

TITLE OF INVENTION

Connectable beverage bottle

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This International Application claims priority to U.S. Non-Provisional Application No. 18/220,794, filed July 11, 2023; and claims priority to U.S. Non-Provisional Application No. 18/206,896, filed June 7, 2023; and claims priority to U.S. Provisional Application No. 63/389,117, filed July 14, 2022; all three of which are hereby incorporated herein by reference in their entirety.

FIELD OF THE INVENTION

[0002] The present invention relates generally to the field of beverage bottles for industrial manufacturing, and more particularly to methods and systems for a connectable beverage bottle with manufacturable features.

BACKGROUND OF THE INVENTION

[0003] Interlocking connectable beverage bottle designs are well-known, and offer the opportunity for improved storage density, and can therefore reduce logistics cost for transport and storage.

[0004] However, such interlocking connectable beverage bottle designs have not gained widespread use, as they have proved difficult or impossible to manufacture using both traditional and state-of-the-art bottle molding methods.

[0005] As such, considering the foregoing, it may be appreciated that there continues to be a need for novel and improved connectable beverage bottles that are manufacturable with state-of-the art methods.

SUMMARY OF THE INVENTION

[0006] The foregoing needs are met, to a great extent, by the present invention, wherein in aspects of this invention, enhancements are provided to the existing model of connectable beverage bottles in order to enable manufacturability.

[0007] In an aspect, a connectable beverage bottle can include:

a) a hollow body, including:

- i. a bottle top, including a bottle opening, such that the bottle opening provides access to a central cavity of the hollow body;
- ii. a sidewall, which forms the central cavity, wherein the sidewall comprises:
 1. a vertical bottle locking protrusion, which is positioned on a first side of the sidewall; and
 2. a vertical bottle locking indentation, which is positioned on a second side of the sidewall, such that the vertical bottle locking indentation is oppositely positioned relative to the vertical bottle locking protrusion;

such that the vertical bottle locking protrusion can be configured to be slidable into a corresponding bottle locking indentation of a first like connectable beverage bottle, such that the connectable beverage bottle can be connected to the first like connectable beverage bottle; and

such that the vertical bottle locking indentation can be configured to slidably receive a corresponding bottle locking protrusion of a second like connectable beverage bottle, such that the connectable beverage bottle can be connected to the second like connectable beverage bottle.

[0008] In a related aspect, the vertical bottle locking indentation can be configured with a horizontal overhang from a bottom outer edge of the vertical bottle locking indentation to a top outer edge of the vertical bottle locking indentation.

[0009] In another related aspect, the bottle body further comprises:

- a) a left front vertical indentation on a left side of the vertical bottle locking protrusion, wherein the left front vertical indentation is configured with a concave left inner surface; and
- b) a right front vertical indentation on a right side of the vertical bottle locking protrusion, wherein the right front vertical indentation is configured with a concave right inner surface.

[00010] In a further related aspect, a left opening angle between an inner left tangent line of an inner end of the concave left inner surface and an outer left tangent line of an outer end of the concave left inner surface can be in a range of 35 – 45 degrees; and a right opening angle, between an inner right tangent line of an inner end of the concave right inner surface and an outer right tangent line of an outer end of the concave left inner surface, can be in a range of 35 – 45 degrees.

[00011] In another further related aspect, a left outward inclination angle, between a longitudinal center line of the bottle body and the inner left tangent line of the inner end of the concave left inner surface, can be in a range of 20 – 30 degrees; and a right outward inclination angle, between the longitudinal center line of the bottle body and the inner right tangent line of the inner end of the concave right inner surface, can be in a range of 20 – 30 degrees.

[00012] In yet a further related aspect, a maximum left opening width of the left front vertical indentation between the outer left transition point and the inner left transition point can be in range of 75-85% of a maximum protrusion width of the vertical bottle locking protrusion; and a maximum right opening width of the right front vertical indentation between the outer right transition point and the inner right transition point can be in range of 75-85% of the maximum protrusion width of the vertical bottle locking protrusion.

[00013] There has thus been outlined, rather broadly, certain embodiments of the invention in order that the detailed description thereof herein may be better

understood, and in order that the present contribution to the art may be better appreciated. There are, of course, additional embodiments of the invention that will be described below and which will form the subject matter of the claims appended hereto.

[00014] In this respect, before explaining at least one embodiment of the invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and to the arrangements of the components set forth in the following description or illustrated in the drawings. The invention is capable of embodiments in addition to those described and of being practiced and carried out in various ways. In addition, it is to be understood that the phraseology and terminology employed herein, as well as the abstract, are for the purpose of description and should not be regarded as limiting.

[00015] As such, those skilled in the art will appreciate that the conception upon which this disclosure is based may readily be utilized as a basis for the designing of other structures, methods and systems for carrying out the several purposes of the present invention. It is important, therefore, that the claims be regarded as including such equivalent constructions insofar as they do not depart from the spirit and scope of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[00016] FIG. 1 is a top front left perspective view of a connectable beverage bottle, according to an embodiment of the invention.

[00017] FIG. 2 is a top rear right perspective view of a connectable beverage bottle, according to an embodiment of the invention.

[00018] FIG. 3 is a bottom front left perspective view of a connectable beverage bottle, according to an embodiment of the invention.

[00019] FIG. 4 is a bottom rear right perspective view of a connectable beverage bottle, according to an embodiment of the invention.

[00020] FIG. 5 is a front view of a connectable beverage bottle, according to an embodiment of the invention.

[00021] FIG. 6 is a rear view of a connectable beverage bottle, according to an embodiment of the invention.

[00022] FIG. 7 is a left side view of a connectable beverage bottle, according to an embodiment of the invention.

[00023] FIG. 8 is a right side view of a connectable beverage bottle, according to an embodiment of the invention.

[00024] FIG. 9A is a bottom view of a connectable beverage bottle, according to an embodiment of the invention.

[00025] FIG. 9B is a bottom view of a connectable beverage bottle, according to an embodiment of the invention.

[00026] FIG. 10 is a top view of a connectable beverage bottle, according to an embodiment of the invention.

[00027] FIG. 11 is a sectional view of a connectable beverage bottle taken along section 11-11 of FIG. 10, not showing any features of an interior of the connectable beverage bottle, according to an embodiment of the invention.

[00028] FIG. 12 is a sectional view of a connectable beverage bottle taken along section line 12-12 of FIG. 10, not showing any features of the interior of the connectable beverage bottle, according to an embodiment of the invention.

[00029] FIG. 13 is a sectional view of a connectable beverage bottle taken along section line 13-13 of FIG. 5, not showing any features of the interior of the connectable beverage bottle, according to an embodiment of the invention.

[00030] FIG. **14** is a sectional view of a connectable beverage bottle taken along section line **14-14** of FIG. **10**, not showing any features of the interior of the connectable beverage bottle, according to an embodiment of the invention.

[00031] FIG. **15** is a sectional view of a connectable beverage bottle taken along section line **15-15** of FIG. **10**, not showing any features of the interior of the connectable beverage bottle, according to an embodiment of the invention.

[00032] FIG. **16A** is a schematic view of a process of a vertical movement to detachably interlock two connectable beverage bottles, according to an embodiment of the invention.

[00033] FIG. **16B** is a schematic view of a process of a lateral movement to detachably interlock two connectable beverage bottles, according to an embodiment of the invention.

[00034] FIG. **16C** is a perspective view of three connectable beverage bottles that are interconnected, according to an embodiment of the invention.

[00035] FIG. **17** is a cross-sectional view of three connected connectable beverage bottles taken along section line **17-17** of FIG. **16C**, showing an outer shell of the three connected connectable beverage bottles only, according to an embodiment of the invention.

[00036] FIG. **18A** is a bottom right perspective view of a connectable beverage bottle, according to an embodiment of the invention.

[00037] FIG. **18B** is a bottom left perspective view of a connectable beverage bottle, according to an embodiment of the invention.

DETAILED DESCRIPTION

[00038] Before describing the invention in detail, it should be observed that the present invention resides primarily in a novel and non-obvious combination of elements and process steps. So as not to obscure the disclosure with details that will readily be apparent to those skilled in the art, certain conventional elements and steps have been presented with lesser detail, while the drawings and specification describe in greater detail other elements and steps pertinent to understanding the invention.

[00039] The following embodiments are not intended to define limits as to the structure or method of the invention, but only to provide exemplary constructions. The embodiments are permissive rather than mandatory and illustrative rather than exhaustive.

[00040] In the following, we describe the structure of an embodiment of a connectable beverage bottle **100** with reference to FIG. **1**, in such manner that like reference numerals refer to like components throughout; a convention that we shall employ for the remainder of this specification. The connectable beverage bottles **100** are designed to be interlockable, such that they may save space in logistics, such as during transport, storage, and store display, thereby improving space efficiency and cost efficiency; and, in comparison to earlier designs of interlockable bottles, are designed to be manufacturable with state-of-the-art bottle manufacturing methods.

[00041] In a related embodiment, FIGS. **1-12**, shows an example of a connectable beverage bottle **100**. The connectable beverage bottle **100** comprises a plurality of substantial design changes for the purpose of enabling manufacturability and improving connectability in comparison to an earlier design of an earlier connectable beverage bottle as disclosed in U.S. Patent No. 10,472,117, issued November 12, 2019; US Patent No. D941,152, issued January 18, 2022; and International PCT Application Publication No. WO2019241246A1, published December 19, 2019; all three of which are hereby incorporated herein by reference in their

entirety. The earlier connectable beverage bottle was not manufacturable due to particular features of the corresponding earlier design and also did not have reliable connectability.

[00042] In a further related embodiment, compared to the earlier connectable beverage bottle, improvements to the connectable beverage bottle **100** include:

- a) all the corners or hard edges of the base of the connectable beverage bottle **100** have been rounded out completely so that the connectable beverage bottle **100** is much easier to blow mold during manufacturing;
- b) the interlocking back part of the bottle, i.e. the vertical bottle locking protrusion **126**, is substantially thinner and the opening of the bottle on the other side, i.e. the vertical bottle locking indentation **224**, where the vertical bottle locking protrusion **126** goes in, is also correspondingly substantially thinner, as per further specification below; and
- c) the locking portion of the connectable beverage bottle **100**, is now only about 1/3 to 1/2 of the bottle height of the connectable beverage bottle **100**. In the original design of the earlier connectable beverage bottle, the entire back side was designed to lock into the bottle, but that original design has been found to be impossible to manufacture with available manufacturing methods and system.

[00043] In a related embodiment, a connectable beverage bottle **100** can include:

- a) a hollow body **103**, including:
 - i. a bottle top **105**, including a bottle opening **115** and a bottle interior **111**, such that the bottle opening **115** provides access to a central cavity **111** for storing a liquid;

- ii. a bottom **107**; and
- iii. a substantially cylindrical sidewall **109**, which forms the central cavity **111** (as shown in FIGS. **11** and **12**), the sidewall **109** tapering inward adjacent to a top of the hollow bottle body **103** to form a tapered neck **113**, which terminates at an opening **115** for the ingress and egress of liquids or solids into the central cavity **111**;

the sidewall **109** including a pair of parallel grooves **930**, **940** (also referred to as left and right front vertical indentations **930**, **940**) inset within the circumference of the substantially cylindrical sidewall **109**, which extend longitudinally from the hollow body's bottom **107** to the tapered neck **113**, the pair of grooves **930**, **940** forming a longitudinally extending projection **126** (also referred to as a vertical bottle locking protrusion **126**) between the grooves **930**, **940** which extends from the hollow body's bottom **107** to the hollow body's tapered neck **113**, wherein the projection **126** radially tapers to form a tapered rounded edge **121**;

the sidewall **109** further including a longitudinally extending channel **224** (also referred to as the vertical bottle locking indentation **224**) located diametrically opposed to the longitudinally extending projection **126**, the channel **224** extending from the hollow body's bottom to the hollow body's tapered neck **113** with the channel's depth diminishing in a tapered manner adjacent to the tapered neck **113** to form a tapered rounded shelf **227**, which is substantially parallel and diametrically opposed to the projection's tapered rounded edge **121**;

and

the projection **126** and the channel **224** are sized and configured so that the projection **126** could be received within a channel of another

like connectable beverage bottle so as to connect and affix to another like connectable beverage bottle.

[00044] In a related embodiment, the connectable beverage bottle **100** can be further configured such that:

- a) the projection's **126** tapered edge **121** and the channel's tapered shelf **227** permit the projection **126** to be inserted into a channel of a like connectable bottle at the hollow body's bottom, but not at the hollow body's top; and
- b) the projection **126** and the channel are sized and configured so that once the projection **126** is inserted into a channel of a like connectable bottle, the projection **126** is slidable within the channel until the projection's tapered edge **121** would engage the channel's tapered shelf **227** so as to prevent further movement or disengagement.

[00045] Thus, in an embodiment, as shown in FIGS. **1-2**, **9A-9B**, and **16**, a connectable beverage bottle **100** can include:

- a) a hollow bottle body **103**, including:
 - i. a central cavity **111**;
 - ii. a bottle top **105**, including a bottle opening **115**, such that the bottle opening **115** provides access to the central cavity **111**;
 - iii. a sidewall **109**, which forms the central cavity, wherein the sidewall **109** comprises:
 - 1. a vertical bottle locking protrusion **126**, which is positioned on a first side of the sidewall **109**; and
 - 2. a vertical bottle locking indentation **224**, which is positioned on a second side of the sidewall **109**, such

that the vertical bottle locking indentation **224** is opposedly positioned relative to the vertical bottle locking protrusion **126**;

such that the vertical bottle locking protrusion **126** is configured to be slidable into a corresponding bottle locking indentation of a first like connectable beverage bottle **100, 1601**, such that the connectable beverage bottle **100, 1602** is connected to the first like connectable beverage bottle **100, 1601**; and

such that the vertical bottle locking indentation **224** is configured to slidably receive a corresponding bottle locking protrusion **126** of a second like connectable beverage bottle **100, 1603**, such that the connectable beverage bottle **100, 1602** is connected to the second like connectable beverage bottle **100, 1603**.

[00046] In a related embodiment, as shown in FIGS. **5** and **6**, the hollow bottle body can further include:

- a) an upper screw portion **512**; and
- b) a main portion **514**, which is below the upper screw portion **512**;

wherein the main portion **514** can be left-right mirror symmetrical relative to a front-rear vertical center plane **520** of the hollow bottle body **103**.

[00047] In another related embodiment, as shown in FIGS. **9A-9B** and **10**, the connectable beverage bottle **100** can be configured with various features, to enable manufacturability and detachable connectability, such that:

- a) a horizontal overhang **913** of the vertical bottle locking indentation **224**, from a bottom outer edge **912** of the vertical bottle locking indentation **224** to a top outer edge of the vertical bottle locking indentation **224**, which is in a range of 5 – 30% or 10 – 25% of a maximum depth **919** of

the vertical bottle locking indentation **224**, such that the limited range of the horizontal overhang **913** enables manufacturability of the connectable beverage bottle **100**;

- b) a maximum protrusion width **1027** of the vertical bottle locking protrusion **126** can be in range of 25%-35% of a maximum bottle width **1056** of the hollow body **103**;
- c) a left front vertical indentation **930** on a left side of the vertical bottle locking protrusion **126**, wherein the left front vertical indentation **930** is configured with a concave left inner surface, such that a left opening angle **938**, between an inner left tangent line **934** of an inner end of the concave left inner surface (in an inner left transition **11** point at an inner end of the concave left inner surface, where the concave inner surface connects with an inner convex left surface) and an outer left tangent line **932** of an outer end of the concave left inner surface (in an outer left transition point **12** at an outer end of the concave left inner surface, where the concave inner surface connects with an outer convex left surface), is substantially 30 degrees (i.e. about 30 degrees subject to manufacturing tolerances) or in a range of 25 – 35 degrees, or in a range of 20 – 40 degrees;
- d) a left outward inclination angle **937**, between a longitudinal center line **935** of the bottle body and the inner left tangent line **934** of the inner end of the concave left inner surface, is substantially 25 degrees (i.e., about 25 degrees subject to manufacturing tolerances) or in a range of 20 – 30 degrees;
- e) a maximum left opening width **936** of the left front vertical indentation **930** between the outer left transition point and the inner left transition point can be in range of 70-90% or 75-85% of a maximum protrusion width **1027** of the vertical bottle locking protrusion **126**;

- f) a right front vertical indentation **940** on a right side of the vertical bottle locking protrusion **926**, wherein the right front vertical indentation **940** is configured with a concave right inner surface, such that a right opening angle **938**, between an inner right tangent line **944** of an inner end of the concave right inner surface (in an inner right transition point **21** at an inner end of the concave right inner surface, where the concave inner surface connects with an inner convex right surface) and an outer right tangent line **942** of an outer end of the concave left inner surface (in an outer right transition point **22** at an outer end of the concave right inner surface, where the concave inner surface connects with an outer convex right surface), is substantially 30 degrees (i.e. about 30 degrees subject to manufacturing tolerances) or in a range of 25 – 35 degrees, or in a range of 20 – 40 degrees;
- g) a right outward inclination angle **947**, between the longitudinal center line **935** of the bottle body **103** and the inner right tangent line **944** of the inner end of the concave right inner surface, is substantially 25 degrees (i.e., about 25 degrees subject to manufacturing tolerances) or in a range of 20 – 30 degrees; and
- h) a maximum right opening width **946** of the right front vertical indentation **940** between the outer right transition point and the inner right transition point can be substantially 80% (i.e., about 80% subject to manufacturing tolerances), or in range of 70-90% or 75-85% of a maximum protrusion width **1027** of the vertical bottle locking protrusion **126**.

[00048] In a further related embodiment, as shown in FIGS. **2** and **9A**, the vertical bottle locking indentation **224** can be configured with an upper rounded indentation bulge **227** (which can also be referred to as a tapered rounded shelf **227**), which is positioned in an upper part of the vertical bottle locking indentation **224**,

such that the upper rounded indentation bulge **227** forms the horizontal overhang **913**.

[00049] In a related embodiment, as shown in FIG. **9A-9B**, a bottom **107** of the hollow bottle body **103**, can further include:

- a) a flat portion **962**; and
- b) a central indentation **964**, which is configured with a laterally elongated shape and is mirror symmetric relative to the longitudinal center line **935** of the bottle body **103**, wherein a periphery of the central indentation comprises:
 - i. a left front concave edge portion **42**;
 - ii. a right front concave edge portion **46**;
 - iii. a center front convex edge portion **44**, which is positioned between the left front concave edge portion **42** and the right front concave edge portion **46**;
 - iv. a left rear concave edge portion **52**;
 - v. a right rear concave edge portion **56**;
 - vi. a center rear convex edge portion **54**, which is positioned between the left rear concave edge portion **52** and the right rear concave edge portion **56**;
 - vii. a left side convex edge portion **62**, which is positioned between the left rear concave edge portion **52** and the left front concave edge portion **42**; and
 - viii. a right side convex edge portion **64**, which is positioned between the right rear concave edge portion **56** and the right front concave edge portion **46**;

such that an alternating pattern of concave edge portions **42, 46, 56, 58** and convex edge portions **44, 62, 54, 62** is formed along the laterally elongated shape of the periphery of the central indentation **964**, which increase a torsional stiffness of the hollow bottle body **103**, to create a sufficient torsional rigidity of the hollow bottle body **103** to aid in manufacturability of the connectable beverage bottle **100**, particularly to ensure swift and frictionless extraction of the connectable beverage bottle **100** from molding components.

[00050] In another related embodiment, as shown in FIGS. **18A** and **18B**, the hollow bottle body **103** can further be configured such that:

- a) the vertical bottle locking protrusion **126** can further be configured with
 - i. an outward-curving left vertical bulge **1830** positioned on a lower outer left surface of the vertical bottle locking protrusion **126**;
such that the outward-curving left vertical bulge **1830** tapers (i.e. fades or recedes) from a left maximum bulge point **1832** of a left lower edge of the vertical bottle locking protrusion **126** to an upper left bulge transition point **1834**, wherein the outward-curving left vertical bulge **1830** vanishes and the vertical bottle locking protrusion **126** becomes substantially straight;
 - ii. an outward-curving right vertical bulge **1840** positioned on a lower outer right surface of the vertical bottle locking protrusion **126**,
such that the outward-curving right vertical bulge **1840** tapers (i.e. fades or recedes) from a right maximum bulge point **1842** of a right lower edge of the vertical bottle locking protrusion

126 to an upper right bulge transition point **1844**, wherein the outward-curving right vertical bulge **1840** vanishes and the vertical bottle locking protrusion **126** becomes substantially straight; and

- b) the vertical bottle locking indentation **224** can further be configured with
- i. an inward-curving left vertical indentation **1850** positioned on a lower outer left surface of the vertical bottle locking indentation **224**;
such that the inward-curving left vertical indentation **1850** tapers (i.e. fades or recedes) from a left maximum indentation **1852** of a left lower edge of the vertical bottle locking indentation **224** to an upper left indentation transition point **1854**, wherein the inward-curving left vertical indentation **1850** vanishes and the vertical bottle locking indentation **224** becomes substantially straight;
 - ii. an inward-curving right vertical indentation **1860** positioned on a lower outer right surface of the vertical bottle locking indentation **224**,
such that the inward-curving right vertical indentation **1860** tapers (i.e. fades or recedes) from a right maximum indentation point **1862** of a right lower edge of the vertical bottle locking indentation **224** to an upper right indentation transition point **1864**, wherein the inward-curving right vertical indentation **1860** vanishes and the vertical bottle locking indentation **224** becomes substantially straight;

such that the inward-curving left vertical indentation **1850** is configured to receive the outward-curving left vertical bulge **1830**;

such that the inward-curving right vertical indentation **1860** is configured to receive the outward-curving right vertical bulge **1840**;

such that a lower portion of the vertical bottle locking protrusion **126** is detachably locked in place inside a lower portion of the vertical bottle locking indentation **224**;

such that the vertical bottle locking protrusion **126** is configured to be vertically slidable **1612** into a bottom of the corresponding bottle locking indentation **224** of the first like connectable beverage bottle **100**, **1601**.

[00051] In a related embodiment, as shown in FIGS. **9A-9B** and **10**, a left maximum lateral bulge depth **973** of the outward-curving left vertical bulge **1830**, between a lower left bulge maximum point **972** and a lower left bulge minimum point **974**, can be in a range of 5 – 10% of a maximum protrusion width **1027** of the vertical bottle locking protrusion **126**; and a right maximum lateral bulge depth **977** of the outward-curving right vertical bulge **1840**, between a lower right bulge maximum point **976** and a lower right bulge minimum point **978**, can be in a range of 5 – 10% of a maximum protrusion width **1027** of the vertical bottle locking protrusion **126**.

[00052] In a related embodiment, as shown in FIGS. **9A-9B** and **10**, a left maximum lateral indentation depth **983** of the inward-curving left vertical indentation **1850**, between a lower left indentation maximum point **982** and a lower left indentation minimum point **984**, can be in a range of 5 – 10% of a maximum indentation width **925** of the vertical bottle locking indentation **224**; and a right maximum lateral indentation depth **987** of the inward-curving right vertical indentation **1860**, between a lower right indentation maximum point **986** and a lower right indentation minimum point **988**, can be in a range of 5 – 10% of a maximum indentation width **925** of the vertical bottle locking indentation **224**.

[00053] In a related embodiment, the hollow bottle body **103** can be made from a sufficiently flexible material, such as a sufficiently flexible plastic material (with

an appropriate wall thickness), such that limited ranges of the left and right maximum lateral bulge depths **973, 977** and the left and right maximum lateral indentation depth **983, 987**, ensure that the vertical bottle locking protrusion **126** is laterally slidable **1614** into the corresponding bottle locking indentation **224** of the first like connectable beverage bottle, wherein the outward-curving left vertical bulges **1830, 1840** snap in place inside the inward-curving left and right vertical indentations **1850, 1860**, such that the vertical bottle locking protrusion **126** snaps in place inside the vertical bottle locking indentation **224** (with a slight deformation of the vertical bottle locking protrusion **126** and the vertical bottle locking indentation **224** during the lateral sliding process).

[00054] Thus, in a related embodiment, as shown in FIGS. **3-4, 16A, 16B, 16C, and 17**, a lower locking protrusion portion **327** of the vertical bottle locking protrusion **126** can be configured to be upward vertically slidable **1612** and laterally slidable **1614** into a lower locking indentation portion **428** of a corresponding vertical bottle locking indentation **224**, such that that the lower portion **327** of the vertical bottle locking protrusion **126** is detachably interlocked with the corresponding vertical bottle locking indentation **224**.

[00055] In a further related embodiment, as shown in FIGS. **3-4, 7, 16A, 16B, 16C, and 17**, a first height **328** of a lower locking protrusion portion **327** (between the uniform horizontal levels **322, 324** of lower maximum bulge points **1832, 1842** and upper bulge transition points **1834, 1844**) of the vertical bottle locking protrusion **126** and a second height **428** of a lower locking indentation portion **427** (between uniform horizontal levels **422, 424** of lower maximum indentation points **1852, 1862** and upper indentation transition points **1854, 1864**) of the corresponding vertical bottle locking indentation **224**, can each be of a uniform height (i.e., the same height) and each can be in range of 20 – 60%, 30 – 50%, 35 – 45%, or 40%-48% of a bottle height **710** of the bottle body **103** of the connectable beverage bottle **100**.

[00056] Thus, in a yet further related embodiment, as shown in FIGS. **3-4, 7, 16A, 16B, 16C, and 17**, the hollow bottle body **103** can further include:

- a) a lower locking protrusion portion **327** of the vertical bottle locking protrusion **126**, wherein the lower locking protrusion portion **327** is positioned between uniform lower bulge horizontal levels **322** of left and right lower maximum bulge points **1832, 1842** and uniform upper bulge horizontal levels **324** of left and right upper bulge transition points **1834, 1844**; and
- b) a lower locking indentation portion **427** of the vertical bottle locking indentation **224**, wherein the lower locking indentation portion **427** is positioned between uniform lower indentation horizontal levels **422** of left and right lower maximum indentation points **1852, 1862** and uniform upper indentation horizontal levels **424** of left and right upper indentation transition points **1854, 1864**;

wherein a first height **328** of the lower locking protrusion portion **327** of the vertical bottle locking protrusion **126** and a second height **428** of the lower locking indentation portion **427** of the vertical bottle locking indentation **224**, are each of a uniform height **328, 428**, which is in range of 30 – 50% of a bottle height **710** of the hollow bottle body **103**.

[00057] In a related embodiment, as shown in FIG. **13**, an interlocked combination of connectable beverage bottles **100** can include:

- a) a first connectable beverage bottle **100, 1601**, which can include:
 - i. a hollow body **103** including a top, a bottom and a substantially cylindrical sidewall **109** which form a central cavity, the sidewall **109** tapering inward adjacent to the hollow body's top to form a tapered neck **113** which terminates at an opening for the

ingress and egress of liquids or solids into the central cavity;
wherein:

1. the sidewall **109** including a pair of parallel grooves **930**, **940** inset within the circumference of the substantially cylindrical sidewall which extend longitudinally from the hollow body's bottom to the tapered neck **113**, the pair of grooves **930**, **940** forming a longitudinally extending projection **126** between the grooves **930**, **940** which extends from the hollow body's bottom to the hollow body's tapered neck **113** wherein the projection **126** radially tapers to form a tapered rounded edge **121**;
 2. the sidewall **109** further including a longitudinally extending channel located diametrically opposed to the longitudinally extending projection **126**, the channel extending from the hollow body's bottom to the hollow body's tapered neck **113** with the channel's depth diminishing in a tapered manner adjacent to the tapered neck **113** to form a tapered rounded shelf **227** which is substantially parallel and diametrically opposed to the projection's **126** tapered rounded edge **121**; and
- b) a second connectable beverage bottle **100**, **1602**, which can include:
- i. a hollow body **103** including a top, a bottom and a substantially cylindrical sidewall **109** which form a central cavity, the sidewall **109** tapering inward adjacent to the hollow body's top to form a tapered neck **113** which terminates at an opening for the ingress and egress of liquids or solids into the central cavity;
wherein:

1. the sidewall **109** including a pair of parallel grooves **930**, **940** inset within the circumference of the substantially cylindrical sidewall **109** which extend longitudinally from the hollow body's bottom to the tapered neck **113**, the pair of grooves **930**, **940** forming a longitudinally extending projection **126** between the grooves **930**, **940** which extends from the hollow body's bottom to the hollow body's tapered neck **113** wherein the projection **126** radially tapers to form a tapered rounded edge **121**;
 2. the sidewall **109** further including a longitudinally extending channel located diametrically opposed to the longitudinally extending projection **126**, the channel extending from the hollow body's bottom to the hollow body's tapered neck **113** with the channel's depth diminishing in a tapered manner adjacent to the tapered neck **113** to form a tapered rounded shelf **227** which is substantially parallel and diametrically opposed to the projection's **126** tapered rounded edge **121**; and
 3. the first bottle's projection **126** sized and configured to have the same shape as the channel so as to be received within the second bottle's channel so as to connect and affix to the first bottle to the second bottle; and
- c) a third connectable beverage bottle **100**, **1603**, which is connected to the second connectable beverage bottle **100**, **1602**.

[00058] Here has thus been described a multitude of embodiments of the connectable beverage bottle **100**, and methods related thereto, which can be employed in numerous modes of usage.

[00059] The many features and advantages of the invention are apparent from the detailed specification, and thus, it is intended by the appended claims to cover all such features and advantages of the invention, which fall within the true spirit and scope of the invention.

[00060] Many such alternative configurations are readily apparent and should be considered fully included in this specification and the claims appended hereto. Accordingly, since numerous modifications and variations will readily occur to those skilled in the art, the invention is not limited to the exact construction and operation illustrated and described, and thus, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

CLAIMS

What is claimed is:

1. A connectable beverage bottle, comprising:

a hollow bottle body, comprising:

a central cavity; and

a bottle top, including a bottle opening, such that the bottle opening provides access to the central cavity;

a sidewall, which forms the central cavity, wherein the sidewall comprises:

a vertical bottle locking protrusion, which is positioned on a first side of the sidewall; and

a vertical bottle locking indentation, which is positioned on a second side of the sidewall, such that the vertical bottle locking indentation is oppositely positioned relative to the vertical bottle locking protrusion;

such that the vertical bottle locking protrusion is configured to be slidable into a corresponding bottle locking indentation of a first like connectable beverage bottle, such that the connectable beverage bottle is connected to the first like connectable beverage bottle; and

such that the vertical bottle locking indentation is configured to slidably receive a corresponding bottle locking protrusion of a second like connectable beverage bottle, such that the connectable beverage bottle is connected to the second like connectable beverage bottle.

2. The connectable beverage bottle of claim 1, wherein the vertical bottle locking indentation is configured with a horizontal overhang from a bottom outer edge of the vertical bottle locking indentation to a top outer edge of the vertical bottle locking indentation.
3. The connectable beverage bottle of claim 2, wherein the horizontal overhang is in a range of 10 – 25% of a maximum depth of the vertical bottle locking indentation.
4. The connectable beverage bottle of claim 2, wherein the vertical bottle locking indentation is configured with an upper rounded indentation bulge in an upper part of the vertical bottle locking indentation, such that the upper rounded indentation bulge forms the horizontal overhang.
5. The connectable beverage bottle of claim 1, wherein a maximum protrusion width of the vertical bottle locking protrusion is in range of 25%-35% of a maximum bottle width of the hollow bottle body.
6. The connectable beverage bottle of claim 1, wherein the hollow bottle body further comprises:
 - a) a left front vertical indentation on a left side of the vertical bottle locking protrusion, wherein the left front vertical indentation is configured with a concave left inner surface; and
 - b) a right front vertical indentation on a right side of the vertical bottle locking protrusion, wherein the right front vertical indentation is configured with a concave right inner surface.
7. The connectable beverage bottle of claim 6, wherein a left opening angle, between an inner left tangent line of an inner end of the concave left inner surface and an outer left tangent line of an outer end of the concave left inner surface, is in a range of 35 – 45 degrees; and

wherein a right opening angle, between an inner right tangent line of an inner end of the concave right inner surface and an outer right tangent line of an outer end of the concave left inner surface, is in a range of 35 – 45 degrees.

8. The connectable beverage bottle of claim 7, wherein a left outward inclination angle, between a longitudinal center line of the hollow bottle body and the inner left tangent line of the inner end of the concave left inner surface, is in a range of 20 – 30 degrees; and wherein a right outward inclination angle, between the longitudinal center line of the hollow bottle body and the inner right tangent line of the inner end of the concave right inner surface, is in a range of 20 – 30 degrees.
9. The connectable beverage bottle of claim 8, wherein the left opening angle and the right opening angle are each substantially 30 degrees; and wherein the left outward inclination angle and the right outward inclination angle are each substantially 25 degrees.
10. The connectable beverage bottle of claim 7, wherein a maximum left opening width of the left front vertical indentation, between an outer left transition point at an outer end of the concave left inner surface and an inner left transition point at an inner end of the concave left inner surface, is in range of 75-85% of a maximum protrusion width of the vertical bottle locking protrusion; and wherein a maximum right opening width of the right front vertical indentation between an outer right transition point at an outer end of the concave right inner surface and an inner right transition point at an inner end of the concave right inner surface, is in range of 75-85% of the maximum protrusion width of the vertical bottle locking protrusion.
11. The connectable beverage bottle of claim 10, wherein the maximum left opening width and the maximum right opening width are each substantially 80% of the maximum protrusion width of the vertical bottle locking protrusion.

12. The connectable beverage bottle of claim 1, wherein a bottom of the hollow bottle body further comprises:
- a) a flat portion; and
 - b) a central indentation, which is configured with a laterally elongated shape and is mirror symmetric relative to a longitudinal center line of the hollow bottle body.
13. The connectable beverage bottle of claim 12, wherein the central indentation further comprises:
- an alternating pattern of concave edge portions and convex edge portions along a periphery of the central indentation, such that the alternating pattern of concave edge portions increase a torsional stiffness of the hollow bottle body.
14. The connectable beverage bottle of claim 13, wherein the alternating pattern of concave edge portions and convex edge portions further comprises:
- a) a left front concave edge portion;
 - b) a right front concave edge portion;
 - c) a center front convex edge portion, which is positioned between the left front concave edge portion and the right front concave edge portion;
 - d) a left rear concave edge portion;
 - e) a right rear concave edge portion;
 - f) a center rear convex edge portion, which is positioned between the left rear concave edge portion and the right rear concave edge portion;

- g) a left side convex edge portion, which is positioned between the left rear concave edge portion and the left front concave edge portion; and
- h) a right side convex edge portion, which is positioned between the right rear concave edge portion and the right front concave edge portion.

15. The connectable beverage bottle of claim 1, wherein the vertical bottle locking protrusion further comprises:

- an outward-curving left vertical bulge positioned on a lower outer left surface of the vertical bottle locking protrusion;
such that the outward-curving left vertical bulge is configured to taper from a left maximum bulge point of a left lower edge of the vertical bottle locking protrusion to an upper left bulge transition point, wherein the outward-curving left vertical bulge vanishes;
- an outward-curving right vertical bulge positioned on a lower outer right surface of the vertical bottle locking protrusion,
such that the outward-curving right vertical bulge is configured to taper from a right maximum bulge point of a right lower edge of the vertical bottle locking protrusion to an upper right bulge transition point, wherein the outward-curving right vertical bulge vanishes and the vertical bottle locking protrusion becomes substantially straight; and

wherein the vertical bottle locking indentation further comprises:

- an inward-curving left vertical indentation positioned on a lower outer left surface of the vertical bottle locking indentation;
such that the inward-curving left vertical indentation is configured to taper from a left maximum indentation of a left lower edge of the vertical bottle locking indentation to an upper

left indentation transition point, wherein the inward-curving left vertical indentation vanishes;

an inward-curving right vertical indentation positioned on a lower outer right surface of the vertical bottle locking indentation, such that the inward-curving right vertical indentation is configured to taper from a right maximum indentation of a right lower edge of the vertical bottle locking indentation to an upper right indentation transition point, wherein the inward-curving right vertical indentation vanishes;

such that the inward-curving left vertical indentation is configured to receive the outward-curving left vertical bulge;

such that the inward-curving right vertical indentation is configured to receive the outward-curving right vertical bulge; and

such that a lower portion of the vertical bottle locking protrusion is detachably locked in place inside a lower portion of the vertical bottle locking indentation;

such that the vertical bottle locking protrusion is configured to be vertically slidable into the corresponding bottle locking indentation of the first like connectable beverage bottle.

16. The connectable beverage bottle of claim 15, wherein a left maximum lateral bulge depth of the outward-curving left vertical bulge, between a lower left bulge maximum point and a lower left bulge minimum point, is in a range of 5 – 10% of a maximum protrusion width of the vertical bottle locking protrusion; and a right maximum lateral bulge depth of the outward-curving right vertical bulge, between a lower right bulge maximum point and a lower right bulge minimum point, is in a range of 5 – 10% of a maximum protrusion width of the vertical bottle locking protrusion.

17. The connectable beverage bottle of claim 16, wherein a left maximum lateral indentation depth of the inward-curving left vertical indentation, between a lower left indentation maximum point and a lower left indentation minimum point, is in a range of 5 – 10% of a maximum indentation width of the vertical bottle locking indentation; and a right maximum lateral indentation depth of the inward-curving right vertical indentation, between a lower right indentation maximum point and a lower right indentation minimum point, is in a range of 5 – 10% of a maximum indentation width of the vertical bottle locking indentation.
18. The connectable beverage bottle of claim 17, wherein the hollow bottle body is made from a flexible material, such that the vertical bottle locking protrusion is laterally slidable into the corresponding bottle locking indentation of the first like connectable beverage bottle.
19. The connectable beverage bottle of claim 15, wherein the hollow bottle body further comprises:
- c) a lower locking protrusion portion of the vertical bottle locking protrusion, wherein the lower locking protrusion portion is positioned between uniform lower bulge horizontal levels of left and right lower maximum bulge points and uniform upper bulge horizontal levels of left and right upper bulge transition points; and
 - d) a lower locking indentation portion of the vertical bottle locking indentation, wherein the lower locking indentation portion is positioned between uniform lower indentation horizontal levels of left and right lower maximum indentation points and uniform upper indentation horizontal levels of left and right upper indentation transition points;

wherein a first height of the lower locking protrusion portion of the vertical bottle locking protrusion and a second height of the lower locking indentation portion of the vertical bottle locking indentation, are each of a uniform height, which is in range of 30 – 50% of a bottle height of the hollow bottle body.

20. The connectable beverage bottle of claim 1, wherein the hollow bottle body further comprises:

- a) an upper screw portion; and
- b) a main portion, which is below the upper screw portion;

wherein the main portion is left-right mirror symmetrical relative to a front-rear vertical center plane of the hollow bottle body.

21. A connectable beverage bottle, comprising:

- a) a central cavity; and
- b) a sidewall, which comprises:
 - a vertical bottle locking protrusion; and
 - a vertical bottle locking indentation;

such that the vertical bottle locking protrusion is configured to be slidable into a corresponding bottle locking indentation of a first like connectable beverage bottle, such that the connectable beverage bottle is connected to the first like connectable beverage bottle; and

such that the vertical bottle locking indentation is configured to slidably receive a corresponding bottle locking protrusion of a second like connectable beverage bottle, such that the connectable beverage bottle is connected to the second like connectable beverage bottle.

22. The connectable beverage bottle of claim 21, wherein the vertical bottle locking indentation is configured with a horizontal overhang from a bottom outer edge of the vertical bottle locking indentation to a top outer edge of the vertical bottle locking indentation.
23. The connectable beverage bottle of claim 22, wherein the horizontal overhang is in a range of 10 – 25% of a maximum depth of the vertical bottle locking indentation.
24. The connectable beverage bottle of claim 21, wherein a maximum protrusion width of the vertical bottle locking protrusion is in range of 25%-35% of a maximum bottle width of the connectable beverage bottle.
25. The connectable beverage bottle of claim 21, wherein the connectable beverage bottle further comprises:
- a) a left front vertical indentation on a left side of the vertical bottle locking protrusion, wherein the left front vertical indentation is configured with a concave left inner surface; and
 - b) a right front vertical indentation on a right side of the vertical bottle locking protrusion, wherein the right front vertical indentation is configured with a concave right inner surface.
26. The connectable beverage bottle of claim 25, wherein a left opening angle, between an inner left tangent line of an inner end of the concave left inner surface and an outer left tangent line of an outer end of the concave left inner surface, is in a range of 35 – 45 degrees; and wherein a right opening angle, between an inner right tangent line of an inner end of the concave right inner surface and an outer right tangent line of an outer end of the concave left inner surface, is in a range of 35 – 45 degrees.

27. The connectable beverage bottle of claim 26, wherein a left outward inclination angle, between a longitudinal center line of the connectable beverage bottle and the inner left tangent line of the inner end of the concave left inner surface, is in a range of 20 – 30 degrees; and wherein a right outward inclination angle, between the longitudinal center line of the connectable beverage bottle and the inner right tangent line of the inner end of the concave right inner surface, is in a range of 20 – 30 degrees.
28. The connectable beverage bottle of claim 27, wherein a maximum left opening width of the left front vertical indentation, between an outer left transition point at an outer end of the concave left inner surface and an inner left transition point at an inner end of the concave left inner surface, is in range of 75-85% of a maximum protrusion width of the vertical bottle locking protrusion; and wherein a maximum right opening width of the right front vertical indentation between an outer right transition point at an outer end of the concave right inner surface and an inner right transition point at an inner end of the concave right inner surface, is in range of 75-85% of the maximum protrusion width of the vertical bottle locking protrusion.
29. The connectable beverage bottle of claim 21, wherein a bottom of the connectable beverage bottle further comprises:
- a) a flat portion; and
 - b) a central indentation, which is configured with a laterally elongated shape and is mirror symmetric relative to a longitudinal center line of the connectable beverage bottle, wherein the central indentation further comprises:
 - an alternating pattern of concave edge portions and convex edge portions along a periphery of the central indentation, such that

the alternating pattern of concave edge portions increase a torsional stiffness of the connectable beverage bottle.

30. The connectable beverage bottle of claim 21, wherein the vertical bottle locking protrusion further comprises:

an outward-curving left vertical bulge positioned on a lower outer left surface of the vertical bottle locking protrusion;
such that the outward-curving left vertical bulge is configured to taper from a left maximum bulge point of a left lower edge of the vertical bottle locking protrusion to an upper left bulge transition point, wherein the outward-curving left vertical bulge vanishes;

an outward-curving right vertical bulge positioned on a lower outer right surface of the vertical bottle locking protrusion,
such that the outward-curving right vertical bulge is configured to taper from a right maximum bulge point of a right lower edge of the vertical bottle locking protrusion to an upper right bulge transition point, wherein the outward-curving right vertical bulge vanishes and the vertical bottle locking protrusion becomes substantially straight; and

wherein the vertical bottle locking indentation further comprises:

an inward-curving left vertical indentation positioned on a lower outer left surface of the vertical bottle locking indentation;
such that the inward-curving left vertical indentation is configured to taper from a left maximum indentation of a left lower edge of the vertical bottle locking indentation to an upper left indentation transition point, wherein the inward-curving left vertical indentation vanishes;

an inward-curving right vertical indentation positioned on a lower outer right surface of the vertical bottle locking indentation,

such that the inward-curving right vertical indentation is configured to taper from a right maximum indentation of a right lower edge of the vertical bottle locking indentation to an upper right indentation transition point, wherein the inward-curving right vertical indentation vanishes;

such that the inward-curving left vertical indentation is configured to receive the outward-curving left vertical bulge;

such that the inward-curving right vertical indentation is configured to receive the outward-curving right vertical bulge; and

such that a lower portion of the vertical bottle locking protrusion is detachably locked in place inside a lower portion of the vertical bottle locking indentation;

such that the vertical bottle locking protrusion is configured to be vertically slidable into the corresponding bottle locking indentation of the first like connectable beverage bottle;

wherein a left maximum lateral bulge depth of the outward-curving left vertical bulge, between a lower left bulge maximum point and a lower left bulge minimum point, is in a range of 5 – 10% of a maximum protrusion width of the vertical bottle locking protrusion; and a right maximum lateral bulge depth of the outward-curving right vertical bulge, between a lower right bulge maximum point and a lower right bulge minimum point, is in a range of 5 – 10% of a maximum protrusion width of the vertical bottle locking protrusion; and wherein a left maximum lateral indentation depth of the inward-curving left vertical indentation, between a lower left indentation maximum point and a lower left indentation minimum point, is in a range of 5 – 10% of a maximum indentation width of the vertical bottle locking indentation; and a right maximum lateral indentation depth of the

inward-curving right vertical indentation, between a lower right indentation maximum point and a lower right indentation minimum point, is in a range of 5 – 10% of a maximum indentation width of the vertical bottle locking indentation;

wherein the connectable beverage bottle is made from a flexible material, such that the vertical bottle locking protrusion is laterally slidable into the corresponding bottle locking indentation of the first like connectable beverage bottle.