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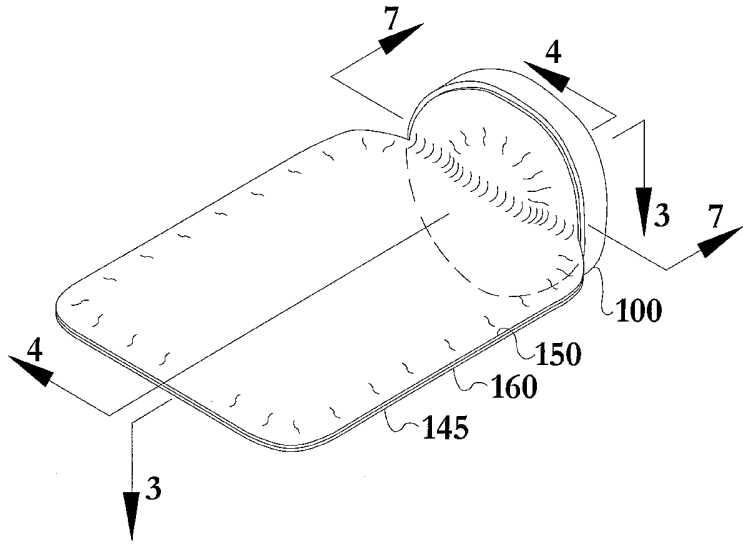
(54) Title: HAND HELD DISPENSING AND APPLICATION APPARATUS



(57) Abstract: A dispensing and application apparatus designed to contain pre-measured amounts of a flowable substance. The apparatus comprises a compartment (130) for storing the substance that is partially enclosed by a frangible seal (210), an applicator (100), and an expandable chamber (170) designed to accept and dissipate the hydraulic force created when pressure is applied to the compartment (130), rupturing the frangible seal (210), and expelling the substance into the chamber (170). The applicator (100) is attached to the chamber (170) with an applicator bond area (180). The expandability of the chamber (170) is conferred by expandability of the applicator (100), and is varied in different embodiments by altering the ratio between the area of the applicator bond area (180) and the area of the applicator (100). The frangible seal (210), in one of many embodiments, may be a chevron shape stress riser (250) with a point of inflection (240) oriented towards the compartment (130). A removable cap may cover the applicator.

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HAND HELD DISPENSING AND APPLICATION APPARATUS

TECHNICAL FIELD

The instant invention relates to hand held dispensing packages, and particularly to a flexible package for storing and dispensing a fluid substance, wherein a controlled rupture seal facilitates transfer of the substance into an unsealed area behind a foam applicator at the time of dispensing. The integral foam applicator facilitates a clean and even spreading of the dispensed substance.

BACKGROUND OF THE INVENTION

Measured amounts of various fluid substances are increasingly commonly dispensed in relatively small flexible packages often composed of plastic or foil. The fluids include a wide variety of products, including foodstuffs such as condiments (for example ketchup, mustard, relish and the like), personal care products such as shampoos and skin creams, cleaning products such as various packaged "wipes," and pharmaceutical products such as medications.

A typical example is the ubiquitous single serving ketchup pack, which is generally formed of two sheets of foil or plastic, superimposed over one another and then sealed together around the periphery, with a notch or other means to facilitate tearing one edge away from the container. The user tears open the container, dispenses the condiment, and then disposes of the package.

Such packaging, while relatively simple and inexpensive, poses numerous drawbacks in this most simple embodiment. Firstly, the simplest such package contains no integral means for directing or spreading the dispensed fluid. In

particular, thick fluids tend to be dispensed as a bolus, leaving the user to find an implement to spread the bolus, or otherwise to improvise with the possibly unsanitary outside of the now empty package to form a crude spreader. Alternatively, thin fluids tend to be dispensed in a difficult to control stream.

Second, the package can be quite difficult to open, particularly for those with arthritic hands or otherwise compromised grip strength. This difficulty is at least in part caused by the fact that, in the simplest conventional embodiments of this package, it is necessary to tear away one of the sidewalls of the packaging in order to release the contents. Such a sidewall must be relatively strong in order to contain the contents under normal handling conditions, which may include accidental compression. Even a small amount of moisture or skin oil on the surface of the packaging can make gripping and tearing the generally small package nearly impossible. It is extremely common to see frustrated users of such packaging using their teeth to open ostensibly manually "tear open" packages. Such a technique poses obvious aesthetic and hygienic issues.

Third, velocity of the fluid as it is expelled from the packaging varies with viscosity of the fluid, the amount of sidewall opened and the pressure applied. Anyone who has squeezed a ketchup package with only a pinpoint opening in its side can testify to the extreme distances the condiment can be propelled.

Various attempts have been made over the years to address these problems, with varying degrees of success. The creation of packaged, pre-moistened towelettes facilitates spreading but requires a handling of the dispensed contents. Pre-loaded,

disposable, swabs obviate handling, but contain very small amounts of dispensable liquid. The need to facilitate spreading a dispensed liquid was addressed by means of an integral roller in U.S. Pat. No. 5,577,851 to Koptis. The '851 patent teaches a sponge applicator attached to a tube dispenser that contains a quantity of a substance, such as painter's spackle, to be dispensed. After use, the sponge applicator is designed to be removed, cleaned, and returned to the tube dispenser. The reuse of the sponge applicator raises issues of potential hardening and chemical or bacterial deterioration of the sponge. This makes the '851 applicator unsuitable for use with products such as those intended for human consumption, where bacterial contamination may be devastating. Such problems can be overcome with single use, or "throw away" sponge applicators, but the complexity of the '851 device makes it ineffective on a cost basis for single use containers.

A similar attempt to provide an integral spreader is seen in U.S. Pat. No. D363,377, which provides a roller atop a dispensing container. The roller spreads the dispensed fluid, but is subject to the same cleaning and hygienic drawbacks posed by the sponge pad applicator of the '851 patent.

Efforts to produce an integral spreading means suitable for single use containers have exhibited mixed success. For example, U.S. Pat. No. 6,007,264 to Koptis teaches a variation on the simplest form of packaging, that of two superimposed sheets sealed together around their periphery, with the provision of peelable flaps along one edge of the package. The user peels back the flaps, pulling apart one sealed edge of the package and thus exposing the contents. The peeled back

flaps, at an approximate 90-degree angle to the package, thereby provide a butterfly wing type spreader for spreading the contents. Such a design overcomes any need to clean or re-use the spreading device, as the entire unit is disposable.

However, the utility of the '264 design has been found to be directly proportional to the viscosity of the fluid dispensed. For example, fluids with a high viscosity, such as ketchup or heavy creams, tend to be dispensed as a discrete bolus, whereupon they can be effectively smeared about the intended surface by the butterfly wings. However, experience has shown that liquids of low fluid viscosity, such as some pharmaceutical preparations and other relatively thin liquids, tend to be dispensed from the opened container in a stream, as opposed to a bolus, and run out of the flap or wing spreading area before they can be effectively spread.

The '264 device attempts to counter this propensity by disclosing an embodiment wherein an absorbent foam applicator is either applied in two pieces to the opposing flaps or is applied in a single piece bridging the flaps. Such embodiments are designed to provide an absorbent surface area to facilitate the spreading of the fluid dispensed. However, experience with the base design has revealed that it is marginally effective for this purpose. In practice, separate foam applicators that do not bridge the container opening may increase surface area and absorbency for spreading, but do nothing to retard the sudden flow of material from the ruptured packaging. Even in the embodiment wherein the absorbent pad bridges the opening, practice has shown that when the pouch is squeezed and the frangible seal breaks, the contents of the pouch burst through the seal and the liquid tends to

squirt through the absorbent pad, rather than being gently absorbed into the pad as intended.

As to the second problem, that of facilitating the opening of the container, various methods have been proposed. The '264 device provides enlarged tear flaps that are intended to facilitate gripping the container, however, the problem of tearing away a relatively strong sidewall of the container remains. In essence the present invention is directed to improvements for the Koptis '264 device and all teaching contained in U.S. Pat. No. 6,007,264 are herein incorporated by reference.

In U.S. Pat. No. 4,921,137 to Heijenga, the container is equipped with an enlarged ear-like structure that facilitates grip. In addition, the '137 device contains, within the ear-like structure, a preformed channel portion that attempts to address the third problem, that of dependably producing a large enough egress channel for the dispensed material so as to minimize excessive pressure effects, such as uncontrolled squirting of the contents. However, the '137 device makes no provision to address the problem of spreading a bolus of dispensed liquid.

U.S. Pat. No. 6,117,123 to Barney discloses a flexible container that provides for the storage and mixing together of diluents and medicaments. The container incorporates multiple compartments, separated by preferentially peelable seals, in which the diluents and medicaments are stored. The peelable seals are ruptured by manipulation of the container to thereby mix the components together for delivery through standard I.V. equipment to a patient. The seals are constructed such that the seal between the diluent and medicament compartments is preferentially ruptured

such that a liquid medicament and a diluent are always mixed before the combined solution is accessible for administration.

The prior art fails to disclose a disposable, unit dose container for liquids of varying viscosity that allows for easy opening, without touching the container contents, where the liquid is dispensed into an unsealed area behind the foam pad in such a manner that the liquid is easily dispensed. Such a dispensing pouch must be inexpensive and easy to manufacture, maintain the integrity of the liquid until dispensing, and must reliably dispense the liquid without being unduly susceptible to accidental release, yet be easy to open. Further, the absorbent pad may be protected by a cover that can be easily removed just prior to dispensing, and the design of the pad should facilitate easy and even spreading of the container contents.

SUMMARY OF THE INVENTION

The instant invention provides a novel dispensing apparatus that addresses the shortcomings of the prior art. In its most general design, the apparatus comprises a compartment, a chamber, and an applicator pad. The chamber and the compartment may be fabricated out of separate materials that are bonded together. It is preferred, however, that the chamber and the compartment be fabricated of the same material as a single structure separated into two sections by a frangible seal.

The present invention is designed to contain a flowable substance that can be dispensed by applying pressure upon the compartment area, where the substance is stored. The pressure ruptures the frangible seal and expresses the substance into the chamber, behind the applicator. The expansion of the chamber walls and the

resilience of the applicator pad allows the substance to spread out behind and into the applicator, where it is available to be expelled and applied.

The prior art describes the concept of an applicator attached to flexible foil wings of a dispensing package, but experimentation with such a design revealed that it was deficient in any number of applications. When sufficient pressure is exerted behind a seal of a closed compartment, the seal ruptures and the material behind the seal is expelled through the seal, releasing the pressure to the atmosphere. The force with which the material flows through the ruptured seal depends on many factors, including but not limited to the viscosity of the fluid, the amount of pressure applied, and the surface area, or orifice area, of the rupture in the seal.

Experimentation with the general design of the package of U.S. Pat. No. 6,007,264 to Koptis, while sufficient in some applications, showed a number of shortcomings. First, if the applicator foam was attached as separate pads (opposing pads disposed on the underside of outwardly folding wings) there was a tendency for the dispensed substance to break through the frangible seal and squirt out on the user or floor, before it could be absorbed and spread by the absorbent pads. It was noted that the severity of this problem increased with increased pressure, decreased area or orifice of seal rupture, and decreased viscosity of the substance dispensed. Alternatively, when the absorbent pad was designed as a single pad spanning a small central opening in the packaging seal, the problem remained unattenuated, as the dispensed substance tended to shoot through the absorbent pad, with the same ill effects noted above.

The instant invention achieves controlled dispensing and application by the combination of two essential features. First, it has a controlled rupture seal that reliably ruptures at a predetermined pressure with a sufficient orifice size, to prevent extremely high pressure dispensing. Second the apparatus features a relatively expandable expansion chamber that absorbs the hydraulic shock of the dispensed substance, providing it time for the fluid to spread into the applicator.

Experimentation with various designs of frangible seals revealed that various possible designs achieved at least some degree of success. For example, the frangible seal could be a straight frangible seal fabricated to be thinner, or to be less securely heat-sealed, than the primary seal. In a second design, the frangible seal with a stress riser was oriented away from the pressure and provided good results. However, in the preferred embodiment, a frangible seal with a chevron shaped stress riser with the point of maximum inflection oriented towards the pressure, was found to present optimal characteristics in terms of breaking reliability and adequate seal rupture area.

Even with an optimally designed frangible seal, it was realized that an expansion chamber was needed to contain the dispensed substance at a reasonably low pressure while it was being absorbed into the applicator pad. It was found that a chamber formed by partially adhering the foam applicator pad to the wings of the device was useful in absorbing the hydraulic shock of the dispensed substance breaking through the frangible seal. However, it was also observed that the sizing of the chamber played an important role in the efficacy of the chamber concept. If the applicator pad were attached over a relatively large area to the wings of the package,

it creates a relatively small chamber and is unable to cushion the aforementioned hydraulic shock. In contrast, if the applicator pad were attached over a very small area of the applicator wings of the package, there would be a relatively large expansive chamber available to cushion the hydraulic force, and there might be insufficient force to move the substance into and through the applicator pad.

The apparatus according to the invention may also have a removable cap for the applicator pad, which depending on the exact design and characteristics of the cap, can maintain cleanliness, or even sterility, of the applicator pad. The apparatus offers a low cost disposable packaging for a wide array of flowable substances, which can include, by way of example and not limitation; pharmaceutical antiseptics, salves, cosmetics, ointments and creams. Additionally, the apparatus provides a package that offers convenience in storage, resistance to package breakage, better sanitation, and lower spillage or waste. In addition, the inventive apparatus provides packaging that allows a user to apply a small measured quantity of a substance in a controlled manner without getting it on the fingers or hands and without the necessity of using the fingers, hands or an additional implement to spread the substance. The ability to easily apply the dispensed substance without direct hand contact with the substance improves aesthetic and hygienic concerns during application, and avoids contamination of the substance as it is dispensed.

BRIEF DESCRIPTION OF THE DRAWINGS

Without limiting the scope of the present invention as claimed below and referring now to the drawings and figures:

FIG. 1 shows a dispensing and application apparatus in elevated perspective view, in enlarged scale;

FIG. 2 shows a top plan view of a variation of the second surface (interior) of the inventive apparatus;

FIG. 3 shows a top plan view of a second (interior) surface of the apparatus shown in FIG. 1 taken along section line 3-3 of FIG. 1 wherein the top layer of FIG. 1 has been removed and reveals the chevron frangible seal;

FIG. 4 shows a cross section view of the apparatus shown in FIG. 1 taken along section line 4-4 of FIG. 1;

FIG. 5 shows a top plan view of a variation of the second surface of the apparatus shown in FIG. 1;

FIG. 6 shows a top plan view of the second surface, flattened out to a single plane, of the apparatus shown in FIG. 3;

FIG. 7 shows a cross section view of the apparatus shown in FIG. 1 taken along section line 7-7 of FIG. 1;

FIG. 8 shows a top plan view of a variation of the frangible seal;

FIG. 9 shows a top plan view of a variation of the frangible seal;

FIG. 10 shows a top plan view of yet another variation of the frangible seal;

FIG. 11 shows a top plan view of another variation of the frangible seal;

FIG. 12 shows a top plan view of a variation of the first and second sheet member of a single sheet embodiment, opened along a fold line and flattened out to a single plane, of an apparatus similar to that of FIG. 1; and

FIG. 13 shows a top plan view of the dispensing apparatus wherein the at least one sheet is configured as a tube.

DETAILED DESCRIPTION OF THE INVENTION

Thus, there is disclosed a dispensing and application apparatus wherein the apparatus is designed to contain a flowable substance, the apparatus comprising: 1) a compartment; 2) at least one sheet divided by at least one seal to form the compartment, wherein one of the at least one seals is a frangible seal designed to break when exposed to a predetermined pressure, thereby creating a channel permitting fluid communication between the compartment and a chamber; 3) an applicator having a periphery and being joined to the at least one sheet with at least one applicator bond; and 4) the chamber being formed by the at least one sheet, and the applicator, and bounded in part by the applicator, the at least one applicator bond, and the frangible seal.

There is further disclosed a means for dispensing and applying a fluid comprising: 1) a means for storing the fluid; 2) at least one means for establishing a boundary divided by at least one joining means to form the means for storing the fluid, wherein one of the at least one joining means is a means for establishing fluid communication between the storing means and a means for expansion when exposed to a predetermined pressure; 3) a means for applying the fluid joined to the at least one boundary establishing means with at least one means for bonding; and 4) the expansion means being formed by the at least one boundary establishing means, and

the applying means, and bounded in part by the applying means, the at least one bonding means, and the fluid communication establishing means.

The dispensing and application apparatus of the instant invention presents a significant advance in the state of the art. The preferred embodiments of the apparatus accomplish this by new and novel arrangements of elements that are configured in unique and novel ways and which demonstrate previously unavailable but desirable characteristics.

The detailed description set forth below in connection with the drawings is intended merely as a description of the presently preferred embodiments of the invention, and is not intended to represent the only form in which the present invention may be constructed or utilized. The description sets forth the designs, functions, means, and methods of implementing the invention in connection with the illustrated embodiments. It is to be understood, however, that the same or equivalent functions and features may be accomplished by different embodiments that are also intended to be encompassed within the spirit and scope of the invention as set forth in the claims.

The dispensing and application apparatus is designed to contain a flowable substance and to facilitate application of that substance to a surface. Referring generally to FIG. 1, the apparatus in its most general design comprises an applicator or pad **100,** a first sheet section **150,** and a second sheet section **160.** Referring generally to FIG. 2, the inventive apparatus comprises a compartment **130**, a chamber **170**, and an applicator foam pad **100** and at least one seal **148**. The body of the

apparatus may be made, as would be apparent to one skilled in the art, of various flexible materials, including in at least one embodiment, a flexible laminated foil material. Other fabrication materials could include, by way of example and not limitation, various plastics, fabrics, non-woven fabrics and coated papers.

The applicator **100** or foam pad can be attached to the film wings with contact or hot-melt adhesives. The applicator may be constructed of porous foam pads, woven or non-woven fabrics or felts. Those of ordinary skill in the art will recognize that various materials can be used for the applicator pad. The applicator **100** and tee film wings may be any desired shape such as square, rectangular, oval, lip shaped and the like with circular being the most preferred. In one embodiment of the present invention, the material used to construct the body of the apparatus, for example the laminated foil material, extends past the applicator pad. The foil extension reduces the possibility that the fingers of the user will come into contact with the dispensed flowable substance or the applicator pad. Further, this flexible foil extension, folds back during use to prevent the bruising of the skin. The foil extension can range from about 1.0 mm to about 50 mm, with about 5 to 25 mm being more preferred, and 5 to 15 mm most preferred.

The foam pads can be a polyurethane foam pad. For example, a 100-pore-per-inch polyurethane foam pad works well when dispensing liquids of the consistency of hand lotion and the like. Other materials, such as non-woven fabrics, are useful as the applicator pad. One especially useful foam pad is a product from the Jacob Holm

Industries of Helen, Georgia, known as Norafin™. Norafin™ is a needle punch composite material comprising 63% lycose, 27% polypropylene and 10% PET.

The material from which the inventive apparatus is constructed can be plastic, fabrics, foils, and the like. One especially useful is a laminated foil product from Pechiney Incorporated. The foil comprises a 48-gauge polyester outside substrate that is heat resistant. The next layer is an adhesive followed by 35-gauge aluminum foil. This works as a moisture and oxygen barrier. Another layer of adhesive is then followed by a 48-gauge layer of polyester. Another layer of adhesive is then followed by a peelable sealant of 2.0 mills. This sealant layer utilizes high-density polyethylene and other polymers to produce the heat-seal. This laminated foil material can have the polyurethane foam or other foam material directly heat-sealed to the peelable sealant layer of the multi-laminate foil. Double-sided contact adhesive can also be used, as well as contact or hot-melt adhesives. These heat sealable foils and laminates are known to those skilled in the art and are commercially available.

The compartment **130** may be formed in part by at least one sheet **145** divided by at least one seal **148** to form the compartment. Alternatively, the compartment **130** can be formed with a first sheet section **150** and a second sheet section **160** interconnected with a primary seal **135**, as shown in FIGS. 2 and 4. Among other variations, the first sheet section **150** and second sheet section **160** can be formed from a single sheet **280** (See FIG. 12) by folding the sheet **280** along a fold line **270**, whereby the first sheet section **150** and second sheet section **160** are additionally interconnected at the fold line **270.** In yet another embodiment, the first sheet section

150 and a second sheet section **160**, may be individual sheets, as shown in FIG. 1. In yet another embodiment, as shown in FIG. 13, the at least one sheet **145** may be configured as a tube with at least one seal **148.** The design of the compartment is intended to contain a measured amount of the flowable substance, ideally a single, or unit dose amount, under clean, or even sterile, conditions. In the embodiments where a primary seal **135** is used to fabricate the apparatus, the primary seal **135** is designed to reliably contain the flowable substance at normal operating pressures during dispensing, as well as to provide a margin of safety to contain the substance in the event that the apparatus is briefly bumped, dropped, or otherwise transiently exposed to higher pressures.

At least one of the seals **148** is a frangible seal **210** (See FIG. 2) designed to break when exposed to a predetermined pressure, creating a channel **230** (See FIG. 5) permitting fluid communication between the compartment **130** and the chamber **170**, as shown by flow indicator lines **F** in FIG. 5. The frangible seal **210 and 220** in FIGS. 3 and 12 are particularly configured to have a lower rupture pressure than the primary seal **135**. Additionally, the frangible seal **210/220** is particularly configured to rupture in a controlled manner across a sufficient area to provide a relatively low-pressure movement of flowable substance into the chamber **170.**

This controlled rupture property of the frangible seal **210/220** is conferred by the design of the seal and the strength of the seal. The frangible seal **210/220** may have a frangible seal first edge **212** and a frangible seal second edge **214**, as indicated in FIG. 9, and multiple conformations are possible for the frangible seal **210/220**, as

indicated in FIGS. 2, 3, 8, 9, 10, and 11. In principles that are well known and apparent to those skilled in the art, the provision of an excursion, or excursions, on the surface of a seal, commonly known as stress risers or inflection points **240**, see FIGS. 8, 10 and 11, tends to create peel initiation points on the frangible seal **210**, at which point or points the frangible seal **210** begins its opening response, or peel, in response to a pressure increase on the side of the frangible seal **210** in which the stress riser or inflection point **240** is oriented. The developing pressure front of a pressure increase against a non-linear barrier, such as that of a frangible seal with stress risers **220** or inflection points **240**, is well known to have a region of maximum concentration of pressure in the region of maximum inflection of the frangible seal with stress riser **220**, when the inflection point **240** is oriented to extend in the direction the compartment **130**, that is, in the direction of the pressure front. This concentration of force of the pressure front tends to preferentially initiate seal opening, or peel, at the stress riser **220**. When pressure is applied to the compartment it begins peeling open the frangible seal starting at the point of the chevron.

It is not necessary that the stress riser **220** have any particular configuration, only, that the initiation of seal opening, or peel, is enhanced as the inflection point **240** of a stress riser **220** becomes sharper. Thus, a gently curved frangible seal **210** as seen in FIG. 8, would tend to concentrate force at a particular point less intensely than would a frangible seal **210** having an inflection point **240** that resembled a saw tooth, as seen in FIG. 11.

In its simplest construction, and has been shown to be undesirable in some applications as discussed above, the frangible seal **210** may be flat, as seen in FIG. 2, which represents the apparatus as though the first sheet section **150** had been peeled away, leaving the second sheet section **160** exposed for better viewing. In one embodiment of the instant invention, shown in FIG. 8, the frangible seal **210** is formed to have at least one sinusoidal shape. This, as discussed, would be a design that would generally be relatively more difficult to rupture. In another embodiment, the frangible seal **210** further includes a stress riser **220** as seen in FIG. 3. Such a stress riser **220** , as discussed, would make the frangible seal **210** generally easier to rupture. A stress riser **220** may, have different configurations in different embodiments, which including, among others, a substantially chevron shape **250**, as shown in FIG. 6, which represents the apparatus as though the first sheet section **150** had been peeled away, leaving the second sheet section **160** exposed, with the second sheet section **160** flattened out for better viewing. The chevron shape stress riser **250** may have a sharp inflection point **260** (See FIG. 9) oriented in the direction of the compartment **130**.

Additionally, in those embodiments utilizing a frangible seal **210** with a chevron shaped stress riser **250** oriented with the point of maximum inflection **240** of the frangible seal first edge **212** towards the compartment **130**, the chevron shape stress riser **250** may have a rear chevron inflection point **260** that does not pass the point of the chamber side of the frangible seal first edge **212**. Viewed in another way the maximum orthogonal distance from the rear chevron inflection point **260** to the

frangible seal second edge **214** is less than a maximum orthogonal distance between the frangible seal first edge **212** and the frangible seal second edge **214**, as shown in FIG. 9. This embodiment has been shown to provide optimal performance in terms of strength and rupture characteristics.

The selection of an optimal design of the stress riser or risers, would lie within the skill of one with ordinary skill in the art, and might be selected to reflect particular characteristics of the flowable substance to be dispensed, including by way of example and not limitation, viscosity of the dispensed substance, desired rupture resistance characteristics of the packaging, type and size of applicator **100**, and size of chamber **170** . The primary seal **135** and frangible seal **210** may be formed by a variety of techniques, as would be apparent to one skilled in the art, including but not limited to thermal seals, and mechanical or chemical seals. Such mechanical seals could include, by way of example and not limitation, crimping and various retainer clips; and such thermal or chemical seals could include, by way of example and not limitation, adhesive bonds such as chemical adhesive or hot-melt techniques, or other fusion methods.

The materials employed to construct the apparatus of the present invention may be transparent or opaque sheets. Transparent sheets would allow the contents of the container to be visually inspected and to allow the level of the dispensed substance in the container to be visually verified during dispensing. Suitable materials for the fabrication of the device are typically single-layer or multi-layer polymer films.

A discussion of useful films for the construction of the inventive device and the preparation of the various seals can be found in U.S. Pat. No. 6,117,123 to Barney et al.

A severe shortcoming of the prior art, as discussed, has been the lack of a well functioning applicator **100** in dispensing packages. For optimal function, an applicator **100** needs to be absorbent, to facilitate the spreading of dispensed substance within the applicator **100**, and to allow the user to apply the dispensed substance easily, and in those applications to the skin, comfortably and cleanly. The instant invention achieves these goals as the apparatus is further configured with an applicator **100**, which has a periphery **110** and is joined to the at least one sheet **145** with at least one applicator bond **180**, as illustrated in FIGS. 2 and 6. The applicator **100** may be a substantially porous pad, such as a foam pad. The foam pad can be constructed of many natural and synthetic materials. The foam pad should have good reservoiring or holding capacity for the substance being dispensed and fast fluid release for transferring the substance to the skin. Some foams are very absorbent sponges with good liquid retention, but with poor releasing properties. These types of sponges result in a substantial quantity of dispensed substance remaining in the pad, thus wasting the dispensed substance. As seen in FIG. 7, the applicator bond **180** is formed with an interior edge **190** and an exterior edge **200**, and in a preferred embodiment, is within the applicator periphery **110**. Additionally, the at least one applicator bond **180** may be a chemical and mechanical bond between the applicator **100** and the at least one sheet **145**. Such mechanical bonds could include, by way of

example and not limitation, crimping and various retainer clips; and such thermal or chemical bonds could include, by way of example and not limitation, adhesive bonds such as chemical adhesive or hot-melt techniques, or other fusion methods.

The embodiment utilizing a configuration wherein the applicator bond **180** lies within the applicator periphery **110**, seen in FIG. 7, confers particular advantages on the apparatus. As the applicator bond **180** tends to restrict the flow of the dispensed substance to that area inside the applicator bond interior edge **190,** having a portion of the applicator **100** lying outside of the applicator bond area **180** initially provides for an area of dry surface that facilitates an even and comfortable spreading of the dispensed substance. Additionally, this results in a relatively soft edge portion for the applicator **100**, which increases comfort levels when the applicator **100** is used to spread a substance on the skin. In an additional embodiment, the foil material may extend beyond the outer edge or periphery of the applicator bond **180**. This embodiment protects the user's finger from coming into contact with the dispensed substance or the applicator.

Besides the need for an applicator **100** for optimal dispensing, experiments with various means of attachment of the applicator **100** to a dispensing package indicated that a key design feature necessary to proper function is the provision of a relatively expansive area that may receive the dispensed substance, as it is being dispensed at relatively high pressure through the rupturing frangible seal **210**. Such a relatively expandable area allows the dispensed substance to spread out and dissipate the energy it had when passing at a relatively high velocity through the channel **230**

and into the chamber **170** (See FIGS. 5 and 6) so it can be gently spread into an applicator. In the absence of such an expandable area, or if the expandable area is too small or otherwise insufficiently expandable, the relatively high pressure dispensing of the substance tends to shoot through or past the applicator **100**, without spreading out into the applicator **100**. On the other hand, if the expandable area is too large, or otherwise excessively expandable, it is possible for the dispensed substance to achieve such a low-pressure state that it does not adequately spread into the applicator **100**.

Accordingly, an optimal design should provide for an easy means of fabricating packages with varying sized expandable areas. The instant invention accomplishes this by its utilization of a chamber **170**, and an applicator bond area **180** and applicator **100**, and in particular, expandability is imparted to the chamber by the expansion of the chamber **170** walls and by the resilient nature of the applicator **100**. This resilient nature allows the contents of the chamber **170** to expand under pressure, thereby absorbing the hydraulic shock as the dispensed substance breaks through the frangible seal **210** and enters the chamber **170**. The dispensed substance then tends to remain behind the applicator **100** and can be easily dispensed and spread.

The volume of the chamber **170** may be varied by varying the relative size of the at least one applicator bond area **180** and the applicator **100**. In a preferred embodiment, the surface area of the bond area **180** is between approximately 62.5% of the surface area of the applicator **100** and approximately 87.5% of the surface area of the applicator **100**. As the ratio of the area of the applicator bond area **180** to the area of the applicator **100**, expressed as a percentage, increases towards 100%, the

expandability of the chamber **170** decreases and the high pressure effects noted above would become more prominent. As the ratio of the area of the applicator bond area **180** to the area of the applicator **100**, expressed as a percentage, decreases towards zero, a point which it cannot reach due to the necessary resulting failure of the bond, the expandability of the chamber **170** increases and the low pressure effects noted above would become more prominent. Numerous embodiments are possible, as would be apparent to one skilled in the art. Varying this applicator bond area **180** to applicator **100** area may be done to reflect particular characteristics of the flowable substance to be dispensed, including by way of example and not limitation, viscosity of the dispensed substance.

The problem associated with "blow-through" of the flowable substance to be dispensed of earlier devices was solved by the discovery that an unattached pad area provided a reservoir to accumulate the volume of cream or other liquid when the frangible seal burst.

Prototype applicators were tested with three different, unattached pad areas. Foam pads for these samples were 1" in diameter and 0.187" thick. Adhesive rings of one inch outside diameter were used to attach the foam pads. The adhesive rings had three different inside diameters: 0.5", 0.375" and 0.25" to evaluate the size of the unattached area on reducing blow-through. Applicators were filled with 0.95gm of acne cream. These tests showed that prototypes with 0.25" diameter unattached pad area still had some cream blow-through. Prototypes with larger diameter unattached pad area (i.e. 0.5") had no cream blow-through.

The unattached area behind the foam pad provides a flexible reservoir to absorb the liquid volume and hydraulic impact when the frangible seal is broken. Proper design of the reservoir in foam pad specifications can prevent liquid blow-through to the outer surface of the pad. Unsealed area, liquid viscosity and pad specification must each be considered to prevent blow-through.

The width of the bond between the foam pad and the foil wings could be wider at the location where the two foil wings are joined. A wider seal in this area can reduce or eliminate liquid squirting out the small "vee" gap where the foil wings are joined and folded back. A foam pad can be slightly larger than the foil wings to reduce the possibility of the foil contacting and abrading the skin surface.

The cream or liquid is initially dispensed onto the skin from the surface of the foam over the unattached area. The ring of foam that is attached to the foil wings initially has no cream or liquid behind it. This drier outer ring adds to the applicator performance by smoothing and spreading the cream resulting in a thin uniform layer of cream over the skin surface being treated.

The chamber **170** may be formed by the at least one sheet **145**, and the applicator **100**, and may be bounded in part by the applicator **100**, the at least one applicator bond **180**, and the frangible seal **210**. In an alternate embodiment, the chamber **170** may be additionally bounded in part by one of the at least one seals **148**. Alternatively, such as is shown in FIG. 4, in embodiments where the compartment **130** is formed with a first sheet section **150** and a second sheet section **160** interconnected with a primary seal **135**, the chamber **170** may be formed by the first

sheet section **150**, the second sheet section **160**, and the applicator **100**, and bounded in part by the applicator bond **180**, and the frangible seal **210**. The chamber **170** may additionally be bounded in part by the primary seal **135**.

To protect the contents and to promote cleanliness of the device, the apparatus may include an applicator cover **120** adapted to releasably enclose the applicator, as shown in FIG. 5. Additionally or alternately, as would be apparent to one skilled in the art, the entire apparatus could be enclosed in a suitable packaging to maintain cleanliness, or even in a special use packaging to keep the apparatus sterile. The preferred embodiment of the apparatus is that of a relatively small, hand held device, but there are no particular restrictions on the size of the apparatus or the amount of substance that might be dispensed, other than those general considerations of size, weight, and resultant ease of use.

INDUSTRIAL APPLICABILITY

The apparatus according to the present invention answers a long felt need for a low cost disposable packaging for a wide array of flowable substances, which can include, by way of example and not limitation; pharmaceutical antiseptics, salves, cosmetics, ointments and creams. The apparatus provides a packaging that offers convenience in storage, resistance to package breakage, better sanitation, and lower spillage or waste. Additionally, the apparatus provides a package that allows a user to apply a small measured quantity of a substance in a controlled manner without getting it on the fingers or hands and without the necessity of using the fingers, hands or an additional implement to spread the substance.

Numerous alterations, modifications, and variations of the preferred embodiments disclosed herein will be apparent to those skilled in the art and they are all anticipated and contemplated to be within the spirit and scope of the instant invention. For example, although specific embodiments have been described in detail, those with skill in the art will understand that the preceding embodiments and variations can be modified to incorporate various types of substitute and or additional or alternative materials, relative arrangement of elements, and dimensional configurations.

Accordingly, even though only few variations of the present invention are described herein, it is to be understood that the practice of such additional modifications and variations and the equivalents thereof, are within the spirit and scope of the invention as defined in the following claims.

WE CLAIM:

1. A dispensing and application apparatus wherein the apparatus is designed to contain a flowable substance, comprising:

a compartment;

at least one sheet divided by at least one seal to form the compartment, wherein one of the at least one seals is a frangible seal designed to break when exposed to a predetermined pressure, thereby creating a channel permitting fluid communication between the compartment and a chamber;

an applicator having a periphery and being joined to the at least one sheet with at least one applicator bond; and

the chamber being formed by the at least one sheet, and the applicator, and bounded in part by the applicator, the at least one applicator bond, and the frangible seal.

2. The apparatus of claim 1, wherein the at least one sheet includes a first sheet section and a second sheet section.

3. The apparatus of claim 2, wherein the first sheet section and the second sheet section are formed from a single sheet by folding the sheet along a fold line.

4. The apparatus of claim 1, wherein the chamber is additionally bounded in part by one of the at least one seals.

5. The apparatus of claim 1, wherein the frangible seal is formed to have at least one sinusoidal shape.

6. The apparatus of claim 1, wherein the frangible seal further includes a stress riser.

7. The apparatus of claim 6, wherein the stress riser is formed to be a substantially chevron shape having a sharp inflection point oriented in the direction of the compartment.

8. The apparatus of claim 7, wherein the frangible seal is formed to include a frangible seal first edge and a frangible seal second edge, and the chevron shape has a rear chevron inflection point whereby a maximum orthogonal distance from the rear inflection point to the frangible seal second edge is less than a maximum orthogonal distance between the frangible seal first edge and the frangible seal second edge.

9. The apparatus of claim 6, wherein the stress riser is formed of at least one sharp inflection point oriented in the direction of the compartment.

10. The apparatus of claim 6, wherein the stress riser comprises a flat area.

11. The apparatus of claim 10, wherein the at least one applicator bond is a bond selected from chemical bonds and mechanical bonds.

12. The apparatus of claim 1, wherein the applicator is selected from the group consisting of foam pads, wovens, non-wovens and felts.

13. The apparatus of claim 1, wherein the at least one sheet is constructed of flexible laminated foil material.

14. The apparatus of claim 1, wherein the applicator bond exterior edge is within the applicator periphery.

15. The apparatus of claim 1, wherein the surface area of the bond area is between approximately 62.5% of the surface area of the applicator and approximately 87.5% of the surface area of the applicator.

16. The apparatus of claim 1, further including an applicator cover adapted to releasably enclose the applicator.

17. The apparatus of claim 1, wherein the at least one seal and the frangible seal are thermal seals.

18. The apparatus of claim 1, wherein said at least one sheet extends beyond the periphery of said applicator.

19. The apparatus of claim 18, wherein said at least one sheet extends beyond the periphery of said applicator from 1 to 50 mm.

20. A dispensing and application apparatus wherein the apparatus is designed to contain a flowable substance, comprising:

a compartment;

a first sheet section and a second sheet section interconnected with a primary seal and a frangible seal to form the compartment, the frangible seal being designed to break when exposed to a predetermined pressure thereby creating a channel permitting fluid communication between the compartment and a chamber;

an applicator having a periphery and being joined to the first sheet section and the second sheet section with at least one applicator bond; and

the chamber being formed by the first sheet section, the second sheet section, and the applicator, and bounded in part by the applicator, the applicator bond, and the

frangible seal.

21. The apparatus of claim 20, wherein the first sheet section and the second sheet section are formed from a single sheet by folding the sheet along a fold line, whereby the first sheet section and second sheet section are additionally interconnected at the fold line.

22. The apparatus of claim 20, wherein the chamber is additionally bounded in part by the primary seal.

23. The apparatus of claim 20, wherein the frangible seal is formed to have at least one sinusoidal shape.

24. The apparatus of claim 20, wherein the frangible seal further includes a stress riser.

25. The apparatus of claim 24, wherein the stress riser is formed to be a substantially chevron shape having a sharp inflection point oriented in the direction of the compartment.

26. The apparatus of claim 25, wherein the frangible seal is formed to include a frangible seal first edge and a frangible seal second edge, and the chevron shape has a rear chevron inflection point whereby a maximum orthogonal distance from the rear inflection point to the frangible seal second edge is less than a maximum orthogonal distance between the frangible seal first edge and the frangible seal second edge.

27. The apparatus of claim 24, wherein the stress riser is formed of at least one sharp inflection point oriented in the direction of the compartment.

28. The apparatus of claim 20, wherein the applicator is selected from the group consisting of porous foam pad, wovens, non-wovens and felt.

29. The apparatus of claim 28, wherein the applicator bond is a chemical and mechanical bond between the applicator and the first and second surfaces.

30. The apparatus of claim 20, wherein the applicator is a foam pad.

31. The apparatus of claim 20, wherein the first sheet section and the second sheet section are sheets of flexible laminated foil material.

32. The apparatus of claim 20, wherein the applicator bond exterior edge is within the applicator periphery.

33. The apparatus of claim 20, wherein the surface area of the bond area is between approximately 62.5% of the surface area of the applicator and approximately 87.5% of the surface area of the applicator.

34. The apparatus of claim 20, further including an applicator cover adapted to releasably enclose the applicator.

35. The apparatus of claim 20, wherein the primary seal and the frangible seal are thermal seals.

36. The apparatus of claim 20, wherein said first and second sheets extend beyond the periphery of said applicator.

37. The apparatus of claim 36, wherein said first and second sheets extends beyond the periphery of said applicator from 1 to 50 mm.

38. A means for dispensing and applying a fluid, comprising:

a means for storing the fluid;

at least one means for establishing a boundary divided by at least one joining means to form the means for storing the fluid, wherein one of the at least one joining means is a means for establishing fluid communication between the storing means and a means for expansion when exposed to a predetermined pressure;

a means for applying the fluid joined to the at least one boundary establishing means with at least one means for bonding; and

the expansion means being formed by the at least one boundary establishing means, and the applying means, and bounded in part by the applying means, the at least one bonding means, and the fluid communication establishing means.

39. The means for dispensing and applying a fluid of claim 38, wherein the at least one boundary establishing means includes a means for establishing a front boundary and a means for establishing a rear boundary.

40. The means for dispensing and applying a fluid of claim 38, wherein the expansion means is additionally bounded in part by one of the at least one joining means.

41. The means for dispensing and applying a fluid of claim 38, further including a means for covering the applying means.

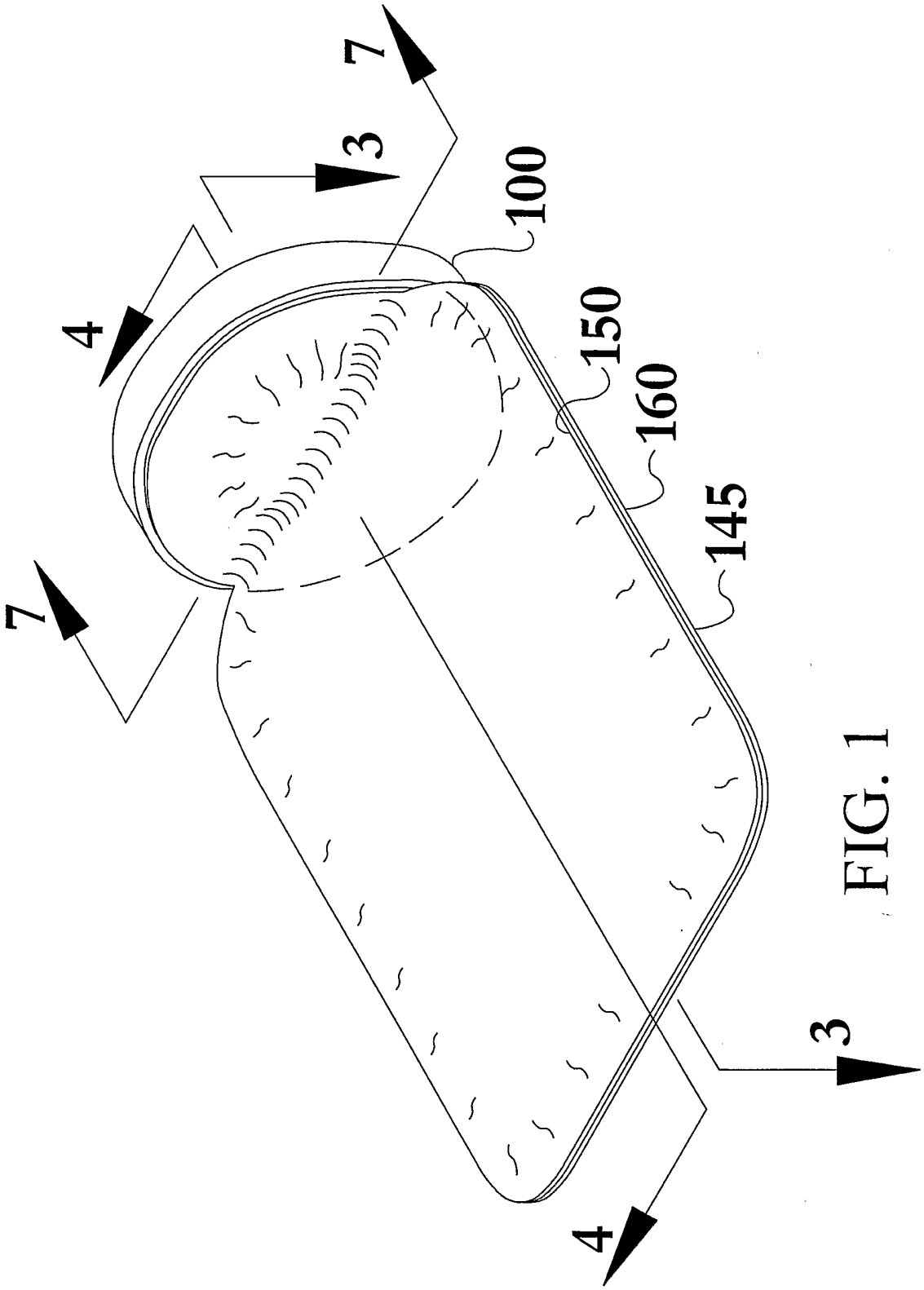

FIG. 1

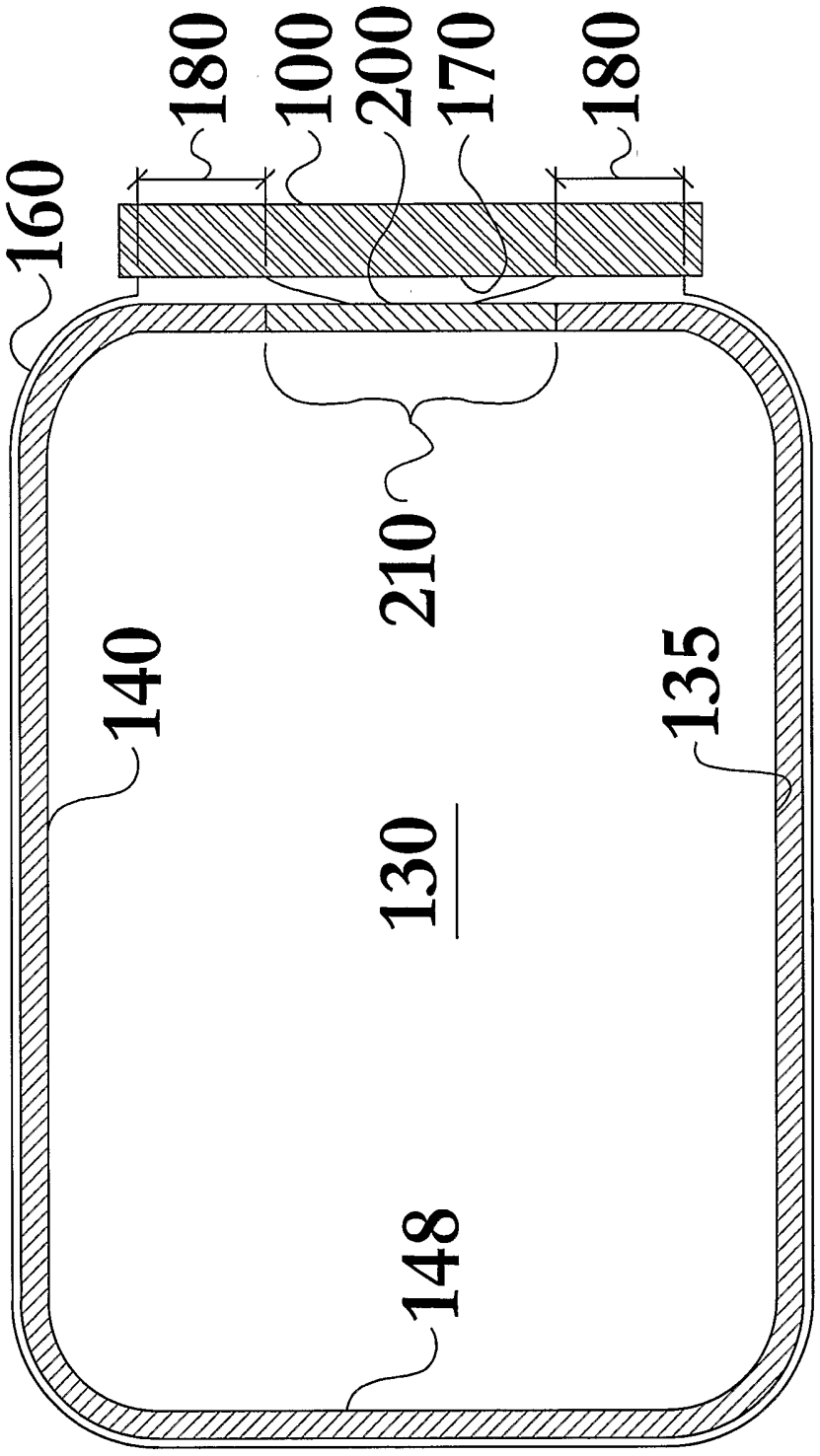

FIG. 2

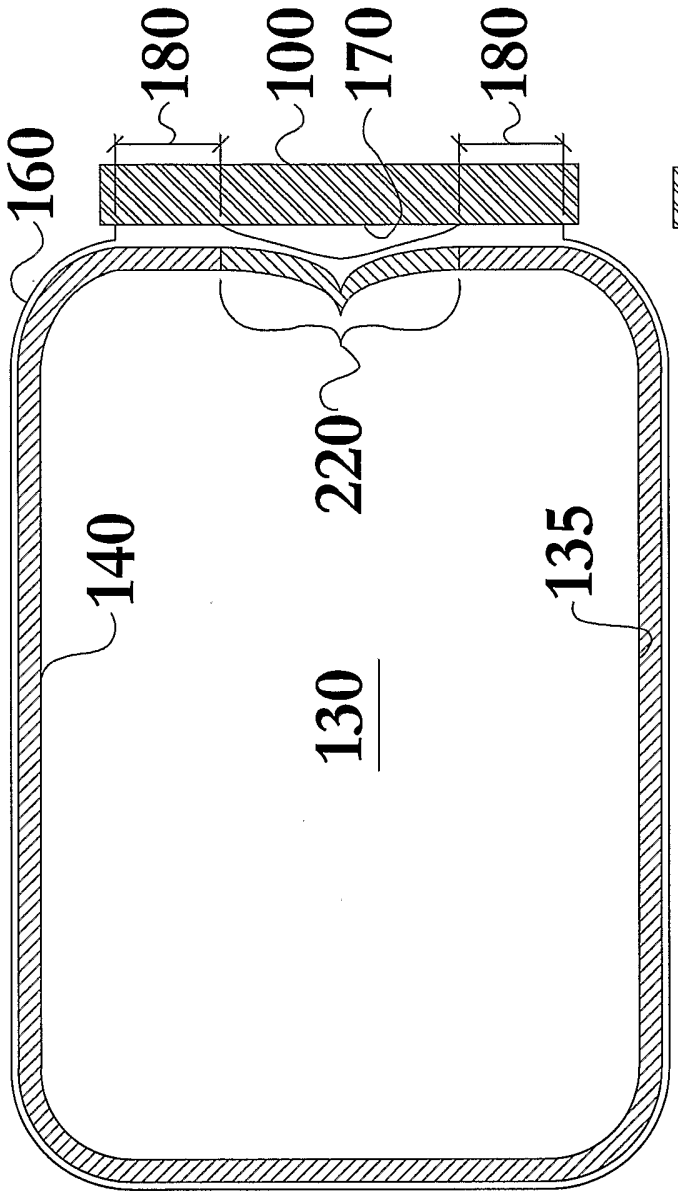
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FIG. 3

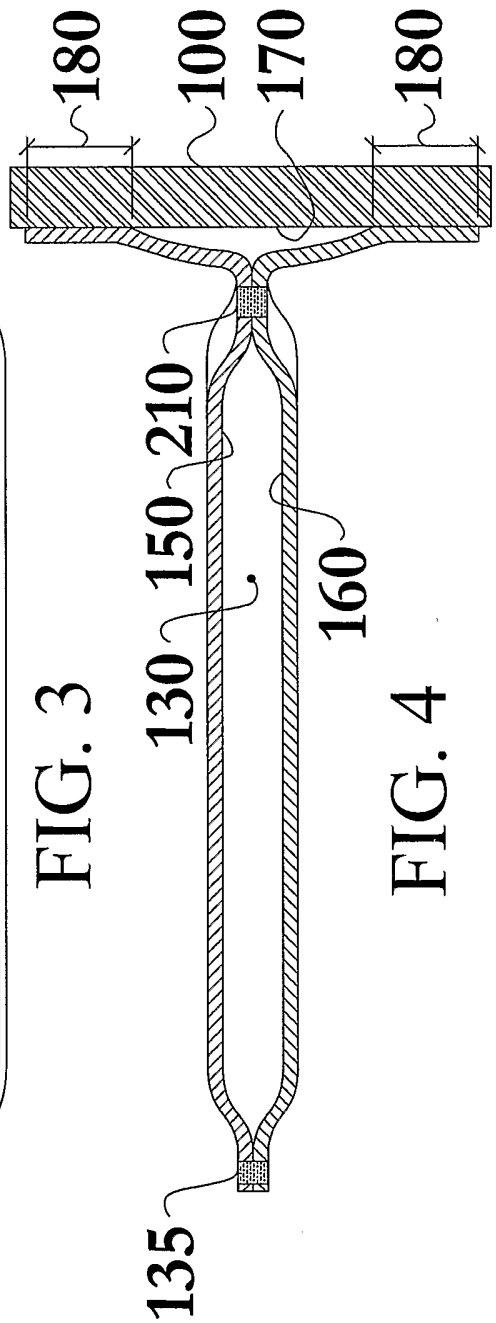
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FIG. 4

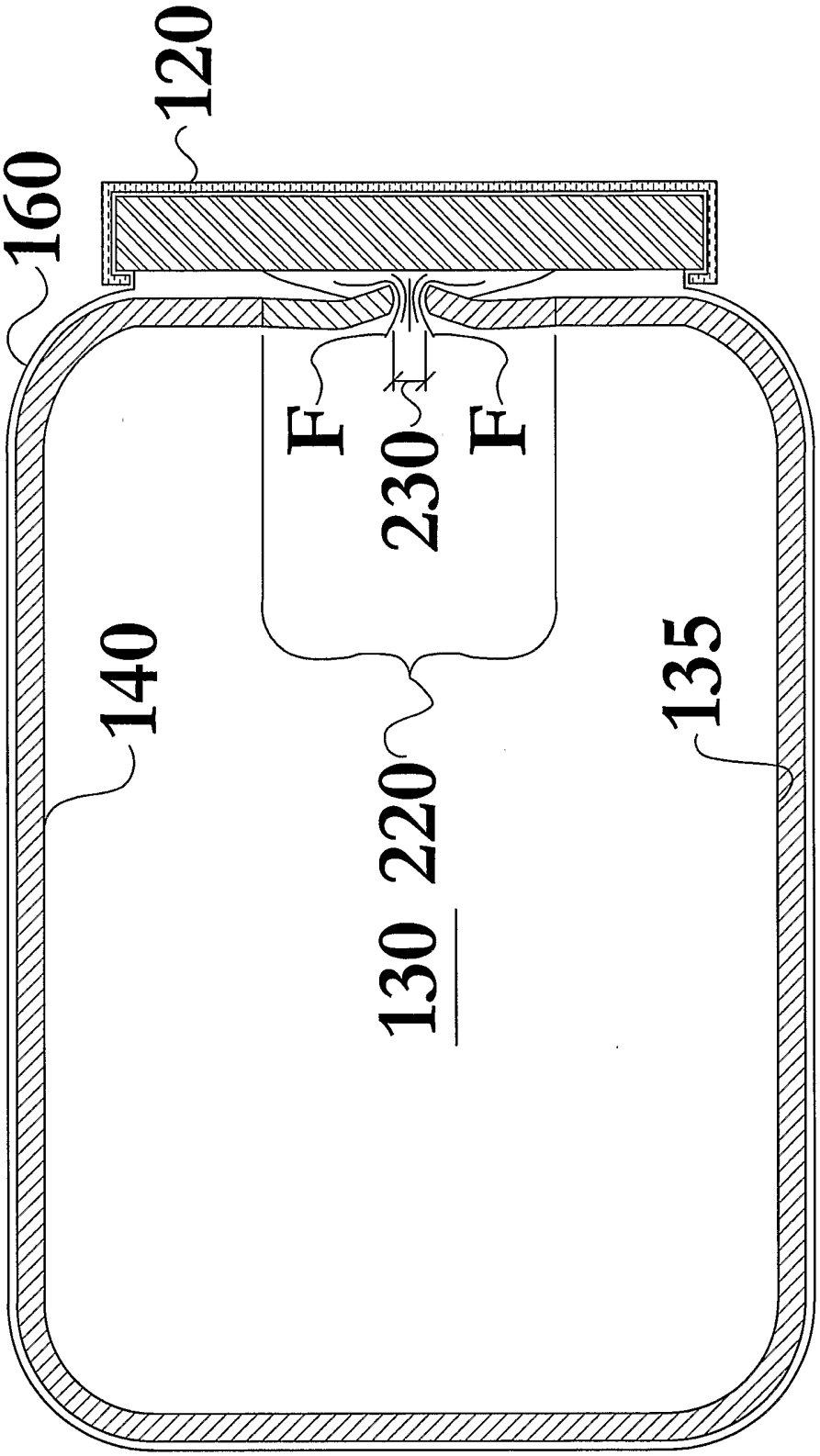

FIG. 5

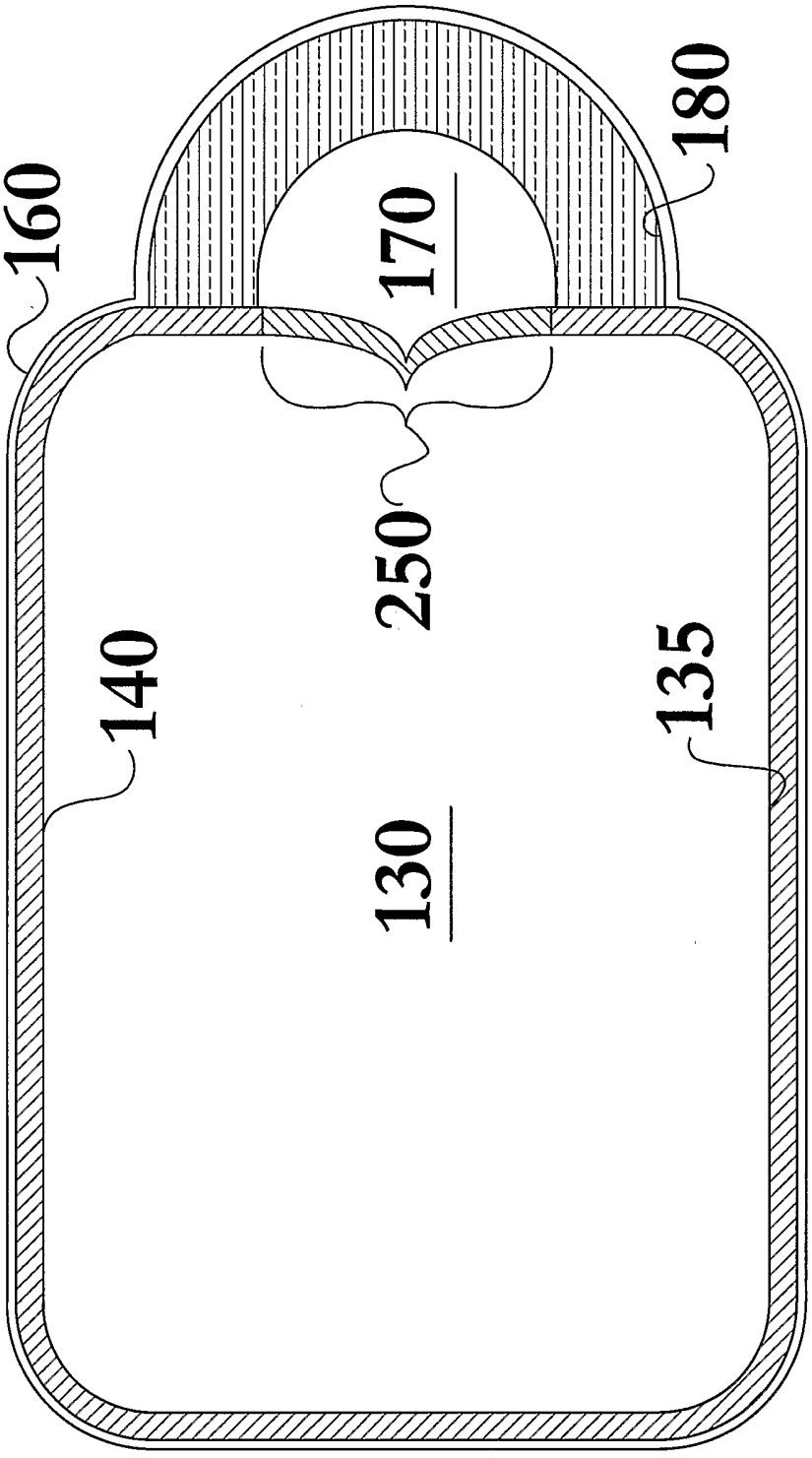

FIG. 6

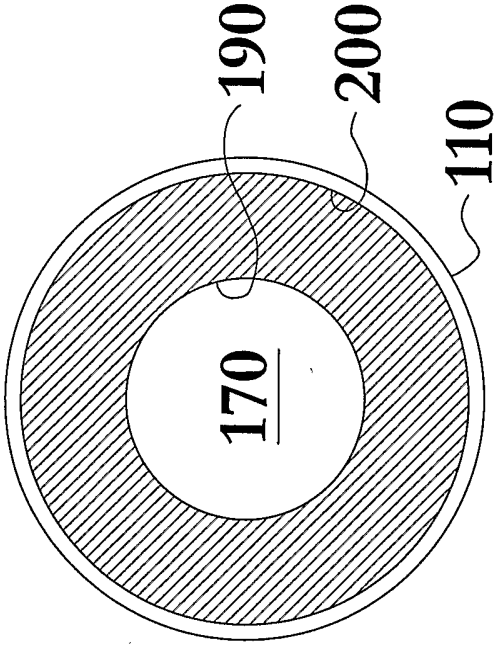

FIG. 7

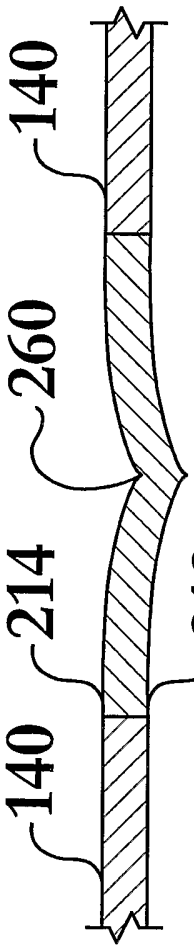

FIG. 9

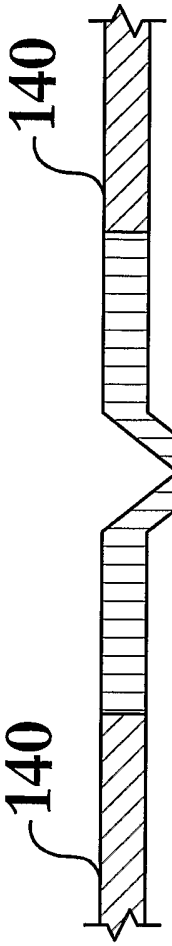

FIG. 10

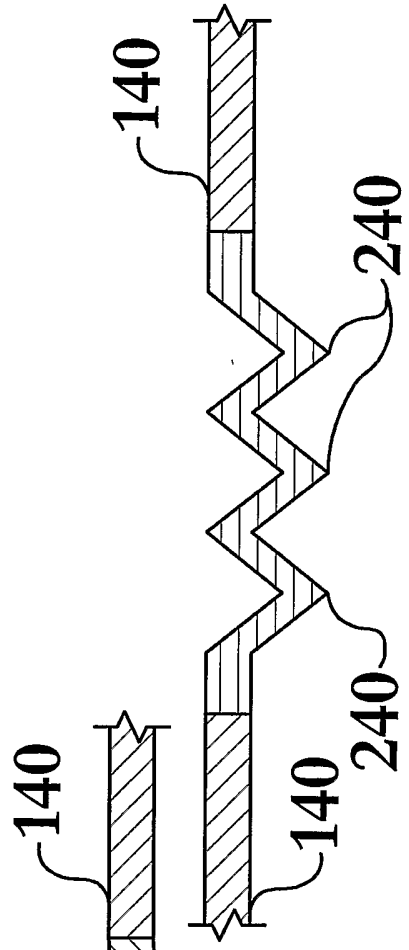

FIG. 11

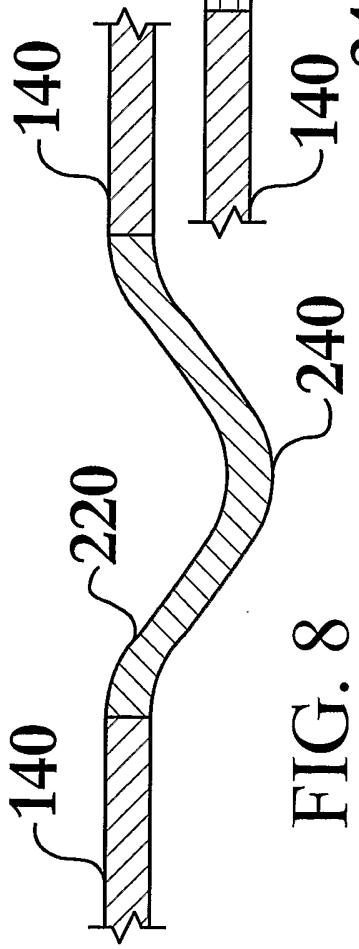

FIG. 8

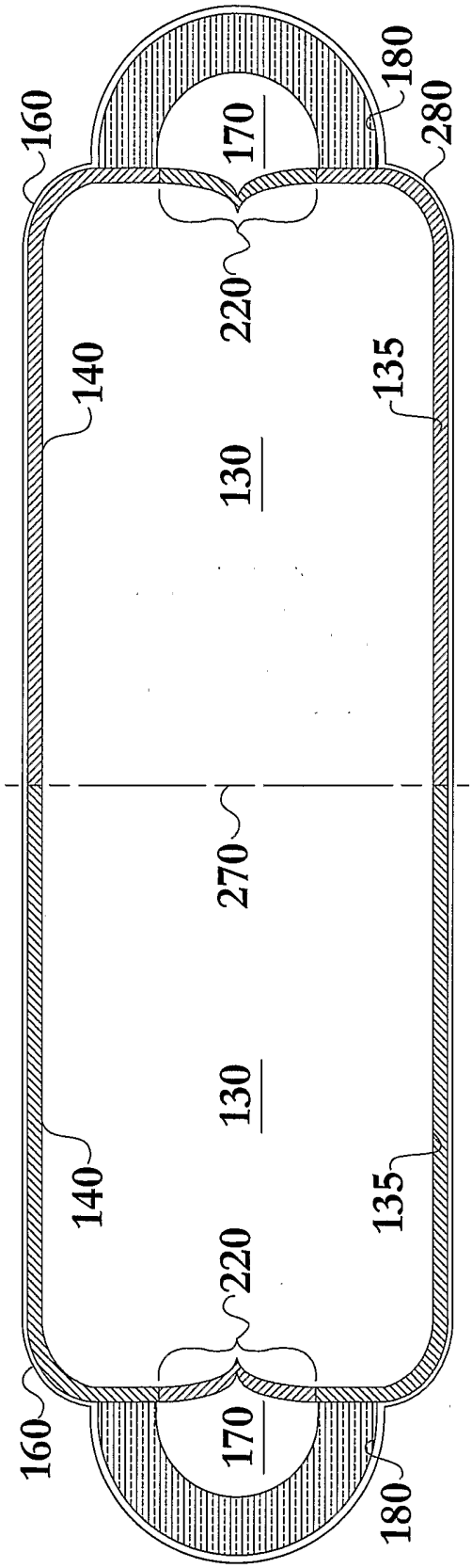
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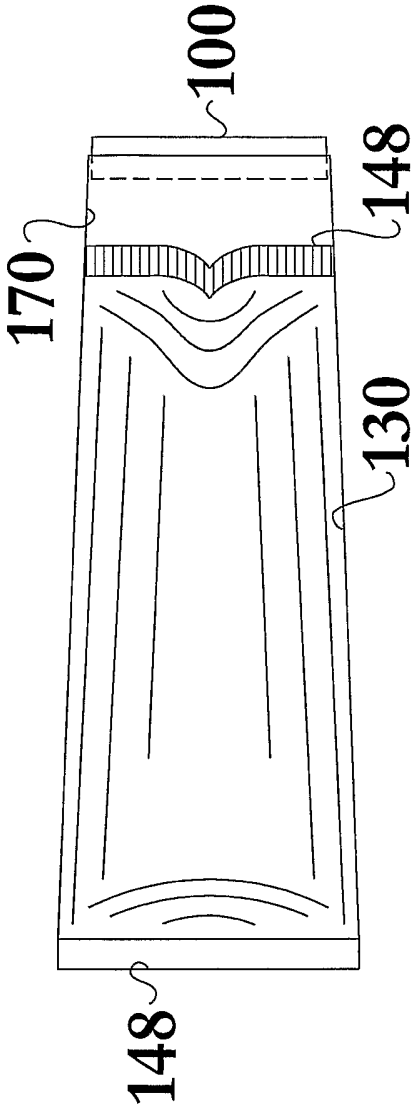
FIG. 12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148
170
130
148

FIG. 13