An exemplary embodiment of the present invention sets forth a closure apparatus which may include, an exemplary closure having a cavity to receive a payload; and an interface configured to secure the payload in said cavity of said closure wherein said interface may secure the payload in said closure when affixing said closure to a container, and wherein said interface may include a material that changes state.
EXEMPLARY CHILD RESISTANT CLOSURE

EXEMPLARY CONTINUOUS THREAD CLOSURE

FIG. 2A

FIG. 2B

EXEMPLARY DISPENSING CLOSURE

FIG. 2C

EXEMPLARY TAMPER EVIDENT (T-E) CLOSURE

FIG. 2D
PAYLOAD CARRYING AND DISPENSING APPARATUS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This is a Non-provisional U.S. patent application claiming benefit under 35 U.S.C. Section 119(e) of presently pending U.S. Provisional Patent Application Ser. No. 60/746,004, confirmation no. 3367 entitled “Product Dispensing Caps via Dissolving Membrane,” to Bradley Andrew Mastin, filed Apr. 28, 2006, the contents of which are incorporated herein by reference in their entirety.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention
[0003] The present invention relates generally to packaging, and more particularly to closures for packaging, and even more particularly to liquid container closures.
[0004] 2. Related Art
[0005] Conventionally, there are perhaps hundreds of different well known closure types for containers. For example, water bottle containers may conventionally include any of a wide variety of caps including, e.g., but not limited to, threaded caps, dispensing closures, tamper resistant closures, child-resistant closures, etc.
[0006] In recent years, purchasing of bottled water has increased dramatically. During war, large amounts of bottled water may be provided to the military for example. Conventionally, it has been possible to add water soluble powder such as, e.g., but not limited to Kool Aid® and/or Crystal Lite® powdered beverage mixes to water bottles. However, conventionally it has been difficult to get all the powdered beverage mix into the bottle, especially small mouthed bottles.
[0007] Conventional solutions to address the need for improved provision of powdered beverage for bottles, includes providing tearable paper packets containing the powdered beverage mixture. However, such conventional solutions have various shortcomings, including that the paper packets can become when and may be destroyed as a result.
[0008] Various conventional packaging solutions exist including those set forth in U.S. Pat. Nos. 5,772,017, 5,984, 141, 7,041,326, 6,117,464, 6,123,189, 6,159,513, 6,165,523, 6,184,990, 6,186,051, 6,527,109, 6,610,339, 6,644,471, 6,692,780, 6,820,740, 6,886,686, 6,951,275, 6,962,254 and 7,055,084, the contents of all of which are incorporated herein by reference in their entireties. Some conventional solutions require that a package must be punctured or pierced or otherwise parsed to allow a dissolvable material to be released. Others include a dissolvable disc. Others require an insert within an opening in a container. Others describe the use of a sachet, or an injector mechanism. Shortcomings of these conventional solutions include the requirement that packaging must be punctured to release the material. If the membrane malfunctions and stretches or is not successfully pierced, then the material is not released.

SUMMARY OF THE INVENTION

[0009] What is needed is an improved delivery mechanism for powdered or other dissolvable mixtures that overcomes shortcomings of the conventional art.

[0010] An exemplary embodiment of the present invention sets forth a closure apparatus which may include, an exemplary closure having a cavity to receive a payload; and an interface configured to secure the payload in said cavity of said closure wherein said interface may secure the payload in said closure when affixing said closure to a container, and wherein said interface may include a material that changes state.

[0011] One exemplary embodiment may include the apparatus where the closure is adapted to be secured to the container.

[0012] One exemplary embodiment may include the apparatus where the closure may include at least one of: a snap-on capability allowing said closure to snap to the container; and/or a thread adapted to engage with threads on the container.

[0013] One exemplary embodiment may include the apparatus where the interface may include a dissolvable interface.

[0014] One exemplary embodiment may include the apparatus where the interface includes a dissolvable liquid interface.

[0015] One exemplary embodiment may include the apparatus where the liquid dissolvable interface may include a water-based liquid dissolvable interface.

[0016] One exemplary embodiment may include the apparatus where the interface may include a Pullulan material.

[0017] One exemplary embodiment may include the apparatus where the interface may include an edible interface.

[0018] One exemplary embodiment may include the apparatus where the interface may include an edible Pullulan material.

[0019] One exemplary embodiment may include the apparatus which may further include at least one of: a seal; more than one seals; a metal seal; a foil seal; an aluminum foil seal; a moisture seal; a seal at an opening of the closure; a seal internal to the opening of the closure; a seal internal to the opening of the closure at least one of above and/or below a threading of the closure; and/or a peel away seal.

[0020] One exemplary embodiment may include the apparatus which may further include one or more fastening mechanisms. One exemplary embodiment may include where the fastening mechanism may include one or more O-rings. One exemplary embodiment may include the fastening mechanism which may include one or more tongue (s), which may be coupled to an interior of the closure.

[0021] One exemplary embodiment may include a closure which may be cylindrical in shape and where the fastening mechanism may include one or more, or two or more O-rings coupled to the interface, affixing the interface within the closure against the at least one tongue.

[0022] One exemplary embodiment may include the apparatus where the tongue may include one or more annular rings, which may be coupled to an internal edge or wall of the closure.

[0023] One exemplary embodiment may include the apparatus where the tongue may include a one-directional member, allowing insertion of the interface, but preventing escape/unintended removal of the interface.
[0024] One exemplary embodiment may include the apparatus further comprising a prepackaged payload, where the prepackaged payload may include one or more of any of: crystalline material, powdered material, granular, finely ground material, a beverage mix comprising at least one of: a dry milk mix, a tea mix, a coffee mix, a flavored beverage mix, a baby formula, a dry lemonade, a flavor, a juice mix, a powder drink mix, an electrolyte power drink mix, an energy drink mix, a protein drink mix, a breakfast drink mix, and/or a sweetened beverage mix; a supplement comprising at least one of: a protein supplement, flavoring, a non-sugar sweetener, a diabetic product, a breakfast drink mix, a sweetener, a nutrient, an electrolyte power drink, an energy drink, a dietary supplement, and/or a vitamin supplement; a dehydrated food comprising at least one of: a dehydrated liquid remnant, dehydrated alcohol, a pancake mix, a cake mix, a pudding mix, a gelatin mix, and/or a soup mix; a fertilizer, an industrial chemical; a paint mixture; a coloring; a non-edible liquid dissolvable mixture; and/or a dissolvable medicine comprising at least one of: a pharmaceutical, an ingestible, an antibiotic, a prescription drug, an over the counter drug, and/or a laxative.

[0025] One exemplary embodiment may include the apparatus wherein the closure may include one or more of the following: a child resistant closure; a threaded closure; a continuously threaded closure; a dispensing closure comprising at least one of: a pump closure, a dropper closure, a brush base closure, a lift top closure, a threaded top closure, a misted closure, and/or a lotion dispensing closure; a tamper-evident (T-E) closure; a sports bottle closure; a clear closure; a colored closure; a ribbed closure; a plastic closure; a metal closure; a lid; a cap; a cover; a tip; a decorative closure; a holiday closure; a reusable closure; a nipple; and/or a protective cover covered closure.

[0026] One exemplary embodiment may include the apparatus where the closure may be sold as part of a kit including a container.

[0027] One exemplary embodiment may include the closure may be sold as part of a kit which may include a plurality of the closures, where each of the plurality of closures may include prepackaged payloads.

[0028] One exemplary embodiment of the closure may include an upper rim, which may be adapted to receive another closure atop the closure to serve as a two-part closure.

[0029] Further features and advantages of the invention, as well as the structure and operation of various embodiments of the invention, are described in detail below with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030] The foregoing and other features and advantages of the invention will be apparent from the following, more particular description of a preferred embodiment of the invention, as illustrated in the accompanying drawings wherein like reference numbers generally indicate identical, functionally similar, and/or structurally similar elements. The left most digits in the corresponding reference number indicate the drawing in which an element first appears.

[0031] FIG. 1A depicts an exemplary embodiment of a closure according to an exemplary embodiment of the present invention;

[0032] FIG. 1B depicts an exemplary embodiment of an exploded view of the closure according to an exemplary embodiment of the present invention;

[0033] FIG. 1C depicts an exemplary embodiment of a cross-sectional view of an exemplary embodiment of the present invention;

[0034] FIG. 2A depicts an exemplary embodiment of an exemplary child resistant closure according to an exemplary embodiment of the present invention;

[0035] FIG. 2B depicts an exemplary embodiment of an exemplary continuous thread closure according to an exemplary embodiment of the present invention;

[0036] FIG. 2C depicts an exemplary embodiment of an exemplary dispensing closure according to an exemplary embodiment of the present invention;

[0037] FIG. 2D depicts an exemplary embodiment of an exemplary tamper-evident (T-E) closure according to an exemplary embodiment of the present invention;

[0038] FIG. 2E depicts an exemplary embodiment of various exemplary conventional alternative closures, which may be modified as set forth herein according to any of the various exemplary embodiments of the present invention;

[0039] FIG. 3A depicts an exemplary embodiment containers equipped with exemplary closures according to an exemplary embodiment of the present invention;

[0040] FIG. 3B depicts an exploded view and FIG. 3C depicts an enclosed view of another exemplary embodiment of an exemplary container equipped with an alternative embodiment of a two-part closure set forth further with reference to FIGS. 4A-4D, according to exemplary embodiments of the present invention;

[0041] FIG. 4A depicts an exemplary cross-sectional view of an alternative embodiment of an exemplary two-part closure, according to an exemplary embodiment of the present invention;

[0042] FIG. 4B depicts an exemplary bottom view of another alternative embodiment of an exemplary two-part closure, including a dissolvable interface according to any of the various exemplary embodiments of the present invention; and

[0043] FIGS. 4C and 4D depict exemplary embodiments of closures including a dissolvable interface according to various exemplary embodiments.

DETAILED DESCRIPTION OF AN EXEMPLARY EMBODIMENT OF THE PRESENT INVENTION

[0044] A preferred embodiment of the invention is discussed in detail below. While specific exemplary embodiments are discussed, it should be understood that this is done for illustration purposes only. A person skilled in the relevant art will recognize that other components and configurations can be used without parting from the spirit and scope of the invention.

[0045] FIG. 1A depicts an exemplary diagram 100 illustrating an exemplary embodiment of the present invention including a closure 102 adapted to receive a payload 104, including a liquid soluble membrane 106, which may be secured by one or more fastening mechanisms 110. In one exemplary embodiment, the closure may further include threads 108, if a threaded closure. Further, in an exemplary embodiment, the closure may further include a removable moisture seal 112, which may be foil, in an exemplary embodiment.
FIG. 1B depicts an exemplary exploded view diagram illustrating an exemplary embodiment of the present invention including a closure 102 adapted to receive a payload 104, including a liquid soluble membrane 106, which may be secured in the exemplary embodiment, by one or more O-ring fastening mechanisms 110a, 110b. In one exemplary embodiment, the closure may further include a removable moisture seal 112, which may be foil, in an exemplary embodiment.

Exemplary Dissolvable Interfaces

An exemplary dissolvable interface 106 may include, in an exemplary embodiment, a liquid soluble membrane, such as, e.g., but not limited to a water soluble membrane, which may include a material that changes state when it comes in contact with a liquid. In an exemplary embodiment, a starch based dissolvable material may be used, such as, e.g., but not limited to, an edible film, such as, e.g., but not limited to, pullulan, or other similar interface 106, etc.

Pullulan is a polysaccharide polymer consisting of maltotriose units, also known as α-1,4 α-1,6-glucon. Three glucose units in maltotriose are connected by an α-1,4 glycosidic bond, whereas consecutive maltotriose units are connected to each other by an α-1,6 glycosidic bond. Pullulan is produced from starch by the fungus Aureobasidium pullulans.

As an edible, mostly tasteless polymer, the chief commercial use of pullulan is in the manufacture of edible films that are used in various breath freshener or oral hygiene products such as Listerine® Cool Mint PocketPaks™ available from Pfizer Consumer Healthcare of 201 Tabor Road, Morris Plains, N.J. U.S.A.

According to an exemplary embodiment, the dissolvable interface 106 may be dissolvable by bringing the interface in contact with liquid, thus releasing payload 104. According to another exemplary embodiment, the dissolvable interface 106 may be edible, for use in edible/consumable applications of the invention such as, e.g., but not limited to, soup, energy drinks, juices, sports beverages, beverages, etc.

Other exemplary dissolvable interfaces 106 may include, e.g., but are not limited to, dissolvable materials, dissolvable edible materials, dissolvable films, etc.

Exemplary Payloads

According to another exemplary embodiment, the payload 104 may be edible, for use in edible/consumable applications of the invention such as, e.g., but not limited to, soup, energy drinks, juices, sports beverages, beverages, etc. According to another exemplary embodiment, the payload 104 may be nonedible. According to another exemplary embodiment, the payload 104 may be dissolvable in a liquid. According to another exemplary embodiment, the payload 104 may be crystalline, powdered, granular, and/or finely ground, or the like. According to an exemplary embodiment, the payload 104 may include a beverage mix such as, e.g., but not limited to, dry milk, tea, coffee, flavored beverages, baby formula, dry lemonade, flavors, juice mixes, powder drink mixes, electrolyte drink mixes (e.g., POWERADE®), GATORADE®, etc.), energy drink mixes, protein supplement, beverage mixes (such as, e.g., but not limited to, TANG®, Kool-AID®, and/or CRYSTAL LITE®), etc. According to another exemplary embodiment, the payload 104 may be a supplement, such as, e.g., but not limited to, a protein supplement, a flavor (e.g., Nestle’s QUICK®, OVALTINE®, PDQ®), a non-sugar sweetener (such as, e.g., but not limited to, EQUAL®, SLENDARA®, SWEET-AND-LOW®, Nutrasweet®, etc.), a diabetic product, a breakfast drink mix, a sweetener, nutrient, a powder drink, an energy drink, a dietary or vitamin supplement. According to another exemplary embodiment, the payload 104 may be a dehydrated food, and/or liquid remnant, dehydrated alcohol, pancake or other cake mix, pudding mix, gelatin mix, and/or soup mix, etc. According to another exemplary embodiment, the payload 104 may be a medicine, pharmaceutical, insoluble, antibiotic, dissolving medicine, laxative, etc. (e.g., Alka-Seltzer®, Metamucil®, etc.), etc.

Exemplary Interface Fastening Mechanisms

In an exemplary embodiment, closure 102 may include a fastening mechanism 110 to hold the dissolvable interface 106 in place so as to prevent the loss of the payload material 104 during placement of the closure 102 on a bottle 114. An exemplary fastening mechanism may include an internal tongue 110 over which the dissolvable interface 106 may be inserted and retained. According to another exemplary embodiment, the fastening mechanism 110 may include, one or more O-rings to secure the dissolvable interface 106 inside the closure 102.

Exemplary Coupling Mechanism to Couple the Closure to a Container

According to an exemplary embodiment, threading 108, or other coupling mechanisms used to couple closure 102 to a container 114, may be placed sufficiently below the inner top of the closure 102, as shown in the exemplary embodiment of FIG. 1A, to prevent the upper edge of container 114 from coming in direct contact with dissolvable interface 106, so as to create a cavity in closure 102 permitting reception of a payload 108 of a desired size. In an exemplary embodiment, a fastening mechanism 110 may be included inside the closure 102 to secure the dissolvable interface 106. Exemplary fastening mechanisms, may include, e.g., but are not limited to, a ring, one or more protrusions toward the center of the closure 102, one or more one-directional movable baffles, one or more O-rings, which in an exemplary embodiment may include, e.g., but not limited to, two O-rings, one on either side of dissolvable interface 106, securing the interface 106.

According to another exemplary embodiment, as shown in diagram 140 of FIG. 1C an upper edge of a container 114 may dislodge dissolvable interface 106,
releasing payload 104 into the container 114, upon placing the closure 102 on container 114.

Exemplary Sealing Mechanisms

In one exemplary embodiment, a removable moisture seal 112 may be provided for the closure 102. In an exemplary embodiment, the moisture seal may include an aluminum seal, which may be peeled away from the closure 102, according to an exemplary embodiment, prior to placing a closure 102 on a container 114.

According to an exemplary embodiment, a foil (or similar material) seal 112 may be applied to a closure 102 during the manufacturing process after insertion of a payload 1104 and interface 106 to prevent the dissolvable interface 106 from coming into contact with moisture or liquid. When a user is ready to use the closure 102, the moisture barrier seal 112 may be removed immediately prior to affixing the closure 102 on a container 114, to dissolve the interface and mix the payload 104 with the liquid contained in container 114.

After purchase of a closure 102, when ready to prepare a mixture, the user may remove the foil seal 112, and may couple (e.g., but not limited to, thread) the closure 102 to the container 114, until snug. At this point, the membrane interface 106 is still intact (see FIG. 1A), and the closure 102 may still be removed and/or reused, so long as the liquid is not brought in contact with the interface 106. Once the decision by the user has been made to activate the product, i.e., when the user desires to mix the payload 108 with the material in the container 114, then the user need only bring the liquid in contact with the interface 106. (See FIG. 3A-3C, for example), causing the interface to dissolve, and thereby allowing the payload 104 to be intermixed with the liquid material in the container 114. Thorough mixing may be accomplished by agitating the bottle.

Various exemplary embodiments of the closure including a dissolvable interface may be used according to exemplary embodiments of the present invention. Any conventional closure may be modified to accept a payload and to accept a dissolvable interface to secure the payload in the closure, according to exemplary embodiments.

Exemplary Closures

Today, there are literally hundreds of companies in the U.S. and many more, worldwide, which may manufacture a wide variety of types of closures 102 & fitments for containers of all shapes and sizes, any of which may be adapted to be used to carry a payload including a dissolvable interface 106, according to an exemplary embodiment of the present invention. FIG. 2A, 2B, 2C, 2D, and 2E depicts an exemplary embodiment of various exemplary conventional closures, which may be modified as set forth herein according to an exemplary embodiment of the present invention.

FIG. 2A depicts an exemplary embodiment of an exemplary child resistant closure 200 according to an exemplary embodiment of the present invention.

FIG. 2B depicts an exemplary embodiment of an exemplary continuous thread closure 220 according to an exemplary embodiment of the present invention. Discontinuous thread, as well as other well known types of threaded closures may also be used.

FIG. 2C depicts an exemplary embodiment of an exemplary dispensing closure 240 according to an exemplary embodiment of the present invention.

FIG. 2D depicts an exemplary embodiment of an exemplary tamper-evident (T-E) closure with a bottom view 260 and a top view 280, according to an exemplary embodiment of the present invention.

FIG. 2E depicts an exemplary embodiment of various exemplary conventional closures, which may be modified to include a dissolvable interface as set forth herein according to an exemplary embodiment of the present invention.

A. Exemplary Plastic Closures

There are many hundreds of standard and non-standard sizes, materials and styles of closures 102, which may be used, according to an exemplary embodiment. Exemplary embodiments may include, e.g., but not limited to, sizes and styles from, e.g., but not limited to, 9 mm vial closures to, e.g., but not limited to, about 120 mm, or larger, wide mouth jar caps, according to exemplary embodiments.

According to an exemplary embodiment, plastic closures may be used in, e.g., but not limited to, food, cosmetic, pharmaceutical, chemical, and/or other specialty markets, etc. Exemplary plastic closures may include, in an exemplary embodiment, continuous thread, friction fit and/or lug finish caps.

Exemplary Pumps, Sprayers, Misters and Atomizers

Exemplary closures and dispensers may include, in an exemplary embodiment, sprayers, pumps, lotion pumps, fragrance sprayers, cologne sprayers, scent sprayers, cream pumps, snap top caps, disc top caps, plastic caps, metal caps, sifter caps, essential oil sprayers, jar caps, bottle caps, and/or jelly jar caps, etc.

Exemplary sprayers may include, in an exemplary embodiment, a black, white, or other color fine mist sprayer, trigger sprayers, etc.

Exemplary drum pumps may include, in an exemplary embodiment, zinc, or other-plated pumps; plastic pumps including, e.g., but not limited to, white, silver or any other colored plastic pumps, etc.

Exemplary lotion pumps may include, in an exemplary embodiment, white, black, or any other color style lotion pumps, etc.

Exemplary treatment pumps may include, in an exemplary embodiment, black, white, natural, or any other color treatment pumps, including capped treatment pumps, etc.

Exemplary industrial pumps may include, in an exemplary embodiment, gallon pumps, lotion pumps, etc.

Exemplary plastic faucets may include, in an exemplary embodiment, white, natural, and any other color, faucets, gold faucets, natural and red, and any other color, or color combination faucets.

Threaded Caps

Threaded closures may include, in an exemplary embodiment, sprayers, pumps, lotion pumps, fragrance sprayers, cologne sprayers, scent sprayers, cream pumps, snap top caps, disc top caps, plastic caps, metal caps, sifter caps, brush caps, essential oil sprayers, jar caps, bottle caps, jelly jars, closures, sprayers, pumps and/or droppers, etc.

According to various exemplary embodiments, exemplary plastic caps may include, e.g., but not limited to, plastic dome caps including, e.g., but not limited to, phenolic dome lined caps, PP dome lined caps, smooth dome lined
caps, clear, transparent, opaque and/or colored smooth dome lined caps; clear styrene dome caps; plastic smooth caps, including, e.g., but not limited to, PS-22 lined caps, smooth unlined caps, smooth unlined caps 43/485, colored smooth lined and/or unlined caps, plastic sifters, and/or cosmetic jar disc liners; plastic ribbed caps including, e.g., but not limited to, colored ribbed caps, foil lined caps, ribbed Teflon lined caps, ribbed lined caps, and/or ribbed unlined caps; phenolic caps including, e.g., but not limited to, phenolic cone lined caps; phenolic PV lined caps; phenolic brush caps, clear, transparent, opaque and/or colored plastic brush caps, and/or silver, gold, chrome and/or any other shiny colored phenolic caps; tamper-evident caps including, e.g., but not limited to, orifice reducer caps, tamper banded caps, universal picture caps, child resistant, push down and turn caps; ball caps, smooth ball caps, clear, transparent, opaque and/or colored colored ball caps, etc.

[0082] Plastic Dispensing Caps

[0083] Exemplary plastic dispensing caps may include disc top caps, spout caps, glass droppers, and/or twist top caps, baby bottle nipples, sports bottle lift to open caps, etc.

[0084] Exemplary caps may include, in an exemplary embodiment, plastic sifter caps; white or other color plastic sifter caps; smooth disc top caps, silver, white, black, natural and/or any other color smooth disc top caps; twist top caps similar to those used to dispense glue and/or sports beverages, including, e.g., but not limited to, natural cap/natural base twist top caps, red/red twist top caps, black/natural twist top caps, red/white, and any other color, or color combination twist top caps; pull top caps similar to those used on some sports beverages including any color and/or color combination pull top caps, with or without tip or outer caps; tamper evident (T-E) caps which may include, e.g., but not limited to, black, white, and/or any other color, tamper evident caps, with or without orifice reducers; orifice reducers generally, which may include, e.g., but not limited to, 15 mm, or any other size, natural, or any other color, LDPE orifice reducers; plastic snap top caps which may include, in an exemplary embodiment, white or other colored ribbed snap top caps similar to those often used on toothpaste containers, white or other colored snap top caps; flip spout caps, which may include, in an exemplary embodiment, white, black, or any other color, spout top caps as often used to dispense lotions; glass, plastic and/or rubber droppers, which may include, in an exemplary embodiment, white, black, white bulb, black bulb, white bulb/gold glass, and any other combination of colors, rubber, and/or plastic droppers; red and/or other colored tip spout caps, which may include, in an exemplary embodiment, Yorker Long Tip Cap Red Tip with, e.g., but not limited to, 0.030 Hole, and/or Yorker Long Tip Cap Red Tip with no hole, etc.

[0085] Exemplary closures 102, according to an exemplary embodiment may be sold in combination with containers 114, in small kits with contains, or in wholesale bulk cases, with or without containers 114, according to exemplary embodiments.

[0086] FIG. 3 depicts an exemplary embodiment of an exemplary water bottle equipped with an exemplary enclosure according to an exemplary embodiment of the present invention. Upon shaking the bottle, the liquid comes in contact with the interface 106, which may dissolve, allowing the payload to intermix with the liquid in the bottle. Advantageously, in an exemplary embodiment, since the interface dissolves upon contact with the liquid, nothing is left to physically hinder the delivery of the mixture to the liquid, and vice versa, the liquid to the mixture. Also, in an exemplary embodiment, no residual matter may be left over that could compromise integrity and/or quality of the final mixed product.

[0087] Thus, upon the liquid coming into contact with the liquid soluble interface 106, the membrane/interface dissolves. With the separating interface 106 gone, the payload may partially and/or fully mix with the liquid via gravitational pull, and/or agitation of the container.

[0088] In one exemplary embodiment, the payload 104 may be carbon dioxide activated material, or the like.

[0089] Containers

[0090] Exemplary closures 102, according to an exemplary embodiment may be used with containers 114 such as, e.g., but not limited to, plastic containers or bottles, glass containers or bottles, metal containers, bottles, or cans, and/or any other container of the same size, of any other material, of any shape, height, depth, etc.

[0091] Exemplary plastic containers may include, in an exemplary embodiment, several styles of plastic containers including, e.g., but not limited to, plastic bottles, jars, vials and/or pails, etc.

[0092] Exemplary plastic bottles may include, in an exemplary embodiment, any color including, but not limited to, amber, blue, natural, clear, green, white, etc.

[0093] Exemplary plastic bottles may include, in an exemplary embodiment, bottles which may include any material, including, but not limited to, PET, HDPE, PVC, and/or LDPE.

[0094] Exemplary Plastic bottles may include, in an exemplary embodiment, bottles of any shape, which may include, Boston, cosmo, cylinder, oval, round, round pharm, round, rectangular top, square top, water bottle shaped, soda bottle shaped, etc.

[0095] Exemplary plastic jars may include, in an exemplary embodiment, jars of any color, including combinations, including, but not limited to amber, blue, clear, frosted, white, black, natural, including, but not limited to, amber, blue, clear, frosted, white, black, natural.

[0096] Exemplary plastic tubes and/or vials may include, in an exemplary embodiment, tubes and/or vials of any color, including combinations, including, but not limited to clear, natural, white, and/or any other color plastic tubes and/or vials, any sizes, including, but not limited to, lip balm supplies, and other cosmetic containers, etc.

[0097] Exemplary plastic containers may include pails, and/or drums, such as, e.g., but not limited to, paint pails, kegs, etc. In an exemplary embodiment, the container may include a plastic pail, keg or drum which is adapted to receive a closure according to an exemplary embodiment of the present invention.

[0098] Exemplary glass containers may include glass bottles, jars and/or vials, etc. Exemplary glass, (or plastic, and/or metal containers) which may be used with closures according to the present invention include, e.g., but not limited to, glass bottles, jars, and/or vials, which may be acquired, e.g., but not limited to, in small kits with closures and/or caps and/or may be sold in, e.g., but not limited to, wholesale BULK cases. Exemplary glass and/or plastic bottles may include clear, transparent, opaque, semi-transparent and/or colored glass, including, e.g., but not limited to, blue, amber, frosted, clear, green, bottles, jars, etc., in various shapes.
B. Exemplary Metal Closures

Many food manufacturers and cosmetic companies may use metal type closures, which may be adapted according to an exemplary embodiment of the present invention. Chemical manufacturers may also use metal closures for their chemical stability, resistance and durability, which may be adapted according to an exemplary embodiment of the present invention. Various standard, and/or non-standard sizes & styles may be used, including printed lug finish caps to plain friction fit jar lids, according to exemplary embodiments. Exemplary metal closures may include metal covers for metal containers including containers, lids, and/or cans. Exemplary metal containers may include, e.g., but not limited to, flat metal tins, deep dish metal tins, clear top tins, hinge top tins, F style cans, round paint style cans, and gold and/or other colored metal tins with slip covers, etc.

Exemplary metal closures may include threaded caps. Exemplary metal caps may include, in an exemplary embodiment, caps in any of various colors including, e.g., but not limited to, gold, black, silver, white and any other color.

Exemplary Silver Metal Closures

Exemplary silver closures and/or metal closures may include silver caps, which may include, e.g., but not limited to, aluminum caps with a polyethylene (PE) Liner, silver metal lug caps, grated top silver caps, steel with a PV Liner, etc.

Exemplary Gold Metal Closures

Exemplary gold closures and/or metal closures may include gold metal caps, which may include, e.g., but not limited to, gold metal Plastisol lined lug caps, gold metal Plastisol lined caps, gold metal caps with a red or other colored dome, etc.

Exemplary Black Metal Closures

Exemplary black closures and/or metal closures may include black metal caps, which may include, e.g., but not limited to, black metal foil lined caps, black metal pulp/poly lined caps, etc.

Exemplary White Metal Closures

Exemplary white, natural, or other colored closures and/or metal closures may include white or other colored metal caps, which may include, e.g., but not limited to, white metal foil lined caps, white metal Plastisol Lined Caps, white Metal Pulp/Poly Lined Caps.

Exemplary Metal Containers

Exemplary metal containers may include any of a variety of closures, including, but not limited to, metal containers, "tins"; and/or cans, which may be adapted according to an exemplary embodiment of the present invention, and the containers may include, in an exemplary embodiment, metal tins; square, rectangular, round, or other shaped metal tins; which may receive in an exemplary embodiment, clear tops; tin w/covers; metal tins w/clear view tops; footed metal candle tins; deep dish metal tins with slip on covers; flat metal tins with slip covers; metal tins square, round, rectangular, oval, and elliptical; gold, silver or other colored metal tins; holiday tins; decorative closures, and/or decorative tins.

Exemplary Twist Top Metal Tins

Exemplary twist top metal tins may include, e.g., but not limited to, screw top tins, and/or twist top metal tins, etc.

Exemplary Slide Cover Metal Tins

Exemplary slide top metal tins may include, e.g., but not limited to, slide cover metal tins, and/or slide top metal tins, etc.

Exemplary Hinge Top Metal Tins

Exemplary metal tins may include hinge top metal tins, which may include, e.g., but not limited to, hinge top metal tins, etc.

Exemplary Industrial Metal Cans

Exemplary metal tins may include hinge top metal tins, which may include, e.g., but not limited to, oblong cans with cap and/or seal, round paint cans, etc.

C. Exemplary Specialty Closures

There are various well-known specialty type closures used widely in the packaging industry. In an exemplary embodiment of the invention, the technology of the present invention may be combined with any of various existing enclosure technologies. In an exemplary embodiment, there are millions of types of well-known dispensing caps such as, e.g., but not limited to, flip top, disc top, squeegee top, dispensing closures, pumps, sprayers, misters, and/or atomizers, etc. Many of these closures may further include, in exemplary embodiments, tamper evident, and/or child resistant closures, as well as, leak avoiding and/or sealing technologies, for any and all packaging closure applications.

D. Exemplary Child-Resistant Closures

Child-resistant (CR) packaging, and were among the first to introduce effective CR closure systems. Our closures protect children from dangerous substances while being easy for adults to use. two-piece, push and turn child-resistant closures.

E. Exemplary Continuous Thread Closures

These one-piece screw closures come in heavy, standard and light formats so you can select the one that matches your requirements. One-piece closures for many applications including specialised needs for chemical, impact and leak resistance.

F. Exemplary Dispensing Closures

Dispensing closures are simply and efficiently designed to keep material costs minimal and expense per unit low. The range includes one- and two-piece closures for liquids and gels, push-pull closures for water bottles and closures for squeezable food bottles. Completely flush two-piece, continuous thread, hinged dispensary closures. Used in all markets.

G. Exemplary Tamper-Indicating Closures

According to an exemplary embodiment, tamper-indicating closures may provide a visual assurance of product integrity. Modified buttress threads may be combined
with a folding bead linerless seal and/or may be lined with industry standard liners, according to several exemplary embodiments.

H. Exemplary Alternative Closure Embodiments

According to other exemplary embodiments of the present invention, various alternative embodiments may be included, as illustrated, e.g., but not limited to, as shown in FIGS. 3B and 3C, and 4B, 4D and 4I.

FIG. 3B depicts an exploded view and FIG. 3C depicts an enclosed view of another exemplary embodiment of an exemplary container 114 equipped with an alternative embodiment of a two-part closure 102a, 102b set forth and described further below with reference to FIGS. 4A-4D, according to exemplary embodiments of the present invention. Exemplary closure 102b, in an exemplary embodiment, is described in U.S. Pat. No. 6,527,109, the contents of which are incorporated herein by reference in their entirety, and may be modified according to an exemplary embodiment, to include a dissolvable interface 106 (see FIGS. 4A-D). The closure 102b may be inserted between a conventional bottle 114 and a conventional closure 102a.

FIG. 4A depicts an exemplary cross-sectional view of an alternative embodiment of an exemplary two-part closure including a closure 102a and a container 114, according to an exemplary embodiment of the present invention. According to an exemplary embodiment, closure 102b may have a circular cylindrical sidewall 412. An exemplary sidewall 412 may include an inner wall 414, and an outer wall 416, that may be spaced radially from one another, forming an exemplary, but not required, annular cavity 418, therebetween, that may be coaxial with axis A. The inwardly facing surface 420 of inner wall 414 may define a circular cylindrical chamber 20 within the closure 102b. The outwardly facing surface 426 of outer wall 416 may be a circular cylinder in an exemplary embodiment, but may be any other shape, such as a decorative shape, such as an animal, a hose, etc. Alternatively, or additionally, outwardly facing surface 426 may be imprinted with indicia such as, e.g., but not limited to, imprinting, or otherwise applying coloration or shading, may include relief or protrusions, in an exemplary embodiment (not shown). An exemplary collar 422 may be a cylindrical structure extending axially downwardly (in the orientation shown in FIG. 1) from a web 428 that may extend radially inwardly from inner wall 414. When closure 102b is attached to a container 114, the spout of container 114 may be inserted into the receiving end 413 of closure 102b and may be interposed between inner wall 414 and collar 422 of closure 102b. The inwardly extending, helical threads on exemplary inner wall 414 may engage the outwardly extending, helical threads on the radial outwardly facing surface of the spout (see FIG. 3B). In this configuration, closure 102b may be rigidly mounted to the spout of the bottle with collar 422 seated against the radially inwardly facing surface of the spout to prevent liquid from entering the space between the collar 22 and the inner wall 414. The collar 422 thereby may insulate that any liquid in the bottle can only pass through the region of the chamber 420 extending through collar 422 and above (in the orientation of FIG. 4A). Closure 102b may have a spout 436 in one exemplary embodiment (or may be closed as shown and described further below with reference to FIGS. 4C and 4D), with an exemplary sidewall 438 having a preferably circular cylindrical passage therethrough. On exemplary radially outwardly facing surface of the spout 36, there are conventional helical threads for engaging a conventional water bottle closure 102a, 102b, or those shown in FIG. 2E, or the like. An exemplary cavity 418 in the closure sidewall 412 may be defined by an annular gap between the radially outwardly facing surface of the inner wall 414, the radially inwardly facing surface of the outer wall 416, the radial web 428, and the radial web 432, both of which may be part of the inner wall 414. The cavity 418 may extend, in an exemplary embodiment, circumferentially and contiguously around closure 102b.

Closure 102b may be adapted to receive in a cavity a payload 104. Payload 104, which may be of any shape, is shown in an exemplary embodiment having an exemplary annular disk shape having an inner wall 431, and may be placed in the exemplary cavity as formed by an inner wall of portion 436. Closure 102b may include two removable foil covers 112 one for each of the top and bottom openings of the closure 102b, to prevent moisture from reaching the payload, and to prevent tampering with the payload.

An exemplary dissolvable interface 106 (shown, in one exemplary having a diameter approximately comparable to the diameter of inner wall 422, in FIG. 4A). The interface 106 may be held in place by optional fastening mechanisms 110. Exemplary interface 106 may be substantially the diameter of inner wall 422 in one exemplary embodiment, or may be the diameter of the cavity holding payload 104, as shown, e.g., but not limited to, in FIG. 4D. One or more optional fastening mechanisms 110 may be included, such as, e.g., but not limited, the exemplary fastener 110 shown in FIG. 4C. In another exemplary embodiment, interface 106 may be secured by one or more of various exemplary fastening mechanisms 440-451, which may be coupled to an inner wall of closure 102b, in an exemplary embodiment inner wall 416 (or inner wall 422, not shown), as illustrated in FIG. 4B, according to various exemplary but non-limiting embodiments, which may be used to secure dissolvable interface 416. According to one exemplary embodiment, payload 104 and/or dissolvable interface 416 may be inserted into the cavity created within wall 416 of closure 102b, prior to insertion of portion 412 into closure 102b. Portion 412, in an exemplary embodiment, may snap into correspondence with portion 416.

FIG. 4B depicts an exemplary bottom cutaway cross-sectional view of an exemplary embodiment of the closure 102b of exemplary two-part closure 102 depicted in FIG. 5C, including fastening mechanisms 441, 443, 444, 445, 446, 447, 448, 449, 450, 451 for securing a dissolvable interface 106 (not shown) (which in an exemplary embodiment may be of similar diameter to the cavity holding exemplary payload 104, see FIG. 4D, for example). The fastening mechanisms 110, 440-451 may be appendages extending inwardly from wall 416. In another exemplary embodiment, instead of being appendages, 440-451 may instead represent passageways through which liquid may flow. Thus, according to an exemplary embodiment, some of elements 440-451 may be convex fastening mechanisms extending inwardly into the cavity, and others of these elements may be concave passageways carved inwardly into the inner wall of closure 102b, or any combination thereof, according to various exemplary embodiments of the present invention. In one exemplary embodiment, 440-451 may act as fastening mechanisms 110. In another exemplary embodi-
ment. 440-451 may serve other, or additional functions, such as, e.g., but not limited to, a fluid passageway, or any combination of appendages, and/or passageways.

[0131] FIG. 4C depicts an exemplary embodiment of a closure 102 including a dissolvable interface 106 according to an exemplary embodiment. According to one exemplary embodiment, one or more fastening mechanisms 110 may serve to secure in place the interface 106. In an exemplary embodiment, fastener 110 may allow easy one-directional insertion, but may snap so as to prevent release of interface 106. Fastener 110 may be an inner ring, in one embodiment. Fastener 110 may include several appendages, similar to fasteners 440-451, shown in FIG. 4B. Dissolvable interface 106 may be further secured, or alternatively secured, in one exemplary embodiment, by o-ring or other shaped securing mechanisms 110a, 110b, etc.

[0132] FIG. 4D depicts an exemplary embodiment of a closure 102 including a dissolvable interface 106 according to an exemplary embodiment. According to one exemplary embodiment, one or more fastening mechanisms 110 may serve to secure in place the interface 106. In an exemplary embodiment, fastener(s) 110a, 110b, may serve to hold interface 106 in place. In an exemplary embodiment, fastener 110, may be an appendages (such as elements 440-451) which may be coupled to an inner wall of the cavity holding payload 104, as shown in FIG. 4D. Fasteners 110 may allow easy one-directional insertion, but may snap back resiliently so as to prevent release of interface 106. Fastener 110 may be an inner ring, in one exemplary embodiment. Fastener 110 may include several appendages, similar to fasteners 440-451, shown in FIG. 4B. Dissolvable interface 106 may be further secured, or alternatively secured, in one exemplary embodiment, by one or more o-ring(s) or other shaped securing mechanisms 110a, 110b, etc.

II. Exemplary Closure Manufacturing Technologies

[0133] A. Exemplary Injection Molding

[0134] Injection molding may include a method of forming objects from granular and/or powdered plastics. An exemplary injection molding method may be used to form objects from granular and/or powdered plastics, and may most often use plastics of a thermoplastic type. The material may be fed from a hopper to a heated chamber in which it may be softened, after which a ram and/or screw may force the material into a mold.

[0135] B. Exemplary Bi-Injection Molding

[0136] Bi-injection molding may include a method by which two materials may be injected into the same cavity within one cycle. With an exemplary bi-injection process, two materials may be injected into the same cavity within one cycle.

[0137] C. Exemplary Injection Blow Molding

[0138] Injection blow molding may include injecting a polymer onto a core pin. First, the polymer may be injection molded onto the core pin, then the core pin may be rotated to a blow molding station to be inflated and cooled.

III. Exemplary Closure Liners

[0139] Before using any liner product, it is critical that users determine the suitability and acceptability for your package through appropriate testing. As will be apparent to those skilled in the art, various well known liners may be used in enclosures.

[0140] Which closure liner to use, if any, may vary depending on various design choices, including, e.g., but not limited to, container type, desired seal, and/or backing materials, etc.

[0141] A. Exemplary Container Types

[0142] Exemplary container types may include, in an exemplary embodiment, Polyethylene or polystyrene (PS), high density polyethylene (HDPE), low density polyethylene (LDPE), polypropylene (PP), polystyrene (PS), polyvinyl chloride (PVC), polyethylene terephthalate (PET), and/or another plastic (such as, e.g., but not limited to, BAREX®, and/or glass, and/or any other material including, e.g., plastic, metal, glass, and/or any other material, etc.

[0143] B. Exemplary Seal Types

[0144] Exemplary seal types may include, in an exemplary embodiment, welded seal, easy entry, clean peel, tamper indicating, and/or tab function, etc.

[0145] C. Exemplary Backing Materials

[0146] Exemplary seal types may include, in an exemplary embodiment, pulp, OLEFIN foam, barrier seal, None (for dispensers, for example).

IV. Exemplary Closure Coloring

[0147] According to exemplary embodiments of the present invention, exemplary closures may be transparent, opaque, semi-transparent, and/or colored. Extensive research studies consumer preferences relating to color of enclosures. Milliken Chemical of Spartanburg S.C., U.S.A., has conducted extensive research on the topic of closure packaging for soft drinks. The soft drink market is fiercely competitive and packaging is a key demand generator. Conventionally, labeling and bottle shape have been the components used to catch the eye of a consumer. Until recently, the closure has served as dead space with white being the consistent color. Through the use of colorants beverage caps and closures can become an intrinsic and valuable part of packaging aesthetics by replicating beverage color or brand in transparent polypropylene (PP) to enhance consumer appeal and brand image. The concept of transparent, colored PP closures is not new. The use of colored PP closures has been used in a number of areas including personal care products, where clarified PP gives a highly attractive appearance associated with more expensive materials, while at the same time delivering simplified processing as well as cost savings achievable with PP. Bottled beverages with a transparent cap are much more likely to be chosen in a buying situation than one with an opaque cap according to research. When asked to pick their beverage of choice from a cooler stocked with bottled beverages divided equally between opaque and transparent caps, the following was learned: 62% of all consumers chose a beverage with a transparent cap; 72% of consumers less than 18 years of age selected the transparent cap. When specifically asked which cap is more attractive, 71% chose transparent. Among those who chose the transparent cap, the most common reason for doing so was that they found the cap appealing (33%), other reasons included: Cap stands out more (7%); Cap looks different (7%); Looks like “specialty offer” or contest cap (7%).

[0148] While various embodiments of the present invention have been described above, it should be understood that they have been presented by way of example only, and not limitation. Thus, the breadth and scope of the present invention should not be limited by any of the above-described exemplary embodiments, but should instead be defined only in accordance with the following claims and their equivalents.
What is claimed is:
1. An apparatus comprising:
a closure having a cavity to receive a payload; and
an interface configured to secure the payload in said
cavity of said closure
wherein said interface is adapted to secure the payload
in said closure when affixing said closure to a con-
tainer, and
wherein said interface comprises a material that
changes state.
2. The apparatus of claim 1, wherein said closure is
adapted to be secured to the container.
3. The apparatus of claim 2, wherein said closure com-
prises at least one of:
a snap-on capability allowing said closure to snap to the
container;
an opening at the top and threading to allow coupling to
another closure as part of a two-part closure; and/or
a thread adapted to engage with threads on the container.
4. The apparatus of claim 1, wherein said interface
comprises a dissolvable interface.
5. The apparatus of claim 4, wherein said dissolvable
interface comprises a liquid dissolvable interface.
6. The apparatus of claim 4, wherein said liquid dissolv-
able interface comprises a water-based liquid dissolvable
interface.
7. The apparatus of claim 6, wherein said interface
comprises a Pullulan material.
8. The apparatus of claim 1, wherein said interface
comprises an edible interface.
9. The apparatus of claim 1, wherein said interface
comprises a Pullulan material.
10. The apparatus of claim 1, further comprising at least
one of:
a seal;
a metal seal;
a foil seal;
an aluminum foil seal;
a moisture seal;
a seal at an opening of the closure;
a seal internal to the opening of the closure;
a seal internal to the opening of the closure at least one of
above and/or below a threading of the closure; and/or
a peel away seal.
11. The apparatus of claim 1, further comprising at least
one of:
a fastening mechanism.
12. The apparatus of claim 11, wherein said fastening
mechanism comprises at least one O-ring.
13. The apparatus of claim 11, wherein said fastening
mechanism comprises at least one tongue coupled to an
interior of the closure.
14. The apparatus of claim 13, wherein said closure is
cylindrical in shape and said fastening mechanism com-
prises at least two O-rings coupled to said interface, affixing
said interface within the closure against said at least one
tongue.
15. The apparatus of claim 13, wherein said at least one
tongue comprises at least one annular ring coupled to an
internal edge of said closure.
16. The apparatus of claim 13, wherein said tongue
comprises a one-directional member, allowing insertion of
said interface, but preventing removal.
17. The apparatus of claim 1, further comprising a pre-
packaged payload, wherein said prepackaged payload com-
prises at least one of:
crystalline material,
powdered material,
granular,
finely ground material,
a beverage mix comprising at least one of:
a dry milk material,
a tea mix,
a coffee mix,
a flavored beverage mix,
a baby formula,
a dry lemonade,
a flavor,
a juice mix,
a powder drink mix,
an electrolyte drink mix,
an energy drink mix,
a protein drink mix,
a breakfast drink mix, and/or
a sweetened beverage mix;
a supplement comprising at least one of:
a protein supplement,
a flavoring,
a non-sugar sweetener,
a diabetic product,
a breakfast drink mix,
a sweetener,
a nutrient,
an electrolyte drink,
an energy drink,
a dietary supplement, and/or
a vitamin supplement;
a dehydrated food comprising at least one of:
a dehydrated liquid remnant,
dehydrated alcohol,
apan cake mix,
a cake mix,
a pudding mix,
a gelatin mix, and/or
a soup mix;
a fertilizer,
an industrial chemical;
a paint mixture;
a coloring;
a non-edible liquid dissolvable mixture; and/or
da dissolvable medicine comprising at least one of:
a pharmaceutical,
an injectible,
an antibiotic,
a prescription drug,
an over the counter drug, and/or
a laxative.
18. The apparatus according to claim 1, wherein said
closure comprises at least one of:
a child resistant closure;
a threaded closure;
a continuously threaded closure;
a dispensing closure comprising at least one of:
a pump closure,
a dropper closure,
a brush based closure,
a lift top closure,
a threaded top closure,
a mister closure, and/or
a lotion dispensing closure;
a tamper-evident (T-E) closure;
a sports bottle closure;
a clear closure;
a colored closure;
a ribbed closure;
a plastic closure;
a metal closure;
a lid;
a cap;
a cover;
a tip;
a decorative closure;
a holiday closure;
a resealable closure;
a nipple; and/or
a protective cover coated closure.

19. The apparatus according to claim 1, wherein said closure is sold as part of a kit including a container.

20. The apparatus according to claim 1, wherein said closure is sold as part of a kit comprising a plurality of said closures, wherein each of said plurality of closures comprise prepackaged payloads.