. As such, the threads of the closure portion 248 extend into the thread valleys 190 extending around the finish portion 164. During tightening of the closure portion 248 onto the finish portion 164, a plug seal disposed within the closure portion 248 extends into the opening

172 and enters into a pressed relationship with the finish portion 164 whereby contents may be sealed within the interior of the container 100. As shown in Fig. 3, a plurality of knurls 260 may be arranged on top of the closure portion 248 and configured to facilitate grasping the closure portion 248 during tightening and untightening the closure portion 248 on the finish portion 164.

[0043] As shown in Fig. 3, a multiplicity of thin connections 264 attach the tamper evidence band 252 to closure portion 248. The thin connections 264 are configured to break apart when the closure portion 248 is untightened from the finish portion 164, such as during opening the container 100 to access the contents within the container 100. The tamper evidence band 252 generally includes a cam, or a similar structure, disposed around an interior perimeter of the tamper evidence band 252 that interferes with the flat lower portion 236 of the tamper evidence ledge 176. Thus, when an end-user loosens the closure portion 248, the flat lower portion 236 retains the tamper evidence band 252 below the tamper evidence ledge 176, causing the thin connections 264 to break apart and thus allowing the closure portion 248 to separate from the tamper evidence band 252.

[0044] Once all the thin connections are broken, the tethered closure 244 assumes a tethered configuration 280 as best shown in Fig. 4. In the tethered configuration 280, the tamper evidence band 252 resembles a loop of plastic coupled to the closure portion 248 solely by way of the tether bridge 256. As will be appreciated, the tether bridge 256 flexes while the closure portion 248 is tilted with respect to the tamper evidence band 252. It is contemplated that the tether bridge 256 comprises a relatively thick portion of plastic that is configured to resist breaking during tilting the closure portion 248 away from the finish portion 164.

[0045] In general, the tether bridge 256 is configured similarly to the tamper evidence band 252, such that only the thin connections 264 break apart during loosening of the closure portion 248. For example, in some embodiments wherein the tethered closure 244 is formed by way of injection-molding, the tether bridge 256 may be formed by allowing the material comprising the tethered closure 244 to remain disposed between a pair of adjacent thin connections 264. In one exemplary embodiment, a mold for injection-molding the tethered closure 244 may be configured to allow the material comprising the closure 244 to fill one or more spaces 268 (see Fig. 3) between the thin connections 264. As such, one or more protrusions comprising the mold that form the spaces 268 may be omitted in the location of the mold that forms the tether bridge 256. Further,

in some embodiments wherein a knife or other type of blade is used to form the spaces 268 after injection-molding the tethered closure 244, the blade may be configured to avoid cutting the tethered closure 244 at the location of the tether bridge 256. It should be understood, therefore, that the tether bridge 256 is formed generally by leaving material comprising the tethered closure 244 intact within one or more spaces 268 between the thin connections 264, and thus the tether bridge 256 may be formed by way of various diverse techniques without limitation, and without deviating beyond the spirit and scope of the present disclosure.

[0046] Figure 5 illustrates an exemplary-use environment wherein the tethered closure 244 has been installed onto a container 272, formed from the preform 160 of Fig. 2, and then subsequently untightened from the finish portion 164 of the container 272. During installation of the tethered closure 244 onto the container 272, the rounded upper portion 232 of the tamper evidence ledge 176 facilitates passing the tamper evidence band 252 over the tamper evidence ledge 176. As described herein, the flat lower portion 236 of the tamper evidence ledge 176 retains the tamper evidence band 252 positioned below the tamper evidence ledge 176 during loosening of the closure portion 248. As such, loosening the closure portion 248 on the finish portion 164 causes the thin connections 264 to break apart, thus causing the tethered closure 244 to assume the tethered configuration 280 discussed in connection with Fig. 4.

[0047] As shown in Fig. 5, upon removing the closure portion 248 from the finish portion 164, the tether bridge 256 bends and allows the closure portion 248 to be tilted with respect to the tamper evidence band 252. As such, the tether bridge 256 keeps the closure portion 248 attached to the container 272 after the closure portion 248 is unsealed from the finish portion 164 to access the contents within the container 272. It is contemplated that keeping the closure portion 248 coupled with the container 272 will substantially eliminate instances of misplacing the closure portion 248, thereby encouraging the end-user reengaging the closure portion 248 with the finish portion 164 to store unfinished contents within the container 272, as well as preventing the closure portion 248 from contributing to plastic waste being deposited into the environment.

[0048] As described hereinabove, the finish portion 164 includes a handing valley 240 disposed adjacent to the rounded upper portion 232 of the tamper evidence ledge 176. Upon comparing Fig. 2 and Fig. 5, it is straightforward to see that the tamper evidence band 252 is fixated

on top of the tamper evidence ledge 176. In some embodiments, however, the tether closure 244 may be configured to position the tamper evidence band 252 entirely beneath the tamper evidence ledge 176, as described hereinabove. Further, in some embodiments, the tamper evidence ledge 176 may be configured to fixate the tamper evidence band 252 on top of the tamper evidence ledge 176, in lieu of being positioned below the tamper evidence ledge, without limitation.

[0049] Moreover, it should be understood that the tethered closure 244 is not to be limited to the specific embodiments shown in the drawings and described hereinabove. For example, the tether bridge 256 is not to be limited to comprising a single piece of material that extends from the tamper evidence band 252 to the closure portion 248. In some embodiments, for example, the tether bridge 256 may comprise two or more portions of material joining the tamper evidence band 252 and the closure portion 248. It is contemplated that in such embodiments, the two or more portions of material comprising the tether bridge 256 generally are narrower than the single piece of material comprising the tether bridge 256 shown in Fig. 3. It is further contemplated that the tether bridge 256 may comprise any of various structures or mechanisms that facilitate tilting the closure portion 248 relative to the finish portion 264, as shown in Fig. 5. For example, in some embodiments, the tether bridge 256 may include one or more cuts that cause the tether bridge 256 to operate similarly to a scissor hinge when the closure portion 248 is removed from the finish portion 164. As such, the tether bridge 256 may include a wide variety of different configurations and include mechanisms other than shown and discussed herein, without limitation, and without deviating beyond the spirit and scope of the present disclosure.

[0050] While the invention has been described in terms of particular variations and illustrative figures, those of ordinary skill in the art will recognize that the invention is not limited to the variations or figures described. In addition, where methods and steps described above indicate certain events occurring in certain order, those of ordinary skill in the art will recognize that the ordering of certain steps may be modified and that such modifications are in accordance with the variations of the invention. Additionally, certain of the steps may be performed concurrently in a parallel process when possible, as well as performed sequentially as described above. To the extent there are variations of the invention, which are within the spirit of the disclosure or equivalent to the inventions found in the claims, it is the intent that this patent will cover those variations as

well. Therefore, the present disclosure is to be understood as not limited by the specific embodiments described herein, but only by scope of the appended claims.

CLAIMS

What is claimed is:

1. A closure for sealing contents within an interior of a container and remaining coupled with the container after being unsealed from the container, the closure comprising:
 - a closure portion for threadably engaging with a finish portion of the container;
 - a tamper evidence band for engaging with the finish portion; and
 - a tether bridge for keeping the closure portion attached to the tamper evidence band.
2. The closure of claim 1, wherein a multiplicity of thin connections attach the tamper evidence band to closure portion and are configured to break apart when the closure portion is untightened from the finish portion.
3. The closure of claim 2, wherein the tamper evidence band is configured to remain engaged with the finish portion when the closure portion is removed from the finish portion, thereby causing the thin connections to break apart and allow the closure portion to separate from the tamper evidence band.
4. The closure of claim 2, wherein the tether bridge is configured such that only the thin connections break apart during loosening of the closure portion.
5. The closure of claim 4, wherein the tether bridge is formed during injection-molding by allowing material comprising the closure to remain disposed between a pair of adjacent thin connections.
6. The closure of claim 4, wherein the tether bridge is formed after injection-molding by using a blade to create spaces between the thin connections and avoiding cutting at the location of the tether bridge.
7. The closure of claim 1, wherein the tether bridge comprises a single piece of material that extends between the tamper evidence band and the closure portion.
8. The closure of claim 1, wherein the tether bridge comprises two or more portions of material joining the tamper evidence band and the closure portion.

9. The closure of claim 1, wherein the tether bridge is configured to keep the closure portion attached to the finish portion after the closure portion is unsealed from the finish portion.
10. The closure of claim 1, wherein the tether bridge is configured to flex while the closure portion is tilted with respect to the tamper evidence band.
11. The closure of claim 10, wherein the tether bridge comprises a relatively thick portion of plastic that is configured to resist breaking during tilting the closure portion away from the finish portion.
12. A method for a closure to seal contents within an interior of a container and remain coupled with the container after being unsealed from the container, the method comprising:
 - configuring a closure portion for threadably engaging with a finish portion of the container;
 - configuring a tamper evidence band for engaging with the finish portion; and
 - joining the closure portion and the tamper evidence band by way of a tether bridge.
13. The method of claim 12, wherein joining includes configuring the tether bridge to keep the closure portion attached to the finish portion after the closure portion is unsealed from the finish portion.
14. The method of claim 12, wherein joining includes configuring the tether bridge to flex when the closure portion is tilted with respect to the tamper evidence band.
15. The method of claim 12, wherein joining includes extending a single piece of material comprising the tether bridge between the tamper evidence band and the closure portion.
16. The method of claim 12, wherein joining includes coupling the tamper evidence band and the closure portion by way of two or more portions of material comprising the tether bridge.
17. The method of claim 12, wherein joining includes coupling the closure portion and the tamper evidence band by way of a multiplicity of thin connections configured to break apart when the closure portion is untightened from the finish portion.

18. The method of claim 17, wherein joining includes configuring the tether bridge such that only the thin connections break apart during loosening of the closure portion.
19. The method of claim 18, wherein configuring the tether bridge includes injection-molding such that material comprising the closure fills one or more spaces between adjacent thin connections.
20. A method for a closure, comprising:
 - loosening a closure portion threaded onto a finish portion of the container;
 - breaking a multiplicity of thin connections disposed between the closure portion and a tamper evidence band engaged with the finish portion; and
 - bending a tether bridge disposed between the closure portion and a tamper evidence band by tilting the closure portion away from the finish portion.

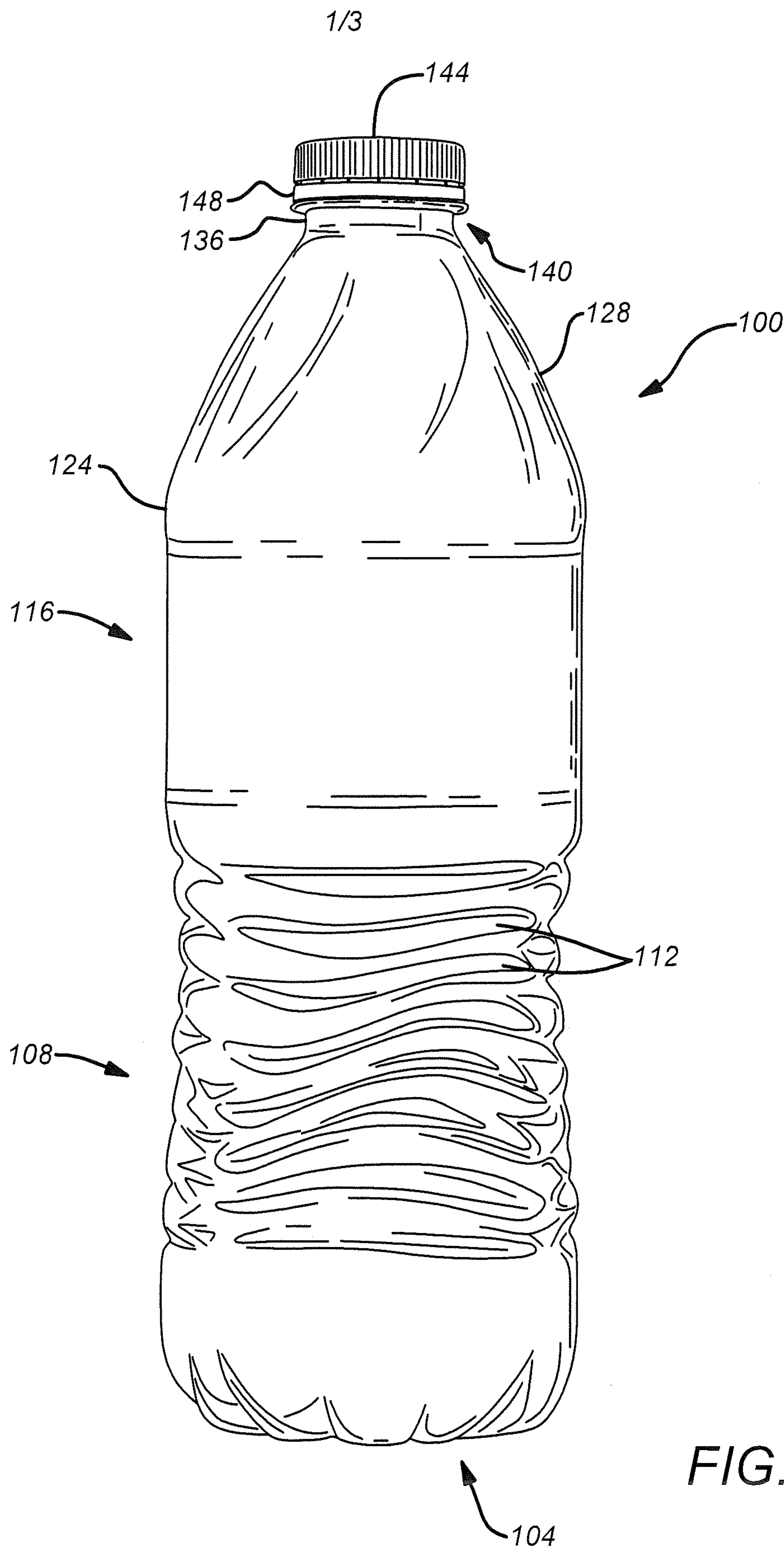


FIG. 1

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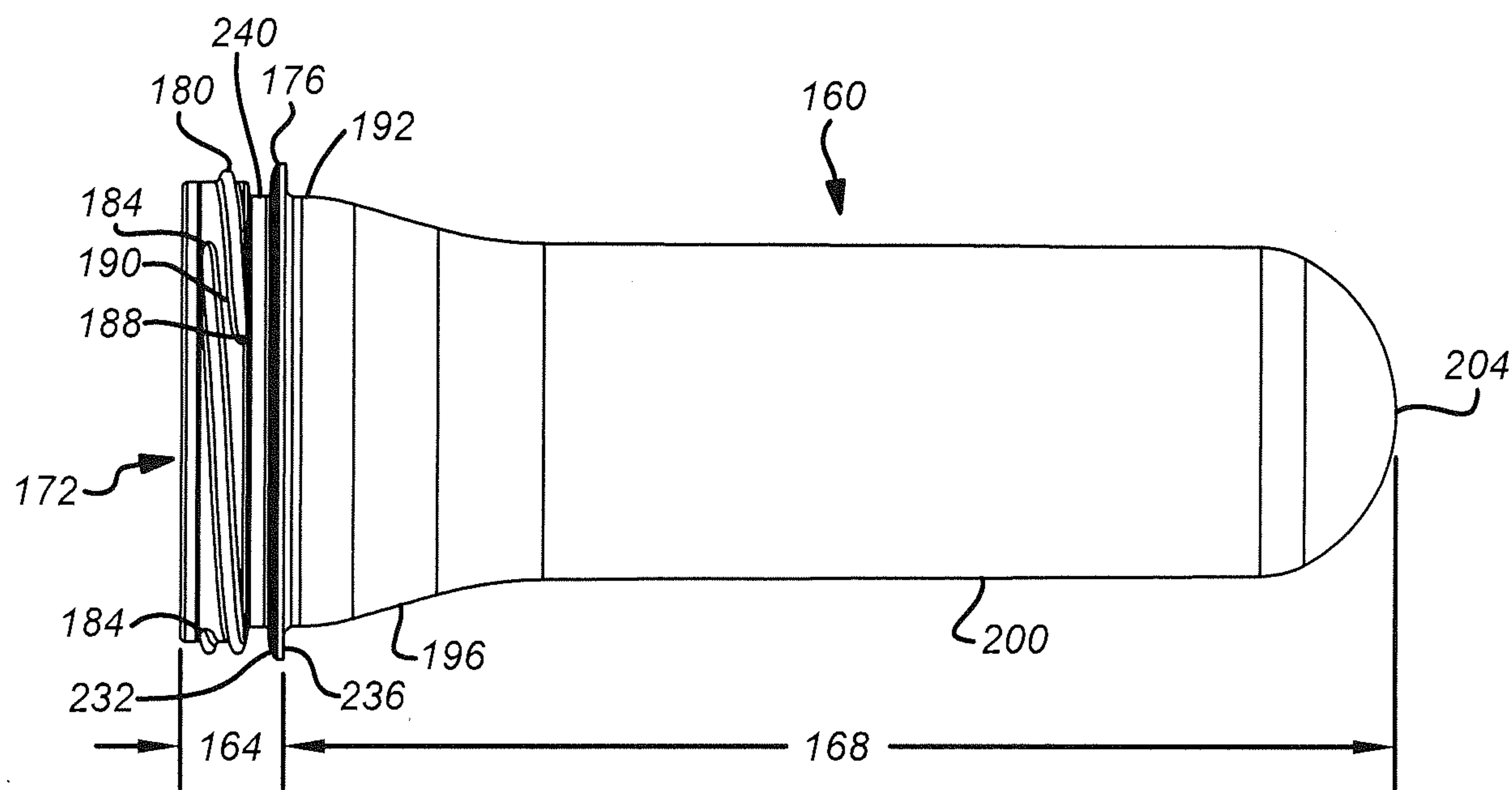


FIG. 2

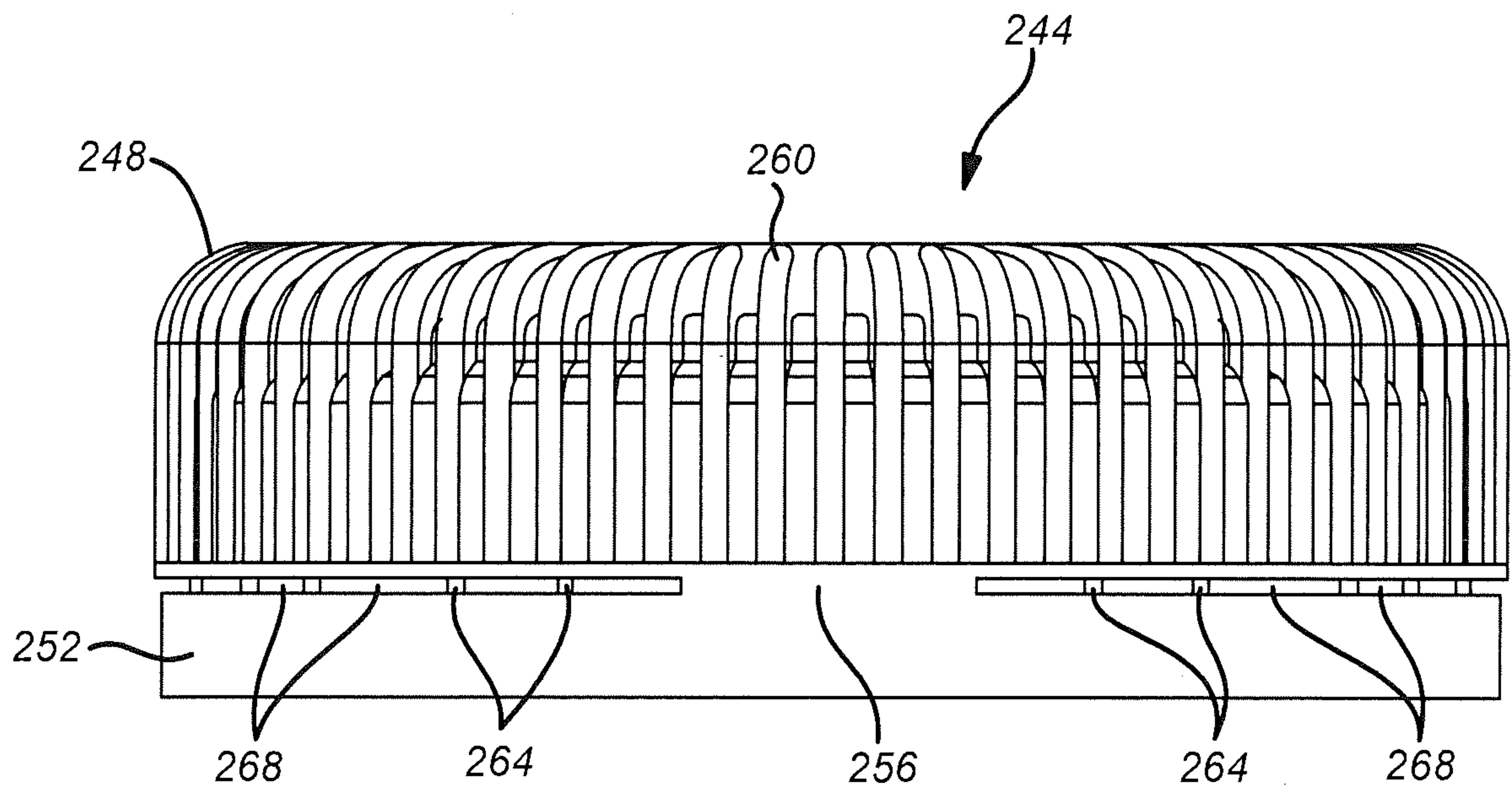


FIG. 3

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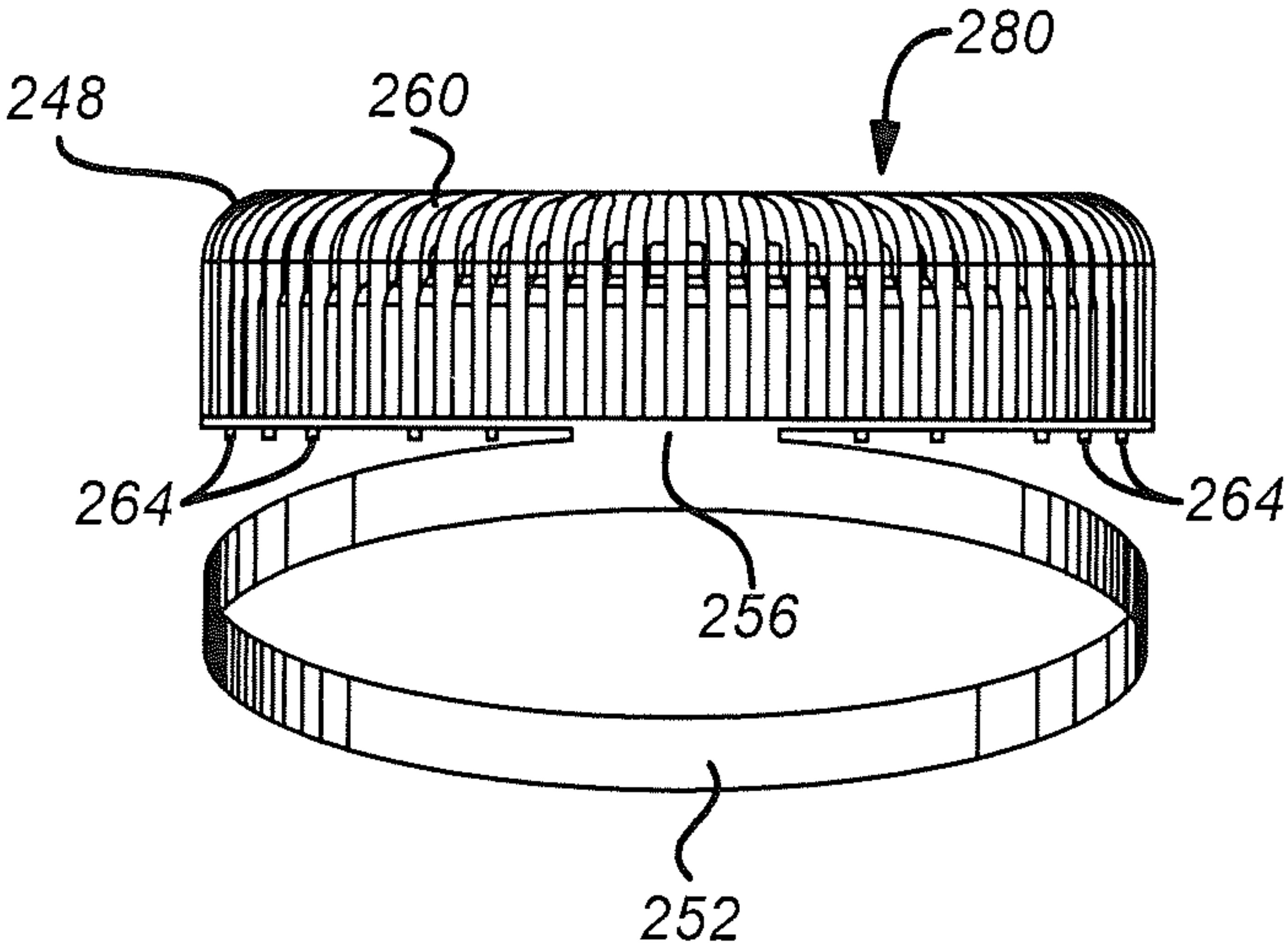


FIG. 4

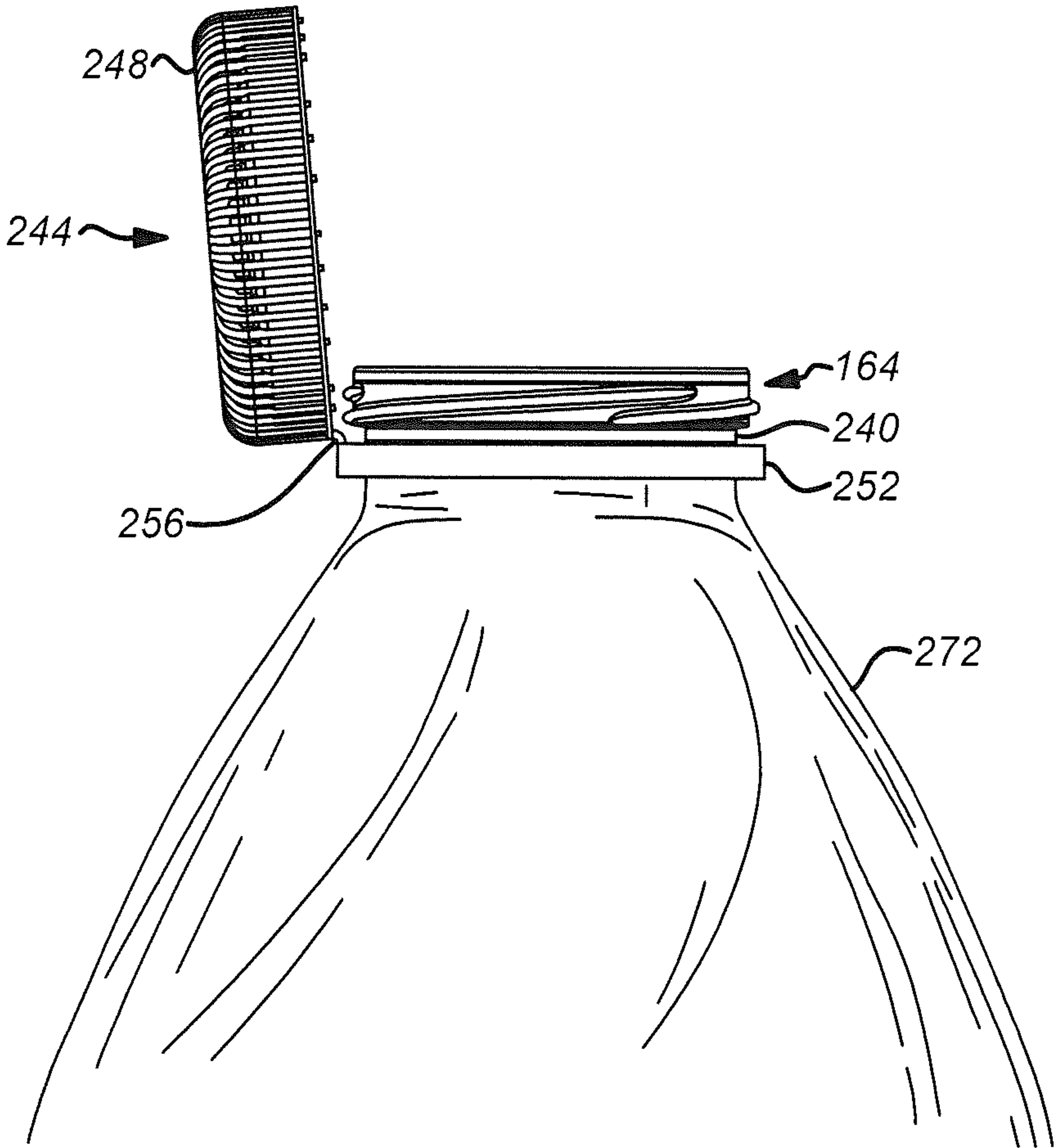


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 20/60875

A. CLASSIFICATION OF SUBJECT MATTER

IPC - B65D 41/34 (2020.01)

CPC - B65D 2401/30, B65D 41/3428, B65D 41/3447

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)

See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2019/0344944 A1 (ThisCap Inc) 14 November 2019 (14.11.2019), entire document, especially Fig. 3, para [0018], [0019], [0020], [0031], [0033], [0035]	1-6, 8-14, 16-20
X	US 2018/0170625 A1 (Sung) 21 June 2018 (21.06.2018), entire document, especially Fig. 2, 3, 4; para [0036], [0040], [0039], [0054], [0056];	1, 7, 12, 15
A	US 2019/0344933 A1 (Silgan White Cap LLC) 14 November 2019 (14.11.2019), entire document	1-20
A	US 2015/0251827 A1 (Campbell) 10 September 2015 (10.09.2015), entire document	1-20
A	US 2011/0174760 A1 (Luzzato et al.) 21 July 2011 (21.07.2011), entire document	1-20

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

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"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

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Date of the actual completion of the international search

6 January 2021

Date of mailing of the international search report

05 FEB 2021

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