

TITLE OF INVENTION

Three-piece mold device, system, and method
for manufacturing of connectable beverage bottle

CROSS-REFERENCE TO RELATED APPLICATIONS

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

FIELD OF THE INVENTION

[0002] The present invention relates generally to the field of molds and mold systems for bottle manufacturing, and more particularly to methods and systems for a three-piece mold device and system for manufacturing of a connectable beverage bottle.

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 well-known bottle molding methods.

[0005] As such, considering the foregoing, it may be appreciated that there continues to be a need for novel and improved devices, systems and methods for manufacturing of connectable beverage bottles.

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 manufacturing of connectable beverage bottles.

[0007] In an aspect, a system for molding can include:

- a) a left upper mold portion, which comprises a left upper molding cavity;
- b) a right upper mold portion, which comprises a right upper molding cavity; and
- c) a lower mold portion;

wherein the left upper mold portion and the right upper mold portion can be positionable side by side, such that the left upper molding cavity and the right upper molding cavity form a combined upper molding cavity for an upper portion of a connectable beverage bottle, such that the left upper mold portion and the right upper mold portion are laterally removable after blow molding of the connectable beverage bottle inside the combined upper molding cavity formed by the left upper mold portion and the right upper mold portion; and

wherein the lower mold portion is positionable between lower ends of the left upper mold portion and the right upper mold portion, such that the combined lower molding cavity combines with the combined upper molding cavity to form an entire molding cavity, such that the lower mold portion is vertically downward removable after blow molding of the connectable beverage bottle inside the combined upper molding cavity formed by the left upper mold portion and the right upper mold portion.

[0008] In an aspect, a method for molding can include:

- a) Preparing blow pin, wherein a heated preform mold is prepared around the blow pin, which is positioned for mold assembly;
- b) Assembling mold components, wherein the mold components are positioned relative to the blow pin, such that:

- i. the lower mold portion is moved vertically upwards to a predetermined molding position of the lower mold portion (relative to the blow pin with the prepared preform mold);
- ii. the left upper mold portion and the right upper mold portion are moved laterally inward, such that the left upper mold portion and the right upper mold portion are positioned side by side;
such that upper parts of the left upper mold portion and the right upper mold portion connect around an upper part of the blow pin, and
such that lower parts of the left upper mold portion and the right upper mold portion connect around an upper part of the lower mold portion;

such that the blow pin with the attached preform mold protrudes into the entire molding cavity formed by the lower mold portion, the left upper mold portion and the right/second upper mold portion;
- c) Perform blow molding, wherein compressed air is injected into the blow pin, such that the heated preform mold is blown into the shape of the entire molding cavity to form a connectable beverage bottle;
- d) Removing blow pin, wherein the blow pin is extracted by a vertical upward movement;
- e) Disassembling mold components, such that:
 - i. the left upper mold portion and the right upper mold portion are moved laterally outward ; and
 - ii. the lower mold portion is moved vertically downwards; and
- f) Extracting the connectable beverage bottle.

[0009] 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.

[0010] 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.

[0011] 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

[0012] FIG. **1A** is a perspective view of a system for molding in a disassembled configuration, according to an embodiment of the invention.

[0013] FIG. **1B** is a top perspective view of a system for molding in an assembled configuration, according to an embodiment of the invention.

[0014] FIG. **1C** is a bottom perspective view of a system for molding in an assembled configuration, according to an embodiment of the invention.

[0015] FIG. **1D** is a top plan view of a system for molding in an assembled configuration, according to an embodiment of the invention.

- [00016] FIG. 1E is a bottom plan view of a system for molding in an assembled configuration, according to an embodiment of the invention.
- [00017] FIG. 1F is a top perspective view of a system for molding in a partially assembled configuration, according to an embodiment of the invention.
- [00018] FIG. 1G is a bottom perspective view of a system for molding in a partially assembled configuration, according to an embodiment of the invention.
- [00019] FIG. 1H is a top perspective view of a system for molding in a partially disassembled configuration with detached left and right removable half-segments, according to an embodiment of the invention.
- [00020] FIG. 2A is a front top perspective view of a left side upper mold portion, according to an embodiment of the invention.
- [00021] FIG. 2B is a rear bottom perspective view of a left side upper mold portion, according to an embodiment of the invention.
- [00022] FIG. 2C is a right side elevational view of a left side upper mold portion, according to an embodiment of the invention.
- [00023] FIG. 2D is a left side elevational view of a left side upper mold portion, according to an embodiment of the invention.
- [00024] FIG. 2E is a top plan view of a left side upper mold portion, according to an embodiment of the invention.
- [00025] FIG. 2F is a bottom plan view of a left side upper mold portion, according to an embodiment of the invention.
- [00026] FIG. 3A is a rear top perspective view of a right side upper mold portion, according to an embodiment of the invention.
- [00027] FIG. 3B is a front bottom perspective view of a right side upper mold portion, according to an embodiment of the invention.

[00028] FIG. **3C** is a left side elevational view of a right side upper mold portion, according to an embodiment of the invention.

[00029] FIG. **3D** is a right side elevational view of a right side upper mold portion, according to an embodiment of the invention.

[00030] FIG. **3E** is a top plan view of a right side upper mold portion, according to an embodiment of the invention.

[00031] FIG. **3F** is a bottom plan view of a right side upper mold portion, according to an embodiment of the invention.

[00032] FIG. **4A** is a front top perspective view of a lower mold portion, according to an embodiment of the invention.

[00033] FIG. **4B** is a rear bottom perspective view of a lower mold portion, according to an embodiment of the invention.

[00034] FIG. **4C** is a top plan view of a lower mold portion, according to an embodiment of the invention.

[00035] FIG. **4D** is a bottom plan view of a lower mold portion, according to an embodiment of the invention.

[00036] FIG. **4E** is a front elevation view of a lower mold portion, according to an embodiment of the invention.

[00037] FIG. **4F** is a rear elevation view of a lower mold portion, according to an embodiment of the invention.

[00038] FIG. **5A** is a front top perspective view of a lower central mold portion, according to an embodiment of the invention.

[00039] FIG. **5B** is a rear bottom perspective view of a lower central mold portion, according to an embodiment of the invention.

[00040] FIG. **5C** is a top plan view of a lower central mold portion, according to an embodiment of the invention.

[00041] FIG. **5D** is a bottom plan view of a lower central mold portion, according to an embodiment of the invention.

[00042] FIG. **6A** is a front top perspective view of a lower bottom mold portion, according to an embodiment of the invention.

[00043] FIG. **6B** is a rear bottom perspective view of a lower bottom mold portion, according to an embodiment of the invention.

[00044] FIG. **6C** is a top plan view of a lower bottom mold portion, according to an embodiment of the invention.

[00045] FIG. **6D** is a bottom plan view of a lower bottom mold portion, according to an embodiment of the invention.

[00046] FIG. **7A** is a front top perspective view of a lower mold support assembly, according to an embodiment of the invention.

[00047] FIG. **7B** is a rear bottom perspective view of a lower mold support assembly, according to an embodiment of the invention.

[00048] FIG. **8A** is a top perspective view of a connectable beverage bottle, according to an embodiment of the invention.

[00049] FIG. **8B** is a bottom perspective view of a connectable beverage bottle, according to an embodiment of the invention.

[00050] FIG. **8C** is a front view of a connectable beverage bottle, according to an embodiment of the invention.

[00051] FIG. **8D** is a rear view of a connectable beverage bottle, according to an embodiment of the invention.

[00052] FIG. **8E** is a right side view of a connectable beverage bottle, according to an embodiment of the invention.

[00053] FIG. **8F** is a left side view of a connectable beverage bottle, according to an embodiment of the invention.

[00054] FIG. **8G** is a bottom view of a connectable beverage bottle, according to an embodiment of the invention.

[00055] FIG. **8H** is a top view of a connectable beverage bottle, according to an embodiment of the invention.

[00056] FIG. **8I** is a cross-sectional schematic diagram of a first connectable beverage bottle connected with a second connectable beverage bottle, according to an embodiment of the invention.

[00057] FIG. **9A** is a flowchart illustrating steps that may be followed, in accordance with one embodiment of a method or process of molding using the system for molding.

[00058] FIG. **9B** is a schematic diagram illustrating steps that may be followed, in accordance with one embodiment of a method or process of molding using the system for molding.

[00059] FIG. **10A** is a cross-sectional schematic view of a molding machine that uses a plurality of molding systems for manufacturing of connectable beverage bottles.

[00060] FIG. **10B** is a cross-sectional schematic view of a portion of a molding machine that uses a molding system for manufacturing of connectable beverage bottles.

[00061] FIG. **10C** is a cross-sectional schematic view of a portion of a molding machine that uses a molding system for manufacturing of connectable beverage bottles.

DETAILED DESCRIPTION

[00062] 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.

[00063] 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.

[00064] In the following, we describe the structure of an embodiment of a system for molding **100** with reference to FIG. **1A**, 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 system for molding **100** enables manufacturing of bottles that can interlock with, so that they may save space in logistics, such as during transport and storage, thereby improving space efficiency and cost efficiency.

[00065] In an embodiment, as shown in FIGS. **1A-1G, 2A-2F, 3A-3F, 4A-4F, 5A-5D, 6A-6D, 7A-7B, 8A-8I**, and **9B**, a molding system **100** for molding a connectable beverage bottle **150** can include:

- a) a molding device **110**, which can include:
 - i. a left/first upper mold portion **112**, which can include a left upper molding cavity **113**;
 - ii. a right/second upper mold portion **114**, which can include a right upper molding cavity **115**; and

- iii. a lower mold portion **120**, which is configured to mold a lower portion of the connectable beverage bottle **150**, wherein can include:
- 1) a lower central mold portion **122**, which can include a penetrating lower central aperture **123**, which is configured to mold (i.e., forms a mold for) a lower central portion of the connectable beverage bottle **150**; and
 - 2) a lower bottom mold portion **124**, which is connected to a bottom of the lower central mold portion **122**, wherein the lower bottom mold portion **124** can include a lower bottom indentation **625** (as shown in FIGS. **6A** and **6C**), which is configured to mold (i.e., forms a mold for) a lower bottom portion of the connectable beverage bottle **150**, such that the penetrating lower central aperture **123** and the lower bottom indentation **625** combine to form a combined lower molding cavity **125**; and
 - 3) a lower mold support assembly **126**, which is connected to a bottom of the lower bottom mold portion **124**, such that the lower mold support assembly **126** provides support for the lower central mold portion **122** and the lower bottom mold portion **124** (which together contain/form the combined lower molding cavity **125**), and wherein the lower mold support assembly **126** can be configured to connect with a molding machine **1000** to enable a vertical movement **922, 924** (i.e., a vertical upward movement **922** and a vertical downward

movement **924**) of the lower mold portion **120**, as shown in FIGS. **9B** and **10A-10C**;

wherein the left/first upper mold portion **112** and the right/second upper mold portion **114** are configured to be positioned side by side (i.e., adjacently), such that the left upper molding cavity **113** and the right upper molding cavity **115** form a combined upper molding cavity **1015** (shown in FIG. **10C**) which is configured to mold an upper portion of a connectable beverage bottle **150**, such that the left/first upper mold portion **112** and the right/second upper mold portion **114** are laterally/horizontally **932**, **934** removable after blow molding of the connectable beverage bottle **150** inside the combined upper molding cavity **1015** formed by the left/first upper mold portion **112** and the right/second upper mold portion **114**; and

wherein at least an upper part of the lower mold portion **120** is positionable between lower ends of the left/first upper mold portion **112** and the right/second upper mold portion **114**, such that the combined lower molding cavity **125** combines with the combined upper molding cavity **1015** to form an entire molding cavity **1025**, which is configured to mold the connectable beverage bottle **150**, such that the lower mold portion **120** is vertically downward **924** removable after blow molding of the connectable beverage bottle **150** inside the upper molding cavity formed by the left/first upper mold portion **112** and the right/second upper mold portion **114**.

[00066] Note that it is readily apparent that if the lower mold portion **120** was vertically split in two parts as a conventional mold, the two parts of the lower mold portion **120** would not be laterally/horizontally removable, due to the interlocking/connectable shape of the lower portion of the connectable beverage bottle **150**, which would hold the two parts in place, similar to the locking configuration shown in FIG. **8I**.

[00067] In a related embodiment, the penetrating lower central aperture **123** can be configured with a uniform horizontal cross-sectional shape.

[00068] In a further related embodiment, the lower central mold portion **122** can be further configured with a vertical mold locking protrusion **524**, which protrudes into a vertical front of the penetrating lower central aperture **123**, wherein the vertical mold locking protrusion **524** is configured to mold a vertical bottle locking indentation **824** of the lower central portion of the connectable beverage bottle.

[00069] In a yet further related embodiment, the lower central mold portion **122** can be further configured with a vertical mold locking indentation **526**, which is positioned along a vertical rear of the penetrating lower central aperture **123**, wherein the vertical mold locking indentation **526** is configured to mold a vertical bottle locking protrusion **826** of the lower central portion of the connectable beverage bottle **150**.

[00070] In a related embodiment, thin layers **564**, **566** of adhesive (or other types of hardening compounds) can be applied to surfaces of the vertical mold locking protrusion **524** and the vertical mold locking indentation **526**, respectively, in order to adjust tolerances of the mold and ensure that the lower central mold portion **122** can easily slide downward and release from the newly molded connectable beverage bottle **150**.

[00071] In a related embodiment, as shown in FIGS. **1A** and **9B**, the left upper mold portion **112** can further include:

- a) a left receiving indentation **133**, which is positioned below the left upper molding cavity **113**, wherein the left receiving indentation **133** is configured to receive a left side of the lower central mold portion **122**; and

wherein the right upper mold portion **114** can further include:

- b) a right receiving indentation **135**, which is positioned below the right upper molding cavity, wherein the right receiving indentation **135** is configured to receive a right side of the lower central mold portion **122**;

such that, when the left upper mold portion **112** and the right upper mold portion **114** are positioned side by side, the left receiving indentation **133** and the right receiving indentation **135** form a combined receiving cavity **936**, which is configured to receive the lower central mold portion **122**.

[00072] In a further related embodiment, each of the left receiving indentation **133** and the right receiving indentation **135** can be configured as a half cylinder, such that the combined receiving cavity **936** is cylindrical; and wherein an outer vertical surface of the lower central mold portion **122** is cylindrical.

[00073] In a related embodiment, the left upper mold portion **112** can further include:

- a) an upper left penetrating indentation **143**, as shown in FIGS. **1G** and **2B**, which is positioned in a left inner side of a left top surface of the left upper mold portion **112**, such that the upper left penetrating indentation **143** penetrates from the left top surface of the left upper mold portion **112** to the left upper molding cavity **113**; and

wherein the right upper mold portion **114** can further include:

- b) an upper right penetrating indentation **145**, as shown in FIG. **3B**, which is positioned in a right inner side of a right top surface of the right upper mold portion **114**, such that the upper right penetrating indentation **145** penetrates from the right top surface of the right upper mold portion **114** to the right upper molding cavity **115**;

such that, when the left upper mold portion **112** and the right upper mold portion **114** are positioned side by side, the upper left penetrating indentation **143** and the upper right penetrating indentation **145** form a combined upper penetrating aperture **147**, which penetrates from a combined top surface of the molding device to the combined upper molding cavity **1015**.

[00074] In a further related embodiment, the molding device **110** can further include:

- a) a left removable half-segment **163**, which can include a left half opening **164**; and
- b) a right removable half-segment **165**, which can include a right half opening **166**;

wherein the left upper mold portion **112**, as shown in FIG. **1H**, can further include:

- i. an upper left surface indentation **117**, as shown in FIG. **1H**, which is positioned in the left top surface of the left upper mold portion **112**, such that the upper left surface indentation **117** is configured to form a left ledge along the upper left penetrating aperture (along a top opening to the left upper molding cavity **113**); such that the left removable half-segment **163** is configured to be removably positioned in the upper left surface indentation **117**; and

wherein the right upper mold portion can further include:

- ii. an upper right surface indentation **119**, which is positioned in the right top surface of the right upper mold portion **114**, such that the upper right surface indentation **119** is configured to form a right ledge along the upper right penetrating aperture; such that the right removable half-segment **165** is configured to be removably positioned in the upper right surface indentation **119**;

such that, when the left upper mold portion **112** and the right upper mold portion **114** are positioned side by side with the left removable half-segment **163** positioned in the upper left surface indentation and the right removable half-segment **165** positioned in the upper right surface indentation:

the left half opening **164** and the right half opening **166** form a combined segment opening **168**, which is aligned with the combined upper penetrating aperture;

such that the removable half-segments **163**, **165** positioned in respectively the left and right upper mold portions **112**, **114** can be positioned below a protruding flange **810** (as shown in FIGS. **1B** and **8A**) of the pre-molded screw portion **962** to aid in removal of the connectable beverage bottle **150** after blow molding of the connectable beverage bottle **150**.

[00075] In a yet further related embodiment, each of the left removable half-segment **163** and the right removable half-segment **164** can further include respectively a left inner top ledge **167** and a right inner top ledge **169**, which are configured to receive respectively left and right sides of the flange **810** of the pre-molded screw portion **962**.

[00076] In various related embodiments, as shown in FIG. 1A, mold components of the molding device **110**, including the left/first upper mold portion **112**, the right/second upper mold portion **114**, and the lower mold portion **120** can include various elongated mounting apertures **191**, **192**, **193**, which are configured to enable attachment to a molding machine **1000**, such that control rods of the molding machine **1000** can engage with the mold components of the molding device **110**, via sliding in to the elongated mounting apertures.

[00077] In an embodiment, as illustrated in FIGS. **9A** and **9B**, a method of molding **900** for molding a connectable beverage bottle **150** by using a molding device **110**, wherein the method **900** can include:

- a) Preparing **901** a blow pin **940**, wherein a heated preform mold **960** is prepared around the blow pin **940**, which is positioned for mold assembly;
- b) Assembling **902** mold components of the molding device **110**, wherein the mold components are positioned around the blow pin **940**, as shown in FIG. **9B**, such that:

- i. Moving the lower mold portion **120** vertically upwards to a predetermined molding position of the lower mold portion **120** (relative to the blow pin **940** with the attached prepared preform mold **960**);
 - ii. Moving each of the left/first upper mold portion **112** and the right/second upper mold portion **114** laterally inward, such that the left/first upper mold portion **112** and the right/second upper mold portion **114** are positioned side by side; such that upper parts of the left/first upper mold portion **112** and the right/second upper mold portion **114** connect around an upper part of the blow pin **940**, and such that lower parts of the left/first upper mold portion **112** and the right/second upper mold portion **114** connect around an upper part of the lower mold portion **120**;

such that the blow pin **940** with the attached preform mold **960** protrudes into the entire molding cavity formed by the lower mold portion **120**, the left/first upper mold portion **112**, and the right/second upper mold portion **114**;

such that an upper part of the preform mold **960** is configured as a pre-molded screw portion **962** of the connectable beverage bottle **150**. Dual removable half-segments **163**, **165** of respectively the left and right upper mold portions **112**, **114** can be positioned below the pre-molded screw portion **962** to aid in removal of the connectable beverage bottle **150**;
- c) Perform blow molding **904**, wherein compressed air is injected into the blow pin **940**, such that the heated preform mold **960** is blown into the shape of the entire molding cavity inside the molding device **110**, such that the heated preform mold **960** forms the connectable beverage bottle **150**;

- d) Removing **906** the blow pin, wherein the blow pin is extracted by a vertical upward movement;
- e) Disassembling **908** mold components, such that:
 - i. the left/first upper mold portion **112** and the right/second upper mold portion **114** are moved laterally outward, toward respectively a left and a right side of the blow pin **940**; and
 - ii. the lower mold portion **120** is moved vertically downwards; and
- f) Extracting **910** the connectable beverage bottle **150**.

[00078] In related embodiments, as shown in FIGS. **10A**, **10B**, and **10C**, the method for molding **900** can be implemented using a molding machine **1000**, such that a plurality of molding processes **900** can be executed in parallel, typically in a synchronized manner. The molding machine **1000** shown in FIGS. **10A-10C** supports six parallel molding processes **900**, such that each process station continually repeats the corresponding molding processes **900**, thereby producing a constant flow of newly blow molded connectable beverage bottles **150**.

[00079] In related embodiments, each of the left/first upper mold portion **112**, the right/second upper mold portion **114**, and the lower mold portion **120** can be made from:

- a) a metal or metal alloy, such as a stainless-steel alloy, or a high-strength aluminum alloy;
- b) a ceramic material;
- c) other materials suitable for making of molds; and
- d) combinations thereof.

[00080] In a related embodiment, the preform mold **960** used in the system for molding **100** can be made from:

- a) A plastic material, including Polyethylene terephthalate and Acrylonitrile Butadiene Styrene;
- b) A glass material;
- c) A rubber material, which can be a synthetic or natural rubber material;
- d) Other materials suitable for blow molding; and
- e) Combinations thereof.

[00081] In a related embodiment, FIGS. **8A-8I**, shows an example of a connectable beverage bottle **150**, which is manufactured by the system for molding **100**, according to the method of molding **900**. The connectable beverage bottle **150** 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.

[00082] In a further related embodiment, compared to the earlier connectable beverage bottle, improvements to the connectable beverage bottle **150** include:

- a) all the corners or hard edges of the base of the connectable beverage bottle **150** have been rounded out completely so that the connectable beverage bottle **150** is much easier to blow mold during manufacturing;
- b) the interlocking back part of the bottle, i.e. the vertical bottle locking protrusion **826**, is substantially thinner and the opening of the bottle on the other side, i.e. the vertical bottle locking indentation **824**, where the vertical bottle locking protrusion **826** goes in, is also

correspondingly substantially thinner, as per further specification below; and

- c) the locking portion of the connectable beverage bottle **150**, which is created by lower central mold portion **122**, is now only about 1/3 of the bottle height of the connectable beverage bottle **150**. 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.

[00083] In a related embodiment, a connectable beverage bottle **150** can include:

- a) a hollow body including:
- i. a top,
 - ii. a bottom; and
 - iii. a substantially cylindrical sidewall, which form a central cavity, said sidewall tapering inward adjacent to said hollow body's top to form a tapered neck which terminates at an opening for the ingress and egress of liquids or solids into said central cavity;

said sidewall including a pair of parallel grooves inset within the circumference of the substantially cylindrical sidewall which extend longitudinally from said hollow body's bottom to said tapered neck, said pair of grooves forming a longitudinally extending projection between said grooves which extends from said hollow body's bottom to said hollow body's tapered neck wherein said projection radially tapers to form a tapered rounded edge;

said sidewall further including a longitudinally extending channel located diametrically opposed to said longitudinally extending projection, said channel extending from the hollow body's bottom to

said hollow body's tapered neck with said channel's depth diminishing in a tapered manner adjacent to said tapered neck to form a tapered rounded shelf which is substantially parallel and diametrically opposed to said projection's tapered rounded edge; and

said projection and said channel are sized and configured so that said projection could be received within a channel of another like connectable beverage bottle so as to connect and affix to another like connectable beverage bottle.

[00084] In a related embodiment, the connectable beverage bottle **150** can be further configured such that:

- a) said projection's tapered edge and said channel's tapered shelf permit said projection 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) said projection and said channel are sized and configured so that once said projection is inserted into a channel of a like connectable bottle, said projection is slideable within the channel until said projection's tapered edge would engage the channel's tapered shelf so as to prevent further movement or disengagement.

[00085] In another related embodiment, the connectable beverage bottle **150** can further include:

- a) a bracket including a longitudinally extending post having a tapered top, said post sized and configured to have the same shape as said channel so as to be received within channel, and said bracket including a fastener means for affixing said bracket to another object.

[00086] In a further related embodiment of the connectable beverage bottle **150**, said fastener means can include a pair of slots sized to receive a belt.

[00087] In a further related embodiment of the connectable beverage bottle **150**, said fastener means can include a hook.

[00088] In a further related embodiment, as shown in FIGS. **8G** and **8H**, the connectable beverage bottle **150** can be configured such that:

- a) a horizontal overhang **813** of the vertical bottle locking indentation **824**, from a bottom outer edge **812** of the vertical bottle locking indentation **824** to a top outer edge of the vertical bottle locking indentation **824**, which is in a range of 5 – 30% or 10 – 25% of a maximum depth **819** of the vertical bottle locking indentation **824**;
- b) a maximum protrusion width **827** of the vertical bottle locking protrusion **826** is in range of 25%-35% of a maximum bottle width **856**;
- c) a right front vertical indentation **830** on a right side of the vertical bottle locking protrusion **826**, wherein the right front vertical indentation **830** is configured with a concave right inner surface, such that an opening angle **838**, between an inner right tangent line **834** of an inner end of the concave right inner surface (in an inner right transition point, where the concave inner surface connects with an inner convex right surface) and an outer right tangent line **832** of an outer end of the concave right inner surface (in an outer right transition point, where the concave inner surface connects with an outer convex right surface);
- d) a maximum right opening width **836** of the right front vertical indentation **830** between the outer right transition point and the inner right transition point can be in range of 70-90% or 75-85% of a maximum protrusion width **827** of the vertical bottle locking protrusion **826**;
- e) a left front vertical indentation **840** on a left side of the vertical bottle locking protrusion **826**, wherein the left front vertical indentation **840** is configured with a concave left inner surface, such that a left opening

angle **838**, between an inner left tangent line **844** of an inner end of the concave left inner surface (in an inner left transition point, where the concave inner surface connects with an inner convex left surface) and an outer left tangent line **842** of an outer end of the concave right inner surface (in an outer right transition point, where the concave inner surface connects with an outer convex left surface); and

- f) a maximum left opening width **846** of the left front vertical indentation **840** 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 **827** of the vertical bottle locking protrusion **826**.

[00089] In a related embodiment, as shown in FIG. **8I**, a combination of connectable beverage bottles **150** can include:

- a) a first connectable beverage bottle **150**, **801**, which can include:
- i. a hollow body including a top, a bottom and a substantially cylindrical sidewall which form a central cavity, said sidewall tapering inward adjacent to said hollow body's top to form a tapered neck which terminates at an opening for the ingress and egress of liquids or solids into said central cavity; wherein:
 1. said sidewall including a pair of parallel grooves inset within the circumference of the substantially cylindrical sidewall which extend longitudinally from said hollow body's bottom to said tapered neck, said pair of grooves forming a longitudinally extending projection between said grooves which extends from said hollow body's bottom to said hollow body's tapered neck wherein said projection radially tapers to form a tapered rounded edge;
 2. said sidewall further including a longitudinally extending channel located diametrically opposed to said

longitudinally extending projection, said channel extending from the hollow body's bottom to said hollow body's tapered neck with said channel's depth diminishing in a tapered manner adjacent to said tapered neck to form a tapered rounded shelf which is substantially parallel and diametrically opposed to said projection's tapered rounded edge; and

- b) a second connectable beverage bottle **150, 802**, which can include:
- i. a hollow body including a top, a bottom and a substantially cylindrical sidewall which form a central cavity, said sidewall tapering inward adjacent to said hollow body's top to form a tapered neck which terminates at an opening for the ingress and egress of liquids or solids into said central cavity; wherein:
 - 1. said sidewall including a pair of parallel grooves inset within the circumference of the substantially cylindrical sidewall which extend longitudinally from said hollow body's bottom to said tapered neck, said pair of grooves forming a longitudinally extending projection between said grooves which extends from said hollow body's bottom to said hollow body's tapered neck wherein said projection radially tapers to form a tapered rounded edge;
 - 2. said sidewall further including a longitudinally extending channel located diametrically opposed to said longitudinally extending projection, said channel extending from the hollow body's bottom to said hollow body's tapered neck with said channel's depth diminishing in a tapered manner adjacent to said tapered neck to form a tapered rounded shelf which is

substantially parallel and diametrically opposed to said projection's tapered rounded edge; and

3. said first bottle's projection sized and configured to have the same shape as said channel so as to be received within said second bottle's channel so as to connect and affix to said first bottle to said second bottle.

[00090] Here has thus been described a multitude of embodiments of the molding system **100**, and methods related thereto, which can be employed in numerous modes of usage.

[00091] 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.

[00092] 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 molding system for molding a connectable beverage bottle, the molding system comprising:

a molding device, comprising:

a left upper mold portion, which comprises a left upper molding cavity;

a right upper mold portion, which comprises a right upper molding cavity; and

a lower mold portion, which comprises a combined lower molding cavity which is configured to mold a lower portion of the connectable beverage bottle;

wherein the left upper mold portion and the right upper mold portion are configured to be positioned side by side, such that the left upper molding cavity and the right upper molding cavity form a combined upper molding cavity which is configured to mold an upper portion of the connectable beverage bottle, such that the left upper mold portion and the right upper mold portion are laterally removable after blow molding of the connectable beverage bottle inside the combined upper molding cavity formed by the left upper mold portion and the right upper mold portion; and

wherein at least an upper part of the lower mold portion is configured to be positionable between lower ends of the left upper mold portion and the right upper mold portion, such that the combined lower molding cavity is configured to combine with the combined upper molding cavity to form an entire molding cavity, which is configured to mold the connectable beverage bottle, such that the lower mold portion is configured to be vertically downward removable after blow molding of the connectable beverage bottle.

2. The molding system of claim 1, wherein the lower mold portion further comprises:
 - a lower central mold portion, which comprises a penetrating lower central aperture, which is configured to mold a lower central portion of the connectable beverage bottle.
3. The molding system of claim 2, wherein the penetrating lower central aperture is configured with a uniform horizontal cross-sectional shape.
4. The molding system of claim 2, wherein the lower central mold portion is further configured with a vertical mold locking protrusion, which protrudes into a vertical front of the penetrating lower central aperture, wherein the vertical mold locking protrusion is configured to mold a vertical bottle locking indentation of the lower central portion of the connectable beverage bottle.
5. The molding system of claim 4, wherein the lower central mold portion is further configured with a vertical mold locking indentation, which is positioned along a vertical rear of the penetrating lower central aperture, wherein the vertical mold locking indentation is configured to mold a vertical bottle locking protrusion of the lower central portion of the connectable beverage bottle.
6. The molding system of claim 2, wherein the lower mold portion further comprises:
 - a lower bottom mold portion, which is connected to a bottom of the lower central mold portion, wherein the lower bottom mold portion comprises a lower bottom indentation, which is configured to mold a lower bottom portion of the connectable beverage bottle, such that the penetrating lower central aperture and the lower bottom indentation combine to form the combined lower molding cavity.
7. The molding system of claim 6, wherein the lower mold portion further comprises:

a lower mold support assembly, which is connected to a bottom of the lower bottom mold portion, such that the lower mold support assembly is configured to provide support for the lower central mold portion and the lower bottom mold portion; wherein the lower mold support assembly is configured to connect with a molding machine to enable a vertical movement of the lower mold portion.

8. The molding system of claim 2, wherein the left upper mold portion further comprises:

a left receiving indentation, which is positioned below the left upper molding cavity, wherein the left receiving indentation is configured to receive a left side of the lower central mold portion; and

wherein the right upper mold portion further comprises:

a right receiving indentation, which is positioned below the right upper molding cavity, wherein the right receiving indentation is configured to receive a right side of the lower central mold portion;

such that, when the left upper mold portion and the right upper mold portion are positioned side by side, the left receiving indentation and the right receiving indentation form a combined receiving cavity, which is configured to receive the lower mold portion.

9. The molding system of claim 8, wherein each of the left receiving indentation and the right receiving indentation are configured as a half cylinder, such that the combined receiving cavity is cylindrical; and wherein an outer vertical surface of the lower mold portion is cylindrical.

10. The molding system of claim 1, wherein the left upper mold portion further comprises:

an upper left penetrating indentation, which is positioned in a left inner side of a left top surface of the left upper mold portion, such that the

upper left penetrating indentation penetrates from the left top surface of the left upper mold portion to the left upper molding cavity; and

wherein the right upper mold portion further comprises:

an upper right penetrating indentation, which is positioned in a right inner side of a right top surface of the right upper mold portion, such that the upper right penetrating indentation penetrates from the right top surface of the right upper mold portion to the right upper molding cavity;

such that, when the left upper mold portion and the right upper mold portion are positioned side by side, the upper left penetrating indentation and the upper right penetrating indentation form a combined upper penetrating aperture, which penetrates from a combined top surface of the molding device to the combined upper molding cavity.

11. The molding system of claim 10, wherein the molding device further comprises:

- a) a left removable half-segment, which comprises a left half opening; and
- b) a right removable half-segment, which comprises a right half opening;

wherein the left upper mold portion further comprises:

an upper left surface indentation, which is positioned in the left top surface of the left upper mold portion, such that the upper left surface indentation is configured to form a left ledge along the upper left penetrating aperture;

such that the left removable half-segment is configured to be removably positioned in the upper left surface indentation; and

wherein the right upper mold portion further comprises:

an upper right surface indentation, which is positioned in the right top surface of the right upper mold portion, such that the upper

right surface indentation is configured to form a right ledge along the upper right penetrating aperture;
such that the right removable half-segment is configured to be removably positioned in the upper right surface indentation;

such that, when the left upper mold portion and the right upper mold portion are positioned side by side with the left removable half-segment positioned in the upper left surface indentation and the right removable half-segment positioned in the upper right surface indentation:

the left half opening and the right half opening form a combined segment opening, which is aligned with the combined upper penetrating aperture.

12. A molding method for molding a connectable beverage bottle by using a molding device, the method comprising:

- a) preparing a blow pin, wherein a heated preform mold is prepared around the blow pin, which is positioned for mold assembly;
- b) assembling mold components of the molding device, wherein the mold components are positioned around the blow pin; and
- c) performing blow molding, wherein compressed air is injected into the blow pin, such that the heated preform mold is blown into a shape of an entire molding cavity inside the molding device, such that the heated preform mold forms the connectable beverage bottle;

wherein the molding device comprises the mold components, which comprises:

- a left upper mold portion, which comprises a left upper molding cavity;
- a right upper mold portion, which comprises a right upper molding cavity; and

a lower mold portion, which comprises a combined lower molding cavity, which is configured to mold a lower portion of the connectable beverage bottle.

13. The molding method of claim 12, wherein assembling the mold components further comprises:

moving the lower mold portion vertically upwards to a predetermined molding position of the lower mold portion relative to the blow pin.

14. The molding method of claim 13, wherein assembling the mold components further comprises:

moving each of the left upper mold portion and the right upper mold portion laterally inward, such that the left upper mold portion and the right upper mold portion are positioned side by side;

such that upper parts of the left upper mold portion and the right upper mold portion connect around an upper part of the blow pin, and such that lower parts of the left upper mold portion and the right upper mold portion connect around an upper part of the lower mold portion;

such that the blow pin and the heated preform mold protrude into the entire molding cavity formed by the lower mold portion, the left upper mold portion, and the right upper mold portion;

wherein an upper part of the heated preform mold is configured as a pre-molded screw portion of the connectable beverage bottle,

such that the pre-molded screw portion protrudes above the mold device.

15. The molding method of claim 13, further comprising:

- a) removing the blow pin, wherein the blow pin is extracted by a vertical upward movement;
- b) disassembling the mold components, such that:
 - the left upper mold portion and the right upper mold portion are moved laterally outward toward respectively a left side and a right side of the blow pin; and
 - the lower mold portion is moved vertically downwards; and
- c) extracting the connectable beverage bottle.

16. The molding method of claim 12, wherein the lower mold portion further comprises:

- a lower central mold portion, which comprises a penetrating lower central aperture, which is configured to mold a lower central portion of the connectable beverage bottle.

17. The molding method of claim 16, wherein the penetrating lower central aperture is configured with a uniform horizontal cross-sectional shape.

18. The molding method of claim 16, wherein the lower central mold portion is further configured with a vertical mold locking protrusion, which protrudes into a vertical front of the penetrating lower central aperture, wherein the vertical mold locking protrusion is configured to mold a vertical bottle locking indentation of the lower central portion of the connectable beverage bottle.

19. The molding method of claim 18, wherein the lower central mold portion is further configured with a vertical mold locking indentation, which is positioned along a vertical rear of the penetrating lower central aperture, wherein the vertical mold locking indentation is configured to mold a vertical bottle locking protrusion of the lower central portion of the connectable beverage bottle.

20. The molding method of claim 16, wherein the lower mold portion further comprises:

a lower bottom mold portion, which is connected to a bottom of the lower central mold portion, wherein the lower bottom mold portion comprises a lower bottom indentation, which is configured to mold a lower bottom portion of the connectable beverage bottle, such that the penetrating lower central aperture and the lower bottom indentation combine to form the combined lower molding cavity.

21. The molding method of claim 20, wherein the lower mold portion further comprises:

a lower mold support assembly, which is connected to a bottom of the lower bottom mold portion, such that the lower mold support assembly provides support for the lower central mold portion and the lower bottom mold portion;
wherein the lower mold support assembly is configured to connect with a molding machine to enable a vertical movement of the lower mold portion.

22. The molding method of claim 16, wherein the left upper mold portion further comprises:

a left receiving indentation, which is positioned below the left upper molding cavity, wherein the left receiving indentation is configured to receive a left side of the lower central mold portion; and

wherein the right upper mold portion further comprises:

a right receiving indentation, which is positioned below the right upper molding cavity, wherein the right receiving indentation is configured to receive a right side of the lower central mold portion;

such that, when the left upper mold portion and the right upper mold portion are positioned side by side, the left receiving indentation and the

right receiving indentation form a combined receiving cavity, which is configured to receive the lower mold portion.

23. The molding method of claim 22, wherein each of the left receiving indentation and the right receiving indentation are configured as a half cylinder, such that the combined receiving cavity is cylindrical; and wherein an outer vertical surface of the lower mold portion is cylindrical.

24. The molding method of claim 12, wherein the left upper mold portion further comprises:

an upper left penetrating indentation, which is positioned in a left inner side of a left top surface of the left upper mold portion, such that the upper left penetrating indentation penetrates from the left top surface of the left upper mold portion to the left upper molding cavity; and

wherein the right upper mold portion further comprises:

an upper right penetrating indentation, which is positioned in a right inner side of a right top surface of the right upper mold portion, such that the upper right penetrating indentation penetrates from the right top surface of the right upper mold portion to the right upper molding cavity;

such that, when the left upper mold portion and the right upper mold portion are positioned side by side, the upper left penetrating indentation and the upper right penetrating indentation form a combined upper penetrating aperture, which penetrates from a combined top surface of the molding device to the combined upper molding cavity.

25. The molding method of claim 24, wherein the molding device further comprises:

- a) a left removable half-segment, which comprises a left half opening; and
- b) a right removable half-segment, which comprises a right half opening;

wherein the left upper mold portion further comprises:

an upper left surface indentation, which is positioned in the left top surface of the left upper mold portion, such that the upper left surface indentation is configured to form a left ledge along the upper left penetrating aperture;
such that the left removable half-segment is configured to be removably positioned in the upper left surface indentation; and

wherein the right upper mold portion further comprises:

an upper right surface indentation, which is positioned in the right top surface of the right upper mold portion, such that the upper right surface indentation is configured to form a right ledge along the upper right penetrating aperture;
such that the right removable half-segment is configured to be removably positioned in the upper right surface indentation;

such that, when the left upper mold portion and the right upper mold portion are positioned side by side with the left removable half-segment positioned in the upper left surface indentation and the right removable half-segment positioned in the upper right surface indentation:

the left half opening and the right half opening form a combined segment opening, which is aligned with the combined upper penetrating aperture.

26. A connectable beverage bottle made according to the molding method of claim 12, wherein a maximum protrusion width of a vertical bottle locking protrusion of the connectable beverage bottle is in range of 25-35 percent of a maximum bottle width of the connectable beverage bottle.