(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
9 December 2010 (09.12.2010)

PCT

(10) International Publication Number
WO 2010/141848 A1

(51) International Patent Classification:
B65D 81/05 (2006.01)

(21) International Application Number:
PCT/US2010/037446

(22) International Filing Date:
4 June 2010 (04.06.2010)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/184,777 5 June 2009 (05.06.2009) US
61/218,030 17 June 2009 (17.06.2009) US

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

(54) Title: FLEXIBLE TO RIGID PACKAGING ARTICLE AND METHOD OF USE AND MANUFACTURE

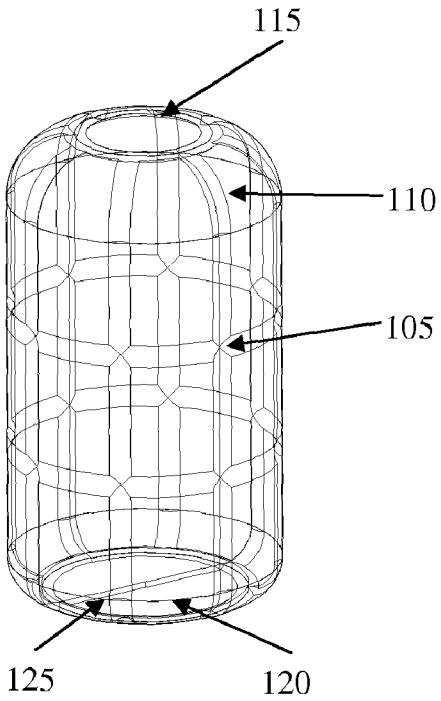

FIG. 5B

(57) Abstract: In one embodiment, a flexible packaging system comprises a flexible container and an inflatable hollow scaffolding component; wherein the flexible packaging system may be made rigid or semi-rigid by pressurizing the hollow scaffolding component. In some aspects, the pressurizing is accomplished by filling the hollow scaffolding component with gas or foam.

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FLEXIBLE TO RIGID PACKAGING ARTICLE AND METHOD OF USE AND MANUFACTURE

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Patent Application No. 61/184,777, filed June 5, 2009, and of U.S. Provisional Patent Application No. 61/218,030, filed June 17, 2009, both of which are incorporated herein by reference in their entirety.

BACKGROUND

[0002] The global consumer packaging industry is estimated to be worth over $400 billion and employs more than five million people worldwide. Packaging allows marketing and product differentiation and educates and informs the consumer. However, the procurement, production, transport and disposal of packaging can have negative consequences for both the environment and societies around the globe. Thus, the consumer packaging industry is looking for new ways to improve social or environmental consequences.

[0003] Moreover, there has been increased consumer demand for sustainable packaging. Even in tough economic times, consumers still demand improvements and more options in green purchasing. According to recent studies, 44 percent of consumers say that their green buying habits remain unchanged in a challenging economy, and one third of consumers are more committed to buying green than they were in the past. The use and development of sustainable packaging is one way to

support innovative, functional packaging materials and systems that promote economic and environmental health.

[0004] To respond to consumer demand, many consumer goods companies have committed to the redesign of traditional packaging methods in order to make their products more sustainable. Over half of consumer goods producers (55 percent) indicate their commitment to sustainability initiatives do not change, even with economic downturns, and that packaging is their top focus area (76 percent). For example, the packaging industry is being pushed by customers, for example, Wal-Mart, for source reduction (i.e., material reduction).

[0005] Some of the factors that contribute to a sustainable design of packaging include use of minimal materials (reduced packaging, reduced layers of packaging, lower mass and volume), logistics efficiency (ability to efficiently transport and utilize the packaging), energy efficiency (total energy content and usage, use of renewable energy), recycled content, ability to recycle and reuse, use of renewable resources, use of biodegradable materials when appropriate, avoidance of toxic materials, effects on the atmosphere and climate, and any other environmentally-conscious practice. At the same time, the packaging must be cost-effective, and must meet market criteria for performance with respect to the type of product to be packaged.

SUMMARY

[0006] In one embodiment, a flexible packaging system comprises a flexible or semi-flexible container and an inflatable hollow scaffolding component; wherein the

flexible packaging system may be made rigid or semi-rigid by inflation of the hollow scaffolding component.

[0007] In some aspects, the flexible container is made from a plastic component and formed into thin sheets or films. In other aspects, the flexible container comprises an embedded fiber matrix. In further aspects, the flexible container is an open top container.

[0008] In some aspects, the hollow scaffolding component may be internally-associated with the flexible container. In other aspects, the hollow scaffolding component may be externally-associated with the flexible container. In some embodiments, the hollow scaffolding component is inflated by a machine that pressurizes the hollow scaffolding component with air, gas or foam. In other embodiments, the hollow scaffolding component is self-inflating, wherein the hollow scaffolding component is associated with two or more compartments that contain two or more inflation components, that, when mixed, form the necessary gas, foam, or liquid to pressurize the hollow scaffolding component. Alternatively, in some aspects, the hollow scaffolding component contains pellets, capsules or beads that contain two or more ingredients that, when mixed, form the necessary gas or foam to pressurize the hollow scaffolding component. In some aspects, the hollow scaffolding component may include a handle-like appendage.

[0009] In some embodiments, a flexible packaging system may further comprise one or more internal or external ribbing supports. The ribbing supports may be string,

webbing, membranes, or one or more inflatable supports that are associated with the hollow scaffolding component.

[0010] In some embodiments, the flexible container, hollow scaffolding component, or the flexible packaging system may be compressed such that the system may be stored and transported flat or in a roll.

[0011] In some embodiments, the flexible packaging system has an opening that allows for filling or pouring contents to be held within. The opening may be associated with an integrated closure assembly, wherein the integrated closure assembly may be selected from a resealable peel top, a screw top, a snap top, a flip top, or a cork or plug-type system. Another embodiment is directed to a packaging system comprising a semi-flexible container and an associated scaffold component, wherein the container includes fiber materials to provide additional stiffness and tension to help define a desired shape, and the associated scaffold component provides support for the fiber container.

[0012] In another embodiment, an unfilled flexible packaging system described above is shipped, stored and utilized according to a method comprising: providing one or more uninflated flexible packaging systems; shipping and/or storing the one or more uninflated flexible packaging systems; inflating the one or more flexible packaging systems prior to use; and optionally deflating the one or more flexible packaging systems after use.

[0013] In some aspects, the uninflated flexible packaging systems are substantially flat and shipped and/or stored in a stack, or are separably attached to each other and formed into a roll of stock for shipping and/or storing.

[0014] In some aspects, the inflating may be accomplished by a machine, and in other aspects, the uninflated flexible packaging system is self-inflating. In one aspect, the hollow scaffolding component of the self-inflating flexible packaging system is associated with two or more compartments that contain two or more inflation components, that, when mixed, form the necessary gas or foam to pressurize the hollow scaffolding component. In another aspect, the hollow scaffolding component of the self-inflating flexible packaging system contains pellets, capsules or beads that contain two or more ingredients that, when mixed, form the necessary gas or foam to inflate the hollow scaffolding component.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] Fig. 1 is a side view of a three-dimensional rendering of a fully expanded flexible packaging system according to one embodiment, having an internally-associated hollow scaffolding component.

[0016] Fig. 2 is a cross-sectional view of a three-dimensional rendering of a fully expanded flexible packaging system according to one embodiment.

[0017] Fig. 3 is a series of line drawings (A, top view; B, perspective view; and C, side view) illustrating a flexible packaging system according to one embodiment,

wherein the flexible packaging system comprises an internally associated hollow scaffolding component and an outer flexible container.

[0018] Fig. 4 is an exploded view of a line drawing illustrating a flexible packaging system according to one embodiment, having an internally-associated hollow scaffolding component.

[0019] Fig. 5A and Fig. 5B are alternate side views of line drawings illustrating a flexible packaging system according to one embodiment, wherein the flexible packaging system comprises an internally-associated hollow scaffolding component and a flexible container providing a smooth outer surface.

[0020] Fig. 6 is a series of line drawings (A, side view; B, perspective view; and C, top view) illustrating a fiber matrix that can be imbedded into the packaging system according to one embodiment.

[0021] Fig. 7 is a side view of a three-dimensional rendering of a packaging system according to one embodiment, wherein the general shape of the fully expanded packaging system is provided by fiber-type materials and the hollow scaffolding system provides tension against the fiber matrix.

[0022] Fig. 8A is a side view of a three-dimensional rendering of a flexible packaging system according to one embodiment, having an externally-associated hollow scaffolding component.

[0023] Fig. 8B is a side view of a three-dimensional rendering of a flexible packaging system according to one embodiment, having an externally-associated

hollow scaffolding component. The externally associated hollow scaffolding component is transparent for visualization of the internal components.

[0024] Fig. 9 is a top view of a three-dimensional rendering of a flexible packaging system according to one embodiment, having an externally-associated hollow scaffolding component.

[0025] Fig. 10 is a series of line drawings (A and D, side views; B and E, top views; and C perspective view) illustrating an alternate way to make a flexible packaging system according to one embodiment, having an externally-associated hollow scaffolding component.

[0026] Fig. 11 illustrates a corner support structure according to one embodiment, wherein the corner support structure is incorporated into the flexible packaging system of Fig. 10 and Fig. 12.

[0027] Fig. 12 is an exploded view of a line drawing illustrating the various components making up the design of a flexible packaging system according to one embodiment, having an externally-associated hollow scaffolding component.

[0028] Fig. 13 is a series of line drawings illustrating a tapered flexible packaging system (A), having a flexible container (C) and an externally-associated hollow scaffolding component (B) that is integral with the bottom area according to one embodiment, wherein the bottom area has 2 compartments that contain chemical reaction components that, when mixed, may produce either gas or foam.

[0029] Fig. 14 is a side view of a three-dimensional rendering of a bag-type flexible packaging system according to one embodiment, having an internally-associated hollow scaffolding component and an open top.

[0030] Fig. 15 is an exploded view of a three-dimensional rendering of a bag-type flexible packaging system according to one embodiment, having an internally-associated hollow scaffolding component and an open top.

[0031] Fig. 16 is a series of line drawings (A, side view; B, top view; C perspective view and D cross-sectional top view) illustrating a open top, bag-type flexible packaging system according to one embodiment, having an internally-associated hollow scaffolding component and an open top.

[0032] Fig. 17 is a side view of a three-dimensional rendering of an open top tray with an associated hollow scaffolding component for support according to one embodiment.

[0033] Fig. 18 is an exploded view of a three-dimensional rendering of an open top tray with an associated hollow scaffolding component for support according to one embodiment.

[0034] Fig. 19 is a series of line drawings of an open top tray with an associated hollow scaffolding component for support according to one embodiment.

[0035] Fig. 20 is an exploded view of a line drawing of an open top tray with an associated hollow scaffolding component for support according to one embodiment.

This view shows where welding or gluing areas occur to provide association or attachment points between the hollow scaffolding and the open top tray.

[0036] Fig. 21 is a side view of a line drawing of a lid that is associated with an open top tray with an associated hollow scaffolding component according to one embodiment.

[0037] Fig. 22 illustrates additional structures, such as webbing that may be added to corners of an open top tray with an associated hollow scaffolding component for support according to one embodiment.

[0038] Fig. 23 is a bottom view of a three-dimensional rendering of a fully expanded flexible packaging system according to one embodiment, showing first and second compartments that contain components that, when mixed, will produce the gas or foam needed to fill the hollow scaffolding component.

[0039] Fig. 24 shows a roll of flat stock that can be made from multi-laminated layers providing separable containers according to one embodiment.

[0040] Fig. 25 is a three-dimensional rendering that illustrates tension features, such as string, that constrain the container expansion against the gas or foam-filled scaffolding pressures, according to one embodiment.

[0041] Fig. 26 is a cross-sectional view of a line drawing that illustrates tension features, such as string, that constrain the container expansion against the gas or foam-filled scaffolding pressures, according to one embodiment.

[0042] Fig. 27 is a three-dimensional rendering that illustrates tension features, such as webbed structures, that provide tension constraints against the pressure provided by the gas or foam-filled scaffolding, according to one embodiment.

[0043] Fig. 28 is a cross-sectional view of a three-dimensional rendering that illustrates tension features, such as webbed structures, that provide tension constraints against the pressure provided by the gas or foam-filled scaffolding, according to one embodiment.

[0044] Fig. 29 is a cross-sectional view of a line drawing that illustrates tension features, such as webbed structures, that provide tension constraints against the pressure provided by the gas or foam-filled scaffolding, according to one embodiment.

[0045] Fig. 30 is a three-dimensional rendering that illustrates internal pressurized features that help create the final shape of the expanded flexible packaging system according to one embodiment.

[0046] Fig. 31 is a cross-sectional view of a line drawing that illustrates internal pressurized features that help create the final shape of the expanded flexible packaging system according to one embodiment.

[0047] Fig. 32 is a series of line drawings (A, side view; B, top view; C perspective view and D cross-sectional view) illustrating internal pressurized features that help create the final shape of the expanded flexible packaging system according to one embodiment.

[0048] Fig. 33 is a front view of a line drawing that illustrates a flexible packaging system having an externally-associated hollow scaffolding component according to one embodiment, wherein the externally-associated hollow scaffolding component contains capsules or beads that that contain the necessary ingredients that if mixed will generate the necessary gas or foam to fill the hollow scaffolding component.

[0049] Fig. 34 illustrates a method of generating a flexible packaging system according to one embodiment, wherein a single flat sheet may be formed into a hollow scaffolding component that may be formed into a tube. A bottom piece is then welded, glued, melted or otherwise sealed to the bottom of the tube such that the hollow scaffolding component is mated to the gas or foam creating compartments and the remaining large cavity is self-closing. The top is then closed off in one line and a closure assembly for filling the system is mated to the bag assembly.

[0050] Fig. 35 illustrates a method of generating a flexible packaging system according to one embodiment, wherein upper, lower and middle film sheets are laminated together, forming an integrated scaffolding component. The laminated sheets are then formed into a tube, then a bottom cap is added and the top is welded together and a pouring or access feature is added.

[0051] Fig. 36 is a three-dimensional rendering of a scaffolding and thin shell system for use as a mail container with a top cover that can be closed via a zipper, glue tabs or other means after the inside contents have been filled with the item to be mailed.

[0052] Fig. 37 is a three-dimensional rendering of the scaffolding and thin shell system of Fig. 36 that shows the scaffolding and thin shell system separately.

[0053] Fig. 38 is a line drawing of the scaffolding and thin shell system of Fig. 36.

[0054] Fig. 39 is a line drawing of the scaffolding and thin shell system of Fig. 37.

[0055] Fig. 40 is an exploded view of three-dimensional rendering of an unassembled scaffolding and thin shell system for use liquid container with a sealed top cover and a bottom cover that can be allow the container to stand upright.

[0056] Fig. 41 is a three-dimensional rendering of the scaffolding and thin shell system of Fig. 40 showing the scaffolding and thin shell system assembled.

[0057] Fig. 42 is an exploded view of a line drawing of the unassembled scaffolding and thin shell system of Figs. 40 and 41.

[0058] Fig. 43 is a three-dimensional rendering of a flexible packaging unit having a substantially ring-shaped base that can be added to the scaffolding component so the flexible container is able to rest on a flat surface according to one embodiment.

[0059] Fig. 44 is an exploded view of the three-dimensional rendering of a flexible packaging unit of Fig. 43.

[0060] Fig. 45 is a series of line drawings (A, side view; B, top view; C perspective view and D cross-sectional view) illustrating the addition of a substantially ring-shaped base that can be added to the scaffolding component of a flexible packaging unit according to one embodiment.

[0061] Fig. 46 is an exploded view of a line drawing of a flexible packaging unit of Figs. 44 and 45.

DETAILED DESCRIPTION

[0062] In order to fully understand the manner in which the above-recited details and other advantages and objects according to the invention are obtained, a more detailed description of the invention will be rendered by reference to specific embodiments thereof. Other features and advantages of the present invention will become apparent from the following detailed description. It should be understood, however, that the detailed description and the specific examples, while indicating the preferred embodiments of the present invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the present invention will become apparent to those skilled in the art from this detailed description.

[0063] In one embodiment, a flexible packaging system is provided. Such a packaging system may be used as a source-reducing packaging alternative. The flexible packaging system comprises a flexible container and an associated inflatable scaffold or scaffolding (such as a structural support or grid) component. The scaffolding component may be hollow or not, and when inflated or pressurized, provides the rigidity necessary to turn the flexible packaging system into a rigid or semi-rigid packaging container. Pressurization of the scaffolding may be accomplished, for example, by inflating with gas, filling with foam or any other suitable means to pressurize without adding excess weight to the packaging system.

[0064] In some embodiments, the hollow scaffold component may be independent from the flexible container. In some aspects, the scaffold component is internally-associated and the flexible container may act as a cover to the hollow scaffold

component. The flexible container may be removably or permanently attached to the hollow scaffolding by an appropriate attaching means, for example, Velcro®, glue, snaps, zipper or welding.

[0065] In other embodiments, the scaffold component is externally associated and the flexible container is held open by the externally associated scaffold component. Such packaging systems may compete with current cylindrical items, because round bottles placed next to each other leave a space between them that can accommodate corner-shaped scaffolding components. An externally associated hollow scaffold component may comprise a flexible container that has attached corners or other external components that form the hollow scaffolding component. The hollow scaffolding component may comprise of one or more compartments that may be interconnected by way of one or more apertures between the compartments, or may be inflated independently.

[0066] Fig. 3 shows a top view, side view, and a three-dimensional view of a flexible packaging system 100, Fig. 4 shows an exploded view of a flexible packaging system 100, and Fig. 5A and 5B show alternate views of a three-dimensional view of a flexible packaging system 100 according to some embodiments. In such embodiments, a flexible packaging system 100 has an internally associated scaffolding component 105 and an outer flexible container 110. The flexible packaging system 100 has a top that has a closure assembly 115, a bottom 120 that contains a separator 125 creating two compartments that may contain components that, when mixed, will create gas or foam to pressurize that internally associated scaffolding component 105.

[0067] Fig. 10 shows a top view, side view and a three-dimensional view of a flexible packaging system 100, Fig. 11 shows a corner support structure 140 of a flexible packaging system 100, and Fig 12 shows an exploded view of a flexible packaging system 100 according to some embodiments. In such embodiments, a flexible packaging system 100 has an externally associated scaffolding component 130 and an inner flexible container 135. The flexible packaging system 100 has a top 150 that has a closure assembly 115, and a bottom 120. The externally associated scaffolding component 130 comprises a corner support structure 140 and horizontal supports 145. The corner support structure 140 and horizontal supports may be connected via holes 155 (as shown in Fig. 12) in order to create a continuous compartment.

[0068] In some embodiments, the hollow scaffold component may be integrated into the flexible container such that the flexible packaging system shape is formed by a single continuous component. In one embodiment, a method for producing a flexible packaging system is illustrated in Fig. 34, and comprises using a single layer or sheet of flexible material, wherein a flat sheet 210 may first be folded, forming enclosed cavities 215. Then, the folded sheet may be formed into a tube 220. A bottom 225 is welded, glued or melted to the bottom of the tube 220 such that the scaffolding is mated to the gas or foam creating cavity and the remaining large cavity is self-closing. The top is then closed off in one line and a closure assembly 115 for filling is mated to the packaging system assembly.

[0069] The term "weld," "welding," "welded" or the like as used herein refers to melting the films together. In addition the films and/or scaffolding could be joined by other means known in the art including adhesives or other fastening means.

[0070] In other embodiments, the hollow scaffold component may be formed from two or more film sheets forming a ribbing system integrated within the flexible container walls. In one embodiment, a method for producing a flexible packaging system is illustrated in Fig. 35, and comprises using upper 230, lower 235 and middle 240 film sheets that are laminated together with different patterns. In some aspects, the upper 230 and lower 235 sheets do not stick to each other but the middle sheet 240 does laminate to the lower 235 and upper 230 sheets. The result creates a sheet assembly 245 that has a natural pocket or pockets 250 between the lower 235 and upper 230 sheets that form the hollow scaffolding component that contains any necessary properties for its function, such as raw components contained by compartments, beads, or capsules (as discussed below) to create gas or foam, or a valve for inflation. Alternatively the valve for inflation may be formed from the sheets, which can be welded or sealed after inflation. In some embodiments, the valve for inflation is one-way valve. In other embodiments, the valve for inflation may be a two-way valve to allow for deflation, refilling and/or reuse of the packaging system. The sheet assembly 245 is then laminated into a tube 220 with a bottom 225 added. The bottom 225 may contain the necessary components to form a gas or foam to pressurize and fill the scaffolding component. The top may be welded or glued together, and includes a spout 255 or other closure means to access to the materials contained in the packaging system.

[0071] The flexible packaging system may take the form of any shape beneficial to efficient storage, trademark design, or other marketing strategies. In some aspects, the flexible packaging system is in the shape of a bottle, cup, tray, cylinder, tapered cylinder or bag to be used for holding food and drink products, personal hygiene products, detergents and soap, and any other suitable household or commercial products, or consumer, industrial or military products that require rigid or semi-rigid storage, for example, for liquids, gels, powders, fragile contents, and food products.

[0072] Fig. 13 shows a three-dimensional side view and an exploded view of a flexible packaging system, 100 according to one embodiment. Such an embodiment has an externally associated tapered scaffolding system 310 and an inner tapered flexible container 300. There is also a bottom 120 with a separator 125, and a top 330 with an incorporated closure assembly 115.

[0073] The flexible container and the hollow scaffolding component may be made of any substance or substances suitable for packaging materials, and may be associated with sustainable packaging. Such substances include, but are not limited to any flexible plastic material or a combination thereof, for example, rubbers, polyesters, nylons, mylars, Saran Wrap®, PETE, cellophane, polyethylene, PVC, LDPE, Polypropylene, and EVA that may be formed into thin sheets or films, thereby producing a packaging container that is light, thin and easily stored or transported in a very small area when deflated. The materials may be recyclable, biodegradable, compostable, or any combination thereof, and may also include aluminized or other treated films.

[0074] Another embodiment is directed to a semi-flexible container that has an embedded fiber matrix that assists in providing the shape of the packaging system. Fig. 6 illustrates a fiber matrix 130 that can be imbedded into the packaging system according to one embodiment. Suitable fiber materials may include, but are not limited to plastic fibers, or any other material that can provide stiffness and tension. A hollow scaffolding component that is associated with a fiber matrix embedded flexible container pushes against the fiber matrix to provide support for the structure. The fiber matrix provides one way to increase the stability of the packaging without substantially increasing the volume, or weight of the packaging system.

[0075] The ability to transform uninflated thin films or shells into inflated rigid or semi-rigid containers allows the packaging to remain functional while reducing the environmental costs of other traditional packaging. Thus, the flexible packaging system described herein may be suitable for replacement of glass jars, metal cans, and rigid plastic bottles such as for shampoo or household goods. In one embodiment, the uninflated flexible packaging system may be transported in a flat or substantially flat state, wherein one or more flat or substantially flat packaging systems are stacked on top of each other. In another embodiment, a plurality of uninflated flexible packaging system units may separably attached to each other and formed into a roll of stock. Fig. 24 shows a roll of stock 600 according to one embodiment.

[0076] The ability to transport and store flexible packaging systems in an uninflated state as described herein conveys substantial benefits to a user of such packaging systems with respect to the transport and storage of the flexible packaging system. For example, one truckload of unfilled, flat or rolled flexible packaging system

is equivalent to approximately 25 truckloads of unfilled glass jars. Therefore, the uninflated flexible packaging systems may be economically shipped to users, stored in a smaller storage space, and may be inflated prior to use, deflated after use, or both. In one embodiment, the uninflated flexible packaging system may be kept in storage until needed, and inflation of a flexible packaging system may occur immediately prior to use. In other embodiments, the inflation may occur at a predetermined time, prior to use.

[0077] The use of a thin, flexible container also reduces the chance of damage to the packaging system. Traditional rigid containers such as thick plastic, metal, or glass may be dented, punctured or broken at the local force application point during an impact event that may occur in transit or other handling. The flexible packaging system described herein retains semi-flexibility such that upon impact, the shape of the container will be retained after a load is removed.

[0078] In some embodiments, the flexible packaging system may include additional inflatable or foam-filled appendages to provide a handle or other carrying means for use in applications such as soups, coffee cups and other applications that require mitigation of heat transfer to the person handling the system.

[0079] In some embodiments, internal ribbing supports may be included to add tension features that would constrain the container expansion against the scaffolding pressures and/or to help create the final shape of an expanded flexible packaging system. In some aspects, as shown in Fig. 26, the internal ribbing supports may be strings 190. In other aspects, as shown in Fig 29, the internal ribbing supports may be webbing 195. Other internal ribbing supports may include membranes or other similar

internal structures that are suitable to provide tension against the scaffolding pressures. The webbing, ribs, filaments or other supports may be internal, external, or both, of either the scaffolding or flexible container portion.

[0080] In other aspects, the internal ribbing supports are pressurized. As shown in Figs. 31 and 32, pressurized internal ribbing supports 700 may be integrated with the hollow scaffolding component and may be filled with air or foam in the same manner as the scaffolding component. In other aspects, the supports may be external.

[0081] In some embodiments, the flexible packaging system may comprise an open-top container such as a cup, a bag, a tray, or another container that can be used to hold liquids, creams, gels, powders or other products or materials. In some aspects the hollow scaffolding component may be enlarged or thickened to provide insulation for heated products, such as for hot drinking cups or food trays to be used in the microwave. An open-top container may also include an associated lid, such as a lid to cover a food tray or a cup to allow for more efficient transport when full.

[0082] Fig. 16 shows a side view, three-dimensional view and top views of an open-top flexible packaging system 400 according to one embodiment. The open-top flexible packaging system described in this embodiment has an open top 165, an internally associated scaffolding component 105, an outer flexible container 110 and a bottom 120 with a separator 125.

[0083] Figs. 19, 20, 21 and 22 show multiple views of an open top tray flexible packaging system 500 according to some embodiments. The open top tray flexible packaging system 500 described in this embodiment comprises an open tray liner 170

and a tray scaffold system 175. Optionally included is a lid 180 as shown in Fig. 21, and a webbing 185 to provide further support.

[0084] In some embodiments, the flexible packaging system is a closed system, for a one-time use. In other embodiments, the flexible packaging system includes an integrated closure assembly that allows a packaging system to be opened and closed multiple times. The closure assembly may comprise a removable and resealable peel-top portion of the flexible container or may comprise a separate opening system such as a screw top, a snap-cap top, a flip top, a cork or plug-type system, or any other suitable recloseable independent closure assembly.

[0085] In some embodiments, inflation of the flexible container system may be accomplished by a machine that fills the inflatable hollow scaffolding component with air, gas, foam, or any other suitable substance to pressurize the scaffolding component. In other embodiments, the flexible container system may be self-inflating. In one embodiment, a self inflatable system includes two or more compartments, each compartment filled with components that, when mixed, will form the gas or foam necessary to fill the hollow scaffolding component. Suitable components that can form gas include, but are not limited to any acid mixed with a form of carbonate, such as citric acid and sodium bicarbonate, will produce carbon dioxide that may pressurize the hollow scaffolding component. Alternatively, the gas may be produced by blowing agents used in the plastics industry such as Ezio di Carbonamides that produce carbon dioxide when heated. The components may be in the form of liquids, solids, powders or any combination thereof. Suitable components that can form the foam include, but are not limited to compounds such as mixtures of isocyanates and polyols.

[0086] In another embodiment, the hollow scaffolding system may contain beads, capsules, small bags, or other means to hold the necessary ingredients that, if mixed, will generate the gas or foam required to fill the hollow scaffolding component. Fig. 33 shows a flexible packaging system 100 with beads 205 in an externally associated scaffold system 310. Suitable components that can form gas include, but are not limited to any acid mixed with a form of carbonate, such as citric acid and sodium bicarbonate, will produce carbon dioxide that may pressurize the hollow scaffolding component. Alternatively, the gas may be produced by blowing agents used in the plastics industry such as Ezio di Carbonamides that produce carbon dioxide when heated. The components may be in the form of liquids, solids, powders or any combination thereof. Suitable components that can form the foam include, but are not limited to compounds such as mixtures of isocyanates and polyols.

[0087] In one aspect, the beads or capsules may be activated by palpating their location and squeezing the scaffolding component, causing them to break open, releasing their contents. In another aspect, the beads may be placed in an area of the scaffolding wherein the act of filling the container with the product or products it was designed to hold will break the beads such that the gas or foam released will cause the scaffolding to be filled simultaneously with the flexible container. In another aspect, the beads may be broken upon quick freezing or flash heating. In another aspect, extra beads or capsules may be added such that if a container starts to lose rigidity due to loss of gas over time, the extra beads could be squeezed to release additional gas.

[0088] In other embodiments, other means known in the art may be employed to inflate or fill the scaffolding component of the flexible packaging system including

heating or cooling, localized laser or radiation means, for example microwaves to activate release of foam or gas. In other embodiments, other means may be employed to fill or inflate the scaffolding such as explosives or similar. For example, a pellet of sodium azide (NaN_3) may be ignited causing a rapid reaction generating nitrogen gas (N_2) to fill the scaffolding. Potassium nitrate and silicon dioxide can be used in secondary and tertiary reactions to deal with the liberated sodium.

[0089] In another embodiment, small chambers are provided that may act as expansion chambers. Such expansion chambers may be necessary to avoid explosion of the scaffolding component due to expansion of the gas or foam that may occur due to heating or shipping by plane or other means of shipping that requires travel through high altitude regions.

[0090] In another embodiment, the flexible container and associated hollow scaffolding component may be manufactured from the same, substantially the same, similar materials, or any combination thereof that would allow recycling of the both the flexible container and associated hollow scaffolding component together.

[0091] Referring to Figs. 36-39, a flexible packaging system 800 including a scaffolding component 810 and a shell 805 for use as a mail container is shown. The system includes a top cover 815 that can be closed by a zipper, glue tabs, adhesives, or other means (not shown) after the inside contents have been filled with the item to be mailed. In one aspect of this embodiment the scaffolding 805 may keep the package rigid or semi rigid, protect the contents of the container system 800, or both. Further, the system may include additional or less scaffolding 805 to provide more or less

protection as required. In another aspect, the container system 800 may be provided uninflated, such that the container is flat or substantially flat, and then the scaffolding may be inflated immediately prior to use, deflated after use, or both.

[0092] Referring to Figs. 40-42, a flexible packaging system 900 is shown having a scaffolding component 910 and thin shell 905 for use as a flexible container with a sealed top cover 915 and a openable bottom cover 920 to allow the container to stand upright. This embodiment can be used with viscous liquids to allow a user easy access to the contents by permitting the contents to move toward the openable bottom cover 920 of the container 900 when not in use. This embodiment can be used as a container for shampoos, lotions, ketchup or other similar viscous product contents or with powders, gels, or other products or materials.

[0093] Referring to Figs. 43-46, a flexible packaging system 1000 according to some embodiments is shown. When a flexible container 1010 is filled, it may tend to form a bowed or substantially rounded bottom 1040, which may affect the flexible packaging system's ability to rest upright on a flat surface. Therefore, a flexible container 1010 may be associated with a scaffolding component 1020 that includes a substantially ring-shaped base 1030 to assure that the flexible container has a substantially flat bottom. The substantially ring-shaped base 1030 may be added as part of the scaffolding component 1010. In an alternative embodiment, the scaffolding may include a plurality of legs that extend therefrom such that they provide support for the flexible container to stand upright (not shown). In one aspect, the scaffolding includes at least three legs for support.

[0094] In another aspect of any of the previous embodiments, the flexible packaging system including a scaffolding component and flexible container or shell can be formed from two or more bonded sheets wherein one or more of the sheets includes weak areas, for example, areas with reduced or no bonding between the sheets, at which the scaffolding would expand upon inflation. The weak areas can be designed into the one or more sheets prior to manufacture or modified, after the two or more sheets are bonded, by a secondary process wherein when the scaffolding is pressurized, the expansion occurs at the weakest areas in the one or more sheets. The weak areas can be of any configuration, for example, a configuration to form any container system set forth herein.

[0095] In other aspects of the previous embodiments, the container system may include an internal reservoir or weak area that is designed to expand if over-pressurization occurs due to altitude changes or temperature changes or pressure changes, or the container system may include several laminated layers so that different properties can be created, for example, to hold modified atmosphere or oxygen scavenging systems.

[0096] In other embodiments, the container may be configured such that the gas or other material used to inflate or fill the scaffolding diffuses out of the scaffolding over time such that the gas or other material used to inflate or fill the scaffolding diffuses to the interior of the container, the exterior of the container, or both. Such embodiments can be configured to indicate the expiration or "shelf life" of the contents of the container by, for example, deflating the scaffolding after a predetermined time. In other aspects of these embodiments, the diffusion may be used to provide a particular gas or other

material to the interior of the container over time to, for example, preserve the contents of the container or for other purposes.

[0097] Although the invention has been described with respect to specific embodiments, it will be readily appreciated by those skilled in the art that modifications and adaptations of the invention are possible without deviation from the spirit and scope of the invention. Accordingly, the scope of the present invention is limited only by the following claims.

WHAT IS CLAIMED IS:

1. A flexible packaging system comprising:

a flexible or semi-flexible container; and

an inflatable hollow scaffolding component;

wherein the flexible packaging system is configured to be rigid or semi-rigid upon inflation of the hollow scaffolding component by air, gas or foam.

2. The flexible packaging system of claim 1, wherein the hollow scaffolding component is internally-associated with the flexible container.

3. The flexible packaging system of claim 1, wherein the hollow scaffolding component is externally-associated with the flexible container.

4. The flexible packaging system of claim 1, wherein the hollow scaffolding component includes a first opening for inflation or deflation, and wherein the first opening can be permanently sealed or releasable sealed.

5. The flexible packaging system of claim 1, wherein the hollow scaffolding component is self-inflating.

6. The flexible packaging system of claim 5, wherein the hollow scaffolding component is associated with two or more compartments that contain two or more inflation components, that, when mixed, form the necessary gas or foam to pressurize the hollow scaffolding component.

7. The flexible packaging system of claim 5, wherein the hollow scaffolding component contains pellets, capsules or beads that contain two or more ingredients that, when mixed, form the necessary gas or foam to inflate the hollow scaffolding component.

8. The flexible packaging system of claim 1, wherein the flexible packaging system further comprises one or more internal supports.

9. The flexible packaging system of claim 8, wherein the internal supports are comprised of ribbing or webbing.

10. The flexible packaging system of claim 1, wherein the flexible packaging system is configured to be in a substantially flat condition upon deflation of the scaffolding.

11. The flexible packaging system of claim 1, wherein the flexible packaging system has an opening that allows for filling or pouring products to be held within.

12. The flexible packaging system of claim 11, wherein the opening is comprises with an integrated closure assembly.

13. The flexible packaging system of claim 11, wherein the opening is configured to receive a separate closure assembly.

14. The flexible packaging system of claim 13, wherein the closure assembly is selected from a resealable peel top, a screw top, a snap top, a flip top, or a cork, press top, or plug-type system.

15. The flexible packaging system of claim 1, wherein the hollow scaffolding component includes one or more handle-like appendages.

16. A flexible packaging system comprising:
a flexible or semi-flexible container;
a hollow scaffolding component; and
one or more internal supports;
wherein the flexible packaging system may be made rigid or semi-rigid by inflation of the hollow scaffolding component.

17. The flexible packaging system of claim 16, wherein the flexible packaging system is made from a plastic component and formed into thin sheets.

18. The flexible packaging system of claim 16, wherein the container comprises a thin shell or film.

19. The flexible packaging system of claim 16, wherein the container comprises an embedded fiber matrix.

20. The flexible packaging system of claim 16, wherein flexible packaging system may be substantially flat or in a roll when in a deflated state.

21. The flexible packaging system of claim 16, wherein the one or more internal ribbing supports are selected from the group consisting of string, webbing and membranes.

22. The flexible packaging system of claim 16, wherein the one or more internal supports are inflatable.

23. A flexible packaging system of claim 16 further comprising an expansion chamber in fluid connection with the scaffolding that will expand and reduce in size to accommodate changes in temperature after inflation of the scaffolding to maintain the rigidity of the container for use.

24. A method for providing a flexible packaging system for holding a product, wherein an unfilled flexible packaging system is provided and utilized according to a method comprising:
providing at least two uninflated flexible packaging containers, wherein the uninflated flexible packaging containers are substantially flat and are provided in a stack or roll;
inflating the one or more flexible packaging containers prior to use; and
wherein the flexible packaging containers comprise a flexible container and a hollow scaffolding component that may be made substantially rigid by inflation of the hollow scaffolding component.

25. The method of claim 24, wherein each of the uninflated flexible packaging containers is not attached to an adjacent flexible packaging container.

26. The method of claim 24, wherein each of the uninflated flexible packaging containers are separably attached to an adjacent flexible packaging container.

27. The method of claim 24, wherein the uninflated flexible packaging containers are self-inflating.

28. The flexible packaging system claim 16 wherein the scaffolding is configured to be deflated following use.

29. The method of claim 24, wherein the stack or roll is comprised of a matrix of individual uninflated containers for providing at least two containers for substantially simultaneous inflation of the at least two containers.

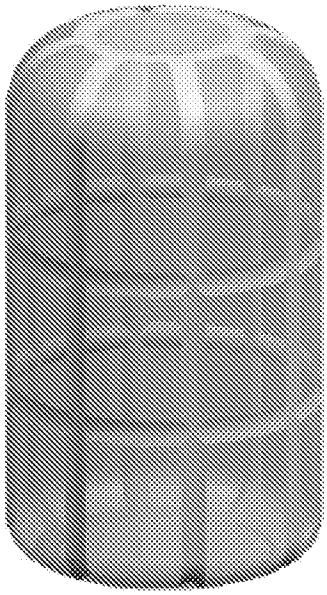


FIG. 1

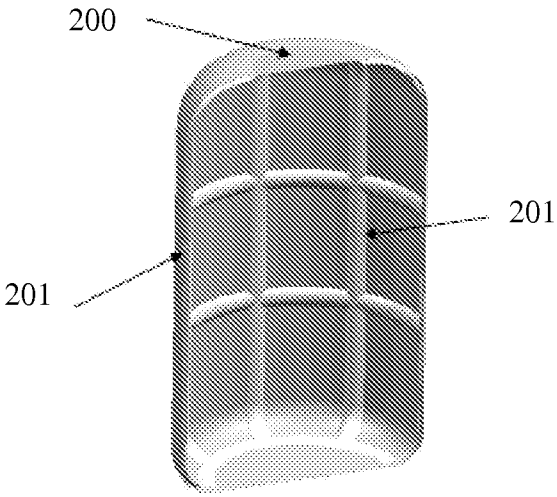


FIG. 2

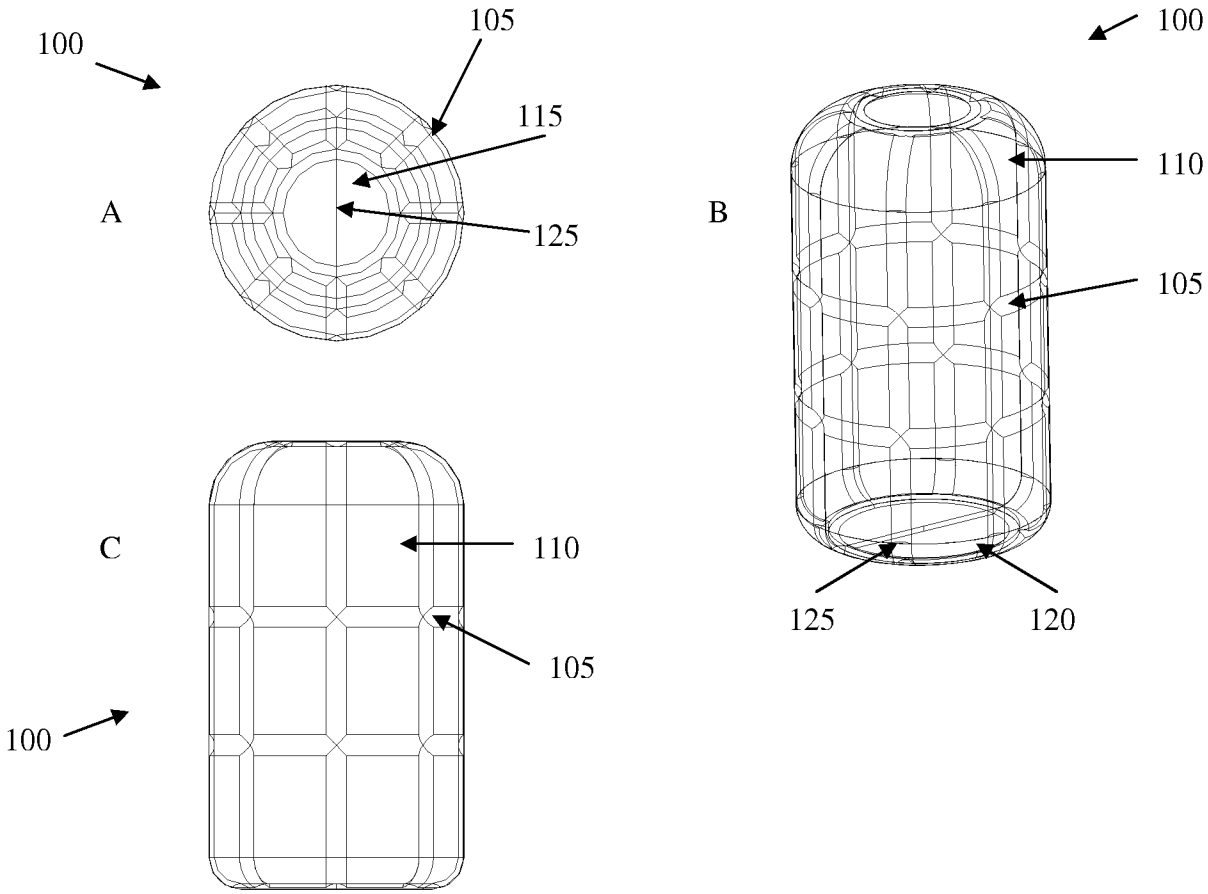


FIG. 3

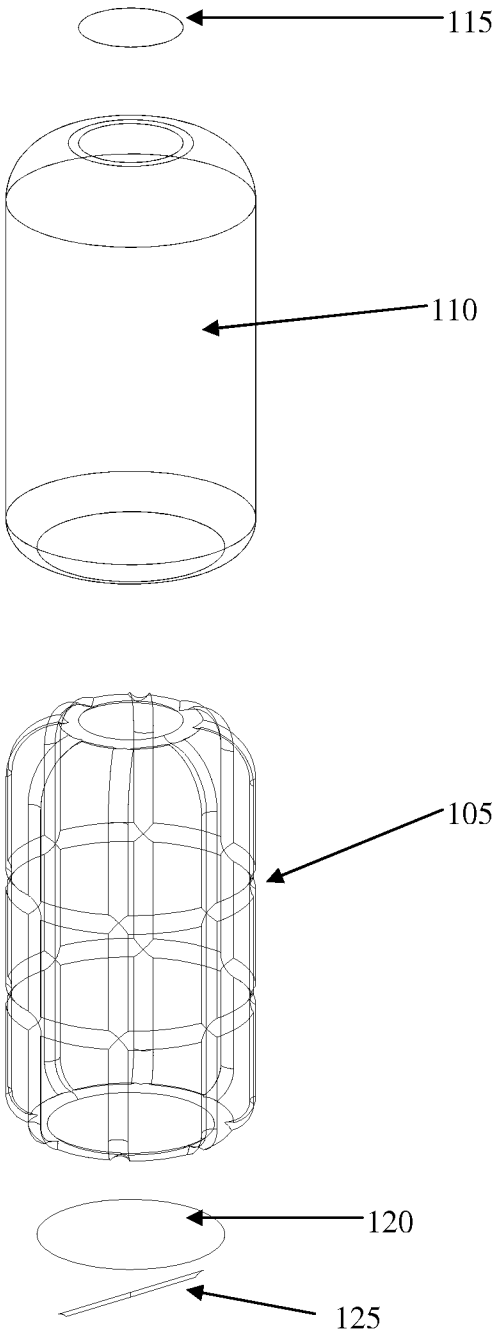


FIG. 4

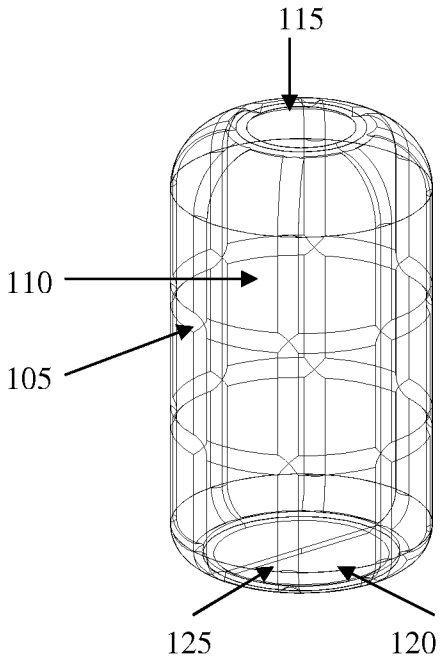


FIG. 5A

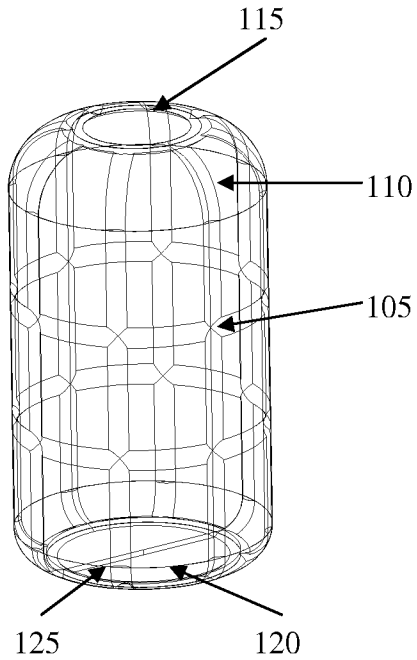


FIG. 5B

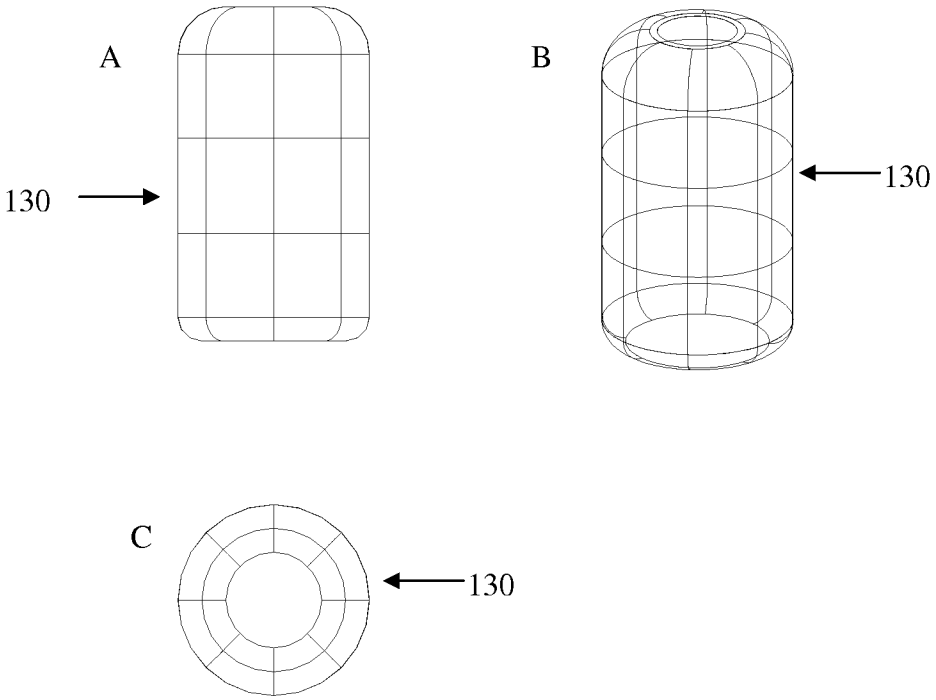


FIG. 6

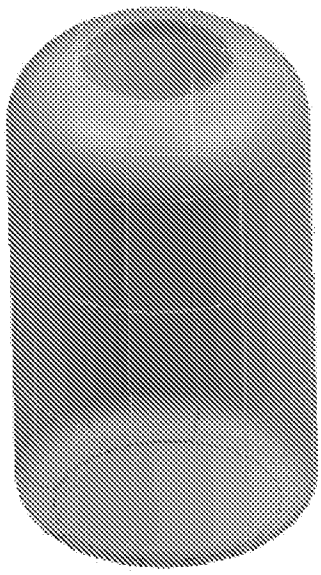


FIG. 7

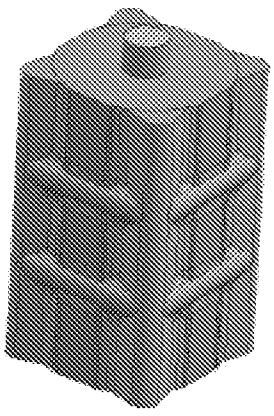


FIG. 8A

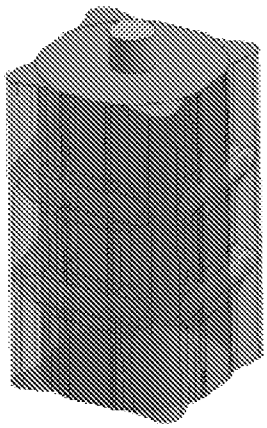


FIG. 8B

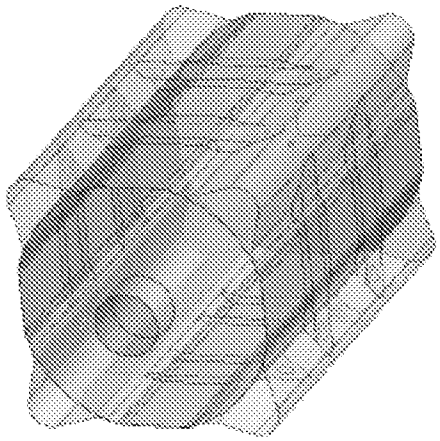
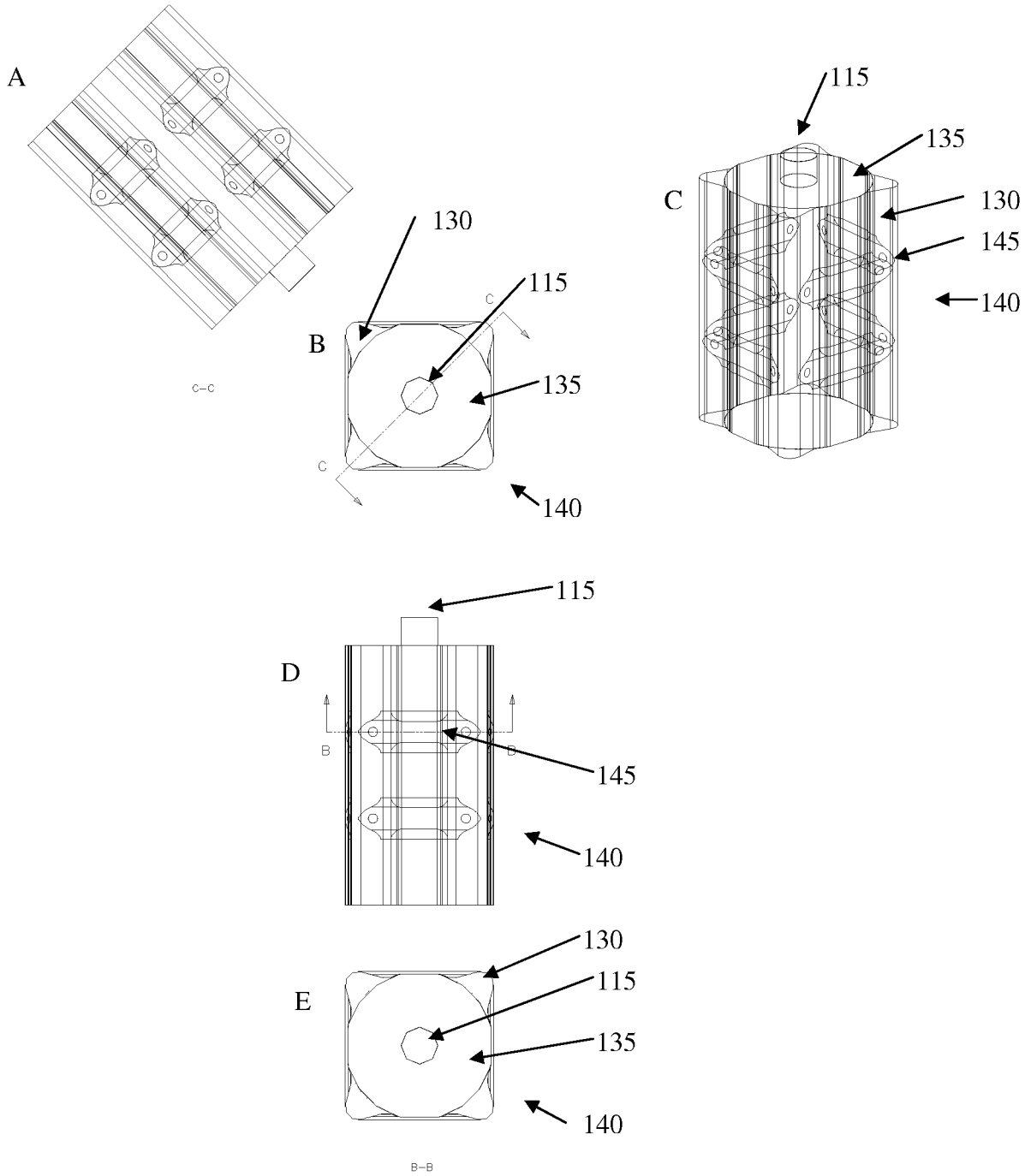


FIG. 9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C–C
B
130
115
135
140
C
C
115
135
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140
D
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B
B
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140
E
130
115
135
140
B–B

FIG. 10

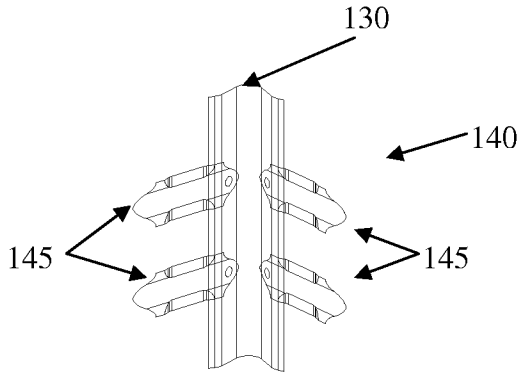


FIG. 11

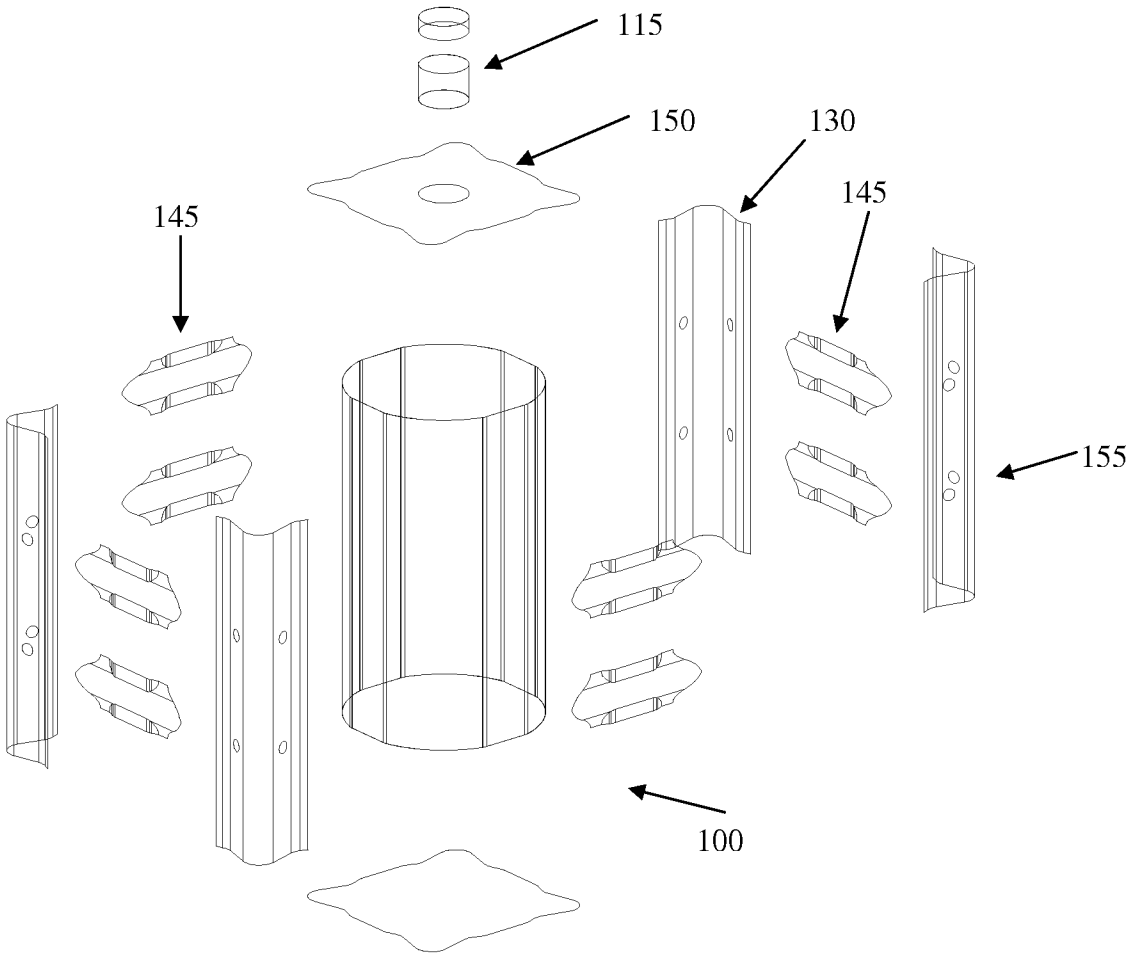


FIG. 12

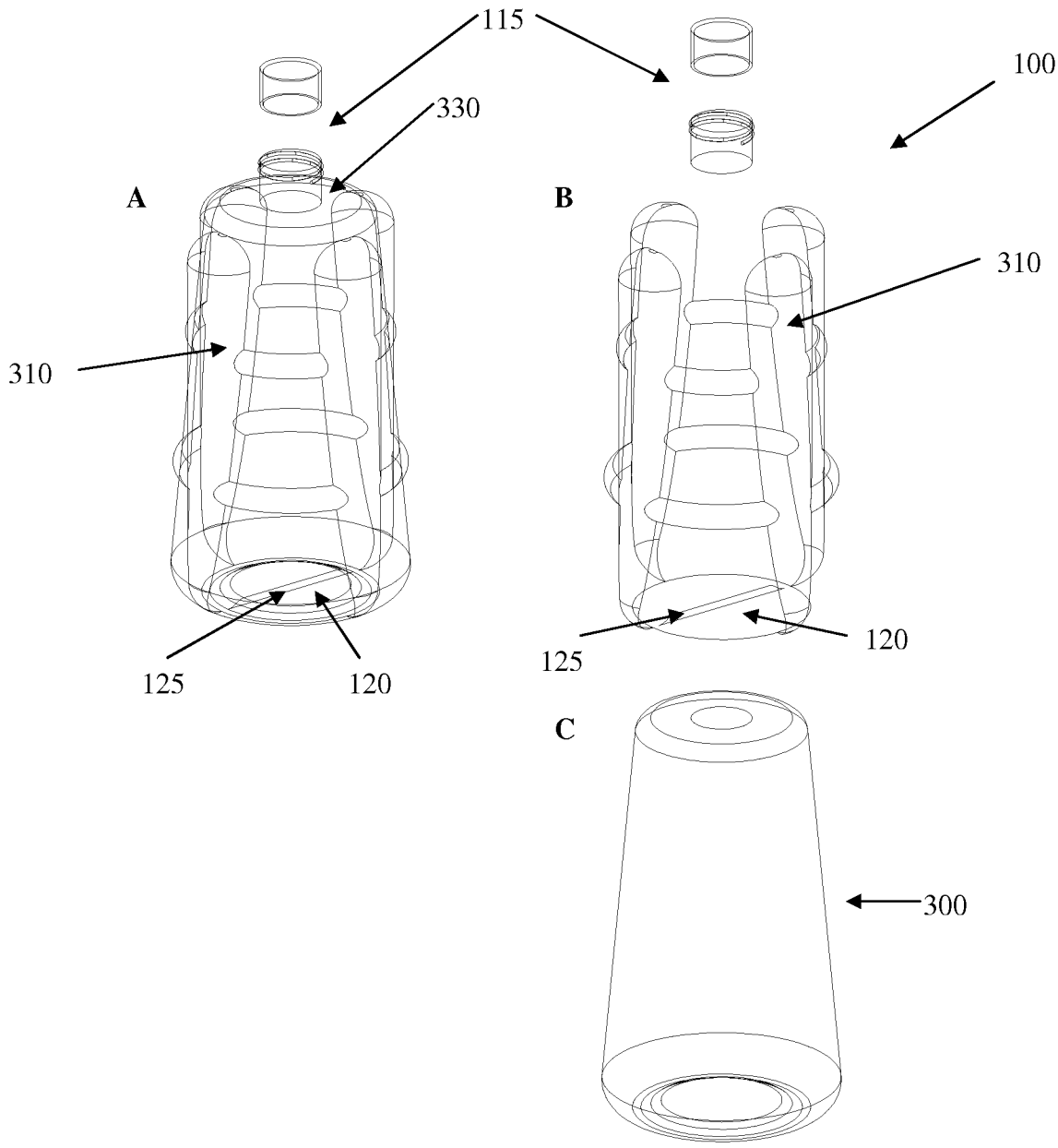


FIG 13

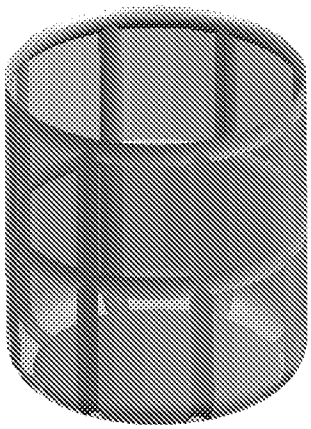


FIG. 14

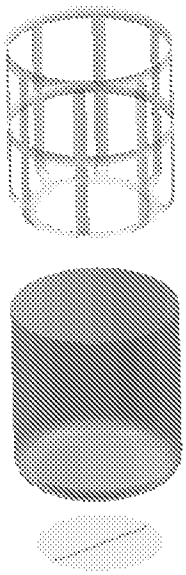
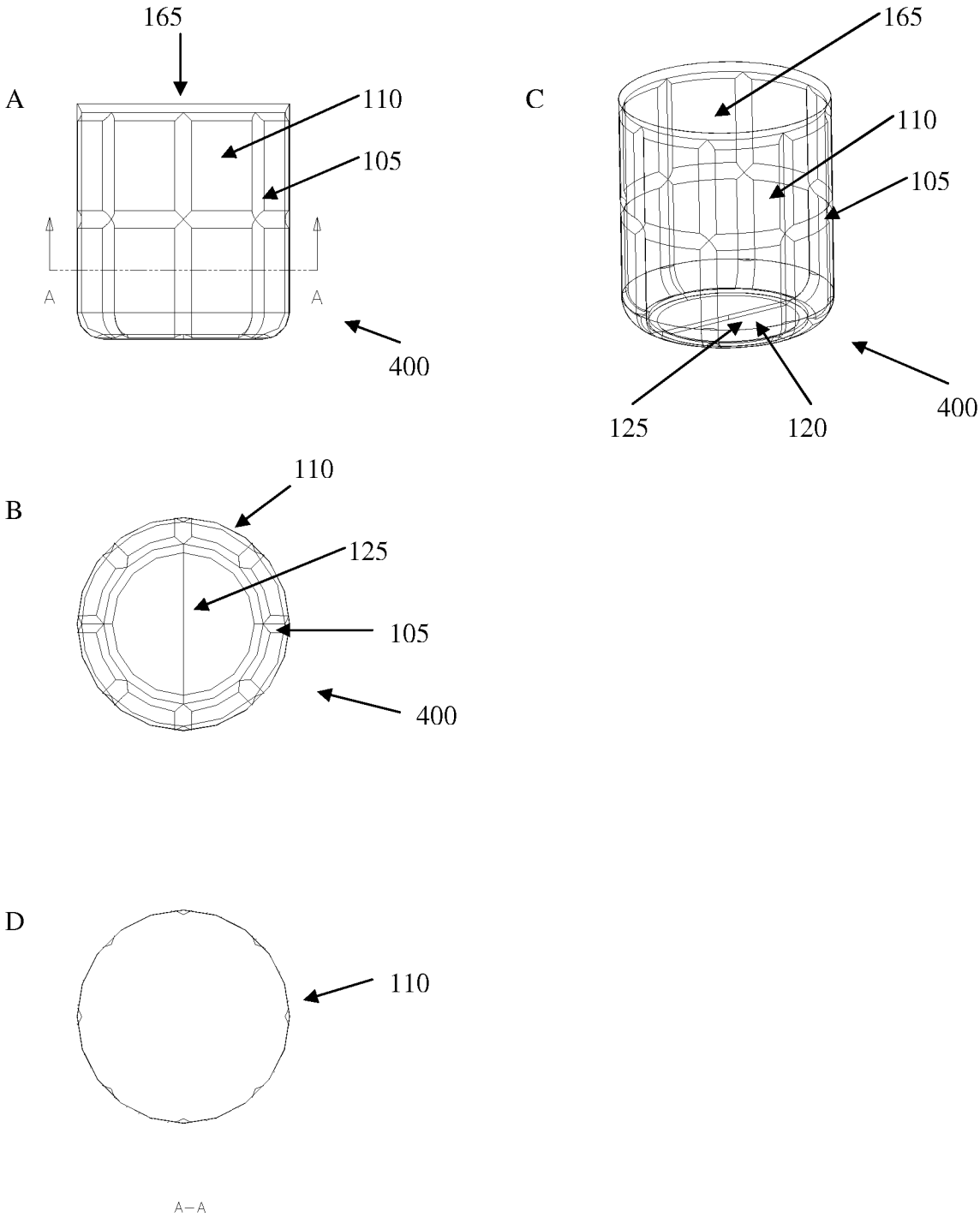


FIG. 15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A
A
400
C
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B
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125
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D
110
A–A

FIG. 16

FIG. 17

FIG. 18

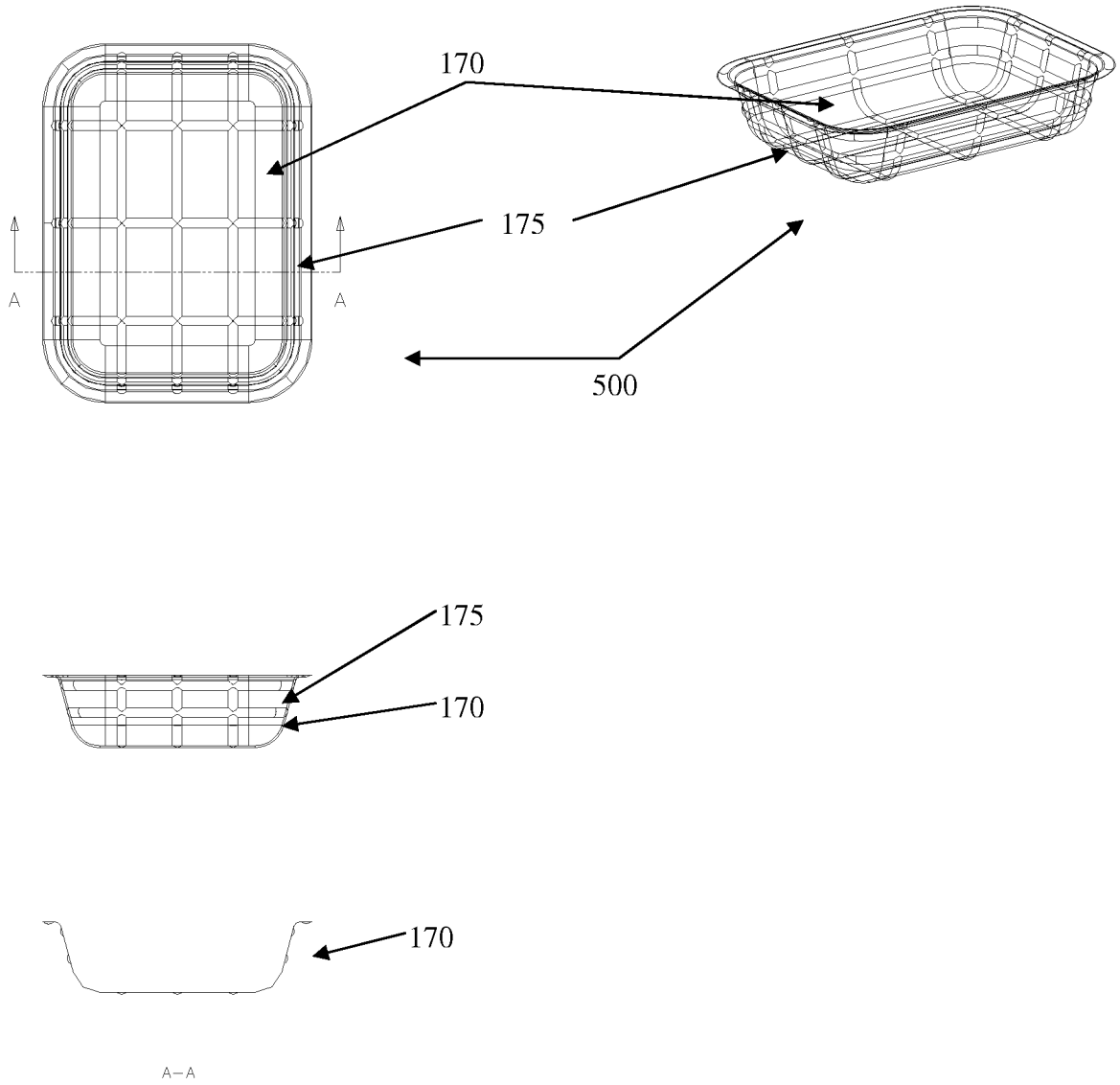

FIG. 19

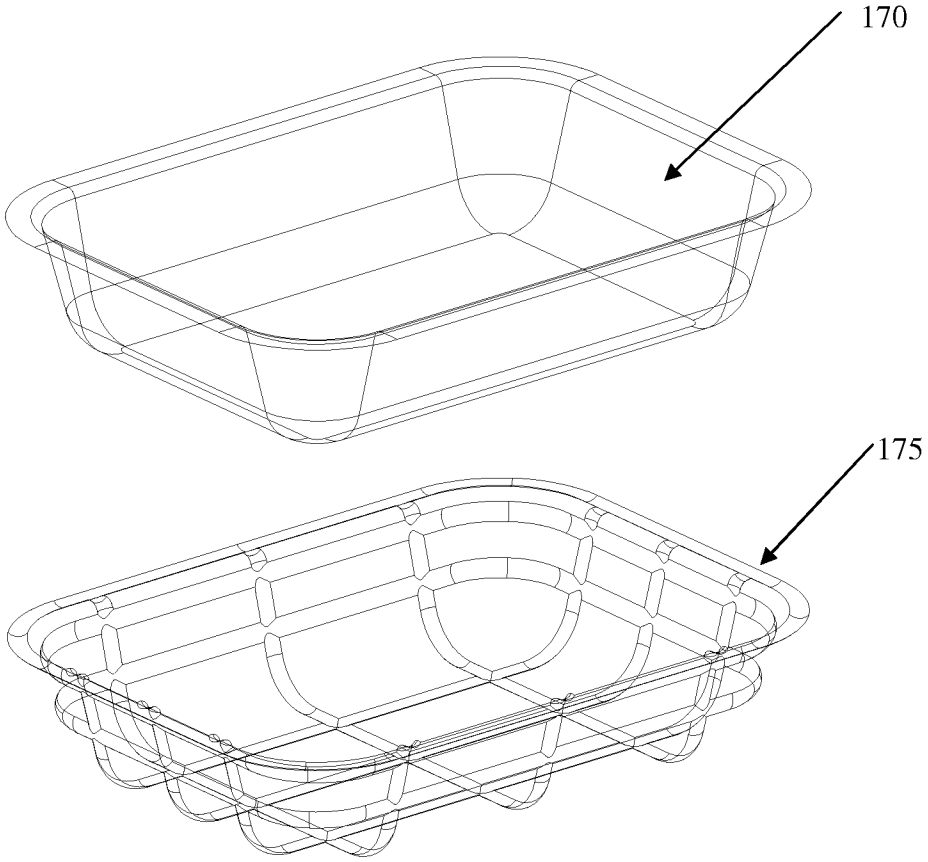

FIG. 20

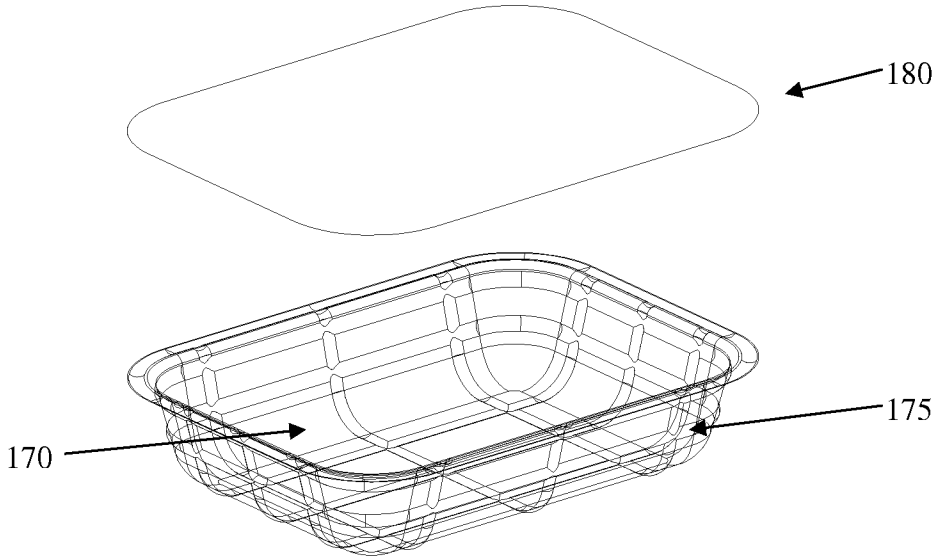

FIG. 21

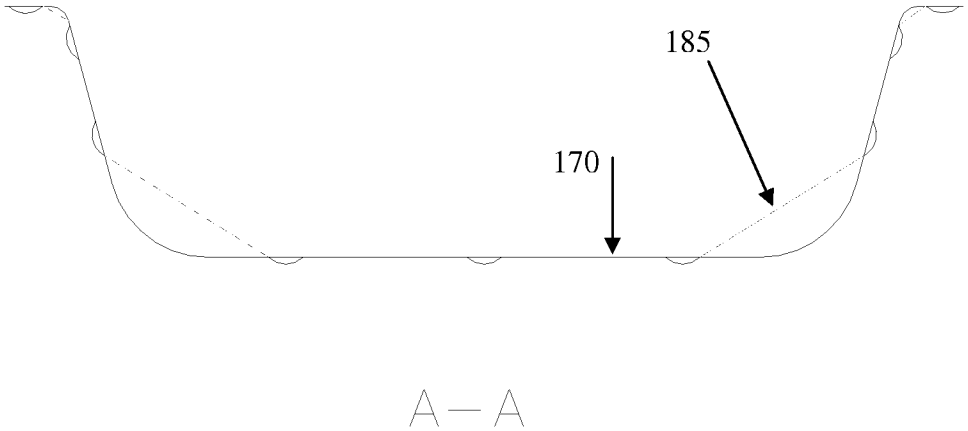

FIG. 22

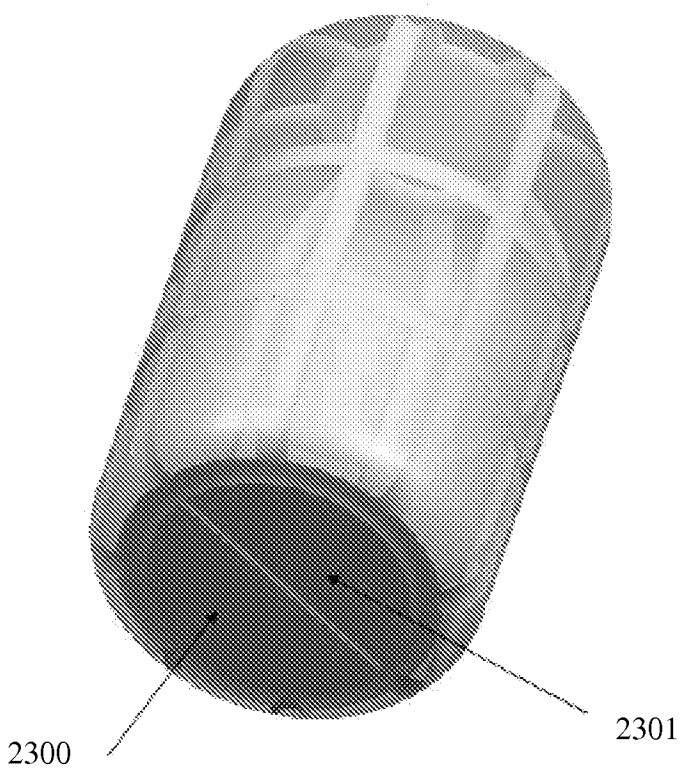

FIG. 23

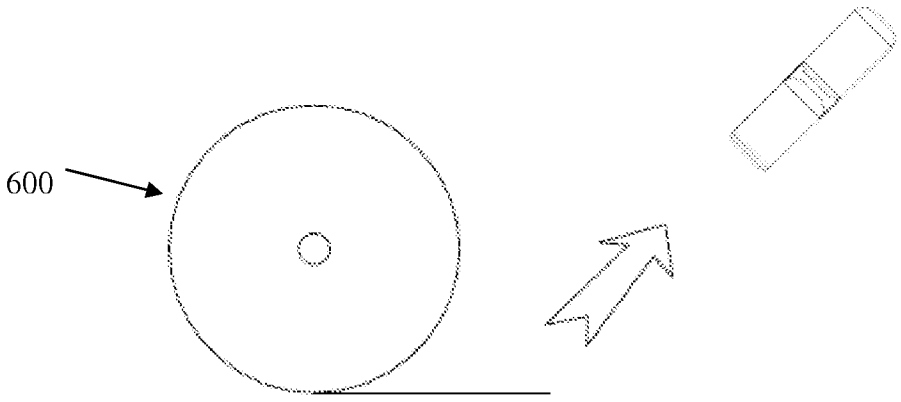

FIG. 24

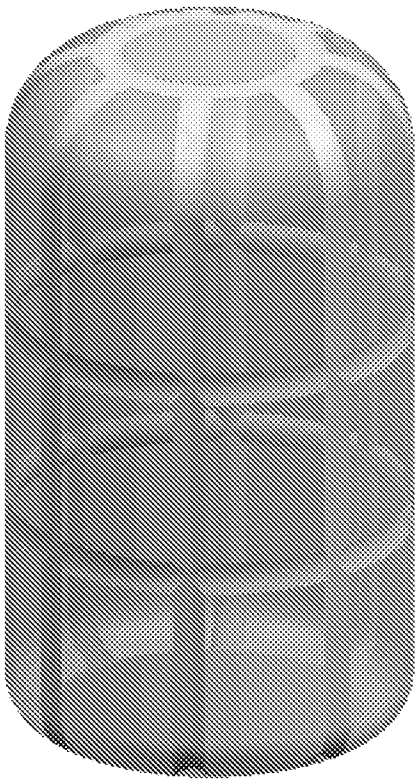

FIG. 25

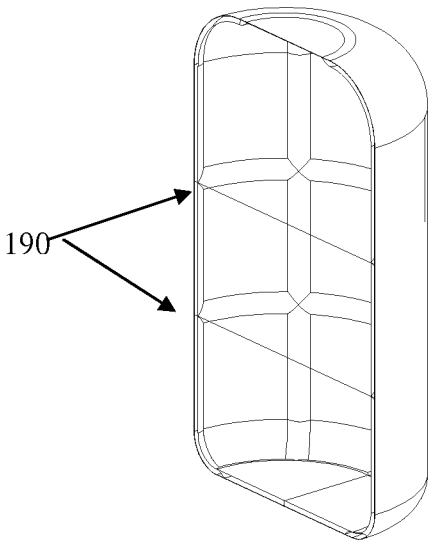

FIG. 26

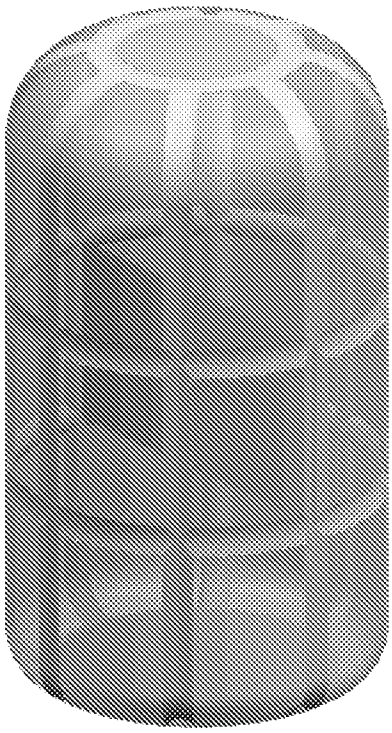

FIG. 27

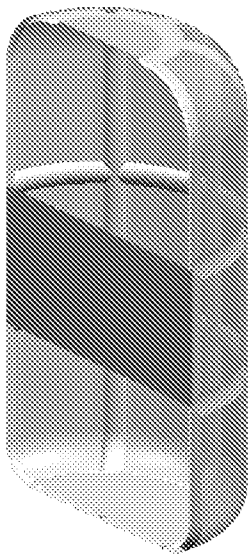

FIG. 28

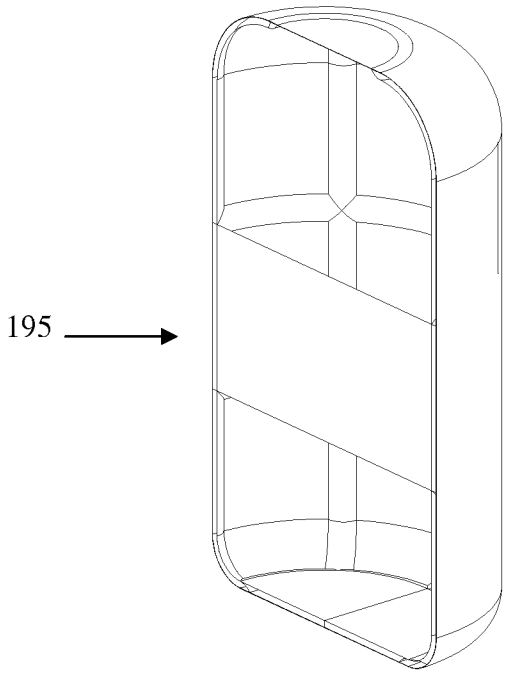

FIG. 29

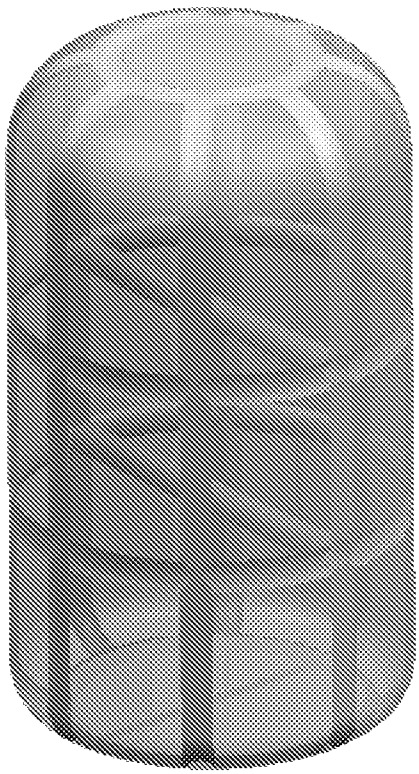

FIG. 30

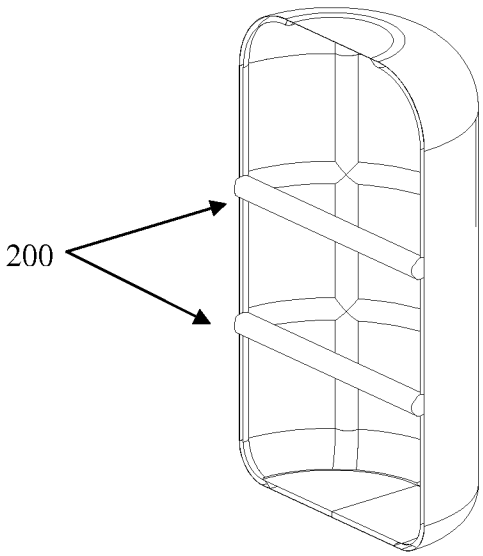

FIG. 31

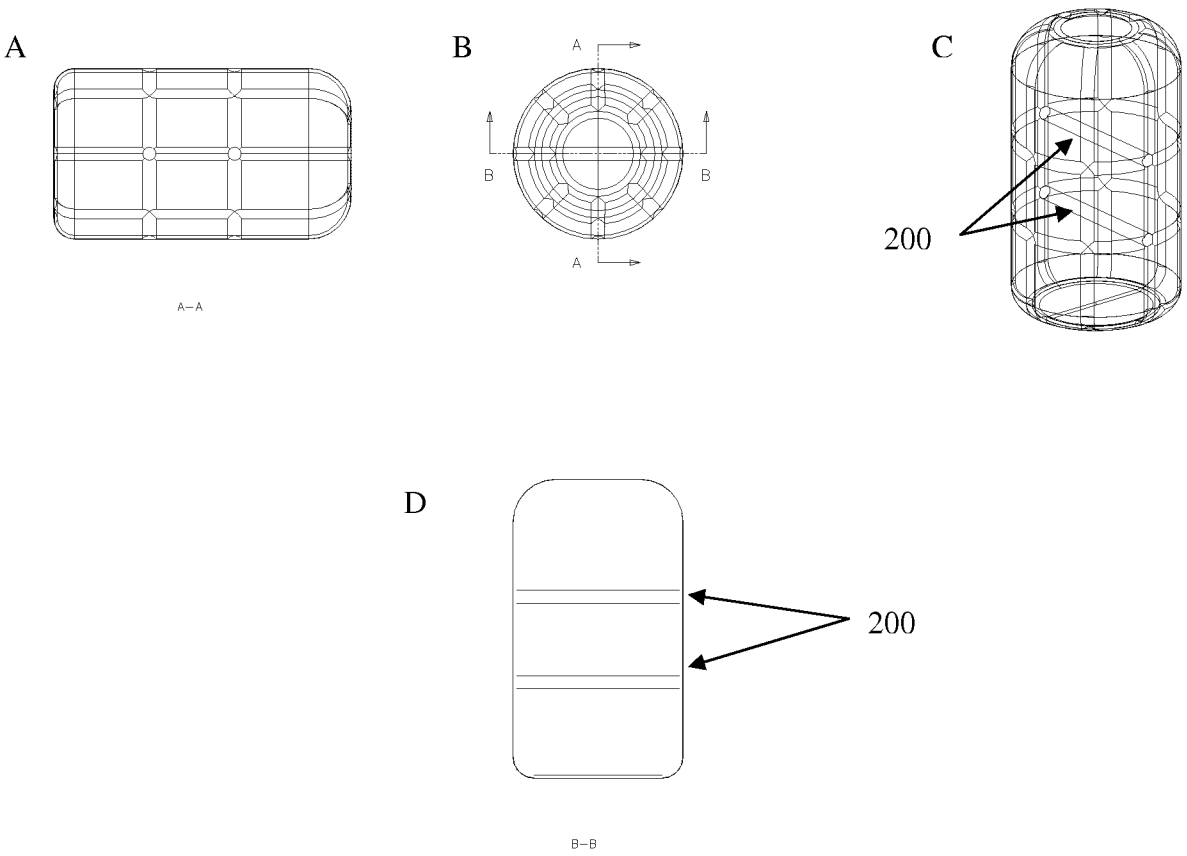

FIG. 32

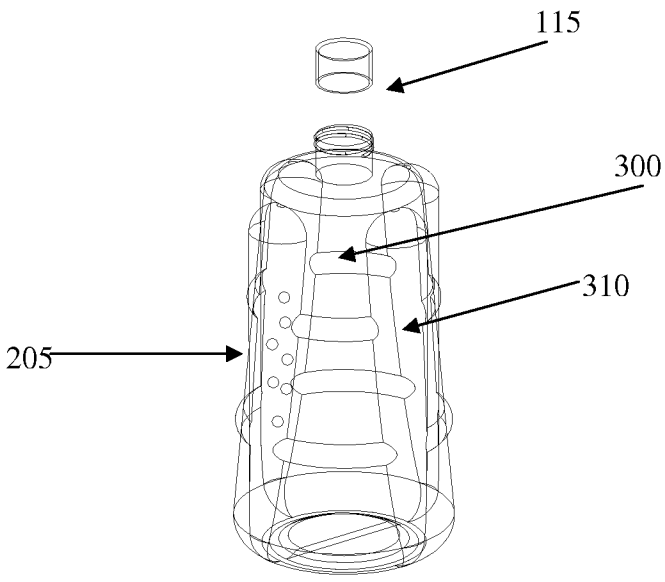

FIG. 33

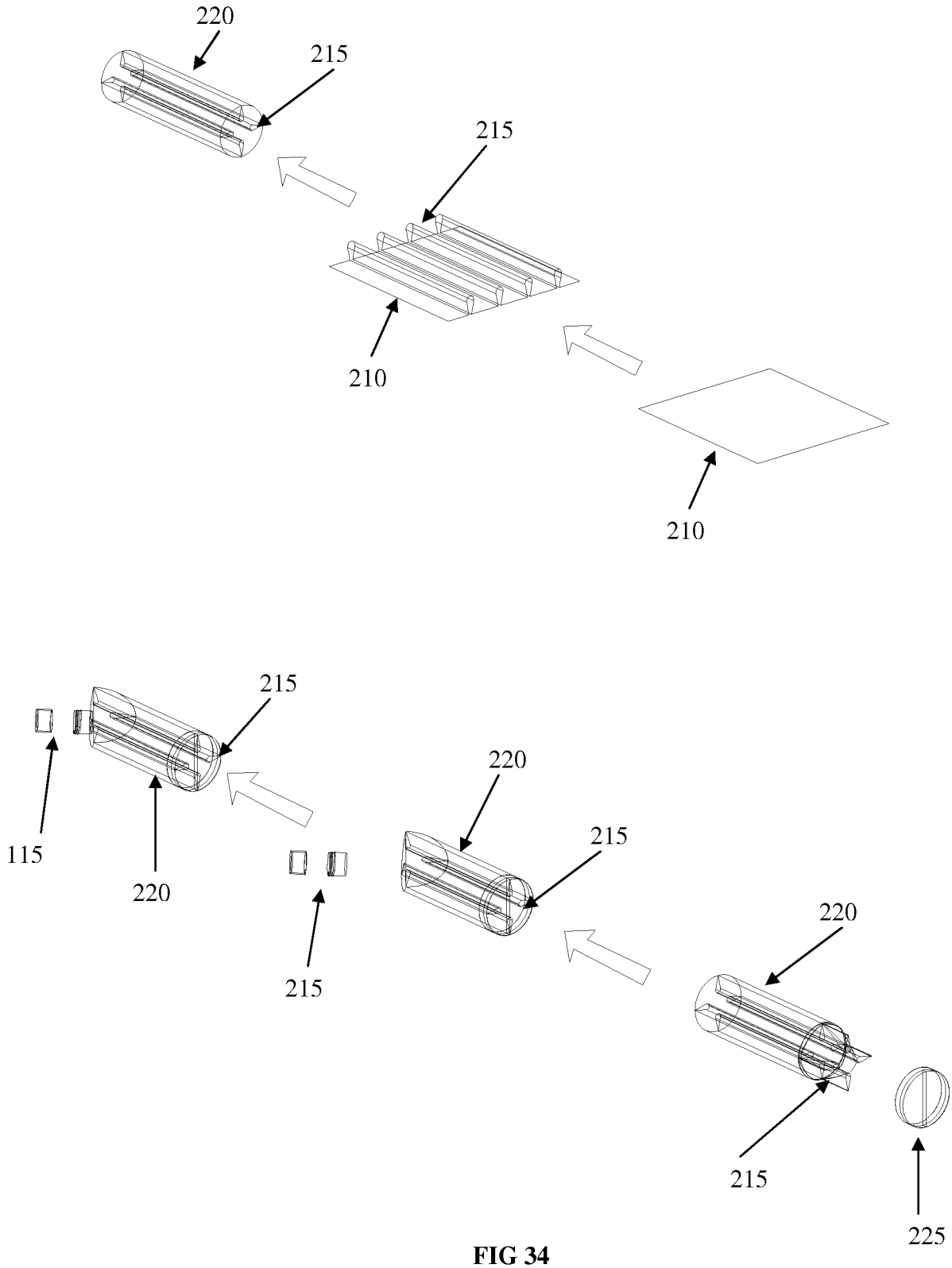

FIG 34

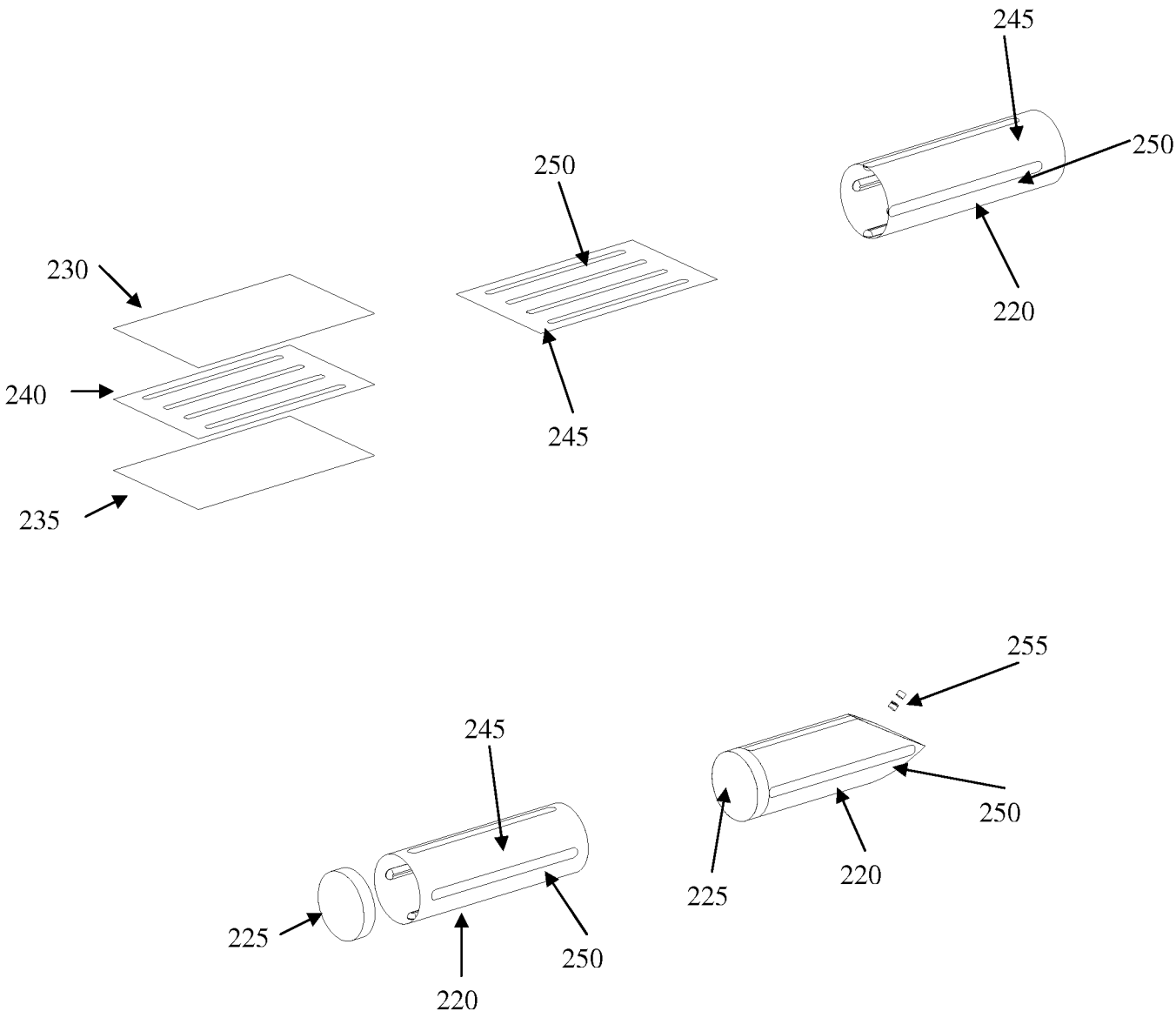

FIG 35

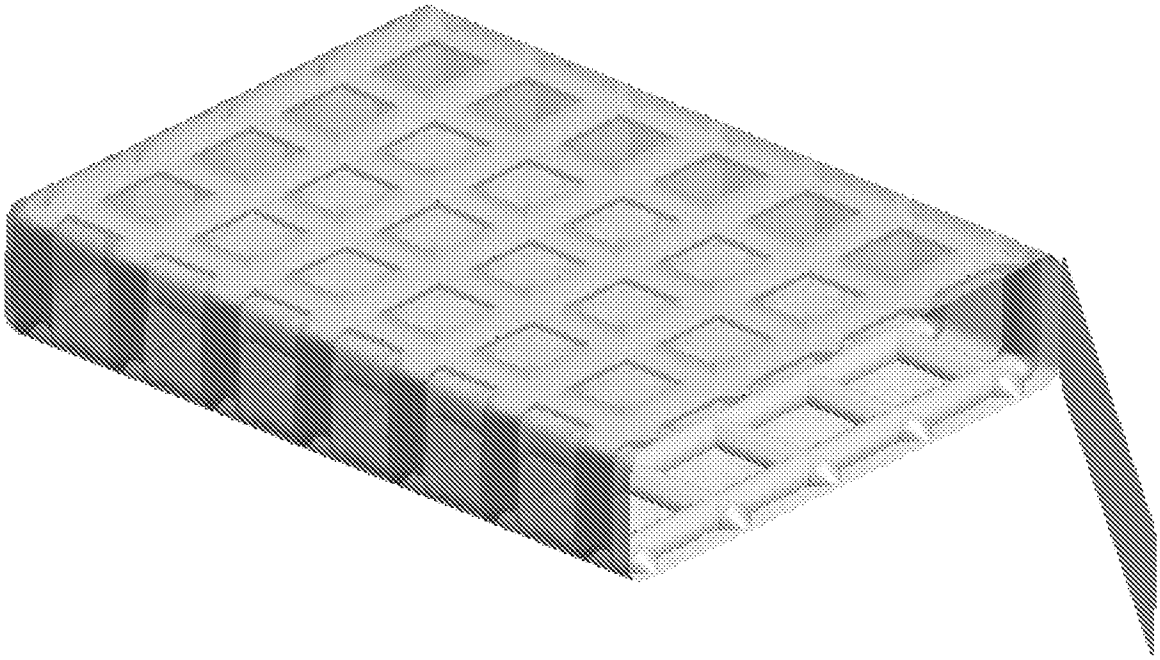

FIG 36

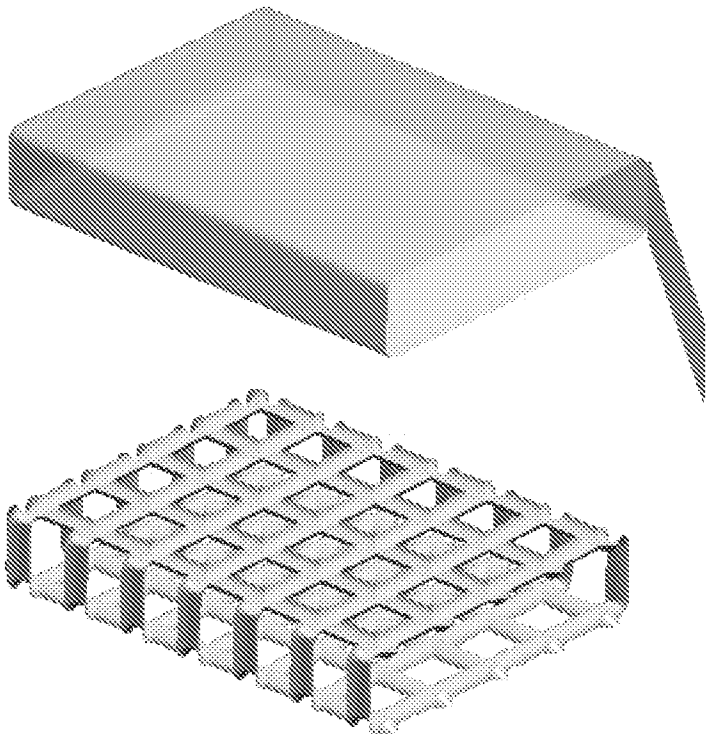

FIG 37

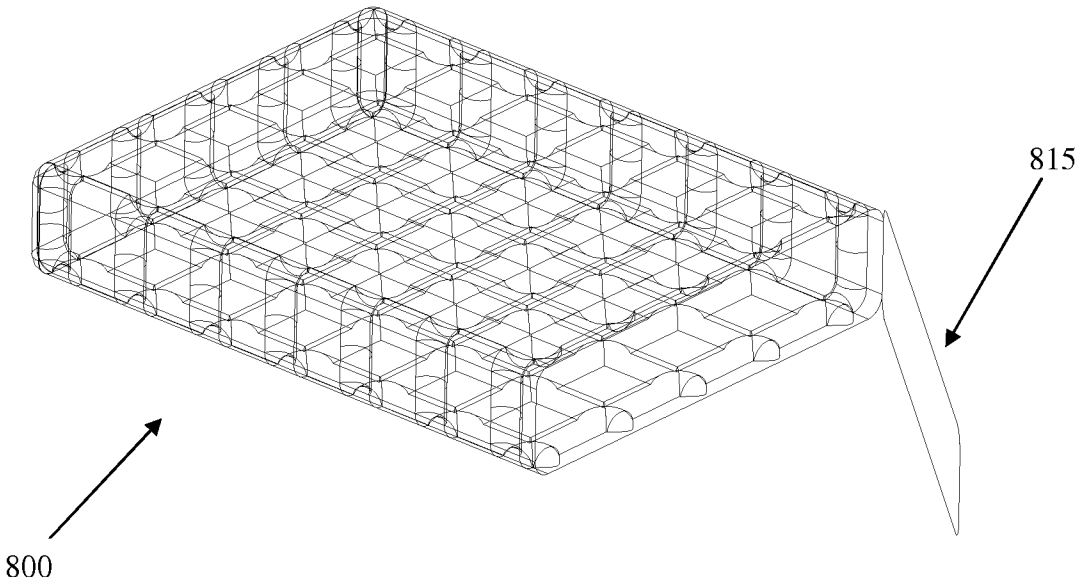

FIG 38

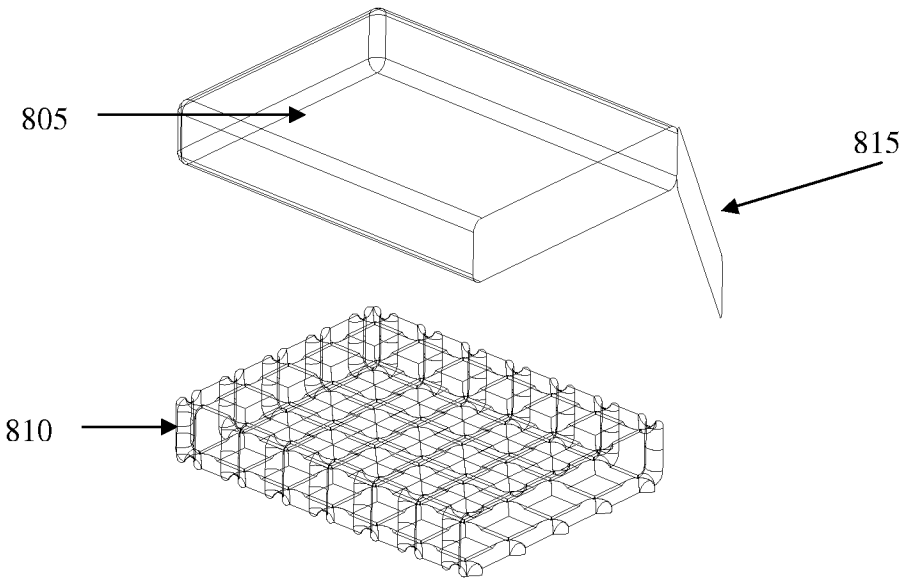

FIG 39

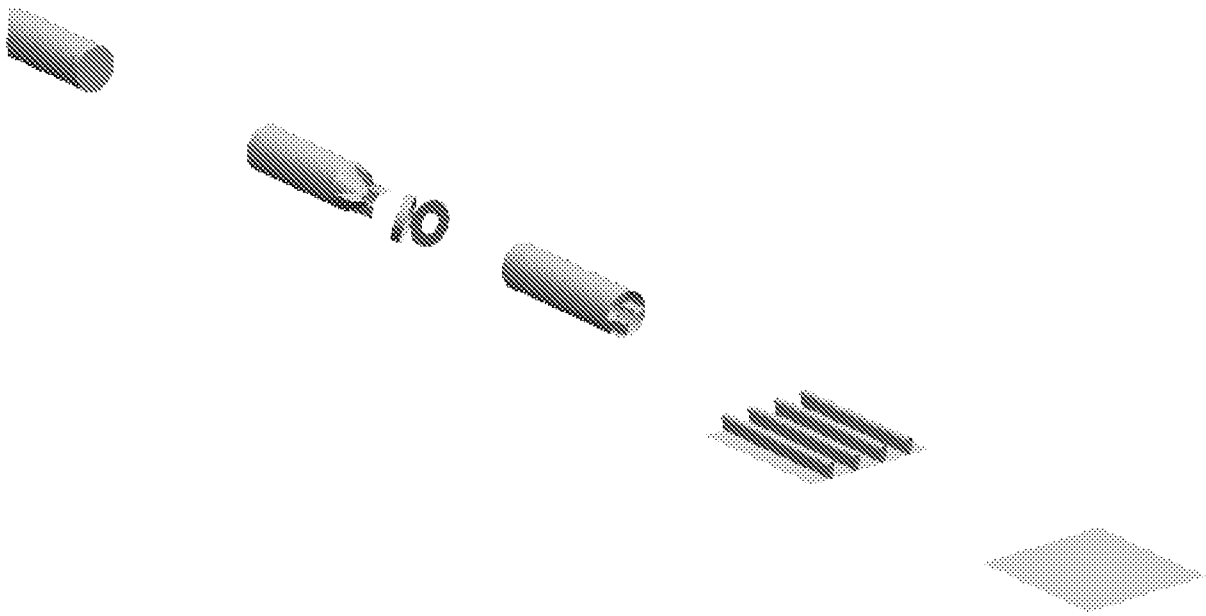

FIG 40

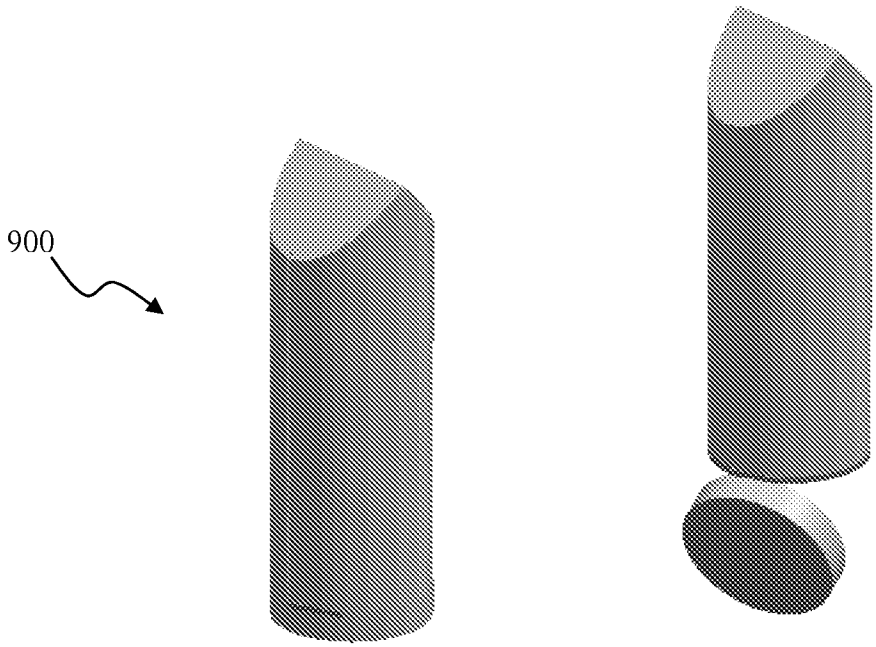

FIG 41

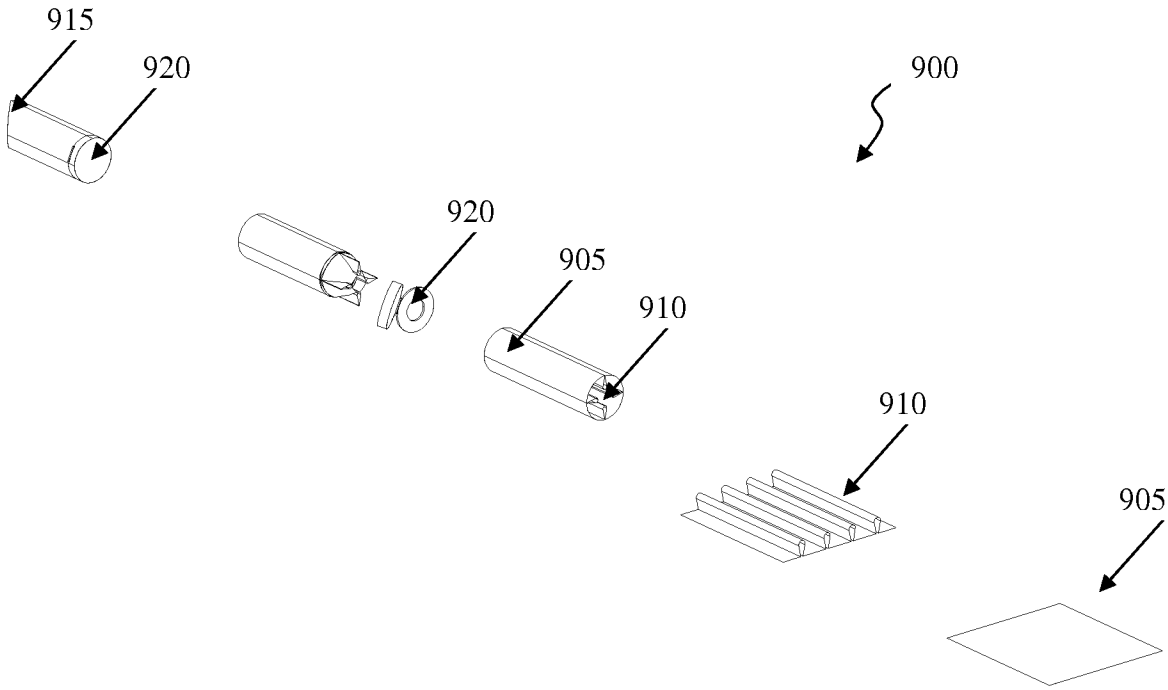

FIG 42

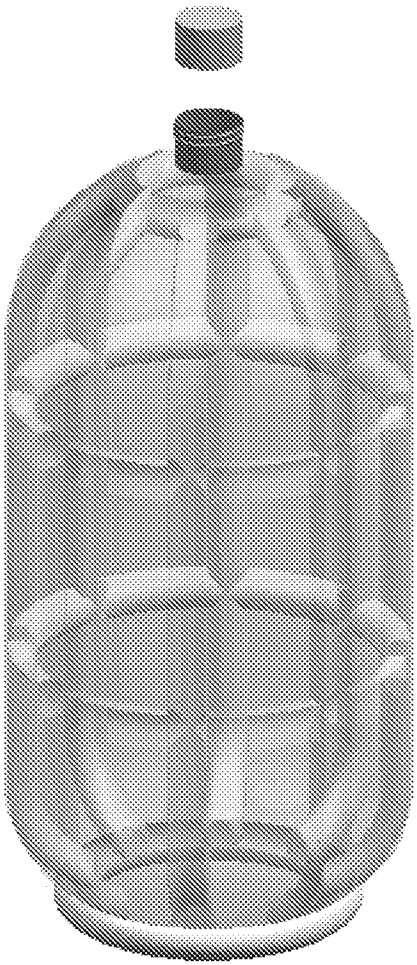

FIG 43

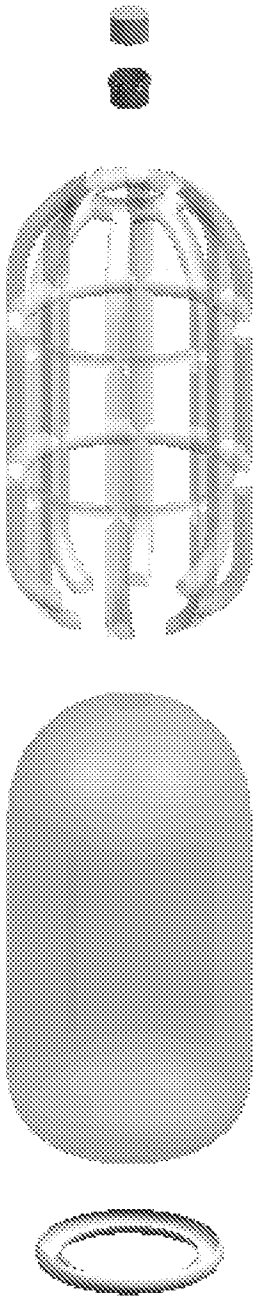

FIG 44

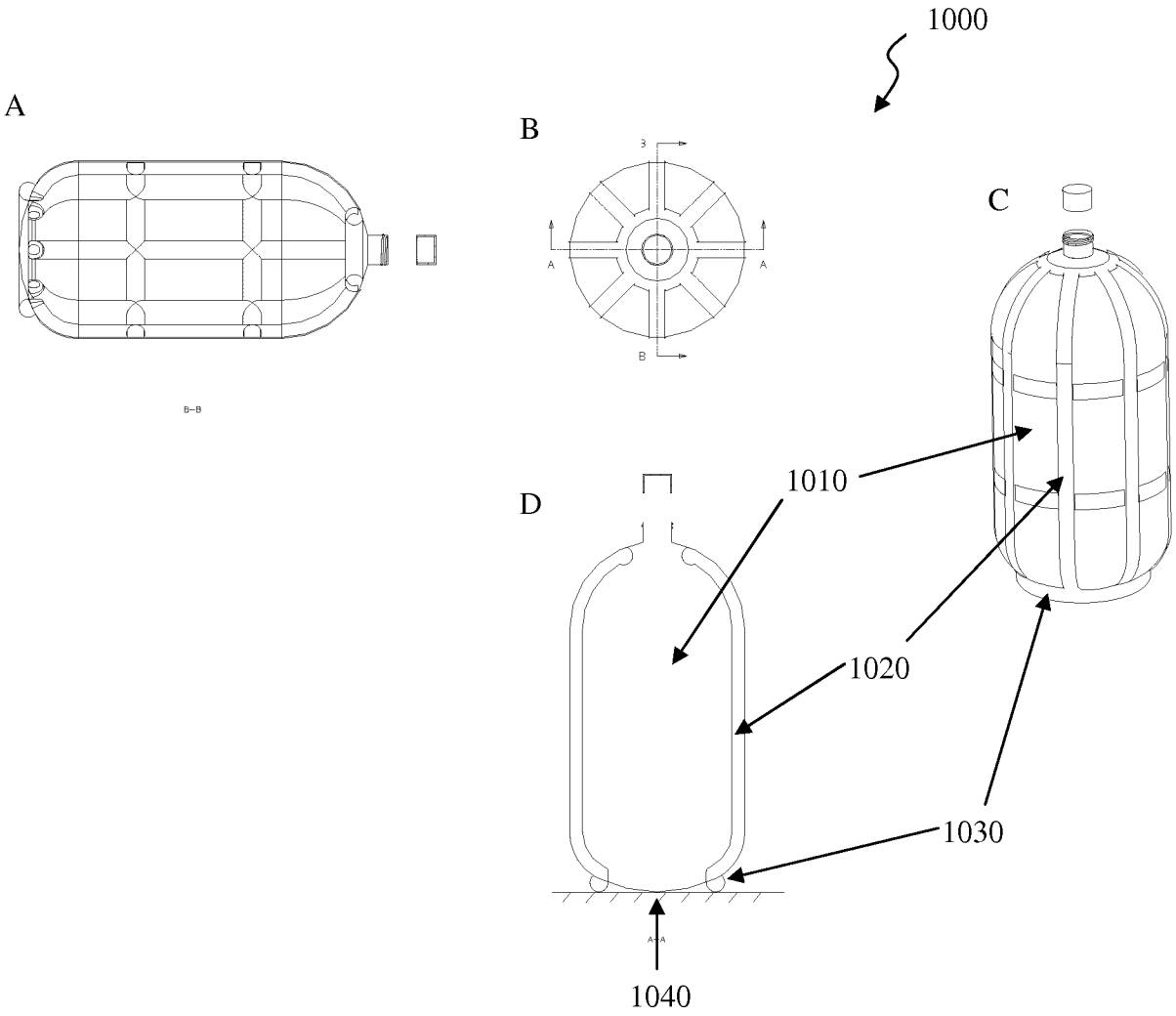

FIG 45

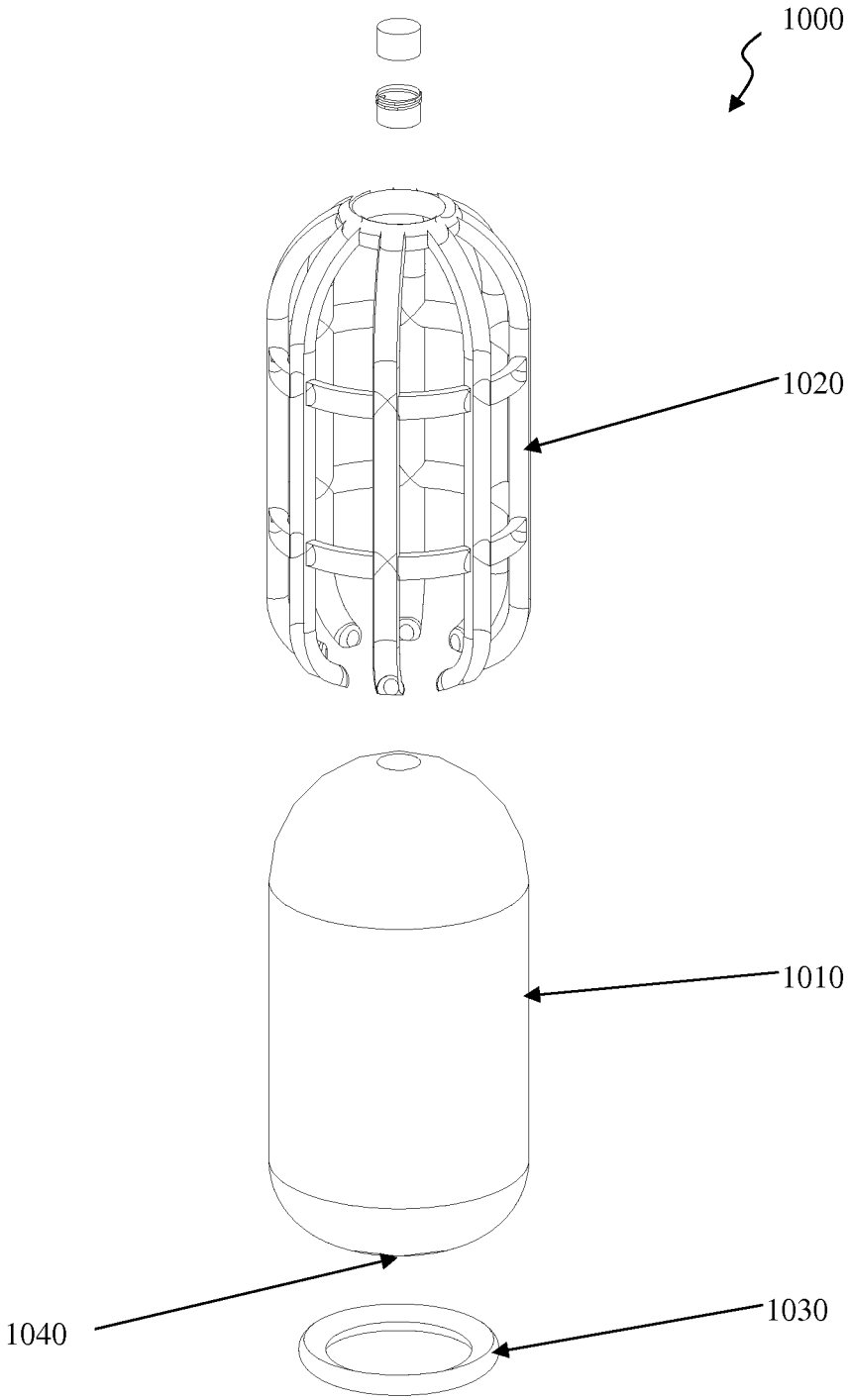

FIG 46

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2010/037446

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - B65D 81/05 (2010.01)
USPC - 53/472
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8) - B65D 81/05 (2010.01)
USPC - 53/469, 472; 206/522; 215/381; 224/320; 428/34.3, 35.7

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Minesoft PatBase, Google Patents

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X -- Y	US 3,829,918 A (STAMBERGER) 20 August 1974 (20.08.1974) entire document	1-5, 8-10, 16-22 --- 6, 7,11-15, 24-29
Y	CN 201183645 Y (RUIYANG) 21 January 2009 (21.01.2009) entire document	6, 7
Y	US 5,272,856 A (PHARO) 28 December 1993 (28.12.1993) entire document	11-14
Y	US 3,587,794 A (MATTEL) 28 June 1971 (28.06.1971) entire document	15
Y	US 4,694,638 A (MADDUX, JR. et al) 22 September 1987 (22.09.1987) entire document	24-29
Y	US 6,755,008 B2 (SCHMETZER et al) 29 June 2004 (29.06.2004) entire document	25

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
27 July 2010	13 AUG 2010
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (July 2009)