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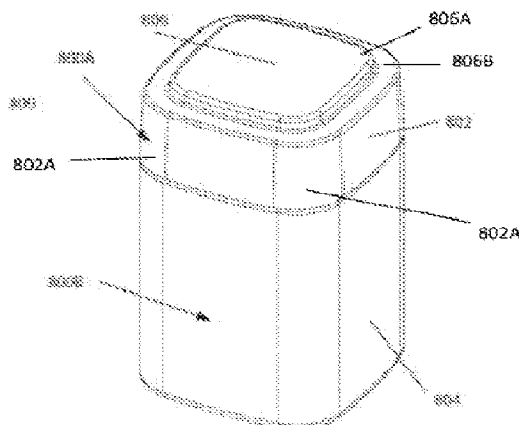
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(54) **Titre : RECIPIENTS ET LEURS PROCEDES D'UTILISATION**
(54) **Title: CONTAINERS AND METHODS OF USING THE SAME**

FIG. 1A



(57) **Abrégé/Abstract:**

Disclosed herein are containers. Also disclosed are methods using the containers and methods of storing substances in containers. The containers suitably have a glass base and a plastic cap and provide for child-resistant containers. A user can releasably remove the cap from base. For example, the user squeezes opposite corners of the container cap, which releases a locking mechanism and allows for removal of the cap by lifting or pulling the container cap off from the container base.



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Abstract:

Disclosed herein are containers. Also disclosed are methods using the containers and methods of storing substances in containers. The containers suitably have a glass base and a plastic cap and provide for child-resistant containers. A user can releasably remove the cap from base. For example, the user squeezes opposite corners of the container cap, which releases a locking mechanism and allows for removal of the cap by lifting or pulling the container cap off from the container base.

CONTAINERS AND METHODS OF USING THE SAME

The present application claims the benefit of U.S. provisional application number 63/195,656 filed June 1, 2021, which is incorporated by reference herein in its entirety.

TECHNICAL FIELD

[0001] The present disclosure relates to glass containers that can be used for storage and provide child-resistant safety features.

BACKGROUND

[0002] Containers intended for storing substances or materials are often designed to prevent opening by a child and yet can be manipulated by adults, including seniors, to gain access to the substance. These “child-resistant” containers are typically used for over the counter and prescription medications. Other child-resistant containers are used for other household items, that are toxic if swallowed or ingested, such as laundry detergent and cleaners. These systems are in place to prevent children from inadvertently gaining access to the contents of these containers.

[0003] Generally, child resistant containers include a multi-step opening process or require steps to be completed simultaneously. A certain level of mental and physical dexterity is required for opening such a container, making it difficult for children to access the contents within. For example, use of a certain amount of pressure or force while a second action is completed is needed to open such a container prevents children from being able to open and access the contents of the container.

[0004] A challenge in creating child resistant containers is making the container easy enough for the elderly and other individuals to be able to use. For example, some child resistant containers offer a screw-cap or pop-top closure, and although they are efficient for child resistance, these devices pose a degree of hardship for individuals with wrist and finger joint inflammation or arthritis.

[0005] Currently available child resistant containers are also often inadequate in protecting the contents from degradation upon exposure to environmental factors such as light including ultraviolet (UV) radiation, moisture, temperature, bacteria, physical damage or air.

[0006] Also, most screw cap medicine containers lack external features favorable for counting, sorting, and stacking and do not allow for efficient inventory management.

SUMMARY

[0007] In view of the above, there remains a need for improved containers that are easy to use for an elderly or disabled individual, while providing child-resistant features. Also, there remains a need for a container where the contents are protected for improved shelf-life, such as being liquid-tight, air-tight, non-stick, or having other desirable properties.

[0008] The present disclosure relates to a container. The container is generally polygonal in shape, for example, generally square, rectangular, diamond, quadrilateral, or rhomboid in shape. Also, parts of the container, such as the container base, are made substantially of glass. Child-resistant glass containers are described in PCT Applications PCT/US2020/017237 and PCT/US2020/017242, the contents of which are hereby incorporated by reference in their entirety.

[0009] The disclosed containers have a container base and a container lid (or cap). The containers provide improved packaging and storage of substances or materials in a controlled environment. The containers provide, for example, an air-tight, liquid-tight, water-tight, humidity-controlled, light-controlled, non-stick, anti-static, or any combination thereof, environment.

[0010] Accordingly, in one aspect, the present disclosure is directed to a container that is child-resistant. In some aspects, the container is not child-resistant. The container includes a substantially symmetrical container base and/or cap. In one aspect, the container is substantially square in shape. The substantially square container preferably has rounded corners.

[0011] In one preferred aspect, a container is provided that comprises: (a) a container base comprising: (i) a closed bottom end; and (ii) an open top end; wherein a base upper portion has a reduced cross-sectional dimension relative to an adjacent base lower portion; (b) a container cap, wherein the cap and base comprise one or more releasable engagement elements on opposing container sides.

[0012] Thus, in a particular embodiment of this aspect, base portions comprise a shoulder or flange portion toward the base top end for nesting and engagement of the cap component.

[0013] In this aspect, the shoulder or flange area suitably can vary in dimension. For instance, the base upper portion cross sectional dimension suitably may be at least 3, 4, 5, 6, 7, 8, 9, 10, 12, 14, 16, 18, 20, 25, 30, 35, 40 or 50 percent less than the cross-sectional dimension of an adjacent base lower portion. In certain aspects, the base upper portion cross sectional dimension is at least 20, 30, 40, 50 or 60 percent the cross-sectional dimension of an adjacent base lower portion. The configuration or shape of base upper portion also may vary. In one preferred embodiment, the flange or shoulder may be substantially perpendicular to the adjacent vertical sidewall of the base lower portion. In another suitable embodiment, the flange or shoulder may be upward sloping from the adjacent vertical sidewall of the base lower portion, for example the flange or shoulder may be configured at greater than a 90 degree angle from the adjacent vertical sidewall of the base lower portion, such as a 95, 100, 105, 110, 120, 130 or 140 or more degree angle with respect to the adjacent vertical sidewall of the base lower portion.

[0014] In certain embodiments, when the cap is engaged with base (i.e. the container is closed with the cap and base releasably locked together) the cap will circumscribe a major portion of the base upper portion outward surface area. For instance, in certain aspects when the cap is engaged with base (i.e. the container is closed with the cap and base releasably locked together) the cap will circumscribe at least about 40, 50, 60, 70, 80 90, 95 or substantially or completely all of the base upper portion outward surface area.

[0015] The base upper portion as referred to herein commences where the base flange or shoulder commences and extends vertically to the base top edge.

[0016] The base upper portion may be a variety of vertical lengths, for example the base upper portion suitably may be 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.2, 1.4, 1.6, 1.8, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 6, 7, 8, 9 or 10 cm or more vertical length. The base upper portion also may constitute varying portions of the total vertical length of the base portion, for example, where the vertical length of the base upper portion is less than 90, 80, 70, 60, 50, 40, 30, 20, 15, 10, or 5 percent of the base total vertical length.

[0017] The container vertical height also suitably may vary, for example where the container vertical length (also referred to herein as the container vertical height) is at least 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 30, 40, 50 cm or more.

[0018] In certain preferred aspects, the cap comprises one or more releasable engagement elements on a total of two cap sides.

[0019] In certain preferred aspects, the container base has corners and the base and cap have corresponding cross-sectional shapes. In certain preferred aspects, the container base has a substantially square cross-sectional shape and preferably both the base and cap portions have substantially square cross-sectional shapes.

[0020] In some embodiments, the container base includes a glass, a polymer glass, a glass-ceramic, a ceramic material, or a combination thereof. For example, the glass is selected from the group consisting of an amber glass, a green glass, an opal glass, and a transparent glass.

[0021] In some embodiments, the child-resistant container further includes a container cap, wherein the container cap is sized and configured to mate with the container base.

[0022] In some embodiments, the container cap includes a polymer, a plastic, or a combination thereof. For example, the polymer includes a thermoplastic elastomer (TPE), a thermoplastic vulcanizate (TPV), a thermoplastic polyurethane (TPU), polypropylene, polypropylene copolymer, ultra-clarified polypropylene, colored polypropylene, PET, PETE, polycarbonate, polystyrene, or a combination thereof.

[0023] In some embodiments, the container cap further includes an annular sealing ring positioned on an inner surface of the top end of the cap. The annular sealing ring includes a thermoplastic elastomer (TPE), a thermoplastic vulcanizate (TPV), or a thermoplastic polyurethane (TPU).

[0024] In certain preferred aspects, the base is substantially glass. The cap suitably may comprise a variety of materials including a polymer or other flexible or deformable material that can enable disengagement of the cap and base portions as disclosed herein, in particular by a user applying pressure on opposing cap sides to thereby disengage the cap and base.

[0025] In some embodiments, the container is substantially air-tight, liquid-tight, light resistant, temperature resistant, moisture resistant, bacteria resistant, tamper resistant, child resistant or a combination thereof.

[0026] Other materials or additives can be added to the container base, container cap or both. For example, in one embodiment, the container cap and/or base further comprise a liner. In some embodiments, the liner is thermoformed, die-cut, or injection molded. In another embodiment, the liner includes a polymer, for example a fluoropolymer. In some embodiments, the fluoropolymer is FEP (fluorinated ethylene propylene), PTFE (polytetrafluoroethylene) or PFA (perfluoroalkoxy alkanes).

[0027] In another embodiment, the container cap and/or base comprise polytetrafluoroethylene (PTFE) coatings. In one embodiment, clear plastisol is applied to an exterior surface of the glass base to prevent breaking and makes the glass opaque. In another embodiment, oleic acid vapor is added to prevent glass from sticking together on production line. In yet another embodiment, SiO₂ vapor is deposited to a plastic cap to provide a flexible layer of glass.

[0028] In some embodiments, the container includes a tamper evident element. For example, the tamper evident element is a seal, a tape, or a combination thereof. In another embodiment, the modular container includes an RFID tag.

[0029] In some embodiments, the child-resistant container includes a writing surface compatible with a pen, a pencil, or a marker.

[0030] In some embodiments, the container cap includes a polymer. For example, the polymer includes a thermoplastic elastomer (TPE), a thermoplastic vulcanizate (TPV), a thermoplastic polyurethane (TPU), polypropylene, polypropylene copolymer, ultra-clarified polypropylene, colored polypropylene, PET, PETE, polycarbonate, polystyrene, or a combination thereof.

[0031] In other aspects, a container base is provided as disclosed, for example a container base comprising: a closed bottom end; an open top end; wherein a base upper portion has a reduced cross-sectional dimension relative to an adjacent base lower portion; and wherein the base comprises on opposing base sides one or more elements for releasable engagement with a cap component. In certain embodiments, the container base may have corners, for example the container base may be substantially square such as where the container base cross-sectional shape is substantially square. In preferred embodiments the container base is configured to provide child-resistant engagement with an associated container cap.

[0032] Another aspect of the present disclosure includes a method of affecting a child-resistant closure of a container. The method includes providing a child-resistant container comprising a container base and a container cap and sliding the container cap over the open end of the container base, wherein the first and second cap engagement elements engage with and couple to the one or more base engagement elements.

[0033] In some embodiments, the method of affecting a child-resistant closure of a container further includes removing the container cap by simultaneously applying about 1 to about 10

pounds of external compression force to opposite sides of the container cap and pulling the container cap off of the container base. In one embodiment, a user applies about 2 to about 8 pounds of external compression force to opposite sides of the container cap and pulling the container cap off the container base. In another embodiment, a user applies about 3 to about 7 pounds of external compression force to opposite sides of the container cap and pulling the container cap off the container base. In another embodiment, a user applies about 4 to about 6 pounds of external compression force to opposite sides of the container cap and pulling the container cap off the container base.

[0034] In preferred aspects, a container provides a substantially air-tight and/or water-tight seal of the container with the cap and base in engaged, closed arrangement. The term air-tight and water-tight is used herein in its customary meaning and may include the ability of the container to restrict airflow in and/or out of the container for extended periods, including the ability to maintain a differential pressure (e.g. maintaining a pressure differential that commences as a positive or negative pressure at least 2, 3, 5, 8, or 10 percent above or below ambient atmospheric pressure) for an extended period such as 1, 6, 12, 24, 48, 72 or 96 hours or longer. Unless otherwise indicated, an air-tight container or seal or a water-tight container or seal as referred to herein is a container seal that does not permit notable water penetration (naked eye inspection) upon submerging the closed container in water for 60 seconds.

[0035] Additional embodiments of the disclosure will be set forth in part in the description which follows. The advantages of the invention will be realized and attained by means of the elements and combinations particularly pointed out in the appended claims. It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only and are not restrictive of the invention, as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0036] Features and advantages of the claimed subject matter will be apparent from the following description of embodiments consistent herewith, which the description should be considered in conjunction with the accompanying drawings.

[0037] FIG. 1A illustrates a side perspective view of an embodiment of a container having a base and a lid. FIG. 1B illustrates a bottom perspective view of the embodiment of the container of FIG. 1A. FIG. 1C illustrates a top view of the embodiment of the container of FIG. 1A. FIG.

1D illustrates a cross-sectional view (Section B-B) of the embodiment of the container of FIG. 1C.

[0038] FIG. 2A illustrates a side view of an embodiment of the container base of FIG. 1A. FIG. 2B illustrates an exploded side view of the embodiment of the container base of FIG. 2A. FIG. 2C illustrates a bottom view of the embodiment of the container base of FIG. 2A. FIG. 2D illustrates a cross-sectional view (Section B-B) of the embodiment of the container base of FIG. 2C.

[0039] FIG. 3 illustrates a bottom perspective view of an embodiment of a container cap of FIG. 1A.

[0040] FIG. 4A illustrates another embodiment of a container having a base and a lid. FIG. 4B illustrates a bottom perspective view of the embodiment of the container base of FIG. 4A. FIG. 4C illustrates a side view of the embodiment of the container base of FIG. 4A. FIG. 4D illustrates a side view of the embodiment of the container of FIG. 4A stacked on another container lid. FIG. 4E illustrates a top view of the embodiment of the container of FIG. 4A. FIG. 4F illustrates a cross-sectional view (Section A-A) of the embodiment of the container of FIG. 4E stacked on another container lid. FIG. 4G illustrates another cross-sectional view (Section C-C) of the embodiment of the container of FIG. 4E stacked on another container lid.

[0041] FIG. 5 illustrates a side view of embodiments of containers having a base and a lid.

DETAILED DESCRIPTION

[0042] The present disclosure relates to containers. The containers are square or substantially square (e.g., having rounded corners and/or sides) in shape. Aspects of present disclosure include methods for using the containers (e.g., for creating child-resistance and for storing or holding a material). The containers can be understood more readily by reference to the following detailed description of the disclosure. It will be apparent to those skilled in the art that various modifications can be made without departing from the scope of the invention.

[0043] As used in the specification and the appended claims, the singular forms “a,” “an” and “the” include plural referents unless the context clearly dictates otherwise. Thus, for example, reference to “an element” includes two or more elements.

[0044] Ranges can be expressed herein as from one particular value, and/or to another particular value. When such a range is expressed, another aspect includes from the one particular

value and/or to the other particular value. Similarly, when values are expressed as approximations, by use of the antecedent ‘about,’ it will be understood that the particular value forms another aspect. It will be further understood that the endpoints of each of the ranges are significant both in relation to the other endpoint, and independently of the other endpoint. It is also understood that there are a number of values disclosed herein, and that each value is also herein disclosed as “about” that particular value in addition to the value itself. For example, if the value “10” is disclosed, then “about 10” is also disclosed. It is also understood that each unit between two particular units are also disclosed. For example, if 10 and 15 are disclosed, then 11, 12, 13, and 14 are also disclosed.

[0045] As used herein, the terms “about” and “at or about” mean that the amount or value in question can be the value designated some other value approximately or about the same. It is generally understood, as used herein, that it is the nominal value indicated $\pm 10\%$ variation unless otherwise indicated or inferred. The term is intended to convey that similar values promote equivalent results or effects recited in the claims. That is, it is understood that amounts, sizes, formulations, parameters, and other quantities and characteristics are not and need not be exact, but can be approximate and/or larger or smaller, as desired, reflecting tolerances, conversion factors, rounding off, measurement error and the like, and other factors known to those of skill in the art. In general, an amount, size, formulation, parameter or other quantity or characteristic is “about” or “approximate” whether or not expressly stated to be such. It is understood that where “about” is used before a quantitative value, the parameter also includes the specific quantitative value itself, unless specifically stated otherwise.

[0046] The terms “first,” “second,” “first part,” “second part,” and the like, where used herein, do not denote any order, quantity, or importance, and are used to distinguish one element from another, unless specifically stated otherwise.

[0047] As used herein, the terms “optional” or “optionally” means that the subsequently described event or circumstance can or cannot occur, and that the description includes instances where said event or circumstance occurs and instances where it does not. For example, the phrase “optionally affixed to the surface” means that it can or cannot be fixed to a surface.

[0048] As used herein, the terms “cap engagement element” and “cap engagement mechanism” are used interchangeably. Similarly, the terms “base engagement element” and “base engagement mechanism” are used interchangeably.

[0049] As used herein the terms “cap” and “lid” are used interchangeably and refers to the closure element that secures over a container base.

[0050] Moreover, it is to be understood that unless otherwise expressly stated, it is in no way intended that any method set forth herein be construed as requiring that its steps be performed in a specific order. Accordingly, where a method claim does not actually recite an order to be followed by its steps or it is not otherwise specifically stated in the claims or descriptions that the steps are to be limited to a specific order, it is no way intended that an order be inferred, in any respect. This holds for any possible non-express basis for interpretation, including matters of logic with respect to arrangement of steps or operational flow; plain meaning derived from grammatical organization or punctuation; and the number or type of aspects described in the specification.

[0051] It is understood that the containers, materials and devices disclosed herein have certain functions. Disclosed herein are certain structural requirements for performing the disclosed functions, and it is understood that there are a variety of structures that can perform the same function that are related to the disclosed structures, and that these structures will typically achieve the same result.

[0052] The containers described herein are configured to be child-resistant. The disclosed containers provide an improved packaging and storage of substances or materials in a controlled environment, providing, for example, an air-tight, liquid-tight, water-tight, humidity-controlled, light-controlled, or any combination thereof, environment. The containers comprise a container base and a container cap. The container base is made up of any suitable material. For example, the base is made from glass (e.g., any non-crystalline amorphous solid) or other glass-like materials (e.g., porcelain, thermoplastics). The container is generally polygonal in shape. For example, the container base and/or container cap are generally square, rectangular, diamond, quadrilateral, triangular, or rhomboid in shape. In some aspects, the container base and/or the container cap is substantially square, square, and/or square with rounded edges. The sides of the container are planar or substantially planar such that they are slightly concave or convex.

[0053] CONTAINERS

[0054] As disclosed herein, the containers generally comprise a base and a cap. The combination and attachment of the base with the cap preferably provides a child-resistant

container. In some embodiments, the base can be attached or tethered to the cap. In other embodiments, the base and the cap are not tethered.

[0055] The cap and the base are sized and shaped to enable attachment with each other. The container is also sized and shaped to provide a container that is substantially air-tight, liquid-tight or both. These properties regulate the amount of air, oxygen, water, water vapor, humidity, and/or liquids that can enter or leave the container when in a closed position. The container can also have light-blocking (e.g., UV) properties. The container can also have other desirable properties, such as non-stick surfaces, anti-static surfaces, tamper resistance, child-resistance, or combinations thereof. The container can also prevent or impede the growth of microorganisms such as bacteria and fungus.

[0056] The base of the container has a neck and a foot or support. The foot or support forms a closed bottom end and the neck forms an open top end. The neck has attachment means (e.g., a cap engagement mechanism) for attaching to a cap. The cap also has attachment means (e.g., a base engagement mechanism) for attaching to a base, such as the neck of the base.

[0057] The overall shape of the container is generally square or square with rounded corners when viewed from the top (e.g., horizontal cross-section). The container is generally square, square with rounded corners, generally rectangular, or rectangular with rounded corners when viewed from the side (e.g., vertical cross-section). The container cap can form a substantially flush side or edge with the base (e.g., the foot or support of the base) when in a closed configuration. The length to width ratio of the base and/or the cap is about 1:1 (i.e., generally square). The height of the base, relative to the length and/or width, can vary and can be smaller or larger than the length and/or width. A height that is substantially the same to the length and width forms a generally cube-shaped structure. A height that is different (e.g., larger or smaller) than the length and width forms a generally rectangular cuboid or rectangular prism shaped structure. Embodiments of the container base and/or container cap are substantially symmetrical in shape.

[0058] In some aspects, the container base is generally a unitary structure. In some aspects, the base neck extends from the support or foot. In some aspects, the diameter of the neck is less than the diameter of the support. When a container cap is placed on a container base, the cap sits flush with the support. This can add to the child-resistance of the container. For example, a flush side can prevent children from getting under the cap by using nails/teeth to open.

[0059] As described herein, the base and/or cap can be composed from a variety of materials. The base generally has a rigid structure. This is generally non-deformable under normal conditions (e.g., user hand strength). The cap generally has a non-rigid or semi-rigid structure. The cap is generally deformable and/or elastic under normal conditions. Non-limiting examples of materials to form a rigid or non-deformable structure includes glass and metals. The container base can be made from glass, polymer glass, glass-ceramic, and/or a ceramic material. For example, the glass can be flint glass, amber glass, green glass, opal glass, transparent glass, recycled glass, tempered glass, soda lime glass, borosilicate glass or others. Non-limiting examples of materials to form a deformable and/or elastic structure includes plastics, polymers, and rubbers.

[0060] As described herein, the container cap is configured to associate with the container base. The container base forms an enclosure for containing materials, and the container cap encloses the open top end of the base. One aspect of the child-resistant container is the container is configured to store, hold and/or preserve a substance or a material as well as providing a mechanism for child-resistance. In a closed configuration, the container is substantially child-resistant, that is, a child would have a difficult time removing the container cap from the container base.

[0061] CONTAINER

[0062] FIGS. 1-5 illustrate various embodiments of the containers described herein. The container base is generally symmetrical in shape. For example, the container base has a length (i.e., height) to width ratio of about 1:1, 1.5:1, 2:1, 2.5:1, 3:1, 3.5:1, 4:1, 1:1.5, 1:2, 1:2.5 or 1:3. In some embodiments, the base is generally polygonal in shape. In some embodiments, the container base is generally square, rectangular, diamond, quadrilateral, or rhomboid in shape. In one some embodiment, the container base is substantially square, square, and/or square with rounded edges. The sides, edges and/or corners of the container base can have a slight curvature, such that the base is generally and substantially square in shape with rounded corners or edges. The containers described herein have features to make them child-resistant. Other features will be readily apparent in light of the foregoing.

[0063] The container bases described herein can be sized and configured so that the base (e.g., cavity or internal capacity) has a total storage volume of about 1 ml (milliliter) to about 2000 ml, about 2 ml to about 1000 ml, about 3 ml to about 500 ml, about 4 ml to about 100 ml,

about 5 ml to about 50 ml, or about 5 ml to about 10 ml. In some embodiments, the volume of the container base is 1 ml, 2 ml, 3 ml, 4 ml, 5 ml, 6 ml, 7 ml, 8 ml, 9 ml, 10 ml, 11 ml, 12 ml, 13 ml, 14 ml, 15 ml, 16 ml, 17 ml, 18 ml, 19 ml, 20 ml, 25 ml, 30 ml, 40 ml, 50 ml, 60 ml, 70 ml, 80 ml, 90 ml, 100 ml, 150 ml, 200 ml, 250 ml, 300 ml, 350 ml, 400 ml, 450 ml, 500 ml, 600 ml, 700 ml, 750 ml, 1000 ml, 1250 ml, 1500 ml, or 2000 ml. In some embodiments, the storage volume of the container base is less than 1 ml or greater than 2000 ml. References herein to an internal capacity or volume include volumes that include a dimension “b” as exemplified by that vertical height b depicted in FIG. 2A.

[0064] Jar Container

[0065] Child-resistant container 800 as generally depicted in FIGS. 1A-1D is a preferred embodiment of the containers described herein. The preferred container cap 800A has planer sidewalls 802 with preferred rounded corners 802A to provide a substantially square cross-sectional shape of container 800. As shown in FIG. 1A, preferred cap 800A has a raised surface or elevated portion 806 and a ramp 806A that slopes to a shoulder portion 806B. Each of elevated portion 806, ramp 806A and shoulder 806B define a closed top end of the container cap 800A.

[0066] Container base 800B has sides 800B, cap engagement sidewalls 802 with radially-extending lip or flange 802A disposed on the base outer surface and defining the distal end of sidewalls 802. Base 800B has closed bottom end 810 which may be a separate component or integral member that mates with base bottom face 815 as shown in FIG. 1D. Base 800B provides cavity 806 for storing of materials as discussed.

[0067] FIGS. 2A-2D depict preferred containers that include container base 904 and cap 909 stacked on each other. Container base 904 at top portions 914A and 914B forms recessed shoulder portion 915A and 915B on which cap element 909 may be mounted.

[0068] As discussed, the size or surface areas of the shoulder or flange 915A and 915B may vary. Thus, for instance, the base upper portion cross sectional dimension (i.e., in FIG. 2A, cross-sectional dimension less d and d') suitably may be at least 3, 4, 5, 6, 7, 8, 9, 10, 12, 14, 16, 18, 20, 25, 30, 35, 40 or 50 percent less than the cross-sectional dimension of an adjacent base lower portion. In certain aspects, the base upper portion cross sectional dimension is at least 20, 30, 40, 50 or 60 percent the cross-sectional dimension of an adjacent base lower portion (in FIG. 2A, the cross-sectional dimension of an adjacent base lower portion shown in length e). The

configuration or shape of base upper portion also may vary. In one preferred embodiment, the flange or shoulder may be substantially perpendicular to the adjacent vertical sidewall of the base lower portion as generally depicted in FIG. 2A. In another suitable embodiment, the flange or shoulder may be upward sloping from the adjacent vertical sidewall of the base lower portion, for example the flange or shoulder may be configured at greater than a 90 degree angle from the adjacent vertical sidewall of the base lower portion, such as a 95, 100, 105, 110, 120, 130 or 140 or more degree angle with respect to the adjacent vertical sidewall of the base lower portion.

[0069] As discussed, in certain preferred embodiments, when the cap is engaged with base (i.e. the container is closed with the cap and base releasably locked together) the cap will circumscribe a major portion of the base upper portion outward surface area. For instance, in certain aspects when the cap is engaged with base (i.e. the container is closed with the cap and base releasably locked together) the cap will circumscribe at least about 40, 50, 60, 70, 80 90, 95 or substantially or completely all of the base upper portion outward surface area shown as the surface area in area a in FIG. 2A.

[0070] As discussed, the base upper portion may be a variety of vertical lengths (shown as vertical height or length a in FIG. 2A, for example the base upper portion suitably may have a vertical length of 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.2, 1.4, 1.6, 1.8, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 6, 7, 8, 9 or 10 cm or more. The base upper portion also may constitute varying portions of the total vertical length of the base portion, for example, where the vertical length of the base upper portion (length a in FIG. 2A) is less than 90, 80, 70, 60, 50, 40, 30, 20, 15, 10, or 5 percent of the base total vertical length (base total vertical length or height shown as c in FIG. 2A). As discussed, the container vertical height also suitably may vary, for example where the container vertical length (also referred to herein as the container vertical height) is at least 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 30, 40 or more cm.

[0071] Container or base shoulder width shown as width d in FIG. 2A suitably may vary and may be at least about 0.5, 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10 mm. In certain embodiments, shoulder width d may be less than 100, 90, 80, 70, 60, 50, 40, 30 or 20 mm. Cap 909 includes engagement elements 913 which suitably are plurality of teeth elements such as 2, 3, 4, 5 or more teeth elements that can mate with an engagement element of base 904 that can releasably engage such teeth elements.

[0072] Referring to FIG. 3, in one embodiment, cap 900A has top 902, inner top surface 915, and locking teeth sets 907A, 907B, 907C and 907D. As depicted in FIG. 3, engagement locking teeth sets 907A, 907B, 907C and 907D are positioned on each side of an inner surface of cap 900A. Each of the teeth sets on a cap side suitably has a plurality of individual teeth elements, such as 2, 3, 4, 5 or more teeth elements.

[0073] FIGS. 4A shows an additional preferred container 900 that includes cap 900A and base 900B. Engagement actuator 914 disposed on opposing side of base 900B can be pressed with a user's fingers to unlock releasably engaged cap 900A and base 900B components.

[0074] FIGS. 4B-4G show a further preferred container 1000 that includes base 1000B with teeth elements 1008 for releasably engaging cap 1000A planar walls 1004 with preferred rounded corners 1020A, 1020B, 1020C and 1020D. Base 1000B includes one or more footings 1018, such as footings 1018A, 1018B, 1018C and 1018D with a single footing positioned at each corner of the bottom surface of a substantially square or rectangular shaped container.

Preferred footings are configured to firmly engage a supporting underlying surface such as a counter, tabletop and the like. Container also may include a further engaging element 1009.

[0075] FIG. 5 shows front views of preferred containers 1000A, 1000B, 1000C and 1000D of varying sizes and holding volumes.

[0076] COMPOSITIONS

[0077] The containers, including the container base and container cap, described herein can be formed of glass (e.g., any non-crystalline amorphous solid), a plastic, a polymer, combinations thereof, or any other suitable material.

[0078] The container base can be made of any suitable material. Generally, the base has a generally rigid and/or non-deformable structure. Suitable materials include, for example, glass (e.g., any non-crystalline amorphous solid), other glass materials, recycled glass, polymer glass, glass-ceramic, plexiglass, ceramic material, metal, metal-alloy, or combinations thereof. Examples of suitable glass used to construct the container base includes, but is not limited to, flint glass, amber glass, green glass, opal glass, transparent glass, recycled glass, tempered glass, soda lime glass, borosilicate glass and others. The glass can be colored, patterned, textured, clear, and/or opaque.

[0079] The container cap can be made of any suitable material. Generally, the cap has a generally non-rigid or semi-rigid and/or deformable structure. Suitable materials include, for

example, plastics, recycled plastic, plastic composite, reinforced plastic, polymers, cardboard, recycled materials, or combinations thereof. For example, suitable polymers and plastics include, but is not limited to, a thermoplastic, a thermoplastic elastomer (TPE), a thermoplastic vulcanizate (TPV), a thermoplastic polyurethane (TPU), polypropylene, polypropylene copolymer, ultra-clarified polypropylene, colored polypropylene, polyethylene terephthalate (PET or PETE), fluorinated ethylene propylene (FEP), acrylonitrile butadiene styrene, polystyrene (PS), high-impact polystyrene, polycarbonate (PC), polyvinyl chloride (PVC), high density polyethylene, polytetrafluoroethylene, polychlorotrifluoroethylene, phenol-formaldehyde resin, para-aramid, polyethylene terephthalate, polychloroprene, polyamide, polyacrylonitrile, copolyimide, aromatic polyester, poly-p-phenylene-2,6-benzobisoxazole, resin, wood, rubber, elastomeric rubber, silicone, vulcanized rubber or combinations thereof.

[0080] The plastic can be injection molded, thermoformed, vacuum formed, or manufactured in any way suitable to make the components described herein to achieve the desired functionality.

[0081] Other materials or additives can be added to the container (e.g., the base and/or cap). For example, an antimicrobial additive can be added. Other additives can include as oxo-degradable additives, biodegradable additives, UV-resistance additives, and anti-static additives.

[0082] The container cap and/or base can also have polytetrafluoroethylene (PTFE) coatings. Clear plastisol can be applied to an exterior surface of a glass base which helps prevent breaking and makes the glass opaque. Oleic acid vapor is added to prevent glass from sticking together on production line. Silicon dioxide (SiO₂) vapor is deposited to provide plastic caps with a flexible layer of glass.

[0083] The container base and/or the container cap can have an UV resistant or blocking material. The container base and/or the container cap are composed of a material having complete opacity. Complete opacity or an opaque material is described herein as exhibiting 100% opacity, wherein the material is light impermeable. In certain embodiments the base or the cap or both are composed of a material having less than complete opacity. Such material can include characteristics having 90%, 80%, 70%, 60%, 50%, 40%, 30%, 20% 10% or 0% opacity, or any range in between. In certain embodiments, the container cap and/or base is completely opaque, and light protective. In some embodiments the container cap and/or base is transparent,

wherein the opacity is less than 100%. In some embodiments the container cap and/or base is transparent, wherein the opacity about 0% to about 10%.

[0084] In various embodiments, the container cap and/or the container base, are protected by a removable sleeve. The removable sleeve can be opaque. The removable sleeve can be UV-resistant. In some embodiments the removable sleeve is moisture resistant. In some embodiments the removable sleeve is light impermeable. In some embodiments the removable sleeve comprises surface markings for product identification, security notice or any combination thereof.

[0085] OTHER COMPONENTS

[0086] The container can include a tamper evident element. The tamper evident element can be found anywhere on the child-resistant containers, such as the base, the cap or both. For example, the tamper evident element is a break-away component. The break-away component can be a seal, a tape, or a combination thereof. The tamper evident element can be a shrink band.

[0087] The modular containers can further comprise a product identification, a manufacturer's note, a radio frequency identification (RFID) tag, near-field communication (NFC) tag, barcode, or a combination thereof.

[0088] In some embodiments, the parts of the containers further comprise a writing surface compatible with a pen, a pencil, or a marker. In some embodiments, the containers further comprise a space available for a specialty material or a surface application to easily remove stickers and labels without leaving residue.

[0089] In some embodiments, the modular containers further comprise one or more sensors. For example, any sensor can be used in the modular container storage system such as an environmental sensor (e.g., a humidity sensor, an oxygen sensor, a temperature sensor, a barometric pressure sensor, a light sensor), a gyroscope, an accelerometer, a global positioning sensor (GPS) sensor, a magnetometer, a proximity sensor, a fingerprint sensor, and a retinal sensor.

[0090] In some embodiments, the container includes one or more other components, e.g., a ring that engages in the inner cap component. For example, suitable materials for these components include, for example, plastics, recycled plastic, plastic composite, reinforced plastic, polymers, cardboard, recycled materials, or combinations thereof. For example, suitable polymers and plastics include, but is not limited to, a thermoplastic, a thermoplastic elastomer

(TPE), a thermoplastic vulcanizate (TPV), a thermoplastic polyurethane (TPU), polypropylene, polypropylene copolymer, ultra-clarified polypropylene, colored polypropylene, polyethylene terephthalate (PET or PETE), fluorinated ethylene propylene (FEP), acrylonitrile butadiene styrene, polystyrene (PS), high-impact polystyrene, polycarbonate (PC), polyvinyl chloride (PVC), high density polyethylene, polytetrafluoroethylene, polychlorotrifluoroethylene, phenol-formaldehyde resin, para-aramid, polyethylene terephthalate, polychloroprene, polyamide, polyacrylonitrile, copolyimide, aromatic polyester, poly-p-phenylene-2,6-benzobisoxazole, resin, wood, rubber, elastomeric rubber, silicone, vulcanized rubber or combinations thereof

[0091] METHODS OF USING AND STORING

[0092] The present disclosure relates to a method for packaging and/or storing a material. The method of packaging comprises providing a child-resistant container and introducing the material into the container.

[0093] The material being packaged can be a material sensitive to one or more environmental factors. Sensitivities include, but is not limited to, air, water, oxygen, light, UV, temperature, bacteria, other microorganisms, or combinations thereof. For example, the material is a consumer product, pharmaceutical, nutraceutical, herbal material, botanical material, food product, animal-based product, plant-based product, or the like. The containers disclosed herein create a substantially air-tight seal, liquid-tight seal or a both.

[0094] The cap engagement mechanism and base engagement elements are configured to cooperatively engage in a locked position that releasably secures the container cap to the container base in a closed position in which the open end of the base is covered by the cap prohibiting access to the open cavity. Securing the container cap on the container base comprises the following steps: sliding and pressing the container cap over the open end of the container base along the long axis of the container. The container is locked by sliding and pressing the cap over the cap engagement mechanisms of the container base, until an audible noise is heard as well as a tactile snap. In other words, the sides of the container cap have to be pressed with a force sufficient to overcome the hindrance of the base engagement elements and then settle in a secure base-cap engagement, such that the base engagement elements of the container cap fit within or around the cap engagement mechanism. This forms a secure coupling of the base engagement element of the container cap and the cap engagement mechanism of the container

base. Additional grooves and ridges can be included in order to increase the hardship or complexity of accessing the contents or using the container.

[0095] In some embodiments the complete coupling of the base engagement mechanism and the cap engagement element is designed to release an acoustic signal, a snap-sound, which lets the operator know that the cap is secure on the base and thereby the contained elements are secure in the child-resistant container.

[0096] Visual signals are provided on the surface of the container which correspond to the site and direction of force to be applied. For example, one or more markings are provided on the surface of the container base, designating the side of the container base that does not have the cap engagement mechanisms. The markings correspond to application of pulling force on the container cap to dissociate the cap from the base, while the container base is held by another hand.

[0097] To access the contents from a closed container, application of a predetermined amount of compression force inward on two opposing sides of the cap is necessary. For example, the method of affecting a child-resistant closure of a container further comprises removing the container cap by simultaneously applying compression force on opposite sides of the container cap. One would press two opposing sides of the cap not having the cap engagement mechanism, and resiliently reduce a first width of the cap along a compression axis to a second width, which releases the cap engagement mechanism from the base engagement element. This frees the cap from the pressure of the ramps and/or ridges on the sides of the base. In one embodiment, the predetermined amount of force can be applied to a position on opposed caps sides adjacent to the cap engagement elements. The markings on the container base constitute the visual indicator of the side for the application of the compression force in order to open the container. The container cap and container base can be uncoupled from the closed position by axially pulling the container cap away from the container base along a longitudinal axis of the container. The pulling can occur after the engagement elements are in an unlocked position.

[0098] The predetermined amount of force is between about 1 to about 10 pounds of external compression force to the container cap and pulling the container cap off of the container base. In one embodiment, a user applies about 2 to about 8 pounds of external compression force to the container cap and pulling the container cap off the container base. In another embodiment, a

user applies about 3 to about 7 pounds of external compression force to the container cap and pulling the container cap off the container base. In another embodiment, a user applies about 4 to about 6 pounds of external compression force to the container cap and pulling the container cap off the container base. In some embodiments, the predetermined amount of force is 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or more pounds of external compression force. In some embodiments, the predetermined amount of force is at least about 3 pounds, at least about 4 pounds, at least about 5 pounds, at least about 6 pounds, or at least about 7 pounds.

[0099] The cap engagement mechanism and base engagement element can be configured to disengage from a locked position to an unlocked position in which the container cap and container base can be uncoupled from a closed position to an open position such that the open cavity of the container is accessible. A change from a locked position to an unlocked position is achieved by radially inwardly applying a predetermined amount of compression force at two opposing sides of the cap to resiliently reduce a first width of the cap along a compression axis to a second width, where the second width is slightly less than the first width. In some embodiments, the predetermined amount of force can be applied to a position on opposing base sides, wherein, at least one side of the base comprises the cap engagement mechanism. The cap and base can be uncoupled from the closed position by pulling apart the cap along a longitudinal axis of the container by simultaneously applying a predetermined force of compression on two opposing sides of the cap, where at least one of the two opposing sides comprises the cap engagement mechanism, and pulling the cap away from the base along the longitudinal axis. In still other embodiments, the cap can be pulled using cap sides corresponding to a position parallel to the expansion axis. In some embodiments, the reduction is from a first width to a second width, where the second width is less than the first width, and the second width expands to the first with resiliently upon release of pressure.

[0100] The present disclosure relates, in various embodiments, to containers and devices for storing substances of restricted use. The consumer Product Safety Commission (CSPC, www.cspc.gov) provides guidance for packaging drugs and other controlled substances for special child-resistant and senior friendly packaging (CRP). The CSPC also administers the Poison Prevention Packaging Act of 1970 (PPPA), 15 U.S.C. § 1471-1476. Substances for restricted use as intended in this application include but are not limited to tobacco, medicines or federally controlled substances, nutraceuticals or vitamins. The substance may be sensitive to

environmental exposure and is liable to decay, decomposition, loss of desirable property upon exposure, for example, pharmaceutical medications, herbal products, botanical products. A substance for storage in a container of the present disclosure may include but is not limited to one or more of the components or drugs classified under Schedules I, II, III, or Schedule IV in the Controlled Substance Act (CSA) by the Drug Enforcement Authority of the United States of America (<https://www.dea.gov/druginfo/ds.shtml>): combination products with less than 15 milligrams of hydrocodone per dosage unit (Vicodin®), cocaine, methamphetamine, methadone, hydromorphone (Dilaudid®), meperidine (Demerol®), oxycodone (OxyContin®), fentanyl, Dexedrine®, Adderall®, and Ritalin®; products containing less than 90 milligrams of codeine per dosage unit (Tylenol® with codeine), ketamine, anabolic steroids, testosterone; or products including Xanax®, Soma®, Darvon®, Darvocet®, Valium®, Ativan®, Talwin®, Ambien®, Tramadol.

[0101] The disclosure provides a method of storing a material in a child resistant container. The method involves providing a child-resistant container comprising a container base having a cap engagement element and a container cap having a base engagement element, wherein the cap engagement element is configured to engage and reversibly couple to the base engagement element cooperatively; introducing the material in the base; and securing the cap over the base, wherein the cap engagement element engages and couples to the base engagement element to form a child-resistant container.

[0102] The teachings of all patents, published applications and references cited herein are incorporated by reference in their entirety.

[0103] While this invention has been particularly shown and described with references to example embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the scope of the invention encompassed by the appended claims.

CLAIMS

What is claimed is:

1. A container comprising:
 - (a) a container base comprising:
 - a closed bottom end;
 - an open top end;
 - wherein a base upper portion has a reduced cross-sectional dimension relative to an adjacent base lower portion;
 - (b) a container capwherein the cap and base comprise one or more releasable engagement elements on opposing container sides.
2. The container of claim 1 wherein the container is child-resistant.
3. The of claim 1 or 2 wherein the base upper portion cross sectional dimension is less than the cross-sectional dimension of an adjacent base lower portion.
4. The container of any one of claims 1 through 3 wherein the base upper portion cross sectional dimension is at least 3 percent less than the cross-sectional dimension of an adjacent base lower portion.
5. The container of any one of claims 1 through 3 wherein the base upper portion cross sectional dimension is at least 10 percent less than the cross-sectional dimension of an adjacent base lower portion.
6. The container of any one of claims 1 through 3 wherein the base upper portion cross sectional dimension is at least 20 percent less than the cross-sectional dimension of an adjacent base lower portion.

7. The container of any one of claims 1 through 3 wherein the base upper portion cross sectional dimension is at least 25 percent less than the cross-sectional dimension of an adjacent base lower portion.
8. The container of any one of claims 1 through 3 wherein the base upper portion cross sectional dimension is at least 30 percent less than the cross-sectional dimension of an adjacent base lower portion.
9. The container of any one of claims 1 through 3 wherein the base upper portion cross sectional dimension is at least 40 percent less than the cross-sectional dimension of an adjacent base lower portion.
10. The container of any one of claims 1 through 3 wherein the base upper portion cross sectional dimension is at least 50 percent less than the cross-sectional dimension of an adjacent base lower portion.
11. The container of any one of claims 1 through 10 wherein the cap engaged with the base circumscribes at least 50 percent portion of the base upper portion outward surface area.
12. The container of any one of claims 1 through 10 wherein the cap engaged with the base circumscribes at least about 80 percent of the base upper portion outward surface area.
13. The container of any one of claims 1 through 10 wherein the cap engaged with the base circumscribes at least about 90 percent of the base upper portion outward surface area.
14. The container of any one of claims 1 through 13 wherein the vertical length of the base upper portion is less than 90 percent of the base total vertical length.
15. The container of any one of claims 1 through 13 wherein the vertical length of the base upper portion is less than 70 of the base total vertical length.

16. The container of any one of claims 1 through 13 wherein the vertical length of the base upper portion is less than 50 of the base total vertical length.
17. The container of any one of claims 1 through 13 wherein the vertical length of the base upper portion is less than 30 of the base total vertical length.
18. The container of any one of claims 1 through 13 wherein the vertical length of the base upper portion is less than 25 of the base total vertical length.
19. The container of any one of claims 1 through 13 wherein the vertical length of the base upper portion is less than 20 of the base total vertical length.
20. The container of any one of claims 1 through 19 wherein the container vertical height is at least about 4 cm.
21. The container of any one of claims 1 through 19 wherein the container vertical height is at least about 8 cm.
22. The container of any one of claims 1 through 19 wherein the container vertical height is at least about 12 cm.
23. The container of any one of claims 1 through 19 wherein the container vertical height is at least about 15 cm.
24. The container of any one of claims 1 through 19 wherein the container vertical height is at least about 25 cm.
25. The container of any one of claims 1 through 24 wherein the cap comprises one or more releasable engagement elements on a total of two cap sides.

26. The container of any one of claims 1 through 24 wherein the cap comprises one or more releasable engagement elements on more than two cap sides.
27. The container of any one of claims 1 through 24 wherein the cap comprises one or more releasable engagement elements on four cap sides.
28. The container of any one of claims 1 through 27 wherein the base comprises one or more releasable engagement elements on each base side.
29. The container of any one of claims 1 through 27 wherein the base comprises one or more releasable engagement elements on a total of two base sides.
30. The container of any one of claims 1 through 29 wherein the base comprises glass.
31. The container of any one of claims 1 through 29 wherein the base is a glass structure.
32. The container of any one of claims 1 through 31 wherein the cap comprises a polymer.
33. The container of any one of claims 1 through 32 wherein a user applying pressure on opposing cap sides disengages the cap from the base.
34. The container of any one of claims 1 through 33 wherein the cap is deformable by a user applying pressure on opposing cap sides to thereby disengage the cap and base.
35. The container of any one of claims 1 through 33 engagement of the cap and base provides a substantially water-tight seal of the container.
36. The container of any one of claims 1 through 35 wherein the container has an internal volume of at least about 1 ml.
37. The container of any one of claims 1 through 35 wherein the container has an internal volume of at least about 30 ml.

38. The container of any one of claims 1 through 35 wherein the container has an internal volume of at least about 100 ml.
39. The container of any one of claims 1 through 35 wherein the container has an internal volume of at least about 500 ml.
40. The container of any one of claims 1 through 39 wherein the container base is substantially square.
41. The container of any one of claims 1 through 40 wherein the container base cross-sectional shape is substantially square.
42. The container of any one of claims 1 through 41 wherein the container base has corners.
43. The container of any one of claims 1 through 42 wherein the container base a cross-sectional shape that has corners.
44. The container of any one of claims 1 through 43 wherein the container cap is substantially square.
45. The container of any one of claims 1 through 44 wherein the container cap cross-sectional shape is substantially square.
46. The container of any one of claims 1 through 45 wherein the container cap has corners.
47. The container of any one of claims 1 through 46 wherein the container cape a cross-sectional shape that has corners.
48. The container of any one of claims 1 through 39 wherein the container base is substantially circular or oval.

49. A child-resistant container comprising:
- (a) a glass container base comprising:
 - a closed bottom end having a substantially square cross-sectional shape;
 - an open top end;
 - wherein a base upper portion has a reduced cross-sectional dimension relative to an adjacent base lower portion;
 - (b) a container cap
- wherein the cap and base comprise one or more releasable engagement elements on opposing container sides.
50. A container comprising:
- (a) a container base that comprises:
 - a closed bottom end;
 - an open top end;
 - wherein a base upper portion has a reduced cross-sectional dimension relative to an adjacent base lower portion;
 - wherein the base comprises on opposing base sides one or more elements for releasable engagement with a cap component.
51. The container of claim 50 wherein the container base is substantially square.
52. The container of claim 50 wherein the container base cross-sectional shape is substantially square.
53. The container of claim 50 wherein the container base has corners.
54. The container of any one of claims 50 through 53 wherein the container base is configured to provide child-resistant engagement with an associated container cap.

FIG. 1A

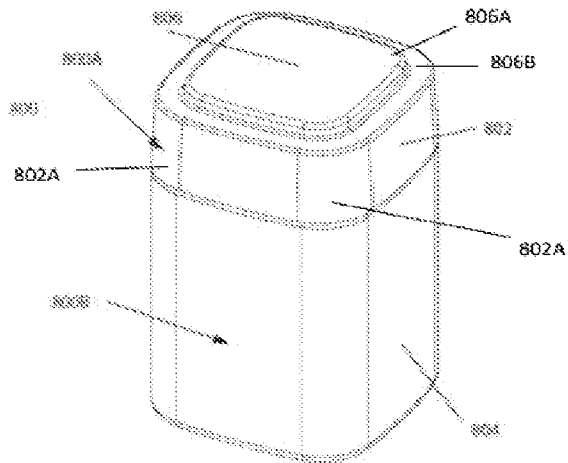


FIG. 1B

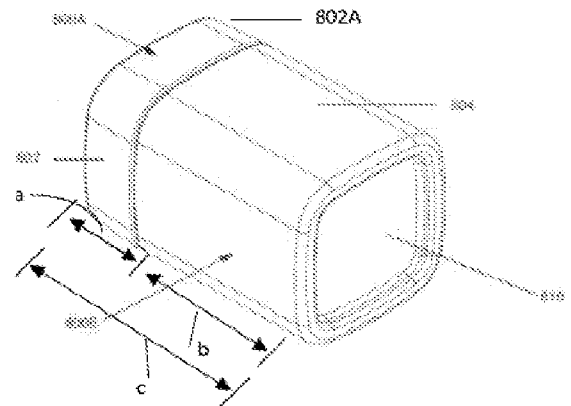


FIG. 1C

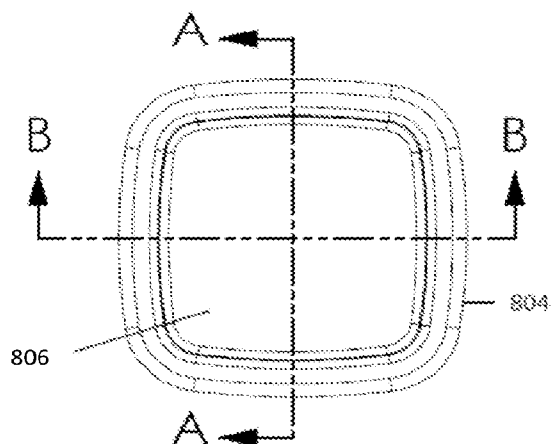


FIG. 1D

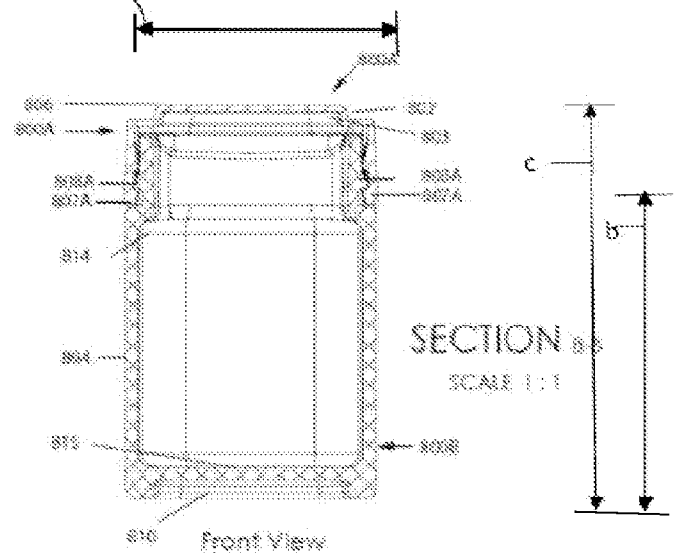


FIG. 2A

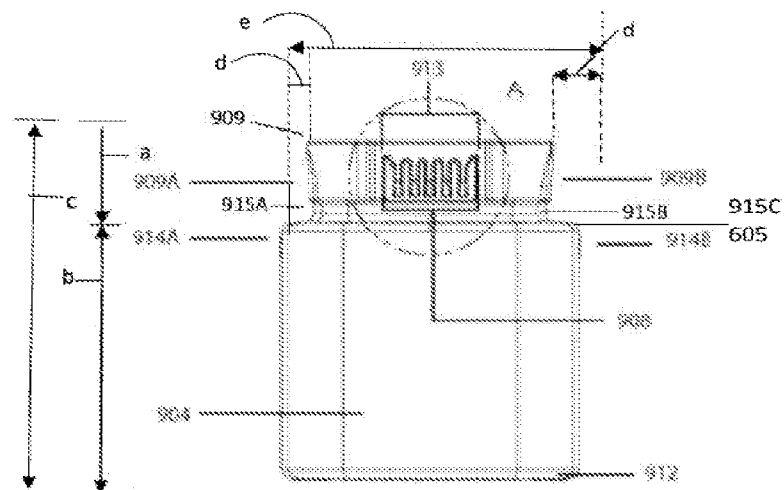


FIG. 2B

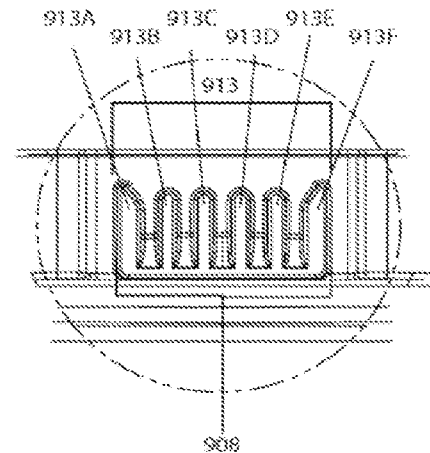


FIG. 2C

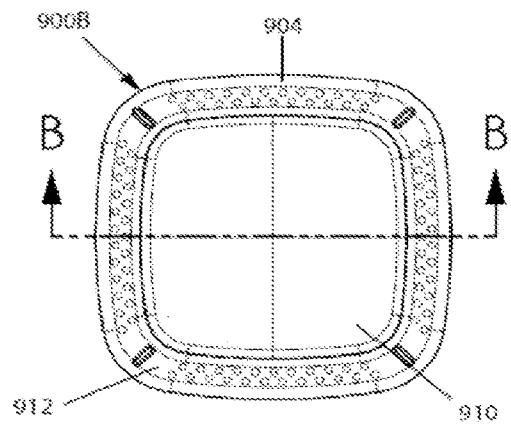


FIG. 2D

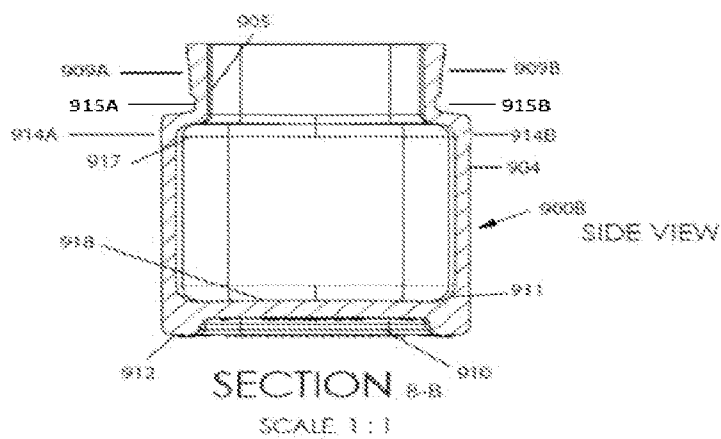


FIG. 3

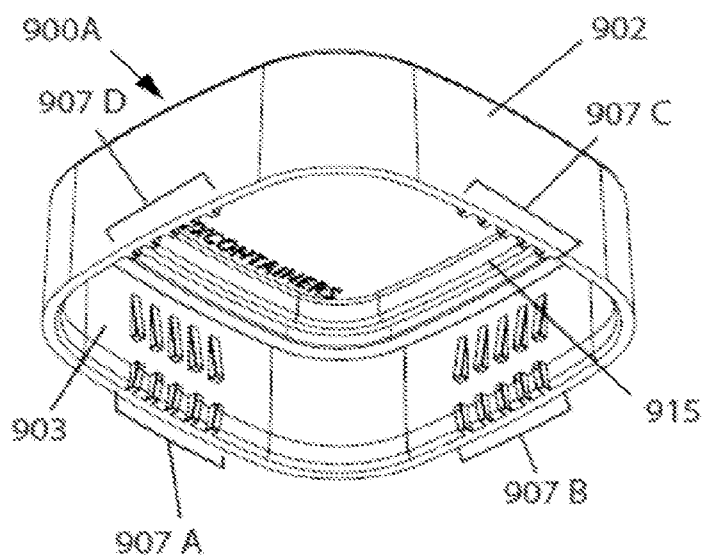


FIG. 4A

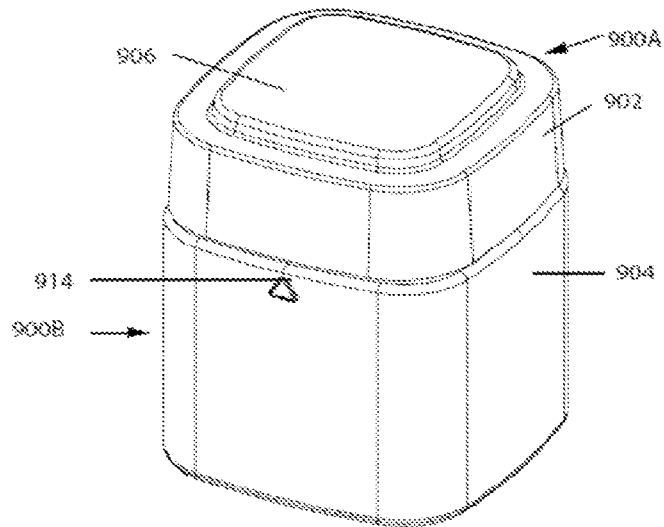


FIG. 4B

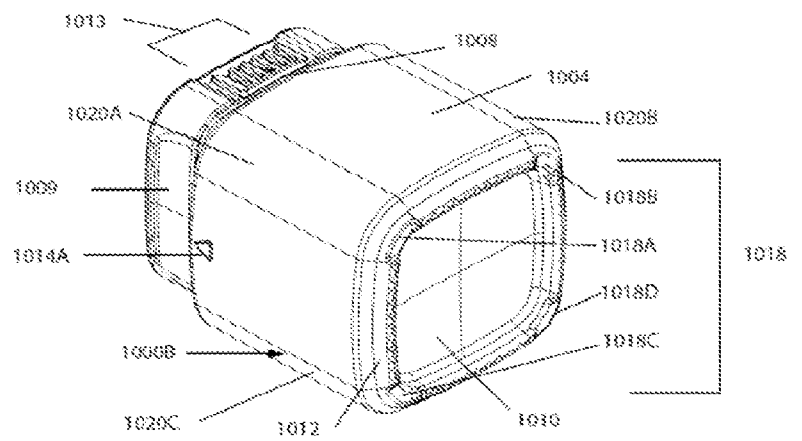


FIG. 4C

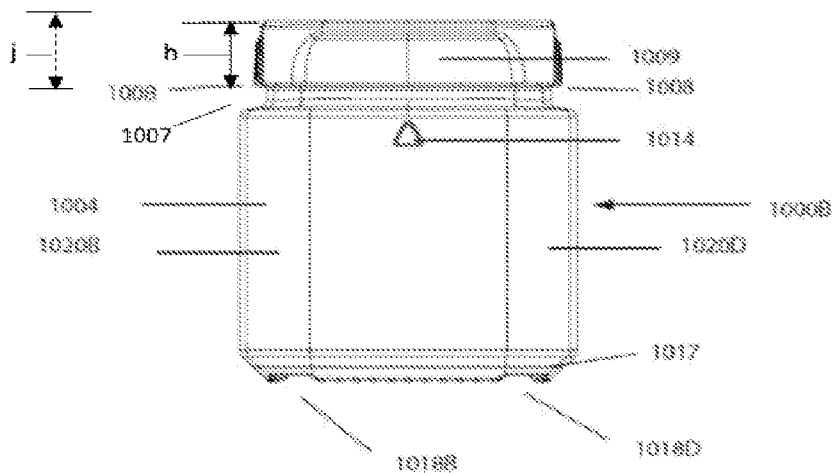


FIG. 4D

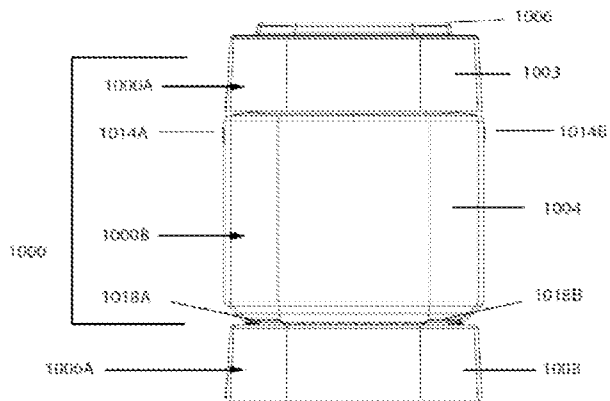


FIG. 4E

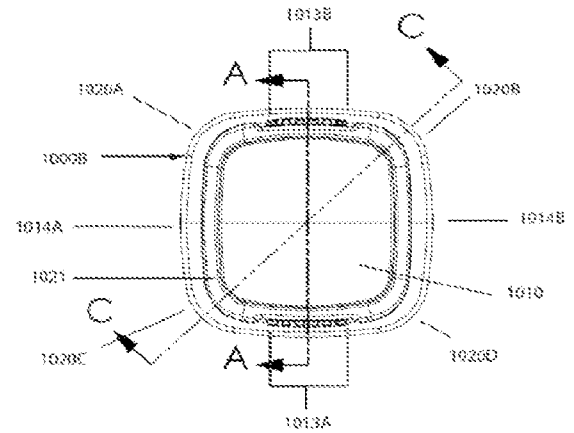


FIG. 4F

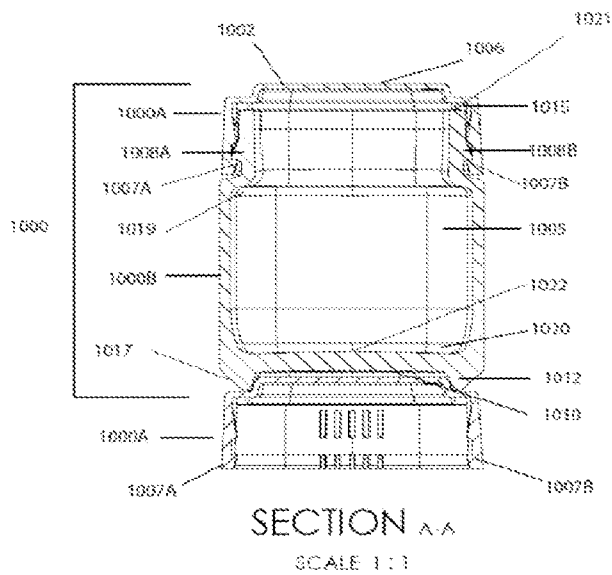


FIG. 4G

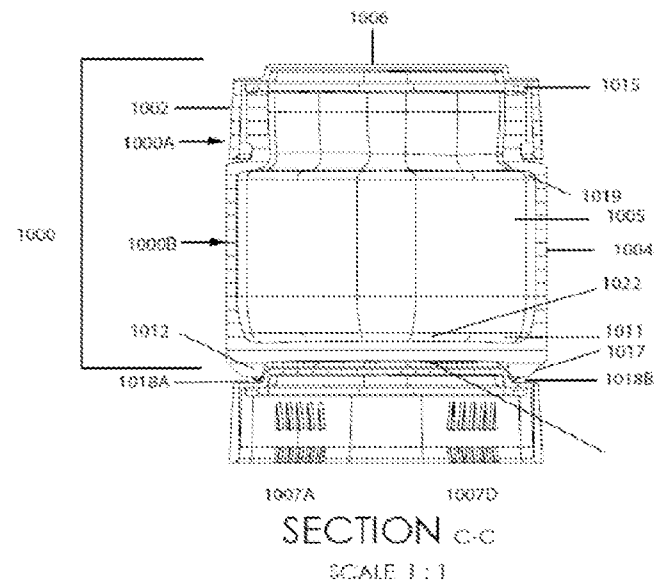
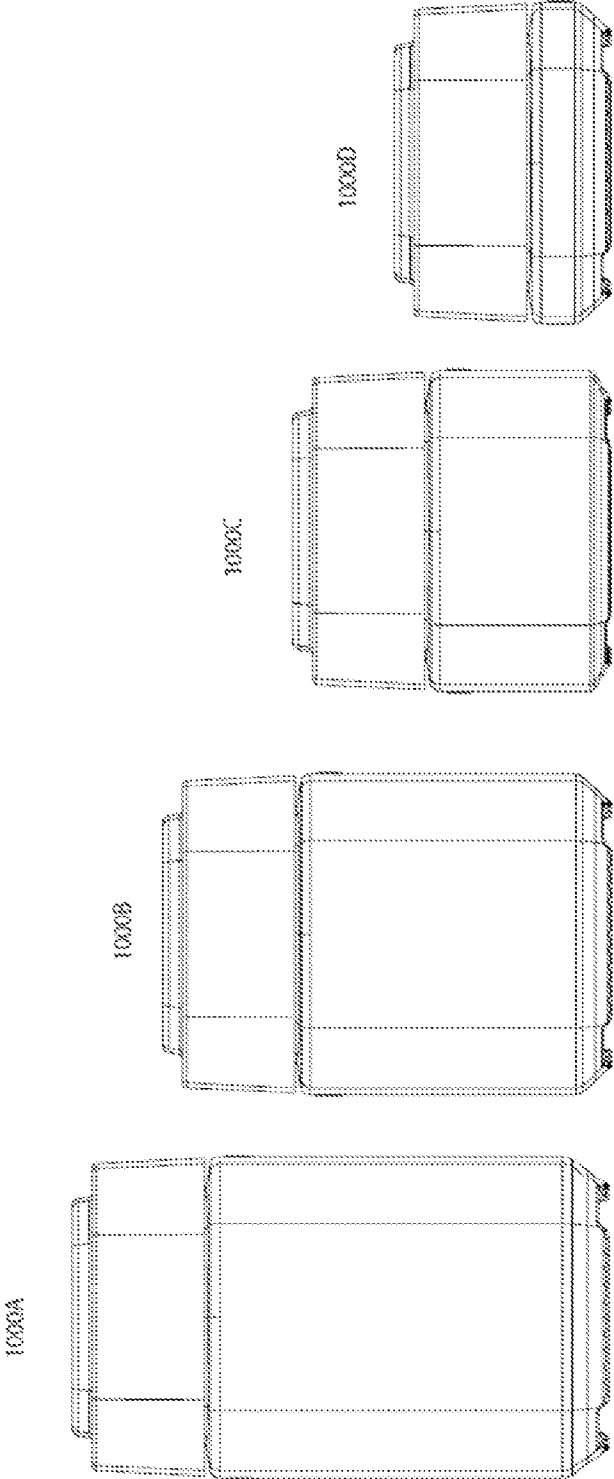


FIG. 5



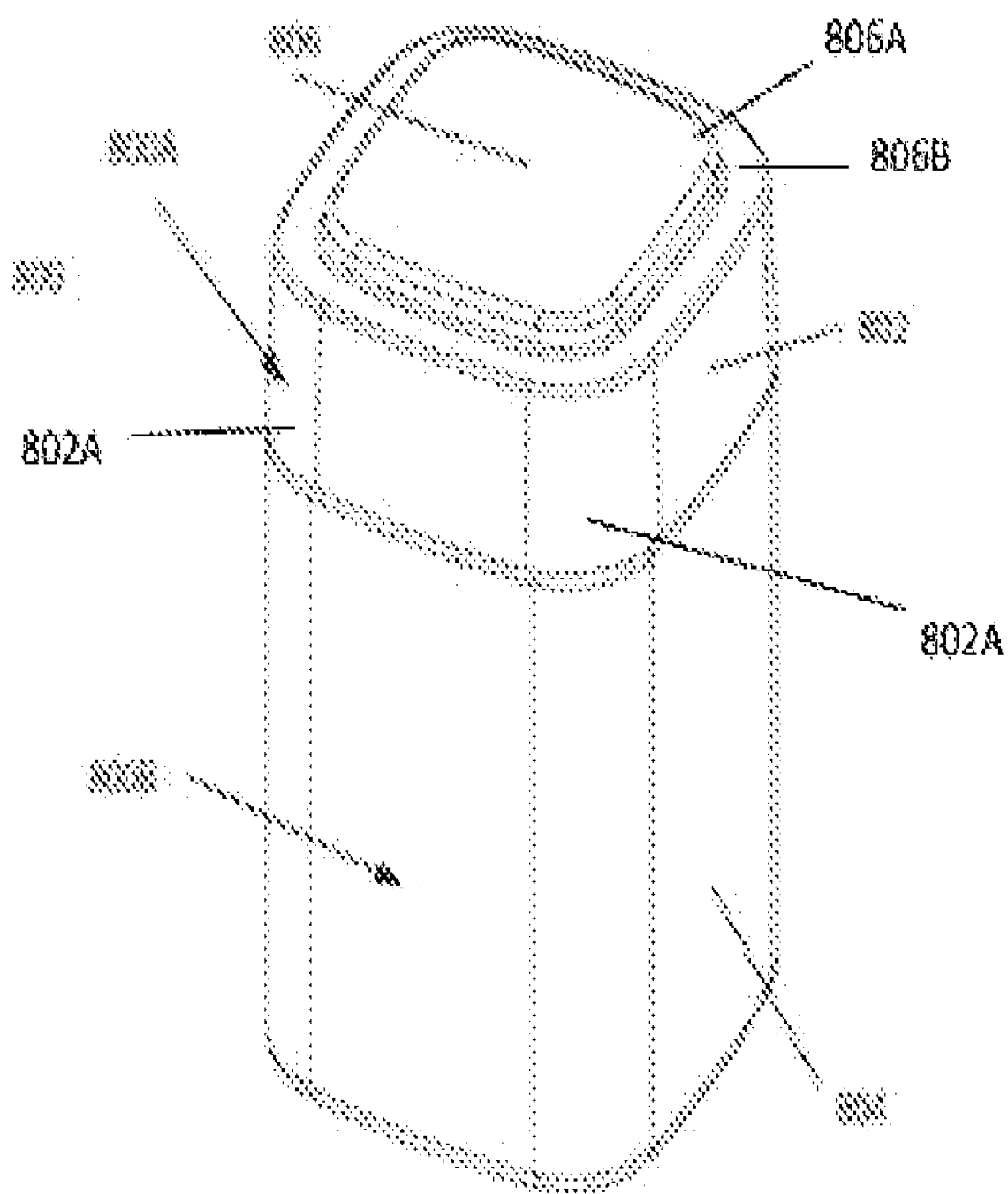


FIG. 1A