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(54) **LID-SECURING MECHANISM, BEVERAGE CONTAINER WITH LID-SECURING MECHANISM, AND METHODS OF MANUFACTURING THE SAME**

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(52) **U.S. Cl.**

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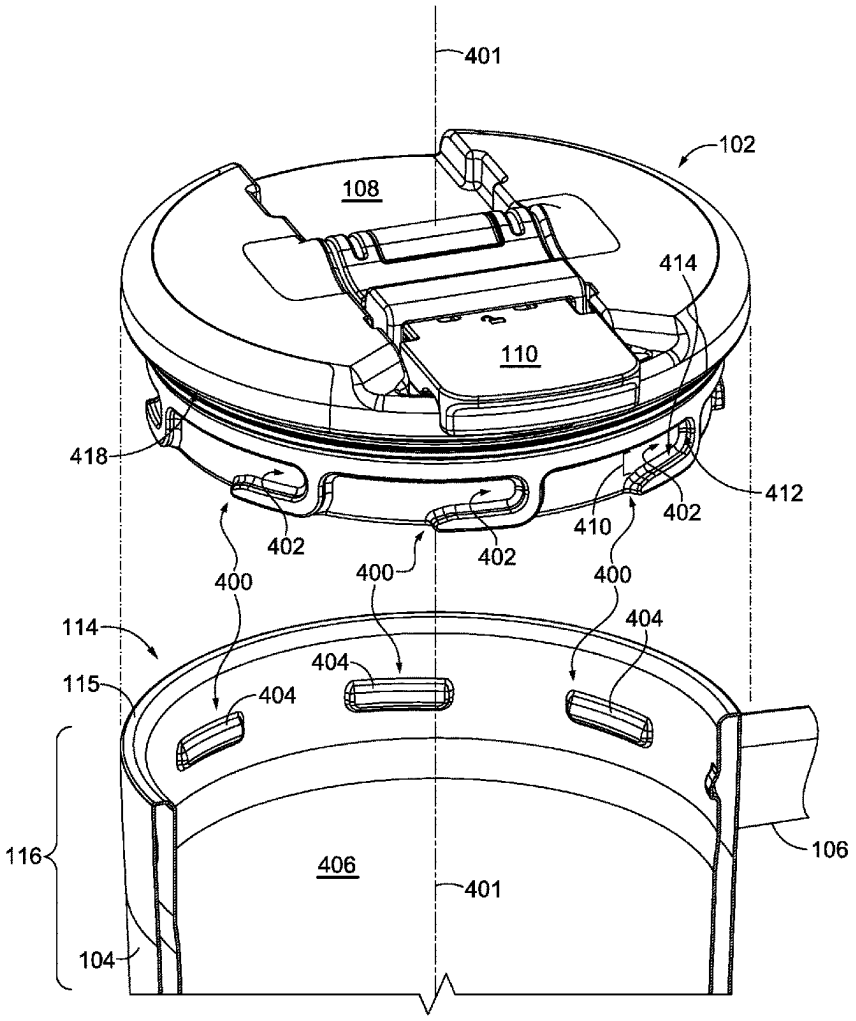
(57) **ABSTRACT**

Lid-securing mechanisms, beverage containers with lid-securing mechanisms, and methods of manufacturing, testing, and using the same are provided herein, among things. The lid-securing mechanism can include separate elements that can be mateably engaged to thereby form a seal that substantially limits or inhibits liquids from passing through the seal. The lid-securing mechanism can include a first element located on a base structure (e.g., a cup or canister) and a second element located on a lid. The first element and the second element are configured to be releasably and/or reversibly coupled together to form a seal between the lid and the base structure. In embodiments, the first element is a plurality of protrusions located about an inner surface of the base structure, and the second element is a plurality of channels located about the lid.



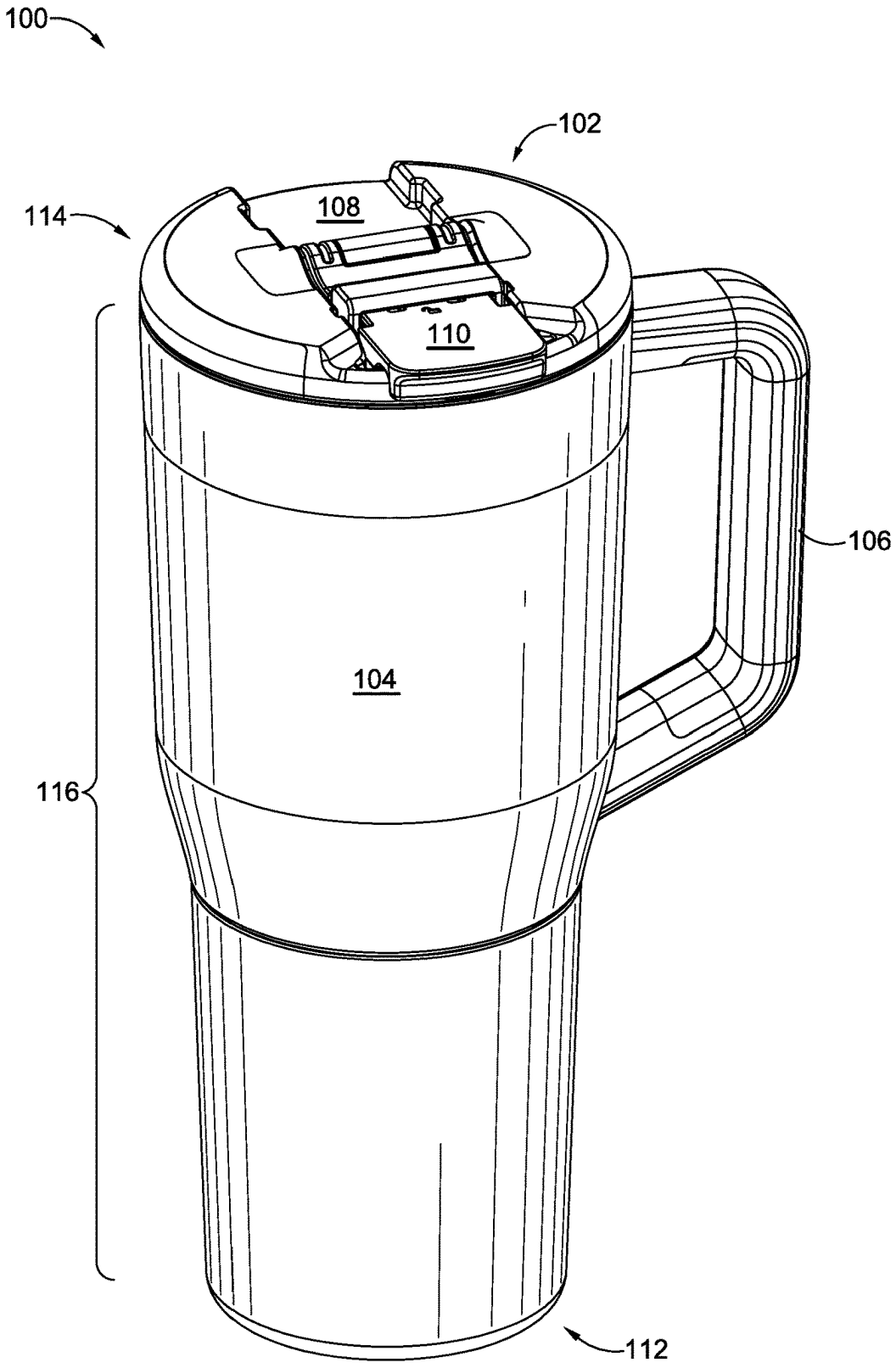


FIG. 1

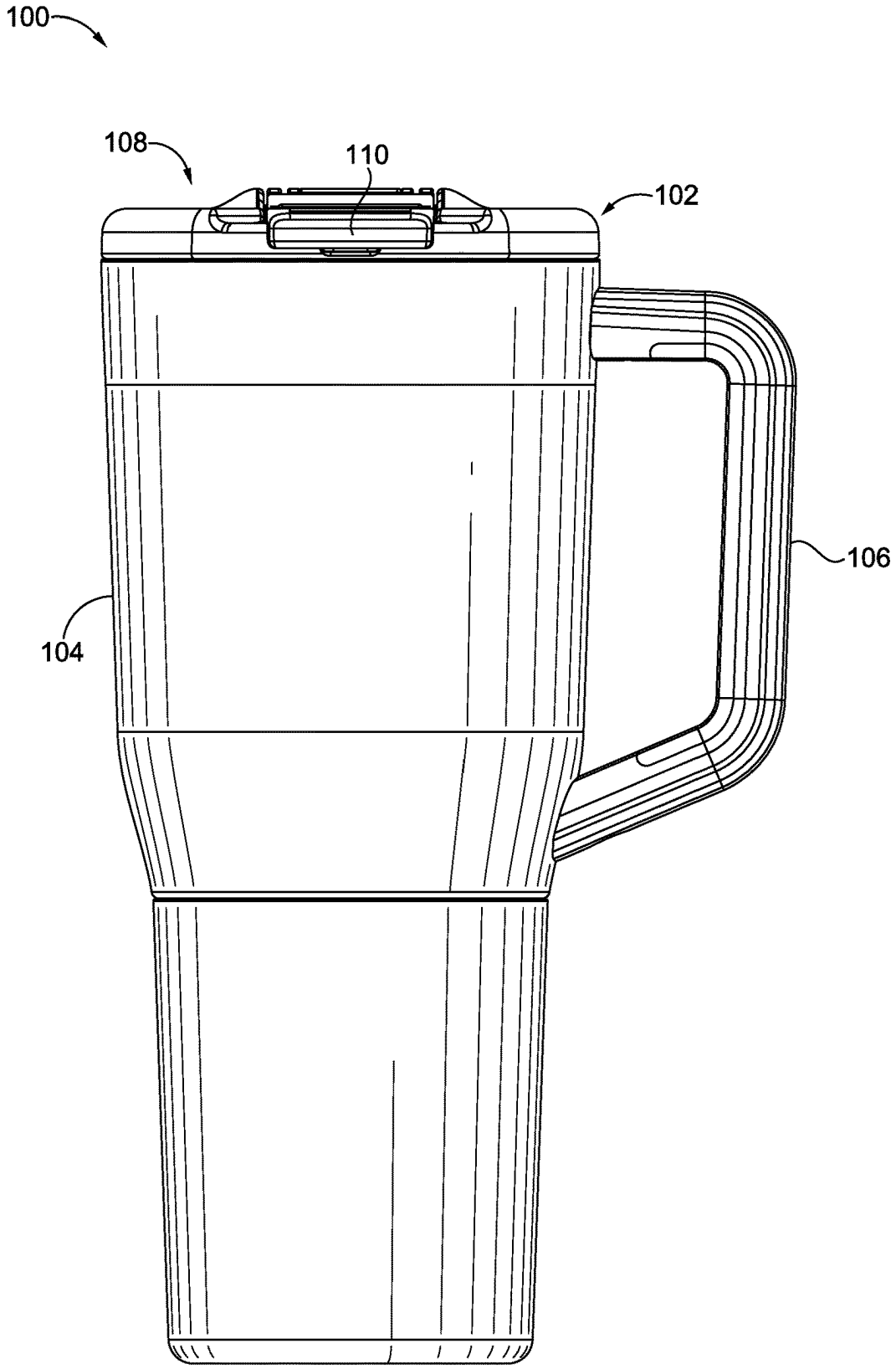


FIG. 2

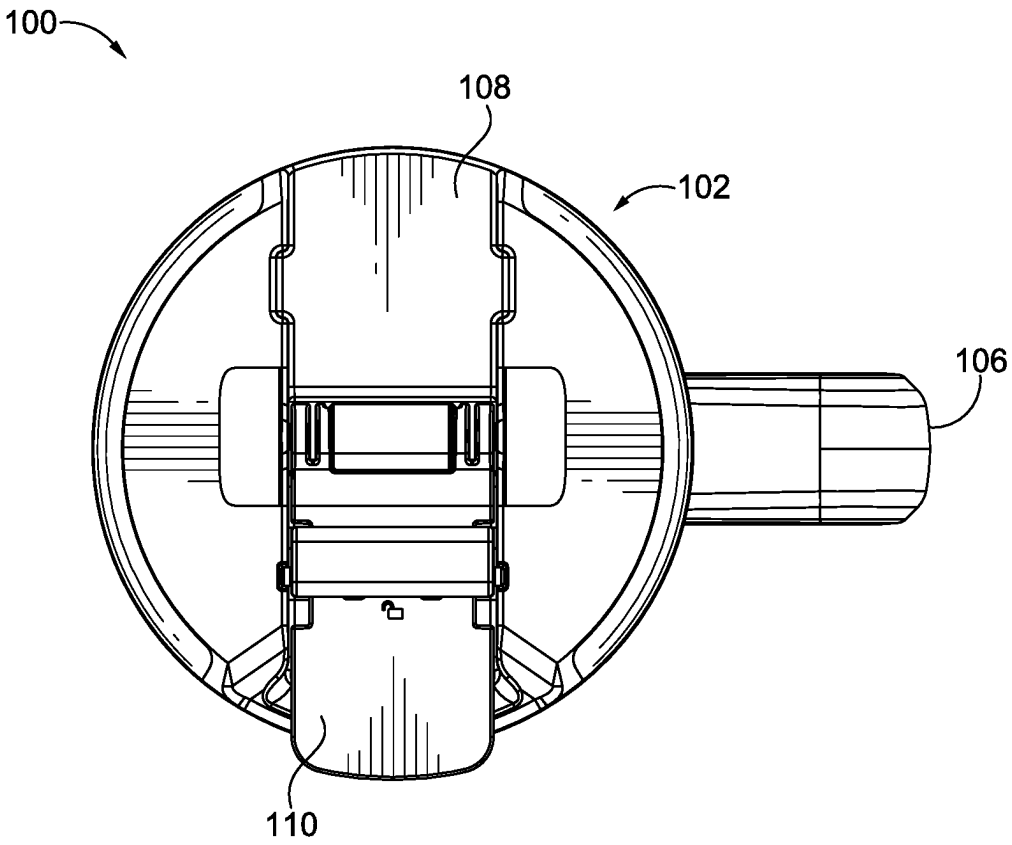


FIG. 3

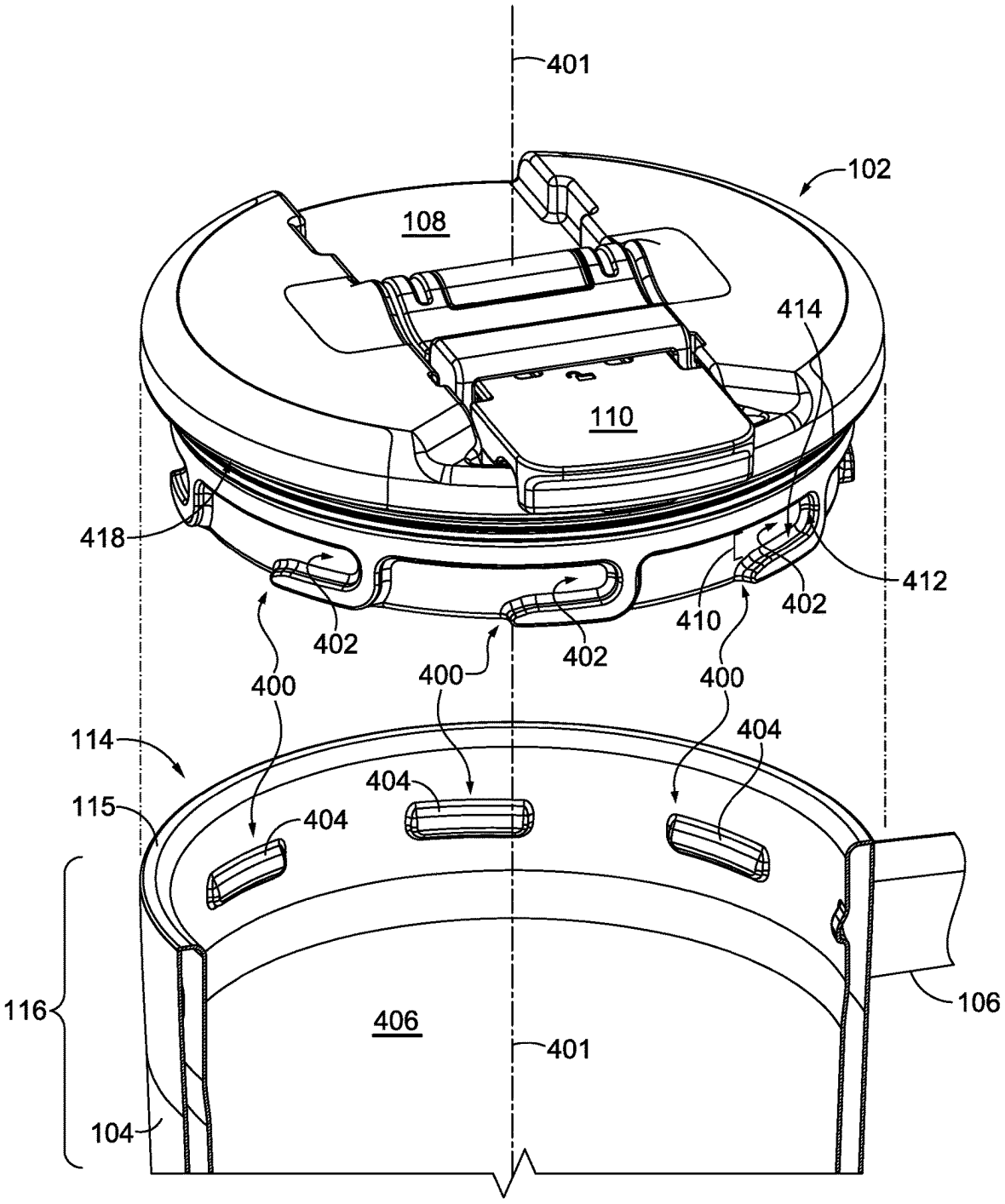

401
102
108
414
110
418
412
402
410
402
402
400
400
400
114
404
404
115
404
116
406
401
106
104

FIG. 4

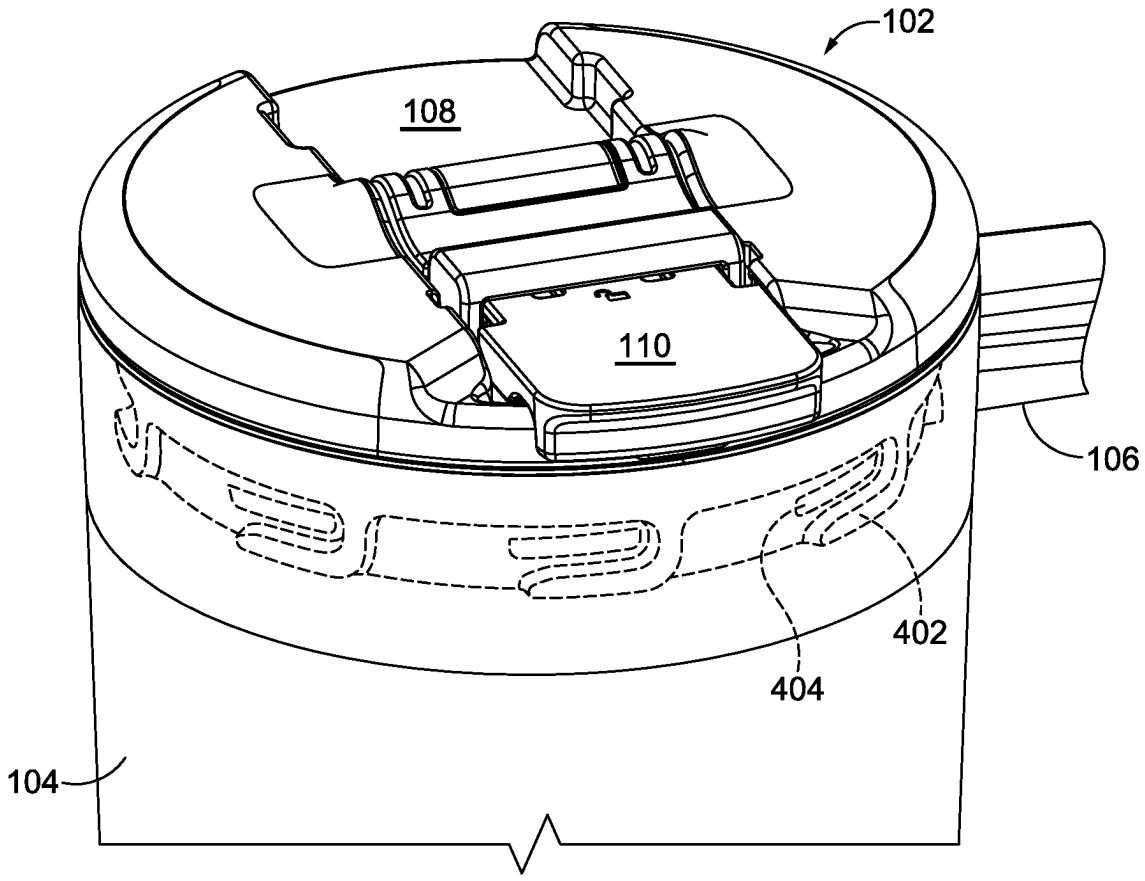


FIG. 5

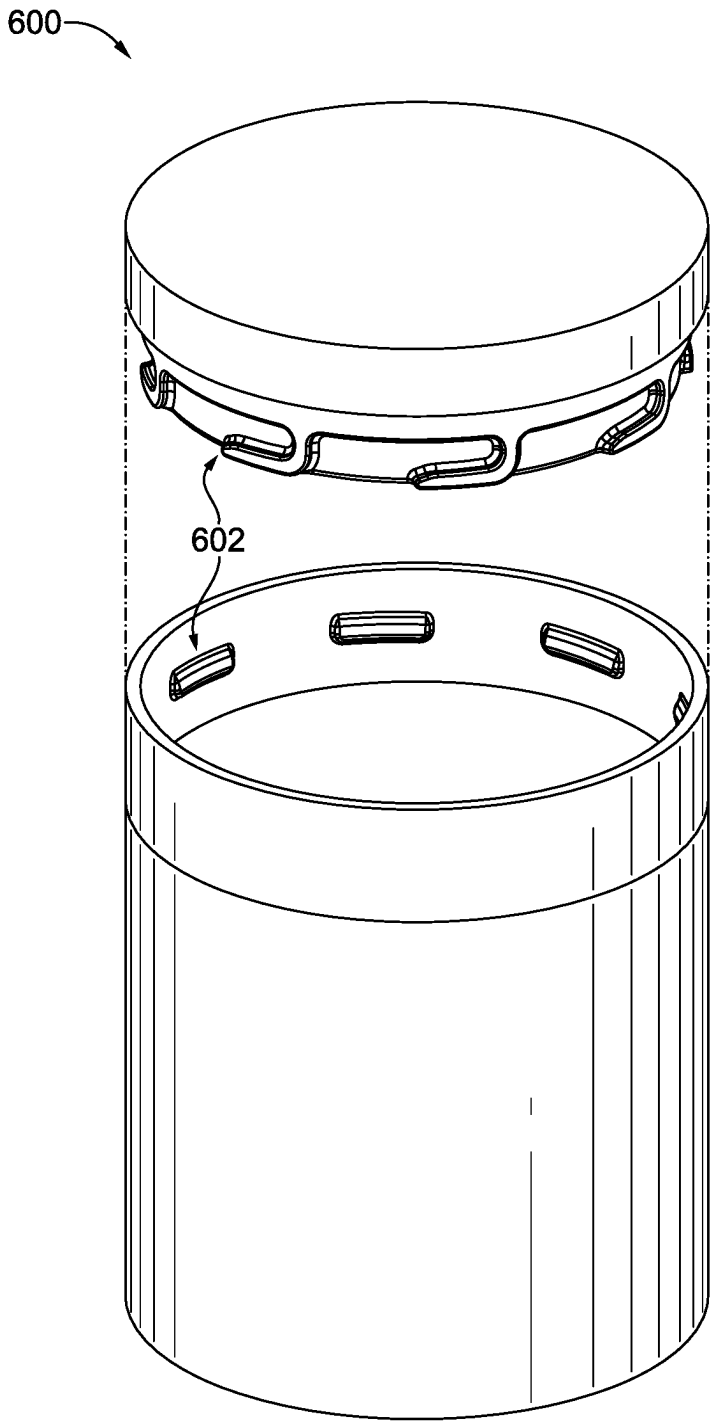


FIG. 6

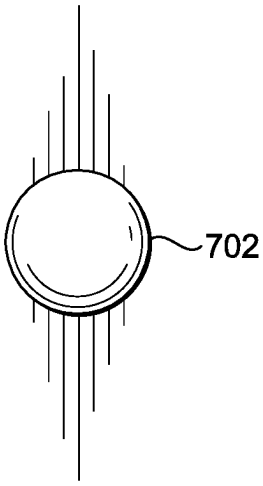


FIG. 7A

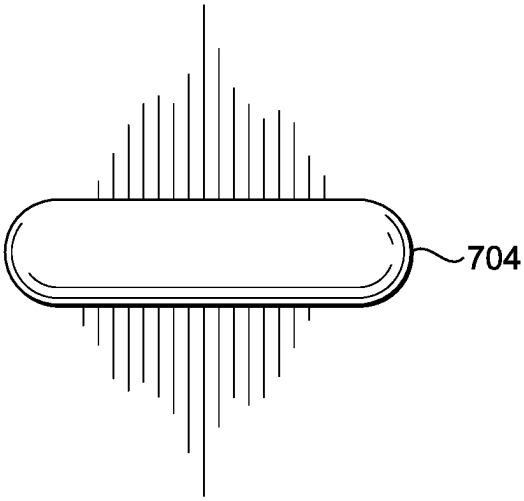


FIG. 7B

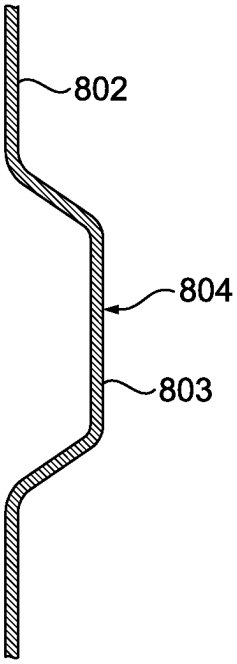


FIG. 8A

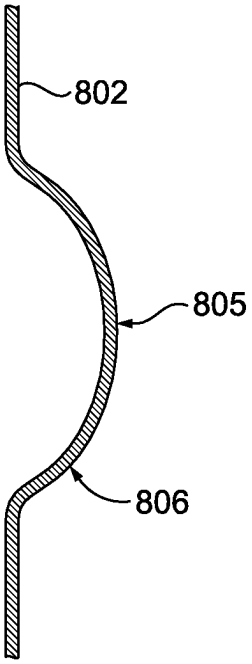


FIG. 8B

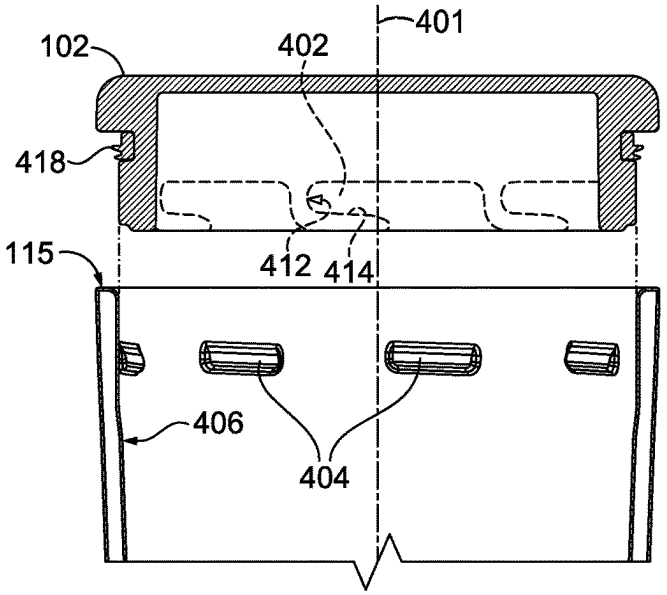


FIG. 9A

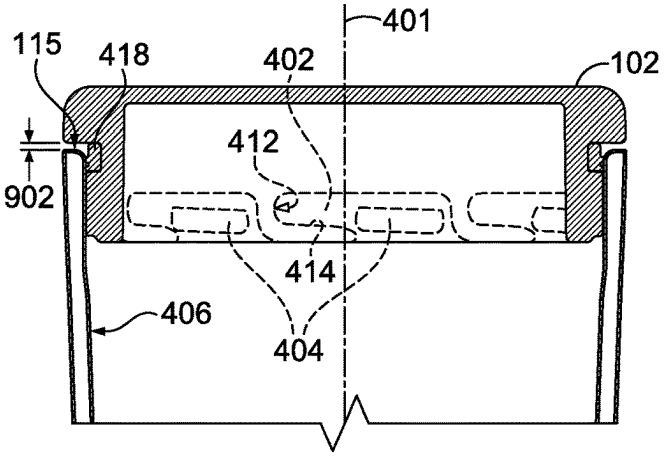


FIG. 9B

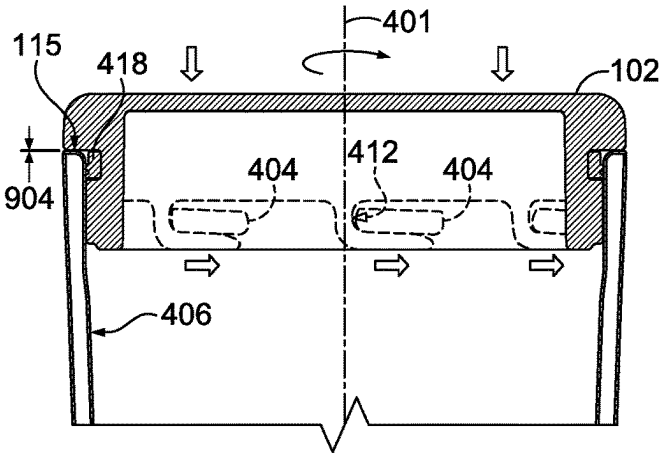


FIG. 9C

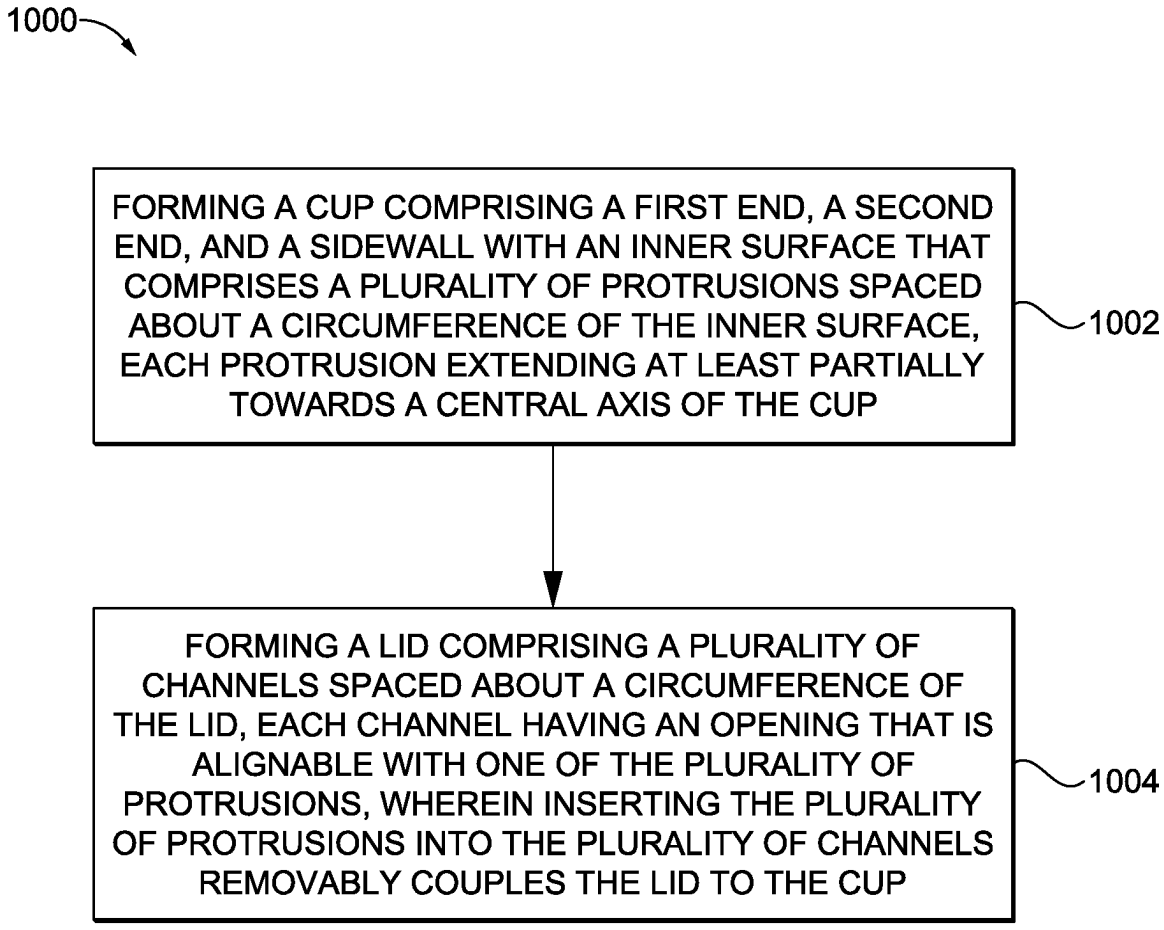

1000
FORMING A CUP COMPRISING A FIRST END, A SECOND END, AND A SIDEWALL WITH AN INNER SURFACE THAT COMPRISES A PLURALITY OF PROTRUSIONS SPACED ABOUT A CIRCUMFERENCE OF THE INNER SURFACE, EACH PROTRUSION EXTENDING AT LEAST PARTIALLY TOWARDS A CENTRAL AXIS OF THE CUP
1002
FORMING A LID COMPRISING A PLURALITY OF CHANNELS SPACED ABOUT A CIRCUMFERENCE OF THE LID, EACH CHANNEL HAVING AN OPENING THAT IS ALIGNABLE WITH ONE OF THE PLURALITY OF PROTRUSIONS, WHEREIN INSERTING THE PLURALITY OF PROTRUSIONS INTO THE PLURALITY OF CHANNELS REMOVABLY COUPLES THE LID TO THE CUP
1004

FIG. 10

LID-SECURING MECHANISM, BEVERAGE CONTAINER WITH LID-SECURING MECHANISM, AND METHODS OF MANUFACTURING THE SAME

TECHNICAL FIELD

[0001] The field relates to travel beverage holders and other containers that can be sealed, e.g., using a lid, to retain liquids inside.

BACKGROUND

[0002] Travel containers are often used to transport liquids. For example, travel beverage containers including those that are insulated, non-insulated, double-walled, or otherwise configured to hold a liquid are often used by consumers to transport their beverages. Travel beverage containers often have a lid for sealing an opening of the container. These lids are often screw-on or press-on lids. However, such lids often readily leak due to absence of a strong seal. Leak-proof mechanisms are typically cumbersome, e.g., requiring excessive turning or force to open and/or close the lid which can result in degradation over time and frustration of use. Leak-proof mechanisms can also be costly or challenging to implement on certain products. Therefore, a lid-securing mechanism that can be easily implemented, easily used, and also provide a substantially sealed connection that is durable, is needed.

SUMMARY

[0003] This summary is intended to introduce a selection of concepts in a simplified form which are further described below in the detailed description section of this disclosure. This summary is not intended to identify key or essential features of the claimed subject matter, nor is it intended to be used as an aid in isolation to determine the scope of the claimed subject matter.

[0004] In brief, and at a high level, this disclosure describes, among other things, a lid-securing mechanism, a container that includes a lid-securing mechanism, e.g., a liquid-holding container such as a travel beverage container used for transporting liquids, and methods of manufacturing, testing, and using the same, among other things.

[0005] In embodiments, a lid-securing mechanism is provided. The lid-securing mechanism can include separate elements that can be mateably engaged to thereby form a seal that substantially limits or inhibits liquids from passing through the seal. The lid-securing mechanism can include a first element located on a base structure (e.g., a cup or canister or other partial enclosure) and a second element located on a lid. The first element and the second element are configured to be releasably and/or reversibly coupled together to form a seal between the lid and the base structure. In embodiments, the first element is a plurality of protrusions located about an inner surface of the base structure, and the second element is a plurality of channels located about the lid. In some embodiments, this relative location of the protrusions/channels can be reversed. The protrusions and channels are configured so that the protrusions can be aligned with the channels, and then inserted into and through the channels to thereby secure the lid to a rim of the base structure (e.g., cup or canister) and as a result create a substantially leak-inhibiting seal. In embodiments, the seal can be enhanced through incorporating curves, contours, or slopes into the channel walls of the channels, so that translating the protrusions through the channels shifts the lid along a central axis of the base structure, thereby increasing a pressure of the lid against the rim (e.g., to help establish a substantially leak-inhibiting seal). In embodiments, the lid can include a ring of material that is at least partially compressible (e.g., one or more rubbers, foams, polymers, and/or other natural or synthetic materials). In such embodiments, the material can be compressed to help establish the seal, e.g., through manual pressure, or during translation of the lid along the central axis. In embodiments, protrusions can be integrally formed on a surface, or separately attached to a surface; further, channels can be integrally formed on a surface, or can be part of a separate structure attached to a surface. The aforementioned lid-securing configurations can allow a lid to be easily secured including with a more limited need for application of turning and pressing forces. In addition, the aforementioned lid-securing configurations can allow a lid to be secured with less than a 45, less than a 30, or less than a 15 degree turn, among other turning rotations, thereby simplifying and easing attachment of the lid.

[0006] In an embodiment, a beverage container assembly is provided. The beverage container assembly can include a cup that is configured to be removably coupled to a lid. The cup can include a first end having a base and a second end having a rim that defines an opening at the top of the cup. The cup can have a sidewall extending between the first end and the second end, the sidewall having an inner surface with a plurality of protrusions. The plurality of protrusions can be spaced equally about a circumference of the inner surface, each protrusion extending at least partially towards a central axis of the cup. The lid can include a plurality of channels spaced equally about a circumference of the lid. Each channel can have an opening that is alignable with one of the plurality of protrusions, allowing the plurality of protrusions to be inserted into the plurality of channels to removably and/or reversibly couple the lid to the cup.

[0007] In another embodiment, a sealable container assembly is provided. The sealable container assembly can include a container that is configured to be removably coupled to a lid. The container can include a first end having a base at the bottom of the container and a second end having a rim that defines an opening at the top of the container. The container can have a sidewall extending between the first end and the second end, the sidewall having an inner surface with a plurality of protrusions. The plurality of protrusions can be spaced equally about a circumference of the inner surface, each protrusion extending at least partially towards a central axis of the container. The lid can include a plurality of channels spaced equally about a circumference of the lid. Each channel can have an opening that is alignable with one of the plurality of protrusions, thereby allowing the plurality of protrusions to be inserted into the plurality of channels to removably and/or reversibly couple the lid to the cup.

[0008] In another embodiment, a method of manufacturing a beverage container assembly is provided. The method includes forming a cup that includes a first end creating a base at the bottom of the cup, a second end creating a rim that defines an opening at the top of the cup, and a sidewall extending between the first end and the second end. The sidewall can be formed with an inner surface that includes a plurality of protrusions, e.g., spaced equally about a circumference of the inner surface, each protrusion extending at least partially towards a central axis of the cup. The

method also includes forming a lid that includes a plurality of channels spaced equally about a circumference of the lid. Each channel can have an opening that is alignable with one of the plurality of protrusions, thereby allowing the plurality of protrusions to be inserted into the plurality of channels to removably and/or reversibly couple the lid to the cup

[0009] The beverage container assembly, sealable container assembly, methods of manufacturing and using the same, and other embodiments described herein can provide multiple advantages and improvements. For example, using the beverage container assembly and related assemblies described herein that includes a lid securing mechanism can reduce, limit, or inhibit liquids from exiting the container, e.g., even when the container is positioned at different orientations and/or experiences changing atmospheric conditions. In some aspects, the seal created by the components described herein can be sufficiently tight that the lid securing mechanism in the closed position is substantially fully or entirely leak-proof, thus limiting instances of spilling, while allowing the user to more easily secure and unsecure the lid when desired, with confidence that such limited engagement will result in a leak-inhibiting seal. In addition, the aspects described herein allow a lid-securing mechanism to be implemented with limited excess components and greater simplicity and cost-efficiency, among other benefits.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The embodiments described herein related to lid-securing mechanisms, container assemblies with lid-securing mechanisms, e.g., such as beverage container assemblies and travel beverage containers, and methods of manufacturing, testing, and using the same are described in detail in connection with the attached drawing figures, which are incorporated by reference herein, and wherein:

[0011] FIG. **1** depicts a perspective view of a beverage container assembly with a lid-securing mechanism, in accordance with embodiments hereof;

[0012] FIG. **2** depicts a side elevation view of the container shown in FIG. **1**, in accordance with embodiments hereof;

[0013] FIG. **3** depicts a top elevation view of the container shown in FIGS. **1** and **2**, in accordance with embodiments hereof;

[0014] FIG. **4** depicts a perspective view of a lid-securing mechanism in an uncoupled configuration, in accordance with embodiments hereof;

[0015] FIG. **5** depicts a partially see-through perspective view of the lid-securing mechanism of FIG. **4** but instead in a coupled or secured configuration, in accordance with embodiments hereof;

[0016] FIG. **6** depicts a container assembly with a lid-securing mechanism similar to that shown in FIGS. **4** and **5**, in accordance with embodiments hereof;

[0017] FIGS. **7**A and **7**B depict examples of uniquely-shaped protrusions that can form part of a lid-securing mechanism for releasably or reversibly securing a lid to another structure, in accordance with embodiments hereof;

[0018] FIGS. **8**A and **8**B depict cross-sections of different protrusions that can form part of a lid-securing mechanism, in accordance with embodiments hereof;

[0019] FIGS. **9**A-**9**C depict an example process of operating a lid-securing mechanism by shifting a protrusion into and through a channel shaped to shift a lid along a central axis of a container to which the lid is being coupled, in accordance with embodiments hereof; and

[0020] FIG. **10** depicts a block diagram of a method of forming/manufacturing a container with a lid-securing mechanism, in accordance with embodiments hereof.

DETAILED DESCRIPTION

[0021] This detailed description is provided in order to meet statutory requirements. However, this description is not intended to limit the scope of the invention described herein. Rather, the claimed subject matter may be embodied in different ways, to include different steps, different combinations of steps, different elements, and/or different combinations of elements, similar to those described in this disclosure, and in conjunction with other present or future technologies. In addition, although the terms "step" and "block" may be used herein to identify different elements of methods employed, the terms should not be interpreted as implying any particular order among or between different elements except when the order is explicitly stated.

[0022] In general, disclosed herein are lid-securing mechanisms; products, cups, and containers having lid-securing mechanisms; and methods of manufacturing, testing, and using the same, among other things. The lid-securing mechanisms described herein can be operated to releasably or reversibly couple a lid to a rim of a liquid-holding container, e.g., a travel beverage container, and thereby quickly and easily form a substantially leak-inhibiting seal. In embodiments, the lid-securing mechanism is operated by inserting a plurality of protrusions located on an inner surface of a cup or container into a plurality of channels located on a lid (the location of the protrusions and channels may in alternative aspects be reversed to provide a similar connection). In embodiments, the channels and the protrusions can have a friction fit such that overcoming a frictional resistance is required to advance the protrusions through the channels. In addition, in embodiments, the channels can be shaped, sized, and directionally oriented to allow the protrusions, once inserted and being translated through the channels, to shift along a central axis of an associated cup and/or container. This shifting, in turn, translates the lid and cup/container towards and/or closer to each other and thereby increases the tightness of the seal that is being formed. In further embodiments, methods of manufacturing lid-securing mechanisms and associated cups, containers, and assemblies are provided, and methods of testing and using the same are also provided herein. Detailed and non-limiting examples of the present subject matter are discussed below in connection with attached FIGS. **1**-**10**.

[0023] Looking initially at FIGS. **1**-**3**, a beverage container assembly **100** is shown, in accordance with an embodiment of the present disclosure. The beverage container assembly **100** includes a lid **102** and a cup **104** that are configured to be releasably and/or reversibly coupled together to form a seal. The beverage container assembly **100** may optionally further include a handle **106** to facilitate carrying the beverage container assembly **100**. As further shown in FIG. **1**, in embodiments, the lid **102** can have a lid body portion **108** and a flip component **110** with a spout opening through which a user is able to drink fluids stored within the beverage container assembly **100**. In different embodiments, the flip component **110** can be a spout portion or a straw mechanism. The flip component **110** extends through an opening of the lid body portion **108** so that it

extends through and above a first surface (exterior surface) of the lid body portion **108**. Looking at FIG. **1**, the cup **104** includes an end **112** that forms a base of the cup **104**, an end **114** with a rim that defines an opening at the top of the cup **104**, and a sidewall **116** connecting and extending between the end **112** and the end **114**. The cup **104** of the beverage container assembly **100** may optionally include a handle **106** located on the sidewall **116** to facilitate transport of the beverage container assembly **100** by a user. FIG. **2** depicts a side elevation view of the lid **102** coupled to the cup **104** as shown in FIG. **1**, in accordance with embodiments hereof. FIG. **3** depicts a top elevation view of the lid **102** coupled to the cup **104** as shown in FIG. **1**, in accordance with embodiments hereof. In FIGS. **1-3**, element **104** is referred to as a cup. This term is intended to be broadly encompassing and to include different types of enclosures with a base, a sidewall, and an opening such that the enclosure is suitable for holding liquids, and is not intended to be limited to a particular type, size, shape, or class of drink container. In some embodiments, the beverage container assembly **100** shown in FIGS. **1-3** could be similarly integrated into another type of container, e.g., such as a canister-type container, e.g., as shown in one non-limiting example in FIG. **6**.

[0024] Looking now at FIG. **4**, a partial cut-away, perspective view of the lid **102** and the cup **104** is depicted, in accordance with embodiments hereof. FIG. **4**, in particular, shows one configuration of a lid-securing mechanism, in particular, lid-securing mechanism **400**. The lid-securing mechanism **400** includes a plurality of protrusions **404** located about an inner surface **406** of the cup **104** as shown in FIG. **4**. The plurality of protrusions **404** are alignable with, and insertable into and through, a plurality of corresponding channels **402** located about a circumference of the lid **102** as also shown in FIG. **4**. In embodiments, the position of the protrusions **404** and the channels **402** can be reversed, e.g., such that instead the protrusions are on the lid **102** and the channels are on the cup **104**. For the purposes of illustration and explanation, in FIG. **4**, only a selection of the protrusions **404** and a selection of the channels **402** are shown and identified (e.g., due to the perspective and cut-away nature of the design shown in FIG. **4**). However, in various embodiments, any number, e.g., 1-10, of protrusions and corresponding channels can be positioned about a circumference of a cup, e.g., cup **104** and a lid, e.g., lid **102**, for use in engaging and reversibly coupling the lid and the cup, as described further below.

[0025] In at least some embodiments herein, a plurality of protrusions, e.g., protrusions **404**, can be spaced apart by substantially equal circumferential distances, e.g., on the inner surface **406**. In addition, as shown in FIG. **4**, each protrusion **404** extends inward or rather at least partially towards a central axis **401** of the cup **104**. In some embodiments, when looking at a cross-section of a protrusion along a tangential direction as shown for example in FIGS. **8**A and **8**B, each protrusion **404** may slope as it transitions towards its apex (e.g., as shown in one example in FIG. **8**B). In embodiments, the apex of each protrusion **404** may be sloped or may be a surface that is substantially flat and/or planar (e.g., as shown in one example in FIG. **8**A). In some embodiments, when looking at a protrusion outward from the central axis along a radial direction, e.g., as in FIGS. **7**A and **7**B, each protrusion **404** can have a circular shape (e.g., as shown in one example in FIG. **7**A) or can have an elongated shaped (e.g., as shown in one example in FIG. **7**B) as the profile is defined against an inner surface, e.g., inner surface **406**. The protrusions can also have other shapes. Elongated shapes of protrusions can include pill-shaped, oval-shaped, elliptical-shaped, and/or race-track-shaped protrusions in different embodiments. In accordance with embodiments herein, the protrusions **404** can be integrally formed with the inner surface **406** of the cup **104**, such that a surface of each protrusion **404** and the inner surface **406** of the sidewall **116** are co-extensive and/or continuous. To state it differently, in some embodiments, the inner surface **406** and the surface of each protrusion **404** can be formed, e.g., through the associated manufacturing process (e.g., molding, e.g., vacuum or injection molding), to be a continuous surface without clear or delineated junctions between distinct materials, such that there is a smooth transition across the adjacent surfaces. This configuration may help facilitate smooth engagement with the channels **402** on the lid **102**.

[0026] Looking still at FIG. **4**, the lid **102** includes the plurality of channels **402** that are spaced-apart, in this example substantially equally, about a circumference of the lid **102**. FIG. **4** shows how each channel **402** includes an opening, e.g., opening **410** as identified in FIG. **4**, and also includes an end-surface, e.g., end-surface **412** as identified in FIG. **4**. The openings are each positioned to be alignable with one of the plurality of protrusions **404** located on the inner surface **406**. Inserting the plurality of protrusions **404** into the correspondingly-aligned channels **402** then removably couples the lid **102** to the cup **104**. In some embodiments, the protrusions **404** and channels **402** can be sized, shaped, and adapted to have a friction fit, or rather, be formed such that inserting a protrusion **404** into a corresponding channel **402** requires, to some extent, overcoming a degree of static/kinetic frictional resistance. This frictional resistance can help with retaining the lid **102** in a desired rotational position on the cup **104**, and in addition help maintain the seal that is formed through engagement of the lid-securing mechanism **400**.

[0027] In embodiments, the lid **102** can include a ring **418** of compressible material (e.g., rubber, foam, soft plastic, or another polymeric material) as shown in FIGS. **4** and **9**A-**9**C. In addition, the plurality of channels **402** can each include a channel wall, e.g., channel wall **414** as identified in FIG. **4**, that is at least partially sloped, curved, and/or contoured, e.g., towards the end **112** as shown in FIG. **1** and relative to FIG. **4**. This sloped, curved, and/or contoured profile of the channel wall means that translating the plurality of protrusions **404** through the plurality of channels **402** at least to some extent shifts the lid **102** along the central axis **401** as identified in FIG. **4**. This, as a result, increases a pressure of the lid **102** against a rim **115** of the cup **104** (located at the end **114**). To state it differently, inserting a protrusion **404** into a channel **402** having the sloped, curved, and/or contoured channel wall **414**, and then shifting the protrusion **404** along the channel wall **414** towards the end-surface **412**, pulls the lid **102** and the rim **115** closer together, increasing a tightness of the seal formed between the lid **102** and the rim **115** increasing its leak-inhibiting characteristics. This process is depicted in FIGS. **9**A-**9**C. FIGS. **9**A-**9**C show a cross-section, side-elevation view of the configuration depicted in FIG. **4** in a sequence where the lid-securing mechanism **400** of FIG. **4** is being engaged. In FIG. **9**A, it can be seen that a protrusion **404** is in the process

of being aligned with a channel **402** that includes the sloped, curved, and/or contoured channel wall **414**, while the elements are still separated. Then, in FIG. **9**B, it can be seen that the protrusion **404** has been aligned with the channel **402** by placing the lid **102** onto the cup **104**. It can be seen that there is still a gap **902** between the lid **102** and the rim **115** indicating that the lid **102** is not yet fully secured on the rim **115**. Then, in FIG. **9**C, it can be seen that the protrusion **404** has been inserted through the channel **402** (e.g., by rotating the lid **102** on the rim **115** to operate the lid-securing mechanism **400**). This causes the protrusion **404** to shift along and up the channel wall **414** and as a result pulls the lid **102** towards the rim **115** and in doing so imparts a force on and/or compresses, at least partially, the ring **418** as shown by the lack of gap **904** in FIG. **9**C, thereby increasing a tightness and liquid-impermeableness of the seal. In addition to increasing the tightness of the seal, the sloped configuration of the channel wall **414** near the opening **410** can also facilitate easier insertion of each protrusion **404** into the corresponding channel **402**, among other benefits.

[0028] In some embodiments, the lid **102** can include a particular number of channels **402** and the cup **104** can include a particular number of corresponding protrusions **404** on the inner surface **406** that can thus be inserted into the channels **402**. For example, in embodiments, the lid **102** may comprise 2, 4, 6, 8, 10, or more channels **402** that are spaced-apart, e.g., by substantially equal circumferential distances. The cup **104** would then have the same number of protrusions **404** to allow the lid **102** to be coupled to the cup **104**. The number and in particular the length of each of the channels/protrusions **402**/**404** can determine how far the user would need to rotate the lid **102** to fully tighten the lid **102** against the rim **115** of the cup **104**. For example, in an embodiment, 8 channels/protrusions **402**/**404** may be used in a lid-securing mechanism to enable a substantially secure seal to be formed. For example, 8 channels **402** and protrusions **404** can offer a higher degree of securement when it comes to the coupling the lid **102** and the cup **104**. The length of each channel **402** and corresponding protrusion **404** may be directly related to how many total channels **402** and protrusions **404** are incorporated on the cup **104** and the lid **102**. For example, in an embodiment that includes 8 channels **402** and **8** protrusions **404**, then the length of each channel can roughly be determined by measuring the perimeter of the cup **104** or the lid **102** and dividing by 16 to determine the approximate size in millimeters of each protrusion **404** and each channel **402**. Said a different way, in some embodiments, the circumferential length of the opposite side of each protrusion **404** or channel **402** will be a little less than the perimeter of the cup **104** or the lid **102** divided by two times the number of protrusions **404**. For example, the length of each channel **402** could be roughly 1-3 mm, 2-6 mm, or 3-8 mm less than the value. The turning radius to couple the lid **102** to the cup **104** will depend on the length of the channels **402** (likewise, the length of the protrusions **404**) such that a rotational translation of the lid **102** having 8 channels **402** from start to finish is equal to or less than 15 degrees of rotation about the central axis **401**. In addition, in various embodiments, a length of each channel may be such that rotating a lid 45 degrees or less, 30 degrees or less, or 15 degrees or less is sufficient to shift each protrusion to an abutting position against the corresponding end-surface of the channel.

[0029] Looking now at FIG. **5**, a perspective view of the lid **102** coupled to the cup **104** is shown, in accordance with embodiments hereof. To illustrate elements obscured by the sidewall **116**, the elements of the lid-securing mechanism **400** shown in FIG. **4** are depicted in broken lines. FIG. **5** shows how the protrusions **404**, once inserted fully through the corresponding channels **402**, help secure the lid **102** to the rim **115** and also pull the lid **102** against the rim **115**. In doing so, the lid **102** and rim **115** compress the ring **418** further tightening or enhancing the seal.

[0030] Looking now at FIG. **6**, one of a plurality of alternative embodiments contemplated herein is shown, in accordance with embodiments hereof. FIG. **6** in particular shows an example of a container assembly **600** with a lid-securing mechanism **602**, e.g., that can be similar to the lid-securing mechanism **400** shown in FIGS. **4** and **5**. In addition to the example of FIG. **6**, the lid-securing mechanisms described herein can be incorporated into portable beverage containers (e.g., insulated and non-insulated), as well as other cans, cups, bowls, canisters, flasks, thermoses, containers, or other enclosures used to store liquids where selectively maintaining a substantially liquid-impermeable barrier at an opening is desired. The container assembly of FIG. **6** is merely provided to demonstrate the versatility of lid-securing mechanisms described herein.

[0031] Looking now at FIGS. **7**A and **7**B, example protrusions, e.g., like the protrusions **404** shown in FIG. **4**A, having different shapes and suitable to be positioned on an inner surface, e.g., the inner surface **406** of cup **104** shown in FIG. **1**, for engagement with corresponding channels on a lid, e.g., the lid **102** shown in FIG. **1**, are provided, according to embodiments hereof. FIGS. **7**A and **7**B are looking radially outward from a central axis (e.g., central axis **401**) towards an inner surface of a cup/container (e.g., inner surface **406** in FIG. **4**). FIG. **7**A shows a protrusion **702** that is generally a circular shape. FIG. **7**B shows a protrusion **704** that is generally an elongated shape, e.g., pill-shape, race-track-shape, ovular shape, or another type of lengthened shape. FIGS. **8**A and **8**B show cross-sections of protrusions **803**, **806** that form part of an inner surface **802** (that can be similar to inner surface **406** in FIG. **4**). FIGS. **8**A and **8**B are oriented to look tangentially or circumferentially relative to the inner wall **802**. The protrusion **803** in FIG. **8**A is sloped, curved, and/or contoured as it transitions towards its apex **804** which includes a substantially flat or planar surface at the apex **804**. The protrusion **804** in FIG. **8**B is sloped, curved, and/or contoured as it transitions towards its apex **805**, e.g., maintaining a generally sloped, curved, or contoured profile across the apex **805**.

[0032] Looking now at FIG. **10**, a block diagram of an example method **1000** of manufacturing a beverage container assembly, any of those described herein or others, is provided, in accordance with embodiments hereof. The method **1000** includes blocks **1002**-**1004** but is not limited to this selection of elements, or the order depicted. In block **1002**, the method **1000** includes forming a cup, e.g., the cup **104** shown in FIGS. **1**-**5**, comprising a first end, a second end, and a sidewall with an inner surface that comprises a plurality of protrusions equally spaced apart, e.g., the protrusions **404** shown in FIGS. **4** and **5**. Each protrusion is spaced about a circumference of the inner surface and extends at least partially towards a central axis, e.g., central axis **401** shown in FIG. **4**, of the cup. In block **1004**, the method **1000** includes forming a lid, e.g., the lid **102** shown

in FIGS. **1-5**, comprising a plurality of channels equally spaced apart, e.g., the channels **402** shown in FIGS. **4** and **5**. Each channel has an opening that is alignable with one of the plurality of protrusions, wherein inserting the plurality of protrusions into the plurality of channels removably couples the lid to the cup, e.g., as shown in the attachment configuration of FIG. **5**.

[0033] In accordance with embodiments herein, a cup or other enclosure described herein can be formed through molding, e.g., injection-molding or vacuum-molding, such that each protrusion is integrally formed with an inner surface of the cup or other enclosure. The protrusions can also be formed separately and attached to the inner surface. In aspects, protrusions can be formed such that they are elongated in shape and slope towards their corresponding apex. To compliment these protrusions, the channels can comprise a channel wall that is at least partially sloped, such that translating the plurality of protrusions through the plurality of channels shifts the lid along the central axis, thereby increasing a pressure of the lid against the rim. In some embodiments, the plurality of channels can each comprise a length such that, when the plurality of protrusions are inserted into the plurality of channels, the lid can rotate between about 10-30 degrees, on in an embodiments about 15 degrees, or less into a locked position in which each protrusion is abutted against an end of a corresponding channel.

[0034] In embodiments, a lid-securing mechanism as described herein, when integrated into an enclosure such as a cup or canister, can provide a substantially leak-proof or leak-inhibiting seal when secured. This seal can be tested, e.g., by inverting the assembly and identifying that substantially no liquid from the sealed enclosure has passed through the seal after a desired period of time e.g., at least 60 seconds.

[0035] Embodiment 1. A beverage container assembly, comprising: a cup, comprising: a first end having a base, a second end having a rim that defines an opening, and a sidewall extending between the first end and the second end, the sidewall having an inner surface with a plurality of protrusions spaced about a circumference of the inner surface, each protrusion extending at least partially towards a central axis of the cup; and a lid, comprising: a plurality of channels spaced about a circumference of the lid, each channel having an opening that is alignable with one of the plurality of protrusions, wherein inserting the plurality of protrusions into the plurality of channels removably couples the lid to the cup.

[0036] Embodiment 2. The assembly of embodiment 1, wherein each protrusion slopes as it transitions towards its apex.

[0037] Embodiment 3. The assembly of embodiment 1 or 2, wherein the apex of each protrusion comprises a surface that is substantially flat.

[0038] Embodiment 4. The assembly of any of embodiments 1-3, wherein each protrusion has a circular shape on the inner surface.

[0039] Embodiment 5. The assembly of any of embodiments 1-4, wherein each protrusion has an elongated shape on the inner surface.

[0040] Embodiment 6. The assembly of any of embodiments 1-5, wherein the plurality of channels each include a channel wall that is at least partially sloped, such that translating the plurality of protrusions through the plurality of channels shifts the lid along the central axis thereby increasing a pressure of the lid against the rim.

[0041] Embodiment 7. The assembly of any of embodiments 1-6, wherein the lid comprises a ring of compressible material that compresses against the rim as the plurality of protrusions are translated through the plurality of channels.

[0042] Embodiment 8. The assembly of any of embodiments 1-7, wherein each protrusion, upon insertion into one of the plurality of channels, has a friction fit.

[0043] Embodiment 9. The assembly of any of embodiments 1-8, wherein the plurality of channels each comprise a length such that, when the plurality of protrusions are inserted into the plurality of channels, the lid rotates 15 degrees or less into a locked position in which each protrusion is abutted against an end of a corresponding channel.

[0044] Embodiment 10. The assembly of any of embodiments 1-9, wherein the plurality of protrusions comprise at least four protrusions that are spaced about the inner surface by approximately equal circumferential distances, each of the four protrusions also spaced a distance from the rim along the central axis.

[0045] Embodiment 11. A sealable container assembly, comprising: a container, comprising: a first end having a base, a second end having a rim that defines an opening, and a sidewall extending between the first end and the second end, the sidewall comprising an inner surface having a plurality of protrusions spaced about a circumference of the inner surface, each protrusion extending at least partially towards a central axis of the container; and a lid, comprising: a plurality of channels spaced about a circumference of the lid, each channel having an opening that is alignable with one of the plurality of protrusions, wherein inserting the plurality of protrusions into the plurality of channels removably couples the lid to the container.

[0046] Embodiment 12. The sealable container assembly of embodiment 11, wherein the plurality of protrusions comprise at least four protrusions spaced apart on the inner surface by approximately equal circumferential distances.

[0047] Embodiment 13. The sealable container assembly of embodiment 12 or 13, wherein the lid includes a ring of compressible material, and wherein the plurality of channels each include a channel wall that is at least partially sloped, so that translating the plurality of protrusions through the plurality of channels shifts the lid along the central axis, increasing a pressure on the compressible material located between the lid and the rim.

[0048] Embodiment 14. The sealable container assembly of any of embodiments 11-13, wherein the plurality of protrusions are integrally formed with the inner surface, such that a surface of each protrusion and the inner surface of the sidewall are co-extensive.

[0049] Embodiment 15. The sealable container assembly of any of embodiments 11-14, wherein a sidewall of each channel is at least partially non-linear, such that shifting the plurality of protrusions through the plurality of channels translates the lid along the central axis.

[0050] Embodiment 16. A method of manufacturing a beverage container assembly, the method comprising: forming a cup that comprises: a first end comprising a base, a second end comprising a rim that defines an opening, and a sidewall extending between the first end and the second end, wherein the sidewall is formed with an inner surface that comprises a plurality of protrusions spaced about a circumference of the inner surface, each protrusion extending at

least partially towards a central axis of the cup; and forming a lid that comprises: a plurality of channels spaced about a circumference of the lid, each channel having an opening that is alignable with one of the plurality of protrusions, wherein inserting the plurality of protrusions into the plurality of channels removably couples the lid to the cup.

[0051] Embodiment 17. The method of embodiment 16, wherein the cup is formed through molding, such that each protrusion is integrally formed with the inner surface.

[0052] Embodiment 18. The method of embodiment 16 or 17, wherein each protrusion is formed such that it is elongated in shape, and slopes towards its apex.

[0053] Embodiment 19. The method of any of embodiments 16-18, wherein each channel comprises a channel wall that is at least partially sloped, such that translating the plurality of protrusions through the plurality of channels shifts the lid along the central axis, thereby increasing a pressure of the lid against the rim.

[0054] Embodiment 20. The method of any of embodiments 16-19, wherein the plurality of channels each comprise a length such that, when the plurality of protrusions are inserted into the plurality of channels, the lid rotates 15 degrees or less into a locked position in which each protrusion is abutted against an end-wall of a corresponding channel.

[0055] In some aspects, this disclosure may include the language, for example, "at least one of [element A] and [element B]." This language may refer to one or more of the elements. For example, "at least one of A and B" may refer to "A," "B," or "A and B." In other words, "at least one of A and B" may refer to "at least one of A and at least one of B," or "at least either of A or B." In some aspects, this disclosure may include the language, for example, "[element A], [element B], and/or [element C]." This language may refer to either of the elements or any combination thereof. In other words, "A, B, and/or C" may refer to "A," "B," "C," "A and B," "A and C," "B and C," or "A, B, and C." In addition, this disclosure may use the term "and/or" which may refer to any one or combination of the associated elements. In addition, this disclosure may use the term "a" (element) or "the" (element). This language may refer to the referenced element in the singular or in the plural and is not intended to be limiting in this respect.

[0056] The subject matter of this disclosure has been described in relation to particular aspects, which are intended in all respects to be illustrative rather than restrictive. In this sense, alternative aspects will become apparent to those of ordinary skill in the art to which the present subject matter pertains without departing from the scope hereof. In addition, different combinations and sub-combinations of elements disclosed, as well as use and inclusion of elements not shown, are possible and contemplated as well.

What is claimed is:

1. A beverage container assembly, comprising:

a cup, comprising:

a first end having a base,

a second end having a rim that defines an opening, and

a sidewall extending between the first end and the second end, the sidewall having an inner surface with a plurality of protrusions spaced about a circumference of the inner surface, each protrusion extending at least partially towards a central axis of the cup; and

a lid, comprising:

a plurality of channels spaced about a circumference of the lid, each channel having an opening that is alignable with one of the plurality of protrusions, wherein inserting the plurality of protrusions into the plurality of channels removably couples the lid to the cup.

2. The assembly of claim **1**, wherein each protrusion slopes as it transitions towards its apex.

3. The assembly of claim **2**, wherein the apex of each protrusion comprises a surface that is substantially flat.

4. The assembly of claim **1**, wherein each protrusion has a circular shape on the inner surface.

5. The assembly of claim **1**, wherein each protrusion has an elongated shape on the inner surface.

6. The assembly of claim **1**, wherein the plurality of channels each include a channel wall that is at least partially sloped, such that translating the plurality of protrusions through the plurality of channels shifts the lid along the central axis thereby increasing a pressure of the lid against the rim.

7. The assembly of claim **6**, wherein the lid comprises a ring of compressible material that compresses against the rim as the plurality of protrusions are translated through the plurality of channels.

8. The assembly of claim **1**, wherein each protrusion, upon insertion into one of the plurality of channels, has a friction fit.

9. The assembly of claim **1**, wherein the plurality of channels each comprise a length such that, when the plurality of protrusions are inserted into the plurality of channels, the lid rotates 15 degrees or less into a locked position in which each protrusion is abutted against an end of a corresponding channel.

10. The assembly of claim **1**, wherein the plurality of protrusions comprise at least four protrusions that are spaced about the inner surface by approximately equal circumferential distances, each of the four protrusions also spaced a distance from the rim along the central axis.

11. A sealable container assembly, comprising:

a container, comprising:

a first end having a base,

a second end having a rim that defines an opening, and

a sidewall extending between the first end and the second end, the sidewall comprising an inner surface having a plurality of protrusions spaced about a circumference of the inner surface, each protrusion extending at least partially towards a central axis of the container; and

a lid, comprising:

a plurality of channels spaced about a circumference of the lid, each channel having an opening that is alignable with one of the plurality of protrusions, wherein inserting the plurality of protrusions into the plurality of channels removably couples the lid to the container.

12. The sealable container assembly of claim **11**, wherein the plurality of protrusions comprise at least four protrusions spaced apart on the inner surface by approximately equal circumferential distances.

13. The sealable container assembly of claim **11**, wherein the lid includes a ring of compressible material, and wherein the plurality of channels each include a channel wall that is at least partially sloped, so that translating the plurality of protrusions through the plurality of channels shifts the lid

along the central axis, increasing a pressure on the compressible material located between the lid and the rim.

14. The sealable container assembly of claim **11**, wherein the plurality of protrusions are integrally formed with the inner surface, such that a surface of each protrusion and the inner surface of the sidewall are co-extensive.

15. The sealable container assembly of claim **11**, wherein a sidewall of each channel is at least partially non-linear, such that shifting the plurality of protrusions through the plurality of channels translates the lid along the central axis.

16. A method of manufacturing a beverage container assembly, the method comprising:

forming a cup that comprises:

a first end comprising a base,

a second end comprising a rim that defines an opening, and

a sidewall extending between the first end and the second end,

wherein the sidewall is formed with an inner surface that comprises a plurality of protrusions spaced about a circumference of the inner surface, each protrusion extending at least partially towards a central axis of the cup; and

forming a lid that comprises:

a plurality of channels spaced about a circumference of the lid, each channel having an opening that is alignable with one of the plurality of protrusions, wherein inserting the plurality of protrusions into the plurality of channels removably couples the lid to the cup.

17. The method of claim **16**, wherein the cup is formed through molding comprising vacuum-molding or injection-molding, such that each protrusion is integrally formed with the inner surface.

18. The method of claim **17**, wherein each protrusion is formed such that it is elongated in shape, and slopes towards its apex.

19. The method of claim **16**, wherein each channel comprises a channel wall that is at least partially sloped, such that translating the plurality of protrusions through the plurality of channels shifts the lid along the central axis, thereby increasing a pressure of the lid against the rim.

20. The method of claim **16**, wherein the plurality of channels each comprise a length such that, when the plurality of protrusions are inserted into the plurality of channels, the lid rotates 15 degrees or less into a locked position in which each protrusion is abutted against an end-wall of a corresponding channel.

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