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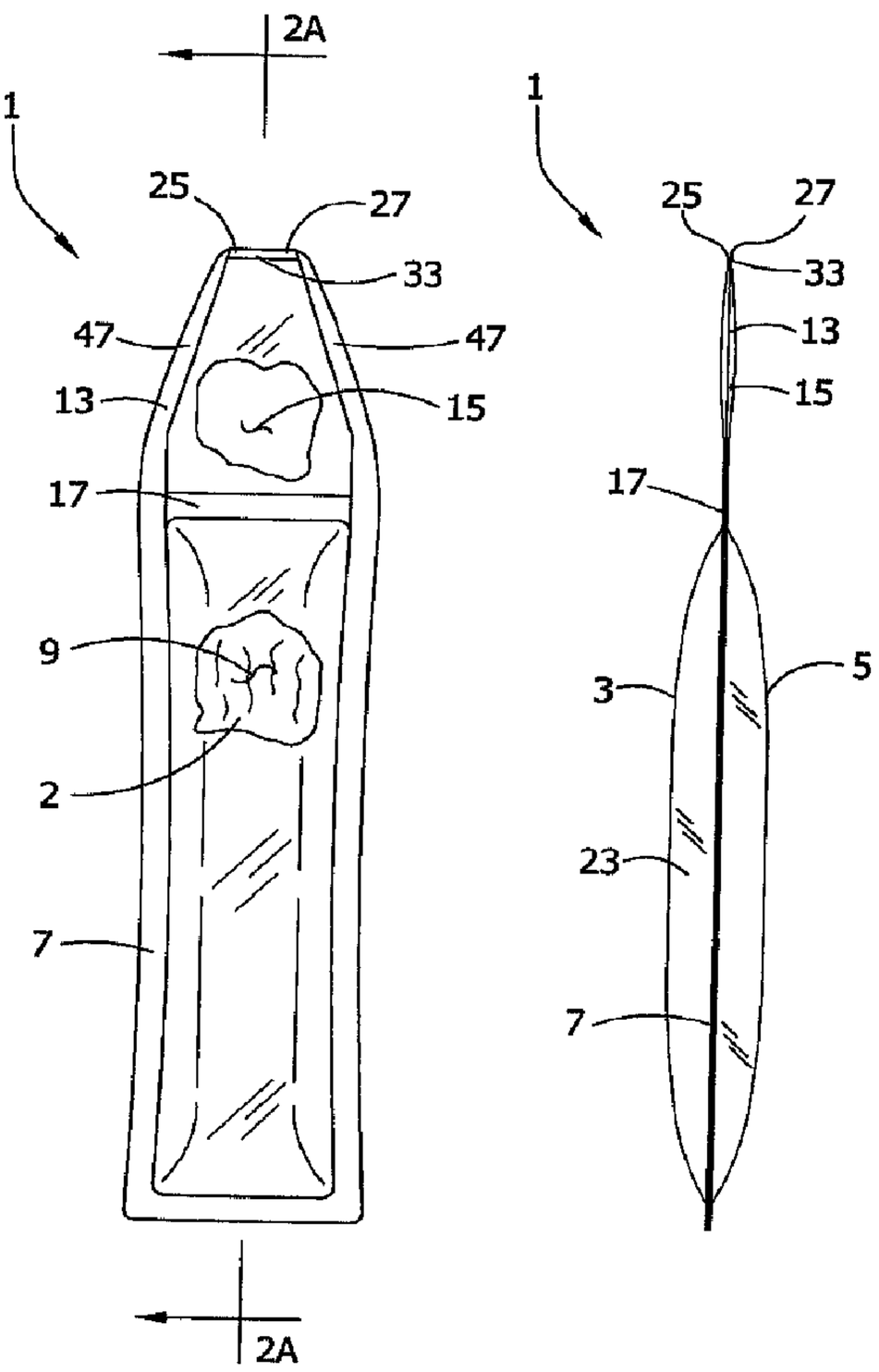

(57) Abrégé/Abstract:
A pliable single use liquid container and dispensing device for delivery of liquids across a broad range of viscosities is provided with the container being formed of opposed pliable sheets (3, 5), a first seal (7) joining the first and second sheets (3, 5) and partially

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(57) Abrégé(suite)/Abstract(continued):
defining a liquid-containing chamber (9), a second seal (13) joining the first and second sheets and partially defining a pressure relieving chamber (15) adjacent to the liquid-containing chamber (9), a boundary seal (17) joining the first and second sheets (3, 5) between the liquid containing chamber (9) and the pressure relieving chamber (15), the boundary seal (17) being lighter than the first and second seals (7, 13) so that upon application of pressure to the liquid in the liquid-containing chamber (9) the fluid transfer region seal opens to permit the liquid to flow from the liquid-containing chamber into the pressure relieving chamber (15), a sealed outlet (27) adapted for fluid communication with the pressure relieving chamber for flow of the liquid from the pressure relieving chamber (15), the outlet seal (33) being adapted to open upon application of fluid pressure from the pressure relieving chamber (15) for dispensing the liquid from liquid container and prevent spilling and splashing of the liquid prior to delivery.

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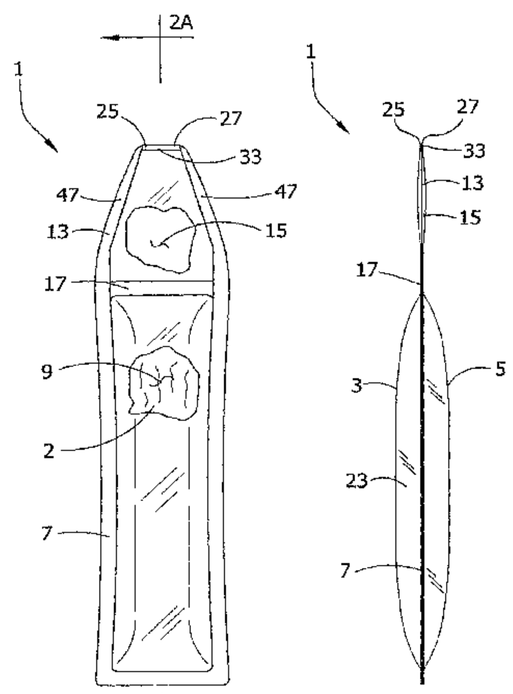
(54) Title: UNIT DOSE FLEXIBLE CONTAINER



(57) Abstract: A pliable single use liquid container and dispensing device for delivery of liquids across a broad range of viscosities is provided with the container being formed of opposed pliable sheets (3, 5), a first seal (7) joining the first and second sheets (3, 5) and partially defining a liquid-containing chamber (9), a second seal (13) joining the first and second sheets and partially defining a pressure relieving chamber (15) adjacent to the liquid-containing chamber (9), a boundary seal (17) joining the first and second sheets (3, 5) between the liquid containing chamber (9) and the pressure relieving chamber (15), the boundary seal (17) being lighter than the first and second seals (7, 13) so that upon application of pressure to the liquid in the liquid-containing chamber (9) the fluid transfer region seal opens to permit the liquid to flow from the liquid-containing chamber into the pressure relieving chamber (15), a sealed outlet (27) adapted for fluid communication with the pressure relieving chamber for flow of the liquid from the pressure relieving chamber (15), the outlet seal (33) being adapted to open upon application of fluid pressure from the pressure relieving chamber (15) for dispensing the liquid from liquid container and prevent spilling and splashing of the liquid prior to delivery.

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UNIT DOSE FLEXIBLE CONTAINER

Field of Invention

[1] The present invention generally relates to liquid containers and more particularly to a pliable single use liquid container and dispensing device for delivery of an orally administered fluent liquid. Liquid containers are prevalent in numerous areas such as medicines, nutritional supplements, and confections to name a few.

Background of Invention

[2] Many orally administered medicines are available in liquid or otherwise fluent or flow able formulations. For example, children's oral medicines are commonly formulated to be liquid because it is easier for children to swallow the medicine in liquid form than in a solid form, such as pills. Of course, many adult medicines are also available in liquid or fluent form.

[3] These liquid formulations are formulated to be administered with a predetermined unit dose. However, economic packaging for unit doses has been difficult to develop. Thus the liquid formulations are packaged in bulk container and options are also supplied for administering a unit dose from these bulk containers. There are a number of conventional options for measuring a proper dose of liquid oral medicine. For example, a person could to pour the medicine into a measuring spoon. Another option is to provide the person with a graduated cylinder that has a spoon integrally formed at its open end. Medicine is poured into the cylinder until the level of the medicine rises to meet a mark corresponding to the proper dose. The dose is administered by tipping the cylinder so the medicine runs out onto the spoon that is then taken into the mouth. Fluent oral medicines are also sometimes sold

in bottles that have a cap that can function as a dosing cup into which the medicine can be poured. It is also common, particularly with children's medicines, to provide a dual- purpose cap having an eyedropper or syringe extending into a bottle of medicine to draw a dose of the medicine from a container and squirt it into the mouth. Another alternative is an oral syringe. These conventional dosing devices have several drawbacks.

[4] Dosing errors can occur when a patient measures his or her own dose or it is measured by a parent or other family member. Patient- or parent-administered doses are often measured under less than ideal circumstances. A patient's ability to measure an accurate dose may be compromised by symptoms of an illness or the environment. In the case of a parent measuring a dose for a child, the parent may be distracted by the conduct of the child, who may be upset, hurting, or crying. The administrator may be tired or the administration may be given in environmental conditions which impede accurate measuring. Similarly, the person may use the measuring cup from a different medicine, either inadvertently or out of convenience.

[5] Several of the devices available to deliver a dose of medicine to another person have little in the way of flow rate control. In addition, they provide no sensory cue that the flow rate is appropriate for the receiver. This leads to a "gushing" of medicine out of the mouths of the patient. Caregivers concerned that the lost volume due to the gushing may try to supplement an additional volume without knowing the volume actually lost. This can lead to inadvertent under dosing or over dosing the patient. Some elderly people may not always remember what the proper dose is, especially if they have to keep track of the proper dose for many different medicines they are taking at the

same time. Furthermore, a portion of the measured dose could spill out of the dosing device on its way to the mouth.

[6] Another problem with conventional dosing methods from a bulk container is that many consumers may feel that it is not convenient to measure an accurate does and either overdose or under dose. For example a consumer my not want to measure out an accurate dose and instead just take a small drink from a bottle. Even over the counter medicines may need to be accurately measured.

[7] Some conventional dosing devices can also be unsanitary. For example, a residue of medicine and saliva is likely to remain on the dosing device. A thorough washing could remove this residue, but this is often inconvenient, especially if a person has just self-administered medicine to combat illness and there is no healthy person available to wash the device. If more than one person uses the same dosing device, failure to wash the device thoroughly after each, may lead to the people spreading germs to each other.

[8] Accordingly, there is a need for a product that allows convenient accurate unit dosing of fluent oral medicines and that avoids the aforementioned problems.

[9] Similar issues are found in administering nutritional supplement continue to gain in popularity. Historically, nutritional supplements consisted of vitamins in pill format. Today, there are various formulations of vitamins, minerals, and protein supplements. Many formulations are being provided in liquid form for convenient use during activity, and for those who prefer liquid delivery to pills.

[10] Nutritional supplements also represent an area of greatest over dose potential. Many supplements are

formulated many times higher than the government's daily nutritional requirements because the FDA does not regulate nutritional supplements as they would a medication. The "more is better" perception is quite strong among those that take nutritional supplements.

[11] Similarly the nutriceutical field is an area in which nutritional supplements are expanding into. Designed for both competitive athletes and very busy persons who do not have time to eat proper meals, nutriceuticals provides a fast, convenient means for delivering calories and depleted vitamins and minerals. Many athletes like runners and skiers compete with nutriceutical products attached to their jerseys. The products are inconvenient, as they require tearing in order to open them. In addition, the torn off portion of the package becomes an environmental issue requiring the athlete to carefully store the tiny tear off pieces until completion of the event.

[12] Accordingly, there is a need for a product that allows economical, convenient accurate unit dosing of fluent oral nutritional supplements and nutriceuticals that avoids the aforementioned problems.

[13] Another area where one may find someone receiving an oral single unit dose is in the confections industry which is becoming more and more competitive. Aimed primarily at youth, manufacturers are increasingly considering unique packaging as a means of differentiating themselves from their competitors. Packaging that adds an element of fun while delivering the confection is being sought after.

[14] It is conceivable that a provider of a confection such as a chocolate confections might want to package a liquid chocolate in this delivery system and utilize a powder separated from a liquid which is then mixed immediately prior to administration.

[15] Accordingly, there is a need for a packaging product that allows convenient accurate dosing of fluent oral liquids, whether initially packaged as a fluent or mixed just prior to adminstration. In addition this packaging must not add an appreciable expense to the cost of manufacture.

[16] Whiting, patent number 4,268,531, teaches of a condiment package containing a single use of ketchup, mustard, etc. However, Whiting requires a tearing open of the package for dispensing. If one were to try to open the package by just squeezing the package, the pressure that would need to be generated to separate the seal would cause the liquid to gush or splatter upon separation of the seal. Conversely if one attempts to make the seal such that a slight pressure will separate the seal then premature actuation of the seal may occur from routine handling.

[17] Redmond, patent number 6,415,939, teaches a re-closable outlet on a disposable package. Redmond also incorporates folding in the design of his invention. O'Reilly, patent number 5,373,966, teaches a bag in a bag method incorporating 3 plies of film in the design. In addition, O'Reilly uses baffles to prevent spilling and splashing from occurring during delivery of the liquid. Finally, Staar, patent number 4,331,264, teaches thermoforming the package to dispense pasty liquids at a constant rate. Staar incorporates a blocking wall to achieve a constant flow rate. Such a construction would add an unacceptable expense to many packaged products.

[18] None of the aforementioned patents teach a method for providing an adjustable flow rate based on tactile information feedback to the administrator, across a range of fluid viscosities, in an economic package. None of the aforementioned patents teach how to prevent inadvertent

discharge of the fluid without the use of a baffle or blocking wall. None of the aforementioned patents teach a method for preserving the cleanliness of the fluid path prior to dispensing. None of the disclosures describe a device which can economically package a unit dose, prevent premature rupture during routine shipping and handling and provide for the accurate, controlled administration at the desired time.

Summary of the Invention

[19] A pliable single use liquid container and dispensing device for delivery of a precise amount of orally administered liquids across a broad range of viscosities, the container is provided with the container including a first and second generally opposed pliable sheets, a first seal joining the first and second pliable sheets and partially defining a liquid-containing chamber, a second seal joining the first and second pliable sheets and partially defining a pressure relieving chamber adjacent to the liquid-containing chamber, a boundary seal joining the first and second pliable sheets between the liquid-containing chamber and the pressure relieving chamber and partially defining the liquid-containing chamber and the pressure relieving chamber, a precisely measured single dose volume of fluent liquid disposed within the liquid-containing chamber, the boundary seal including a fluid transfer region seal forming at least a portion of the boundary seal which is lighter than the first and second seals so that upon application of pressure to the liquid in the liquid-containing chamber the fluid transfer region seal opens to permit the liquid to flow from the liquid-containing chamber into the pressure relieving chamber, the geometry of the portion based on the viscosity of the

liquid, an outlet adapted for fluid communication with the pressure relieving chamber for flow of the liquid from the pressure relieving chamber out of the liquid container and sized based on the viscosity of the liquid and the geometry of the dispensing device, and a lighter outlet seal adapted to open upon application of fluid pressure from liquid in the pressure relieving chamber for dispensing the liquid from the liquid container, the lighter outlet seal being located in the outlet at the periphery of the liquid container for closing the outlet and the pressure relieving chamber, and inhibiting ingress of foreign matter into the outlet and pressure relieving chamber prior to administering the liquid, and for working in combination with the dispensing device to prevent spilling and splashing of the liquid prior to delivery, control the delivery rate of the liquid to the recipient, provide tactile force flow rate information feedback to the administrator.

Brief Description of the Drawings

[20] Fig. 1A is a front elevation of one embodiment of a container of the present invention;

[21] Fig. 1B is a side elevation thereof;

[22] Fig. 2A is a section taken through the cutting plane 2A–2A shown on Fig. 1A;

[23] Fig. 2B is the section of Fig. 2A except that the shape of the container is deformed as if someone were squeezing the container;

[24] Fig. 2C is the section of Fig. 2B except that a fluid transfer seal of the container has opened;

[25] Fig. 2D is a sectional view similar to the sectional views of Figs. 2A-2C except that both the fluid transfer seal and outlet seal have opened and liquid is flowing out of the container;

[26] Fig. 3 is a schematic view of a person administering a dose of liquid from the single use container of the present invention to a recipient's mouth;

[27] Fig. 4A is a front elevation of a single use liquid container of the present invention which is particularly suited for viscous liquids and has an untapered dispensing device;

[28] Fig. 4B is a section taken through the cutting plane 4B--4B shown on Fig. 4A;

[29] Fig. 5A is a front elevation of a single use liquid container of the present invention having a dispensing device which is particularly suited for liquids with low viscosity and has a short tapered region separating two untapered regions;

[30] Fig. 5B is a section taken through the cutting plane 5B--5B shown in Fig. 5A;

[31] Fig. 6A is a front elevation of a single use liquid container of the present invention having a dispensing

device that has a short tapered region adjacent an outlet; This embodiment would likely be used for more viscous fluids

[32] Fig. 6B is a section taken through the cutting plane 6B--6B shown in Fig. 6A;

[33] Fig. 7A is a front elevation of a single use liquid container of the present invention which is particularly suited for viscous liquids and has two spaced apart boundary seals separating the liquid-containing chamber from the fluid dispensing device;

[34] Fig. 7B is a section taken through the cutting plane 7B--7B which is shown on Fig. 7A;

[35] Fig. 8A is a front elevation of a single use liquid container of the present invention having a liquid chamber dividing seal that separates the liquid/powder-containing chamber into two chambers;

[36] Fig. 8B is a section taken through the cutting plane 8B--8B which is shown on Fig. 8A;

[37] Fig. 8C is a section similar to the section shown in Fig. 8B except that the container has been deformed as if someone were squeezing it;

[38] Fig. 8D is a section similar to the sections shown in Figs. 8B and 8C except that the liquid chamber dividing seal has opened as if someone had squeezed the container;

[39] Fig. 9 is a perspective of a package of single use, pliable liquid box containers with a piece of a box of the package broken away to show the liquid containers held therein;

[40] Fig. 10 is a schematic, fragmentary section of a sheet of cardstock laminated to a gas and/or water vapor barrier film;

[41] Fig. 11 is a perspective package including a of a box containing an overpouch which in turn holds a plurality of liquid containers;

[42] Fig. 12 is a perspective of a package of single use liquid containers including a box having a piece of the box broken away to show two different groups of single use liquid containers hold different doses of liquid ;

[43] Fig. 13 is a front elevation of a set of two different groups of single use liquid containers illustrating the different sizes of the containers;

[44] Fig. 14 is a perspective of a ribbon of single use liquid containers of the present invention;

[45] Fig. 15 is a perspective of a package of single use liquid containers including a box showing one overpouch containing liquid containers that hold a first type of liquid and a second overpouch holding liquid containers that contain a different type of liquid.

Detailed Description of the Invention

[46] Referring to Figs. 1A and 1B, for example, a first embodiment of a single use pliable container (generally indicated at 1) includes a single dose volume of liquid 2. The container further comprises first and second generally opposed pliable sheets designated at 3 and 5, respectively. A first seal 7 extends around a lower perimeter of the sheets 3, 5 and joins the sheets to partially define a liquid-containing chamber 9. A second seal 13 extends along most of an upper perimeter of the sheets 3, 5 and joins the sheets to partially define a pressure relieving chamber 15 adjacent the liquid-containing chamber 9. A boundary seal 17 joins the first and second sheets 3, 5 between the liquid-containing chamber 9 and the pressure relieving chamber 15. In the embodiment shown in Figs. 1A

and 1B the entire boundary seal 17 constitutes a fluid transfer region seal. However, it will be understood that the extent of the fluid transfer region seal may be limited to only a portion of the boundary seal 17 without departing from the scope of this invention. The liquid-containing chamber 9 is defined by the first seal 7, the boundary seal 17, and the first and second pliable sheets 3, 5. The pressure relieving chamber 15 is defined by the second seal 13, the boundary seal 17, an outlet seal 33, and the first and second pliable sheets 3, 5.

[47] The volume of liquid 2 corresponding to a single dose is sealed within the liquid-containing chamber 9. The liquid 2 may be over-the-counter or prescription medicine, nutritional supplements, confections, or other liquids one might consume orally. Although a "liquid" is described herein, the present invention is suitable for any substance in a flow able or "fluent" form, whether liquid or solid across a range of viscosities. The second seal 13 is discontinuous in an end portion 25 of the pressure relieving chamber 15 to define an outlet (generally indicated at 27) from the pressure relieving chamber 15 to the outside of the container 1. The outlet seal 33 joins the first and second sheets 3, 5 at the outlet 27 to sealingly close the outlet and separate the pressure relieving chamber 15 from the exterior of the container 1, thereby preventing contaminants from entering the pressure relieving chamber 15 prior to use.

[48] In the embodiment shown in Figs. 1A and 1B, the first and second seals 7, 13 form part of a perimeter seal joining the first and second pliable sheets 3, 5 substantially around their perimeters. The first and second seals 7, 13 need not be located at the perimeter of the container 1. However, the arrangement makes an

efficient use of the material forming the first and second sheets 3, 5. The outlet seal 33 is a continuation of the second seal 13 around the perimeter, but as described below, is a lighter seal.

[49] The fluid transfer region seal 17 and outlet seal 33 are lighter than the first and second seals 7, 13. For purposes of this application, the strength of a seal is defined by the force that is required to separate the first and second sheets 3, 5 at the seal or to rupture the seal. Thus, lighter seals separate or rupture upon application of a smaller separating force than stronger seals. For example, the first and second seals 7, 13 may comprise conventional permanent heat welds. The fluid transfer region seal 17 and outlet seal 33 may comprise peal seals. Instruction on how to form a peal seal may be found in many references including U.S. Patent Nos. 6,309,673; 6,319,243; 5,865,793; 5,577,369 and 5,209,347 which are hereby incorporated by reference. As noted in the foregoing patents, it is possible to vary the strength of a peal seal by varying the materials selected, seal geometry, temperature, pressure and/or time used to form the seal. It is also noted that the width of any seal can be increased to increase the strength of the seal, and vice-versa. Those skilled in the art will recognize that various adhesives could also be used to form the seals 7, 13, 17, 33. It is preferable, for reasons to be described later, for the outlet seal 33 to be lighter or rupture at a lower pressure than the fluid transfer region seal 17. For example, the outlet seal 33 may comprise a seal formed by the heat and pressure associated with the shearing action of a knife or other cutting tool used to cut the first and second sheets (not shown). Those skilled in the art will recognize that a variety of sealing technologies can be

applied to form the various seals 7, 13, 17, 33 in the pliable single dose container 1 without departing from the scope of this invention.

[50] It is contemplated that a variety of single- or multi-layer films or film laminates could be used to form the sheets 3, 5. The first and second sheets 3, 5 should be made of materials (e.g., polymers) that are compatible with the technologies used to form the various seals 7, 13, 17, 33. For example the realm of single and multiple layer polyolefins like polyethylene and polypropylene, or the realm of foils and foil/polyolefin laminates. Those skilled in the art will know how to select or design films that are suitable for use with any of the conventional sealing technologies.

[51] The sheets 3, 5 also have to be chemically and physically compatible with the particular liquid 2 in the container 1. The oral liquid 2 should not leach undesirable chemicals out of the sheets 3, 5 or otherwise react chemically with the sheets 3, 5. It may be desirable for the first and second sheets 3, 5 to be transparent to allow viewing of the contents of the liquid containing chamber 9 prior to use. On the other hand, the first and second sheets 3, 5 may be opaque if needed to protect the liquid 2 from exposure to light, which can degrade some liquids. In some cases, it may be necessary or desirable to include a gas barrier and/or a water vapor barrier layer (not shown) in the first and second sheets to prevent water vapor from escaping the liquid-containing chamber. A gas vapor barrier may also be necessary or desirable to prevent oxidation of the liquid. Information regarding the construction of films having gas vapor barrier properties is provided references such as in U.S. Patent Nos. 4,692,361; 5,098,202; and 6,083,587. Films that include

water vapor barriers are described in such references as U.S. Patent Nos. 4,912,101; 6,541,087 and 6,410,124. The materials used in the sheets 3, 5 may also be selected to block light or other electromagnetic radiation if this is necessary or desirable to protect the liquid. Such films are described in such references as U.S. Patent Nos. 6,455,161; 6,391,946; and 6,306,936.

[52] As shown in Figs. 1A and 1B, the volume of the liquid-containing chamber 9, is selected in coordination with the volume of the liquid 2 to be contained so that the fluid pressure from the dose of liquid in the liquid-containing chamber 9 presses the first and second sheets 3, 5 outwardly, as shown in Figs. 1A and 1B. Film resins are selected specifically with a certain amount of stiffness so that fluid pressure can increase when the first and second sheets 3, 5 are pressed by the user. Should the film be too elastic, upon seeking to apply pressure to the fluid within the chamber 9, the film may stretch and the administrator would have difficulty in creating sufficient fluid pressure to cause the fluid transfer region seal to open. The volume of liquid 2 in the chamber 9 may be closely the same as the volume of the chamber (i.e., the chamber is substantially filled by the liquid). This will facilitate dispensing of the liquid 2, as will be described later. At the same time, care must be taken so the fluid pressure created in the liquid-containing chamber 9 during handling prior to use is maintained below the level that will rupture fluid transfer region seal 17.

[53] In the embodiment shown Figs. 1A and 1B, the pressure relieving chamber 15 has a geometry that generally tapers from the boundary seal 17 to the outlet 27. The taper is formed by the shape of the second seal 13, which runs along both sides 47 of the pressure relieving chamber.

The particular geometry of the pressure-relieving chamber may be tailored to suit the fluid properties of the oral liquid 2. As will be described later, the geometry of the pressure relieving chamber 15, and the size of outlet 27 are important because they moderates the flow of the liquid 2 out of the container 1 upon rupture of the outlet seal 33 and forms the flow into a controlled stream 63 (Fig. 3) during dispensing of the liquid. When the geometry of the pressure relieving chamber 15 and the size of outlet 27 are selected based on the viscosity of the oral fluid, the administrator will receive a sensory feedback of the tactile force required to control the flow rate of the liquid exiting outlet 27. A higher tactile force feedback is associated with a high flow rate and conversely a lower tactile force feedback reflects a low flow rate. One feature of the present invention is that the geometry of the pressure relieving chamber 15 may be varied to suit oral liquids having different fluid properties (e.g., different viscosities). Accordingly, the pressure relieving chamber 15 may be shaped differently from the shapes described herein without departing from the scope of this invention.

[54] The perimeter of the container 1 may be sized and configured such that the container fits in the palm of the user (Fig. 3) The perimeter of the container 1 is also tapered at the end portion 25 so that is has a shape that fits comfortably into a person's mouth especially the mouth of a child. In the embodiment shown in Figs. 1A and 1B, for example, the end portion 25 is tapered. The shape of the liquid containing chamber 9 is designed to fit comfortably between the thumb and fingers of the administrator's hand thus allowing the generation of fluid pressure sufficient enough to cause the fluid transfer

region seal 17 to open naturally. The shape of the end portion 25 is related to the geometry of the pressure relieving chamber 15, but may be unrelated without departing from the scope of the present invention.

[55] Basic operation of a pliable single dose liquid container of the type shown in Figs. 1A and 1B, is shown in Figs. 2A-2D in conjunction with Fig. 3. By squeezing the container 1, person can deform the container 1 as illustrated in Fig. 2B. Increased fluid pressure in the liquid-containing chamber 9 from the squeezing results in separating forces (indicated by arrows 53) being applied to the fluid transfer region seal 17. As shown in Fig. 2C, the separating forces 53 can eventually cause the fluid transfer region seal 17 to open which, in the case of a peal seal, takes the form of the first and second sheets 3, 5 peeling apart at the fluid transfer region seal 17. Generally, it is desirable for the fluid transfer seal 17 to open in a way that is predetermined in size and direction. Consequently, the oral liquid 2 flows into the pressure relieving chamber 15 and the person squeezing the container 1 can feel a drop in resistance to squeezing. This reduces the pressure in the fluid and signals the user to reduce the pressure applied by squeezing before any of the liquid 2 is expelled from the container 1.

[56] Moreover when properly configured the volume of the pressure reducing chamber is supplied so that the pressure of the fluid falls below the pressure which is necessary to separate the outlet seal and expel the fluid from the device. As shown in Fig. 2D, additional squeezing of the container 1 causes separating forces (indicated by arrows 55) on the outlet seal 33 to open in a similar controlled manner. Because the outlet seal 33 is lighter than the fluid transfer region seal 17, fluid pressure does

not build up as much in the opening of the outlet seal as it did during in the opening of the fluid transfer region seal. Consequently, there is less of a tendency for the oral liquid 2 to spurt out upon rupture of the outlet seal 33 as there would be if the outlet seal 33 were made stronger. The person squeezing the container 1 will also feel a drop in resistance to squeezing upon rupture of the outlet seal 33. This will signal the user that fluid liquid 2 has begun to flow through the outlet 27. As shown in Fig. 3, a person 51 can dispense the single dose of oral liquid 2 from the container 1 to a person's mouth 61 by continuing to squeeze the container 1. Although Fig. 3 shows a person 51 administering a dose of liquid 2 to another person's mouth 61, it is understood that a person could also administer a dose of liquid to himself or herself without departing from the scope of this invention.

[57] During the dispensing of the oral liquid 2, the pressure relieving chamber 15 throttles the flow from the liquid-containing chamber 9 to the person's mouth 61. The person 51 squeezing the container is provided continuous tactile feedback about the dispensing from the resistance to the squeezing. In this way, the person 51 administering the dose can feel whether there is still liquid 2 in the container 1 and can feel how fast the liquid is flowing from the outlet 27. The shape of the pressure relieving chamber 15 also forms the flow of liquid 2 into a controlled stream 63, as shown in Fig. 3. The tactile feedback and directional control provided by the container 1 are especially advantageous when a parent administers a dose of medicine to a child at night because these features allow the parent to successfully and reliably administer an accurate dose of medicine in the dark.

[58] Figures 4A-8D show a number of additional exemplary embodiments which will be described to illustrate some of the ways the basic single use oral liquid container could be modified to suit a variety of needs. The embodiments are intended to be representative of the design flexibility and adaptability of containers of the present invention. The embodiments are not intended to be an exhaustive list of containers that are within the scope of this invention. Each of the embodiments shown in Figs. 4A-8D is substantially the same as the embodiment shown in Figs. 1A and 1B except as noted. Reference numbers used to identify parts of the embodiments shown in Figs. 4A-8D correspond to the reference numbers used to describe the embodiment shown in Figs. 1A and 1B except that the 100s digit will be indexed from one embodiment to the next.

[59] Figures 4A and 4B show a container 101 having a pressure relieving chamber 115 that is not tapered. This construction permits a highly efficient use of materials in the manufacture of the container 101. In addition, this embodiment would be utilized for liquids that are extremely viscous in nature. The container 101 is otherwise the same in construction and operation as container 1.

[60] Figures 5A and 5B show a container 201 having a pressure relieving chamber 215 that has a short tapered region 265 between a boundary seal 217 and an outlet 227 of the container 201. The short tapered region 265 separates a first, wider untapered portion 267 from a second narrower untapered portion 269 including the outlet 227. The outlet 227 is sealed by an outlet seal 233 as in the previous embodiments. This embodiment is particularly suitable for relatively non-viscous fluids.

[61] Figures 6A and 6B show a container 301 having a dispensing device 315 including an untapered portion 371

and a short tapered portion 373 adjacent an outlet 327 of the container 301. The untapered portion 371 extends roughly 60% of the length of the dispensing device 315. The tapered portion 373 curves sharply to its intersection with the outlet 327. This embodiment is particularly suitable to very viscous liquids.

[62] Figures 7A and 7B show a container 401 having first boundary seal 479 forming a first fluid transfer region seal and a second boundary seal 475 forming a second fluid transfer region seal 477. The first and second boundary seals 479, 475 are similar to the first boundary seal 17 of the container 1 shown in Figs. 1A and 1B except that the first and second boundary seals 479, 475 are more narrow in width in comparison to the boundary seal 17 of the container 1 shown in Figs. 1A and 1B. Each fluid transfer region seal 481, 477 is co-extensive with the respective boundary seal 479, 475. However, the fluid transfer region seals 481, 477 could easily be limited (for example) to aligned portions of the first and second boundary seals 479, 475. It is also contemplated that the first and second boundary seals 479, 475 could have different strengths. This embodiment could be ideal for applications where the environmental forces surrounding the container are harsher. For instance, should someone place a single use liquid container into a brief case or shaving kit where that container may feel pressure from other items resting on it during the course of travel then seal 475 would provide an added safety precaution against premature dispensing. In addition, this embodiment could provide an additional level of child proofing to the invention

[63] The container 501 shown in Figs. 8A and 8B has a liquid chamber dividing seal 585. The liquid chamber dividing seal 585 divides the liquid-containing chamber

into a primary liquid-containing chamber 589 and a secondary liquid or powder-containing chamber 591. As illustrated the entire dividing seal 585 is formed more lightly than a perimeter seal 507, 513 to facilitate a controlled opening. However, it is only necessary for a portion of the dividing seal 585 to be formed for such a controlled Opening. The container 501 further includes a boundary seal 517 separating the liquid container chambers 589, 591 from a dispensing device 515. To provide controlled activation it is preferred that the dividing seal 585 is lighter than the boundary seal 517. The primary chamber 589 may hold one liquid component 593 and the secondary chamber 591 may hold a different liquid or powder component 595. This container 501 is suited for use when there is a need to maintain the liquids as separate components 593, 595 until use. For example, the individual components 593, 595 may be more stable than the combination of the components so that the shelf life of the product can be increased by keeping the components 593, 595 separate.

[64] As shown in Figs. 8C-8D, when a person squeezes the container 501, the liquid chamber dividing seal 585, which is lighter than the first and second seals 507, 513 opens to establish fluid communication between the primary and secondary chambers 589, 591 and to allow mixing of the components 593, 595. After mixing, further squeezing of the container 1, boundary seal 517 opens. Once boundary seal 517 has opened, continued squeezing opens the outlet seal 533 of container 501 as has been previously described for other embodiments. Additional mixing of the components 593, 595 will occur throughout the opening process.

[65] Referring back to Figs 2A-2D, for convenience, a liquid container 1 of the present invention may be designed to allow one-handed opening as shown in Fig. 3. This can

be done by making the fluid transfer region seal 17 sufficiently weak that an adult having average hand strength can squeeze the container 1 hard enough in one hand to cause the fluid transfer region seal 17 to open(and any other open able seals) in that container as well as the outlet seal 33. At the same time the fluid transfer region seal 17 should be strong enough to prevent accidental opening of fluid transfer region (e.g., during transport and handling) seal. Furthermore, the fluid transfer region seal 17 should also be strong enough that it is difficult for children to open the container 1 to provide adequate childproofing.

[66] In contrast, the outlet seal 33 may be substantially lighter because with little or no fluid in the pressure relieving chamber 15, the outlet seal 33 should not be subjected to any fluid pressure except during the opening sequence (shown in Figs. 2A-2D). Furthermore, it is anticipated that a weak outlet seal 33 will be desirable for most applications because the weakness of the outlet seal 33 facilitates opening of the outlet 27 without much buildup of fluid pressure in the dispensing device, which decreases the tendency for the liquid material 2 to spurt out upon opening of the outlet seal 33. For example, an outlet seal strength of only one pound per inch is sufficient to prevent the spurting out of liquid upon opening of the fluid transfer region seal and can adequately prevent ingress of soil and microbes. It is also contemplated that the outlet seal 33 may be as strong as or stronger than the fluid transfer region seal 17, in circumstances in which additional protection against unintended opening is desired for example, without departing from the scope of this invention. Permanent seals will have a minimum seal strength of 12 pounds per inch.

It is not uncommon to have permanent seal strengths in the 25 to 30 pound per inch range. In the cases of permanent seals, the strength of the film determines the failure strength as the film breaks before the seal peels. In a preferred embodiment the strength of the fluid transfer region seal will be in the 3 to 7 pounds per inch range. This is sufficient strength for the seal to resist peeling during shipping and handling, and yet the average human hand can generate internal pressures sufficient to cause this seal to peel.

[67] As shown in Fig. 9, a package (generally indicated at 602) includes a plurality of single use pliable liquid or otherwise fluent oral liquid containers (generally indicated at 601) may be packaged together in a box 604 (broadly, "a receptacle") for sale to consumers. Thus, instead of a bottle containing a single volume of liquid for multiple doses to be measured by the user, a box 604 of single dose containers 601 is provided. The single dose containers 601 require no measuring in use and may have particular benefit for over-the-counter liquids. The box 604 has a gas and/or water vapor barrier 606 to increase shelf life of the containers. The box 604 may be formed out of laminated sheets of material having gas and /or water vapor barrier properties. As shown in Fig. 10 for example, laminated sheets 635 may be formed of a barrier film 606 having gas vapor barrier properties laminated to cardstock 618 (or cardboard). United States Patent No. 5,147,480, which is incorporated herein by reference, teaches how to construct a corrugated cardboard laminate having a vapor barrier film.

[68] Referring to Fig. 1, it is not essential to the present invention that the box 604 comprises a gas and/or water vapor barrier 606. As noted earlier, it may be

desirable for the first and second sheets 3, 5 of each container 1 to comprise a gas and/or water vapor barrier to increase shelf life by reducing the flow of water vapor out of the container 1 or by reducing the flow of oxygen into the container 1. If the containers 601 already have enough of a gas and/or water vapor barrier to provide the desired shelf life, the gas and/or water vapor barrier 606 may be omitted from the box 604. However, it may be difficult or expensive to obtain sheets having gas and/or water vapor barriers that can be made into a container 601 and that are also compatible with the particular oral liquid in the container. A gas and/or water vapor barrier 606 may be provided in the box 604 as an alternative to or in combination with a gas and/or water vapor barrier in the containers 601 themselves. Because the box 604 will not come in direct contact with the liquid , a wider range of materials may be used to form the gas and/or water vapor barrier 606 in the box 604 without concern about compatibility of the gas and/or water vapor barrier with the liquid. The gas vapor barrier 606, if provided, completely surrounds an interior 616 of the box 604 until the consumer opens the box. Thus, the box 604 is resistant to the transmission of water vapor and oxygen between the interior 616 and exterior of the box. Accordingly, the containers 601 are maintained in a protective environment that is conducive to long shelf life.

[69] Furthermore, a packet 608 containing an oxygen scavenger, such as iron oxide or a similar oxygen scavenging chemical, may be placed inside the box 604 to eliminate oxygen from the interior 616 of the box 604 and to maintain a low-oxygen environment for the containers 601. The box 604 may also be designed to be less pliable than the containers 601 to shield the containers from the

physical abuse of rough handling. For example, the cardstock 618 is selected to be durable enough to protect the containers 601 from damage if someone drops the box 604. Likewise, the box can be opaque to protect the containers 601 from exposure to light, including ultraviolet light, which may degrade the liquid in each container.

[70] In order to allow printing to be placed on the exterior of the box 604, the laminated sheets 635 may be positioned so the cardstock layer 618 faces outward. Thus, printing on the cardstock 618 will be visible on the exterior of the box 604. The exterior surface of the box 604 may be designed to receive printed brand names 626, product logos 632, and directions and precautions 628 for use of the containers 601.

[71] Figure 11 shows an alternative package 702 containing a plurality of single use pliable oral liquid containers 701. The containers 701 are first placed in an overpouch 724. The overpouch may be formed by partially sealing two sheets of gas and/or water vapor blocking film together leaving an opening for receiving the containers 701 therein. Then the containers 701 may be sealed within the overpouch 742. For additional protection, the overpouch 742 may be placed inside a cardboard or cardstock box 704. Any directions 728, brand names 726, or the like can be printed on the box 704. The overpouch 742 is resistant to transmission of water vapor or oxygen through the overpouch. Accordingly, the containers 701 are in a protective environment that is conducive to long shelf life. Packet 708 of oxygen scavenging material may be sealed inside the overpouch 742 with the containers 701 for additional protection.

[72] Different single use containers may be packaged together in the same package, whether it be a gas and/or water vapor barrier package or otherwise. As shown in Fig. 12, for example, the contents of a single package 802 could comprise a plurality of containers 801 containing a first (smaller) dose of oral liquid and a second plurality of containers 801A containing a second (larger) dose of the liquid together in a single box 804. Figure 13 shows a set of containers 899 including a plurality of containers 801 containing a smaller dose and a plurality of containers 801A containing a larger dose that would be suitable for packaging together. Referring again to Fig. 12, the package 802 could include containers (801, 801A, etc.) holding any number of different doses. Thus, a family including multiple children of different ages and/or sizes could meet all its needs by purchasing one package 802 of single use liquid oral containers 801, 801A notwithstanding the fact that different children require different doses of the oral medicines, nutritional supplements, or confections.

[73] As one variation, the package 602, 702, 802 could include two or more different liquids. These liquids might include two or more groups of single use containers, each group containing one of the following: a pain reliever; an allergy medicine; an anti-motion sickness drug; and an antacid. The drugs could be packaged together for convenience of travelers, who may not have room to pack a full package of each medicine separately. Other combinations of drugs could be packaged together in a similar manner. In order to allow the consumer to easily and reliably distinguish the containers containing different drugs in the same package the liquid oral medicines could be formulated to have distinct appearances.

For example, the color or concentration of the liquid oral medicine may be altered so the different containers have a different color.

[74] As shown in Fig. 14, a plurality of single use containers 901 may be provided in a continuous ribbon 962 of detachably connected containers. The ribbon 962 may comprise a series of individual containers 901 connected along a portion of their perimeter seals 907, 913. Perforations 954 between individual containers 901 may be provided to allow easy detachment of containers 901 from the ribbon 967. Those skilled in the art will recognize that conventional form-fill-seal processes can be modified to produce a ribbon 962 of containers 901. Several advantages may be obtained by packaging a plurality of containers 901 as ribbon 962. The ribbon helps maintain the containers 901 in organized relation to one another, which facilitates packing the containers in a smaller package. Referring to Figs. 11 and 12 for example, ribbons of containers 701, 801, 801A have been packed in each box 704, 804. Furthermore, in packages having more than one type (i.e., having a different liquid or different dosage) of container, each group of containers may be integrated in a separate ribbon as shown in Fig. 12. Connecting all containers of each specific type within the package also allows consumers to more readily and reliably ascertain what dose and what liquid is contained within any particular container.

[75] When packages contain more than one type of container, each type of container may be enclosed in its own sub-package. As shown in Fig. 15, for example, a package 1002 includes a first group of containers 1001 sealed within a flexible pouch 1041 and a second group of flexible containers 1001A sealed in second flexible pouch

1088. Both pouches 1041, 1088 may be packaged in the same box 1004, which may or may not comprise a gas and/or water vapor barrier. One or more of the sub-packages could comprise a box. If desired, the pouches 1041, 1088 (or boxes) could be provided with a gas and/or water vapor barrier as described above. Packaging the different containers in sub-packages makes it less likely that a consumer will grab the wrong type of container by mistake. Also if the sub-packages comprise gas and/or water vapor barriers, the consumer can open only the sub-package of the container that is needed, thereby maintaining the protective environment for other containers until they are needed.

[76] When introducing elements of the present invention or the preferred embodiments thereof, the articles "a," "an," "the," and "said" are intended to mean that there are one or more of the elements. The terms "comprising," 'including," and "having" are intended to be inclusive and mean that there may be additional elements other than the listed elements.

[77] In view of the above, its will be seen that the several objects of the invention are achieved and other advantageous results attained.

[78] As various changes could be made in the above constructions, products, and methods without departing from the scope of the invention, it is intended that all matter contained in the above description and shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

We claim:

1. A pliable single use liquid container and dispensing device for delivery of a precise amount of orally administered liquids across a broad range of viscosities, the container comprising a first and second generally opposed pliable sheets, a first seal joining the first and second pliable sheets and partially defining a liquid-containing chamber, a second seal joining the first and second pliable sheets and partially defining a pressure relieving chamber adjacent to the liquid-containing chamber, a boundary seal joining the first and second pliable sheets between the liquid-containing chamber and the pressure relieving chamber and partially defining the liquid-containing chamber and the pressure relieving chamber, a precisely measured single dose volume of fluent liquid disposed within the liquid-containing chamber, the boundary seal including a fluid transfer region seal forming at least a portion of the boundary seal which is lighter than the first and second seals so that upon application of pressure to the liquid in the liquid-containing chamber the fluid transfer region seal opens to permit the liquid to flow from the liquid-containing chamber into the pressure relieving chamber, the geometry of the portion based on the viscosity of the liquid, an outlet adapted for fluid communication with the pressure relieving chamber for flow of the liquid from the pressure relieving chamber out of the liquid container and sized based on the viscosity of the liquid and the geometry of the dispensing device, and a lighter outlet seal adapted to open upon application of fluid pressure from liquid in the pressure relieving chamber for dispensing the liquid from the liquid container, the lighter outlet seal being located in the outlet at the periphery of the liquid container for

closing the outlet and the pressure relieving chamber, and inhibiting ingress of foreign matter into the outlet and pressure relieving chamber prior to administering the liquid, and for working in combination with the dispensing device to prevent spilling and splashing of the liquid prior to delivery, control the delivery rate of the liquid to the recipient, provide tactile force flow rate information feedback to the administrator.

2. A pliable single use liquid container as set forth in claim 1 further comprising a perimeter seal joining the first and second pliable sheets at their perimeters, the outlet seal defining a portion of the perimeter seal.

3. A pliable single use liquid container as set forth in claim 2 wherein the first and second seals form at least a portion of the perimeter seal of the first and second pliable sheets.

4. A pliable single use liquid container as set forth in claim A1 wherein the outlet seal is lighter than the fluid transfer region seal.

5. A pliable single use liquid container as set forth in claim 4 wherein the fluid transfer region seal and the outlet seal are formed for peeling release of the first pliable sheet from the second pliable sheet upon application of selected separating forces to the respective seals.

6. A pliable single use liquid container as set forth in claim 1 further comprising a liquid chamber

dividing seal separating the liquid-containing chamber into a first liquid-containing sub-chamber and a second liquid-containing sub-chamber, at least a portion of said liquid chamber dividing seal comprising a liquid chamber fluid transfer region seal, a first component of said fluent oral liquid contained within the first liquid-containing sub-chamber, and a second component of said fluent oral liquid contained with the second liquid-containing sub-chamber, said liquid chamber fluid transfer region seal being lighter than said first and second seals.

7. A pliable single use liquid container as set forth in claim 1 wherein the boundary seal constitutes a first boundary seal and the fluid transfer region seal constitutes a first fluid transfer region seal, the container further comprising a second boundary seal located between the dispensing device and liquid-containing chamber, the second boundary seal including a second fluid transfer region seal forming at least a portion of the second boundary seal in which the seal joining the first and second pliable sheets is formed lighter than the first and second seals so that upon application of pressure to the liquid-containing chamber both the first and second fluid transfer region seals are adapted to rupture in sequence to permit the liquid to flow from the liquid-containing chamber into the dispensing device.

8. A pliable single use liquid container as set forth in claim 7 wherein the outlet seal is lighter than the first and second fluid transfer region seals.

FIG. 1A

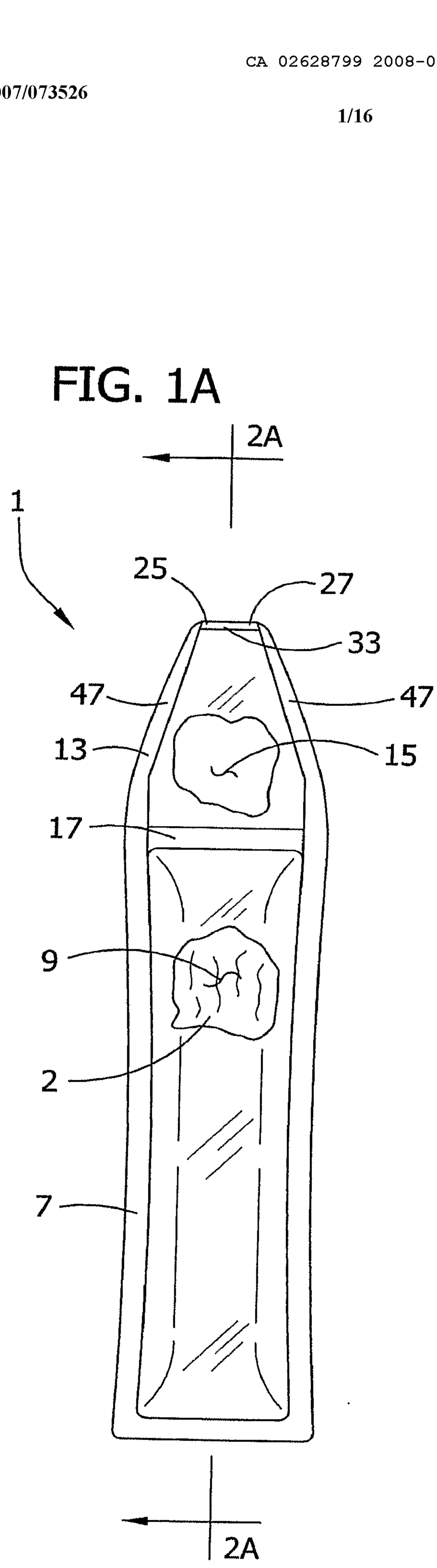
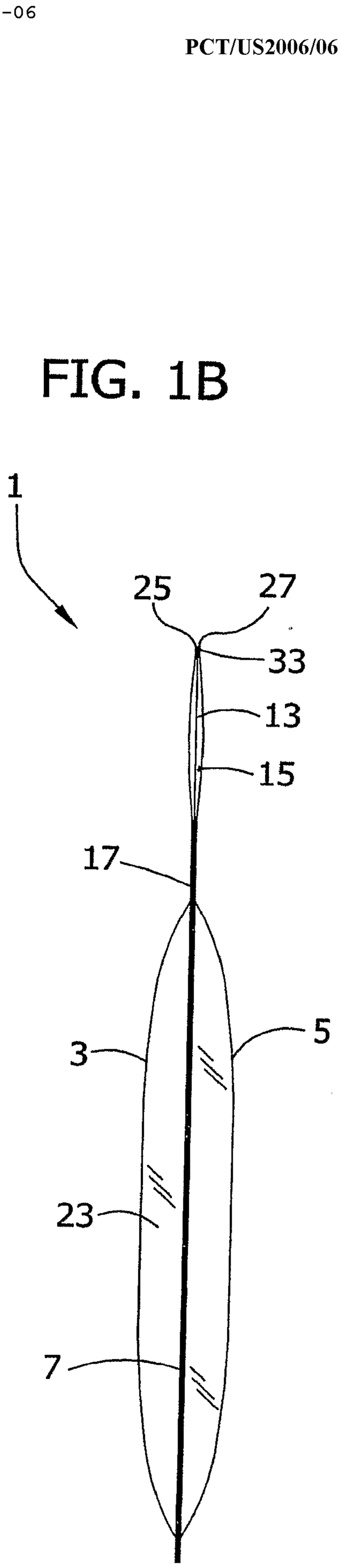


FIG. 1B



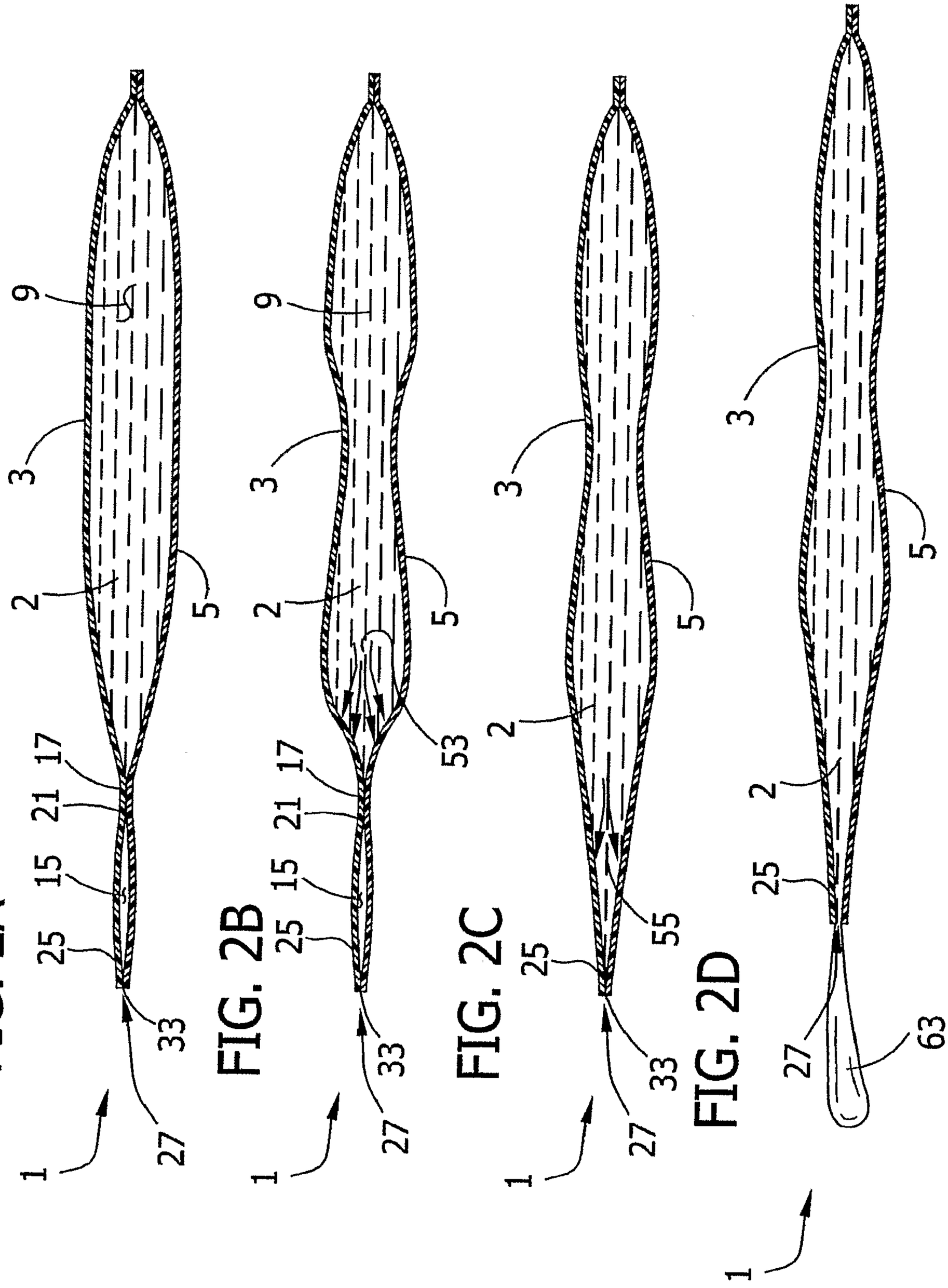

9
3
2
5
17
21
15
25
33
1
27
FIG. 2A
9
3
2
5
53
17
21
15
25
33
1
27
FIG. 2B
3
2
5
2
25
55
33
1
27
FIG. 2C
3
5
2
25
27
63
1
FIG. 2D

FIG. 3

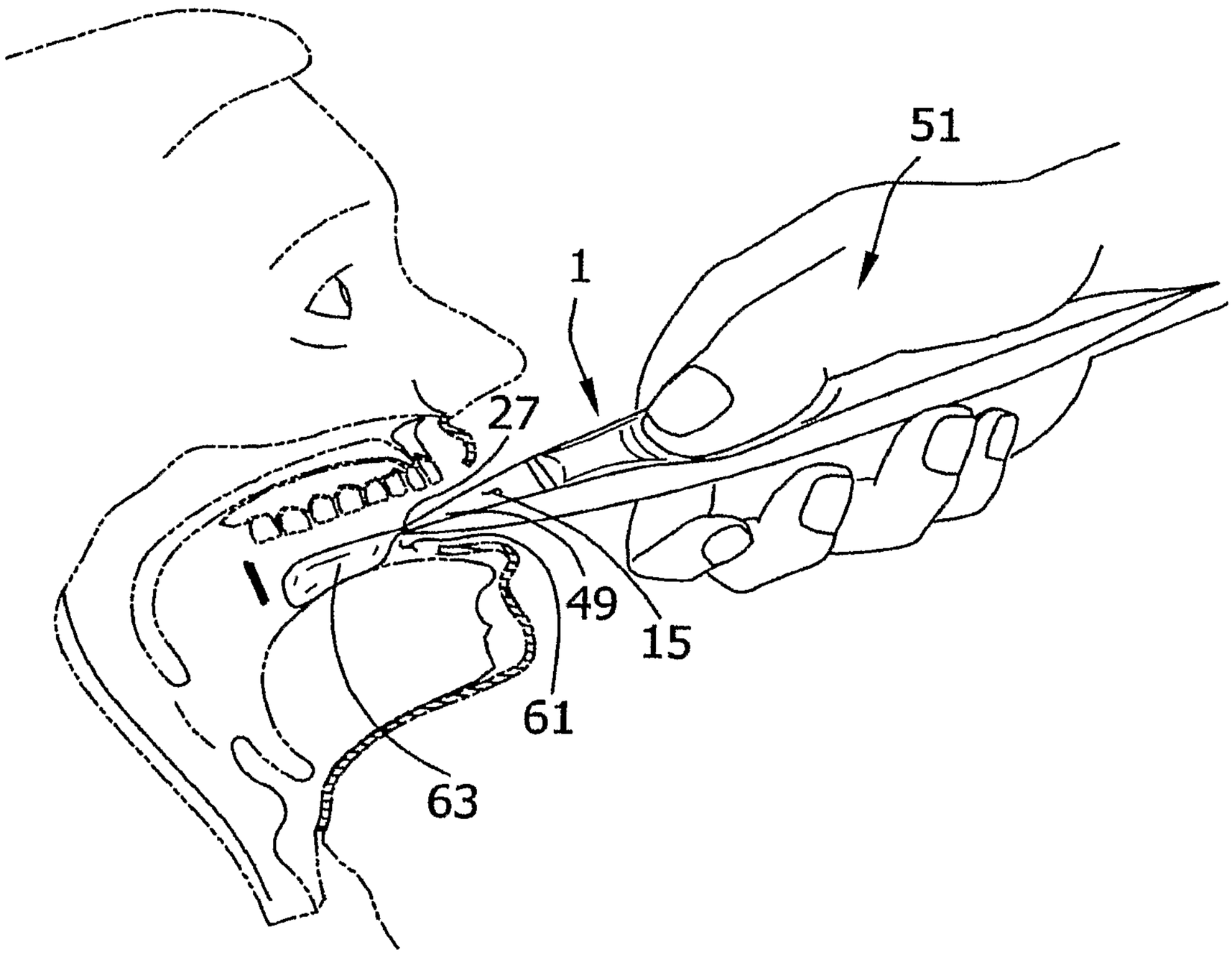


FIG. 4A

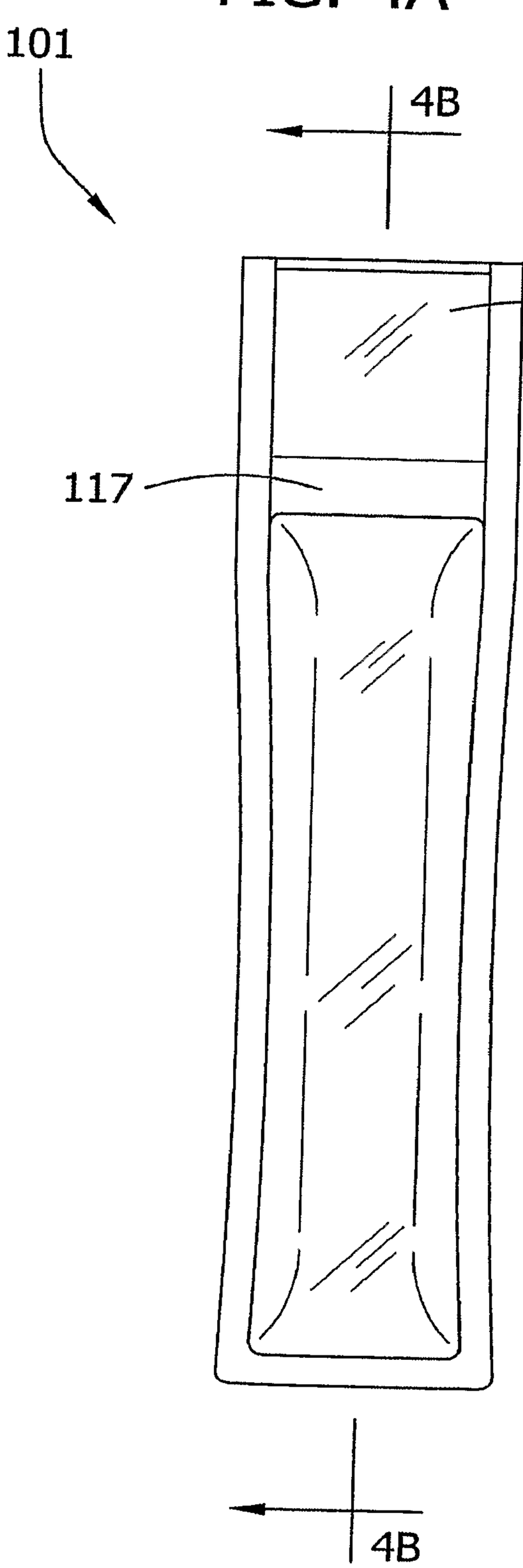


FIG. 4B

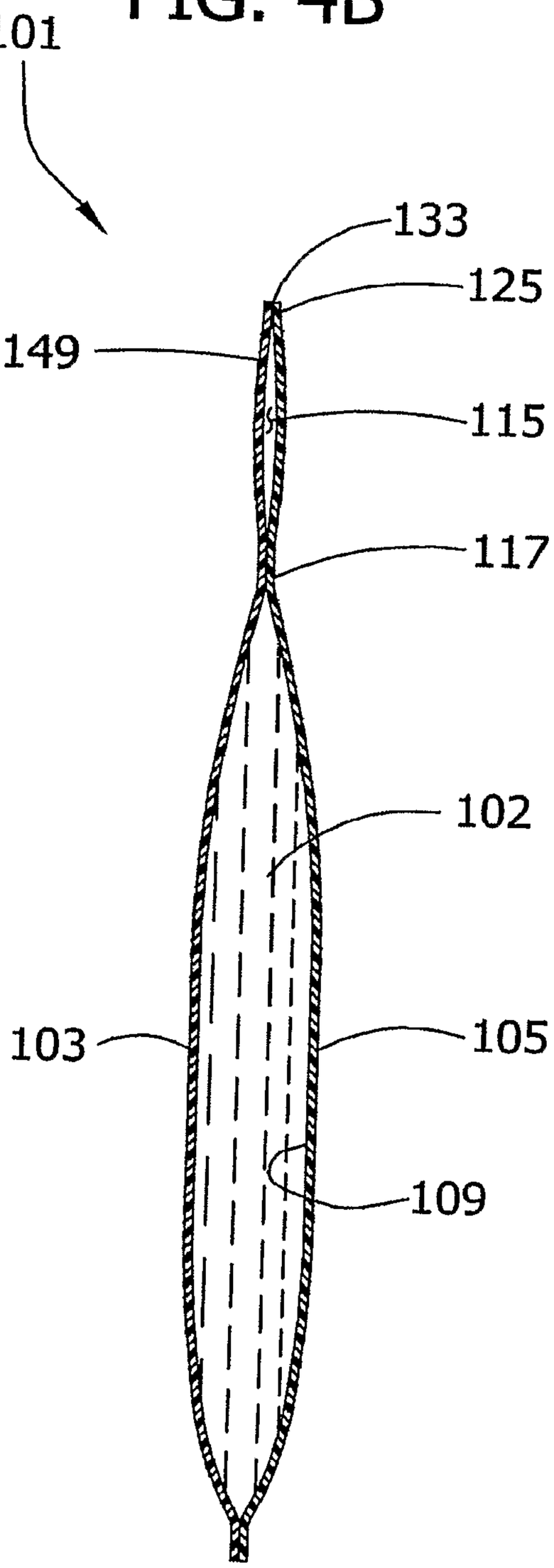


FIG. 5A

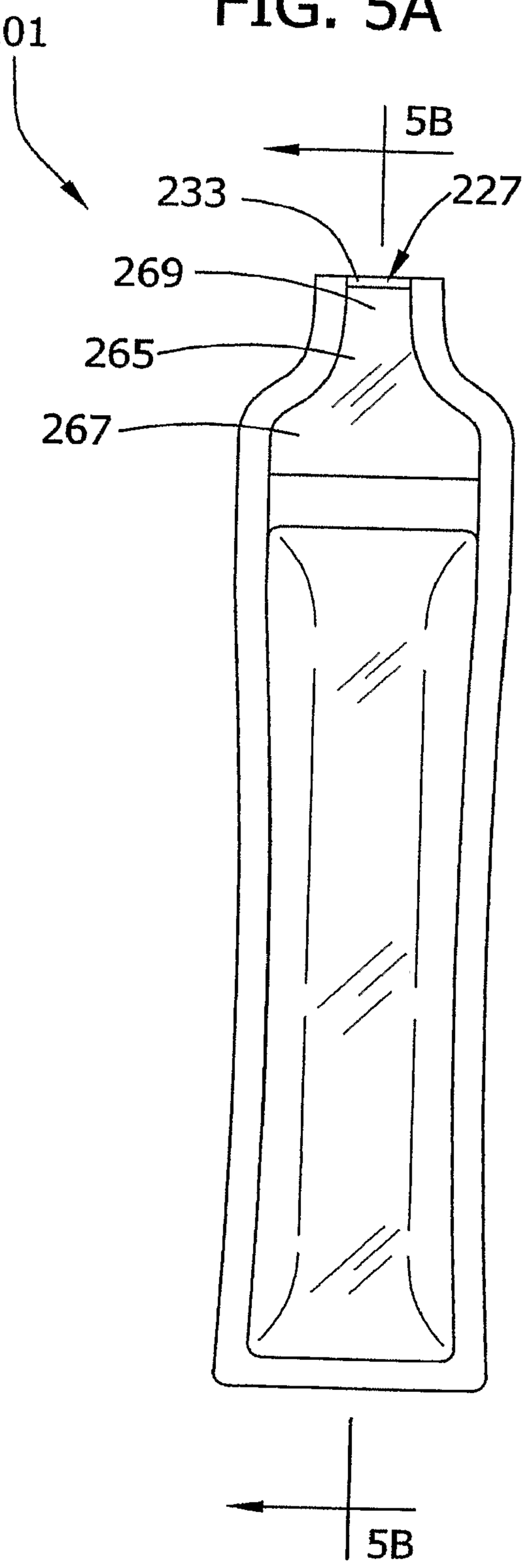


FIG. 5B

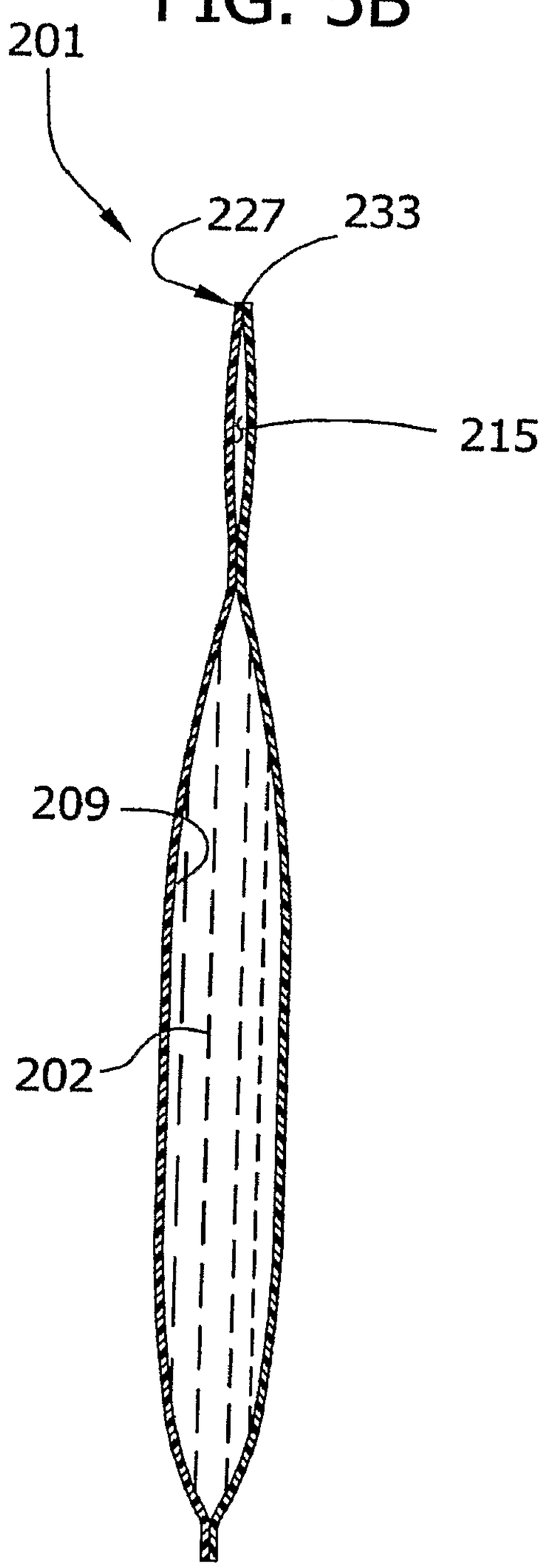


FIG. 6A

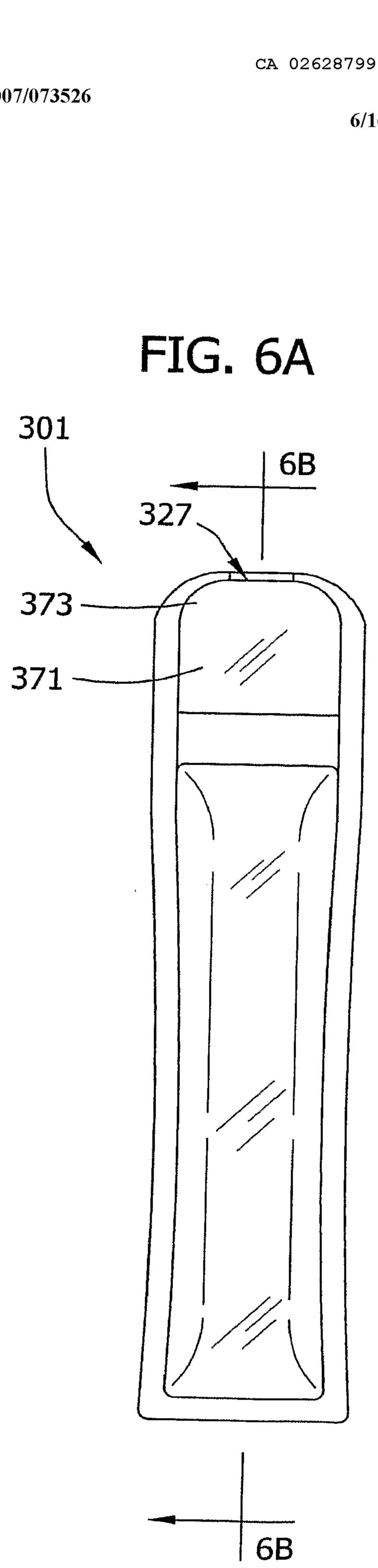


FIG. 6B

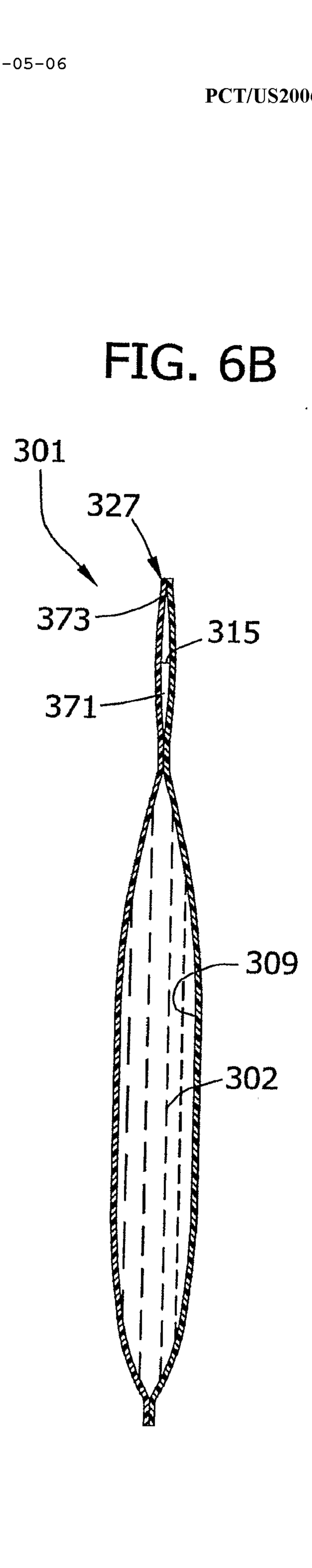


FIG. 7A

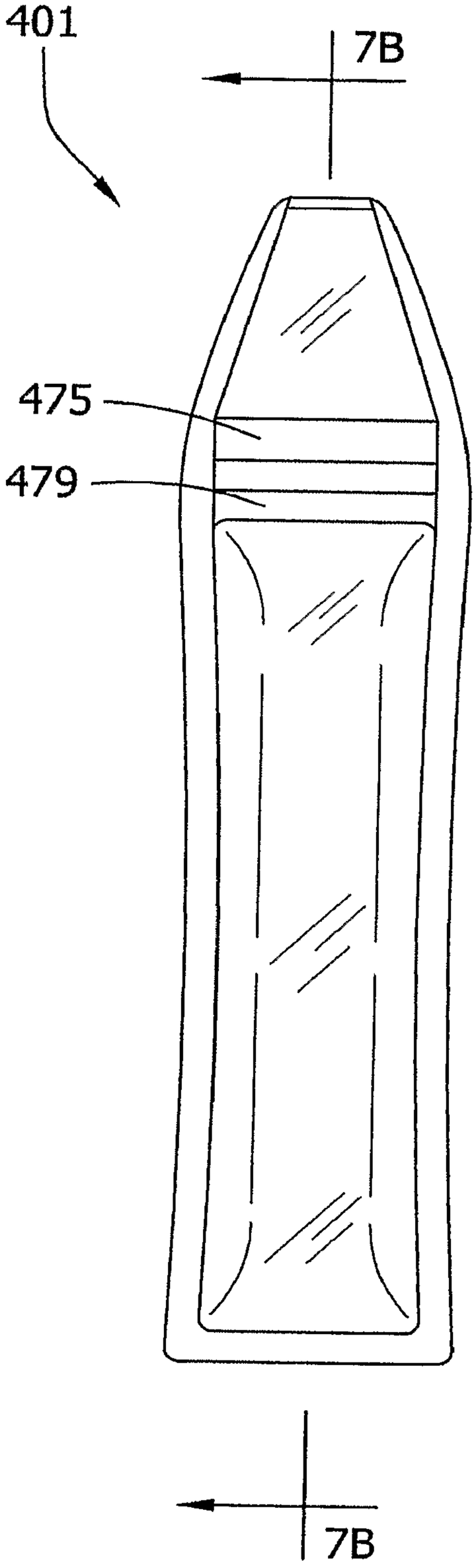


FIG. 7B

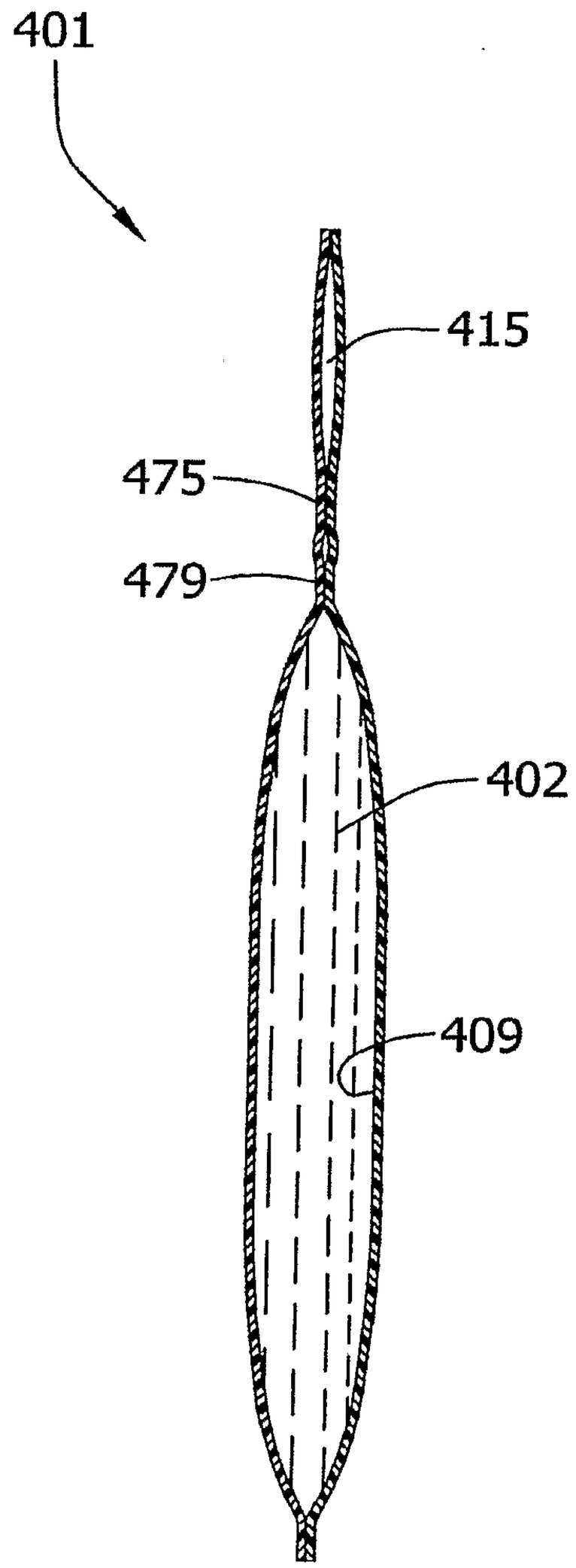


FIG. 8A

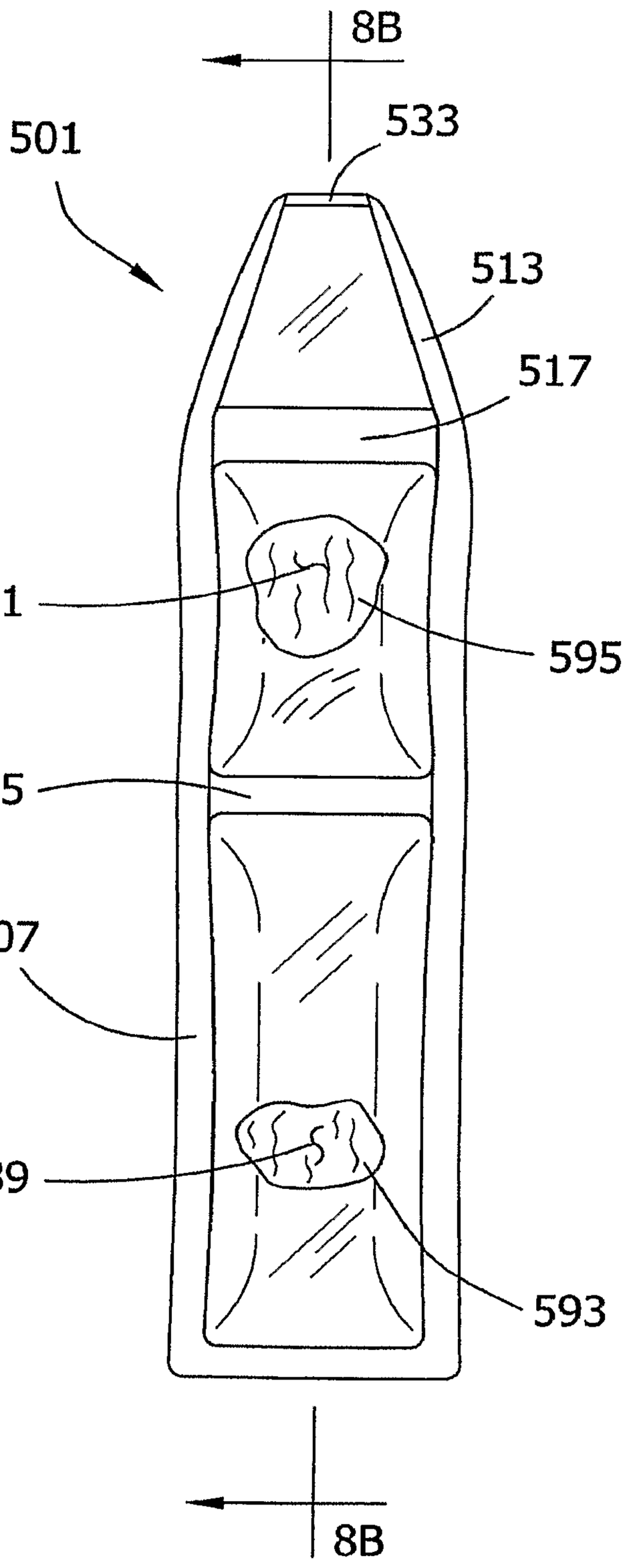
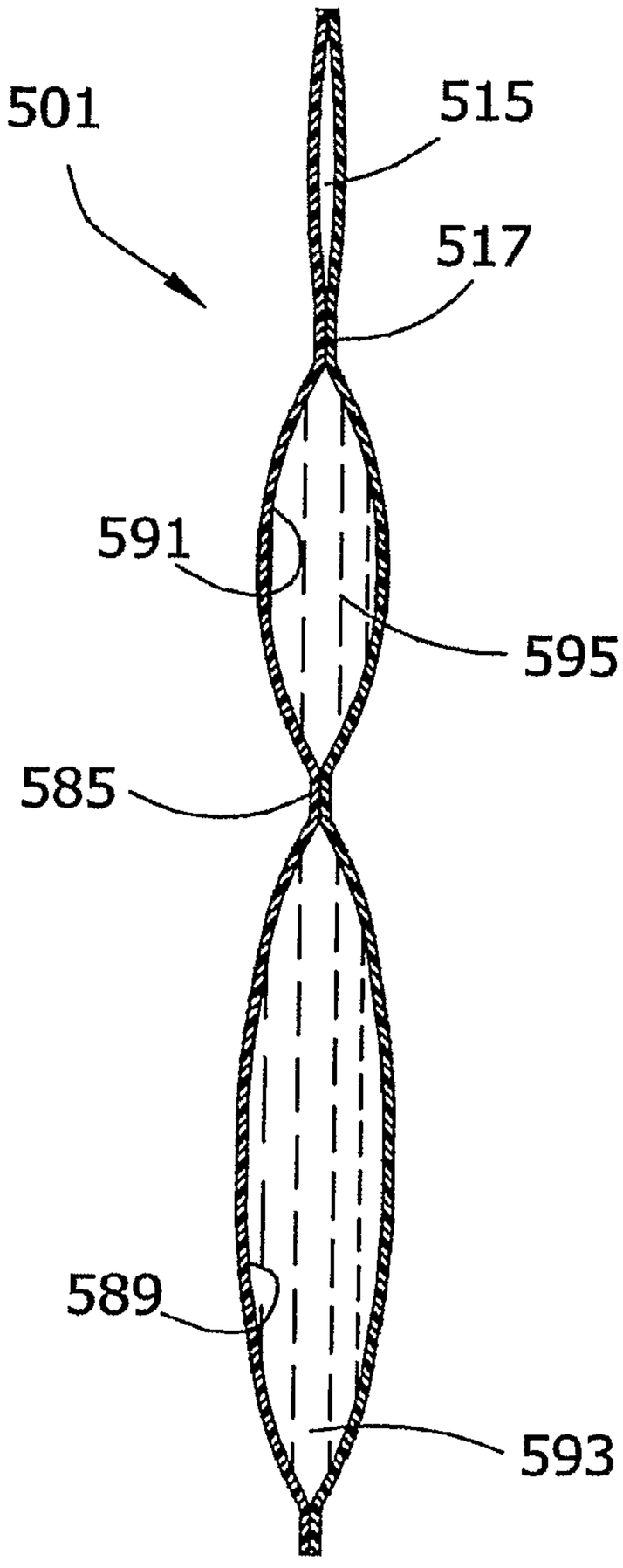

8B
533
501
513
517
591
595
585
507
589
593
8B

FIG. 8B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591
595
585
589
593

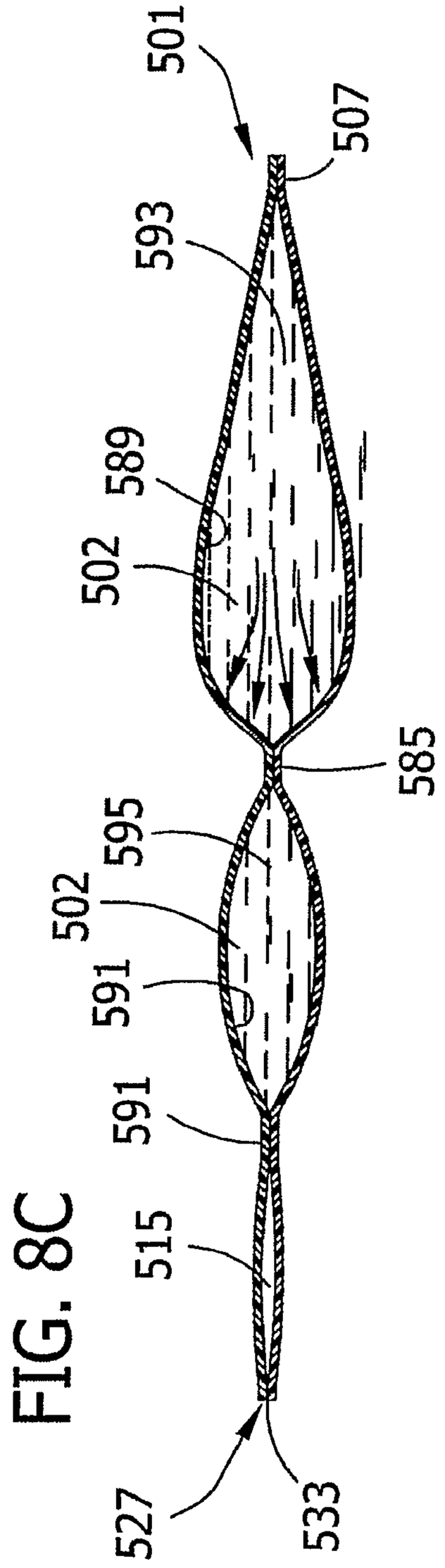

501
507
593
589
502
585
595
502
591
591
515
527
533

FIG. 8C

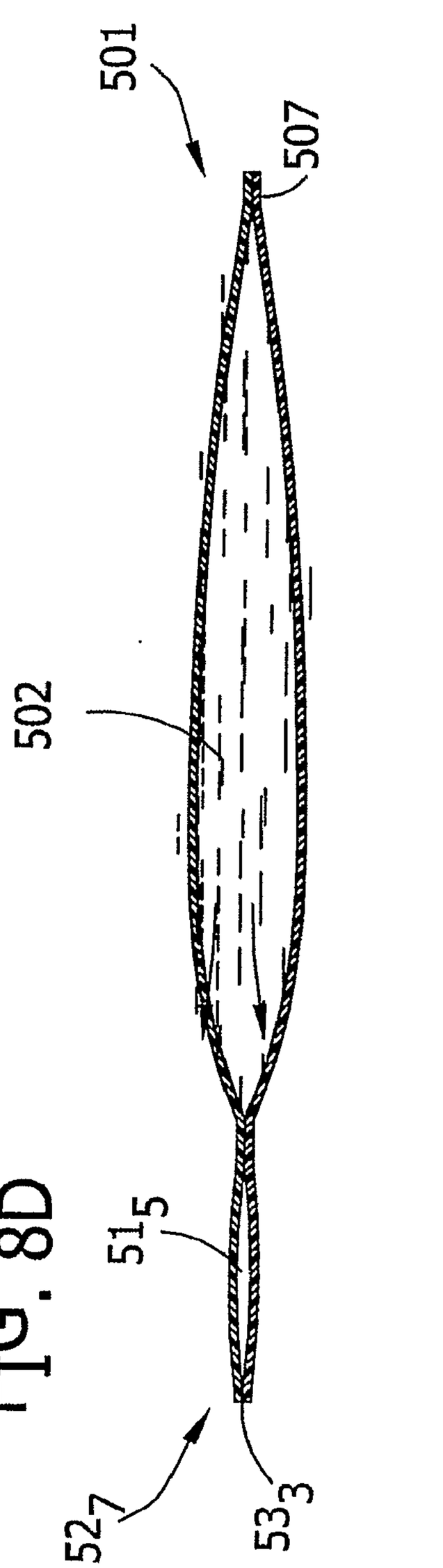

501
507
502
515
527
533

FIG. 8D

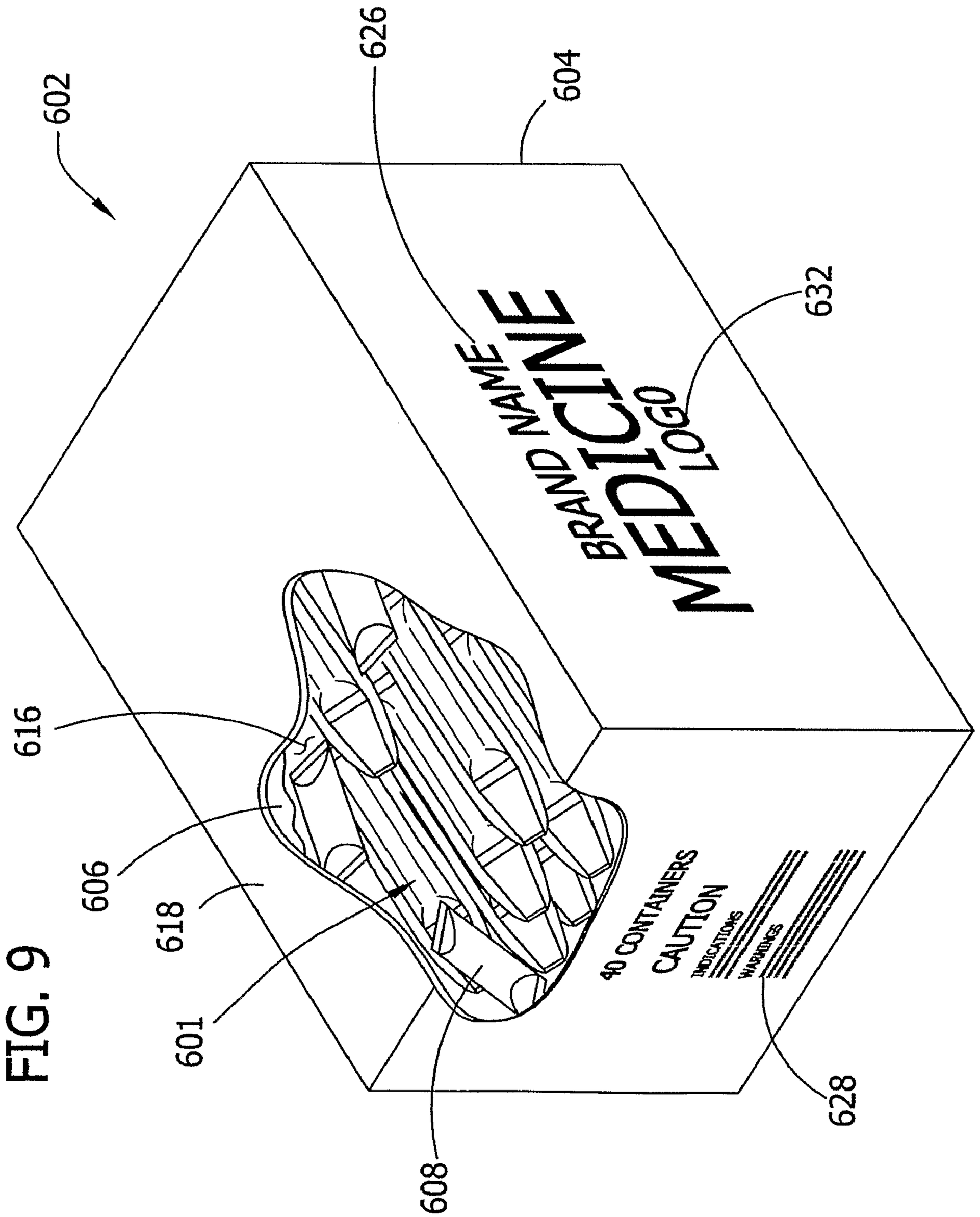

602
604
632
616
606
618
601
608
628
BRAND NAME
MEDICINE
LOGO
40 CONTAINERS
CAUTION
INDICATIONS
WARNINGS

FIG. 9

FIG. 10

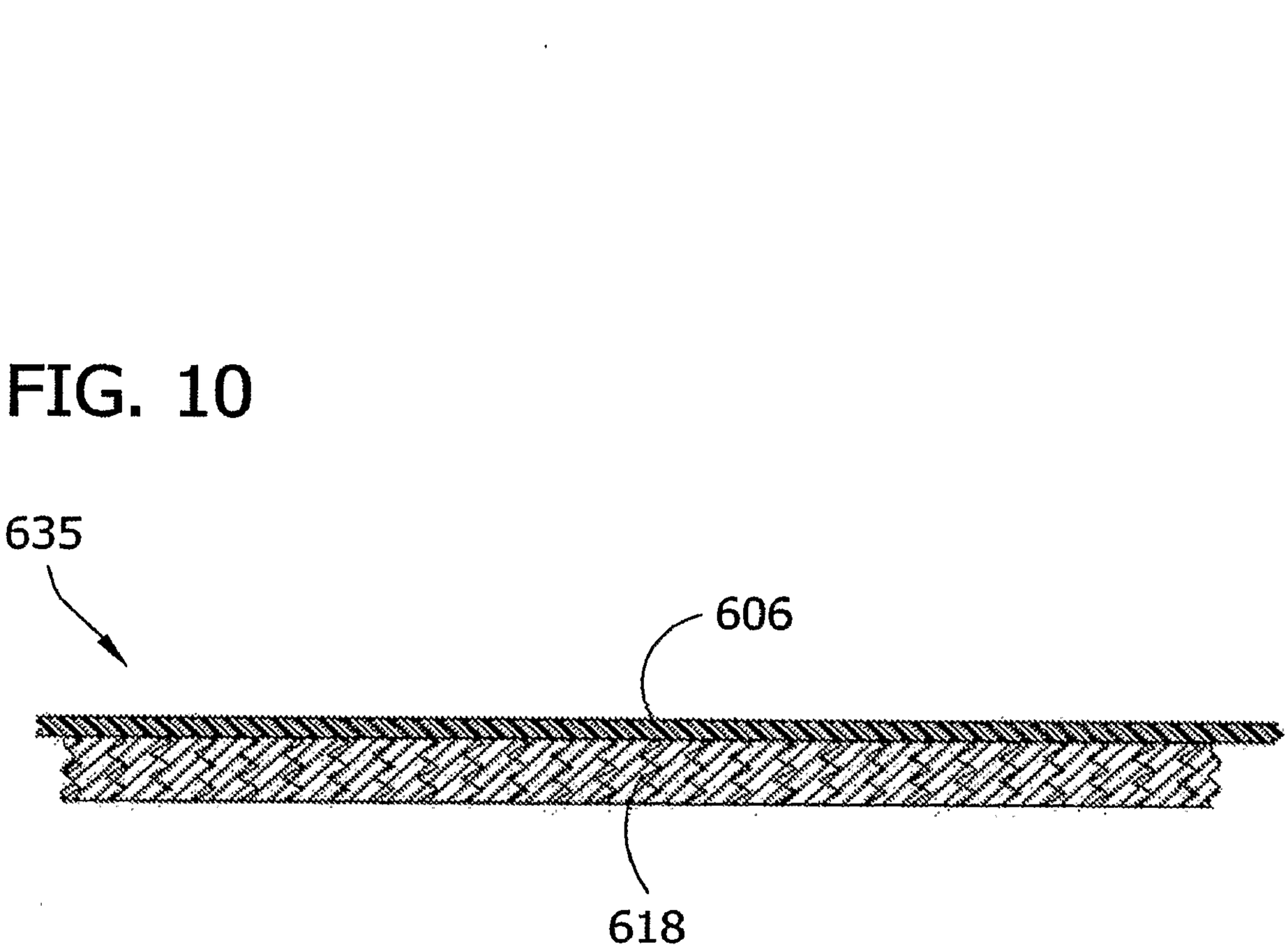
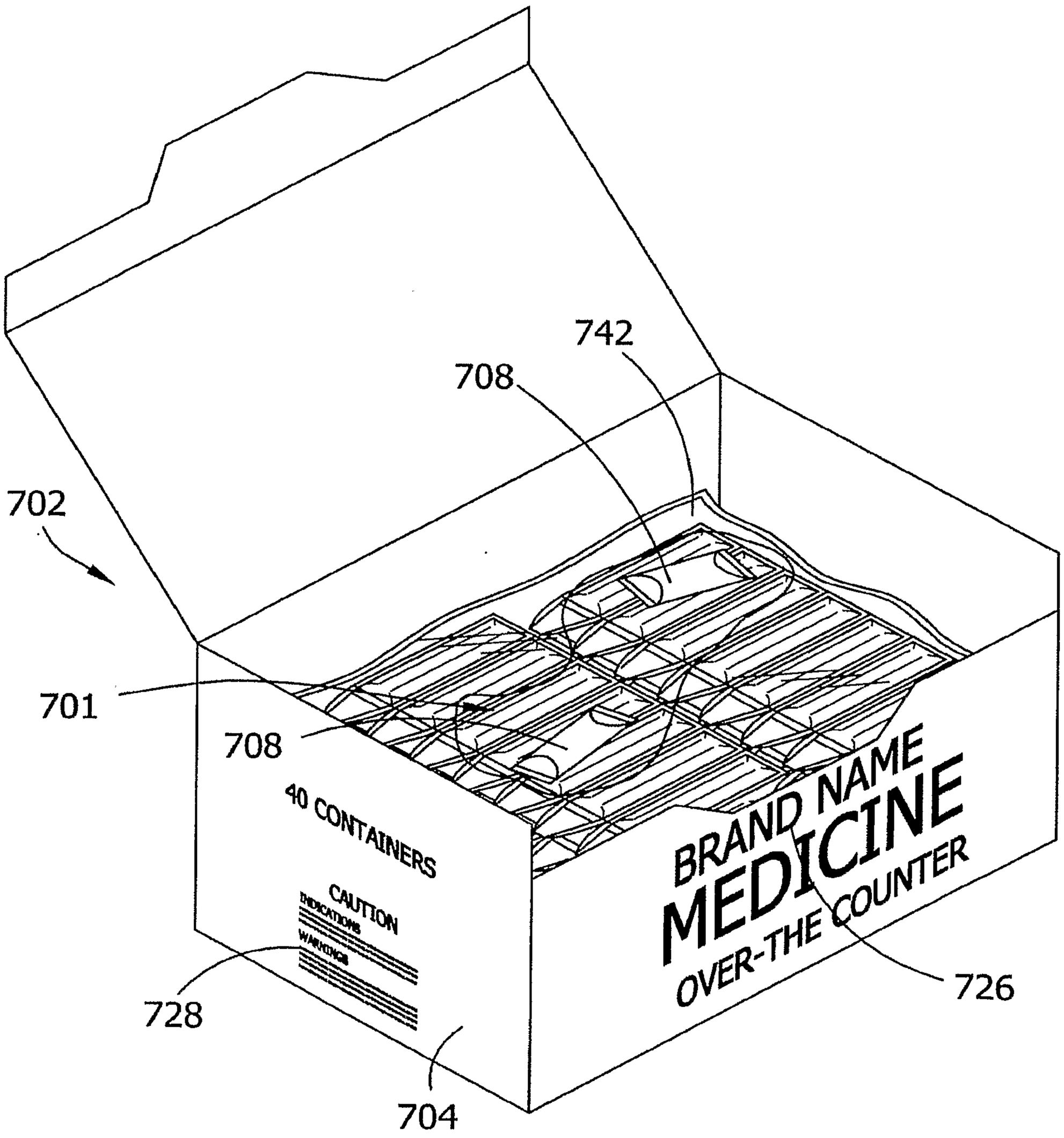


FIG. 11


742
708
702
701
708
40 CONTAINERS
CAUTION
INDICATIONS
WARNINGS
BRAND NAME
MEDICINE
OVER-THE COUNTER
728
726
704

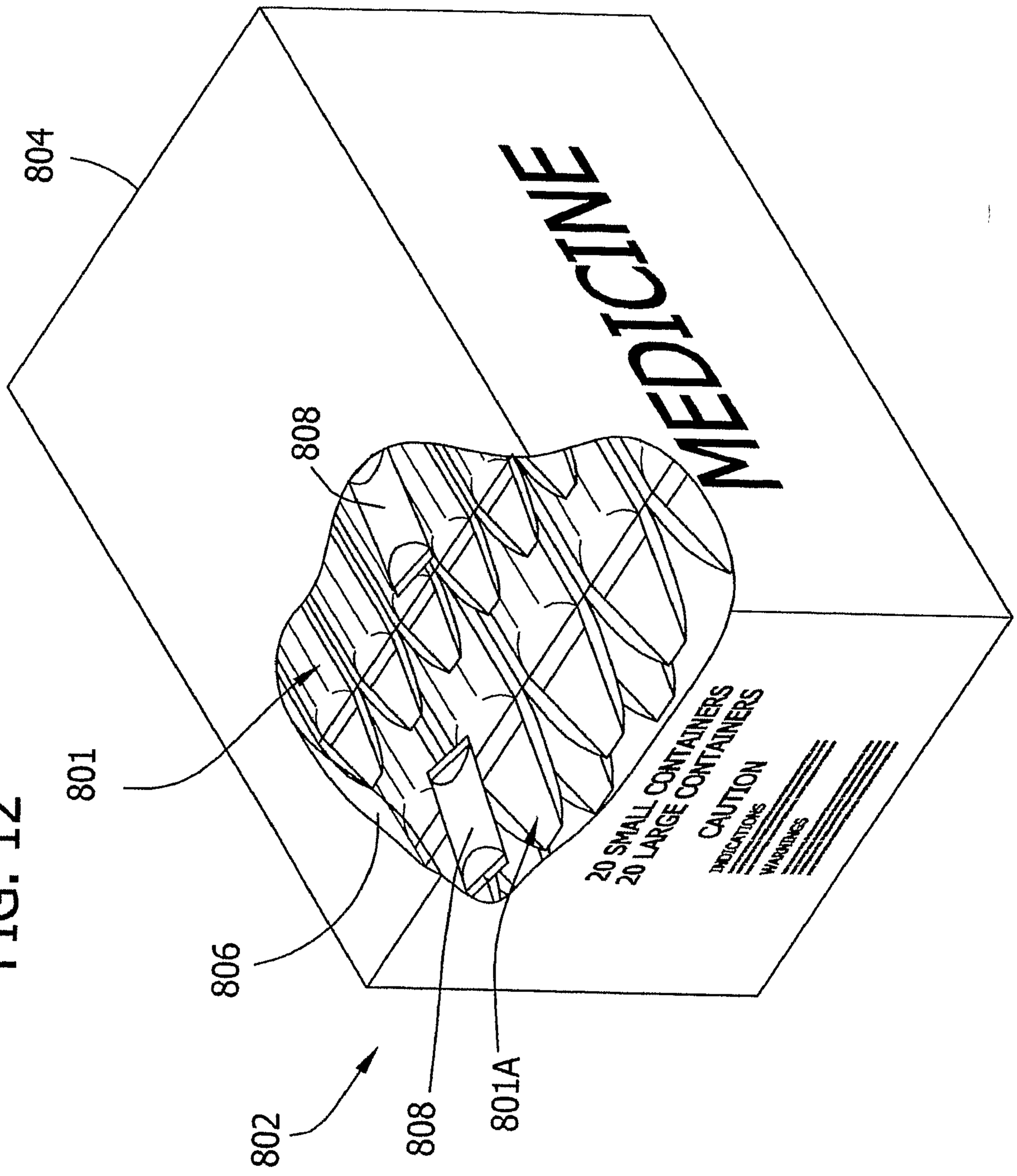

804
801
808
MEDICINE
20 SMALL CONTAINERS
20 LARGE CONTAINERS
CAUTION
INDICATIONS
WARNINGS
806
802
808
801A

FIG. 12

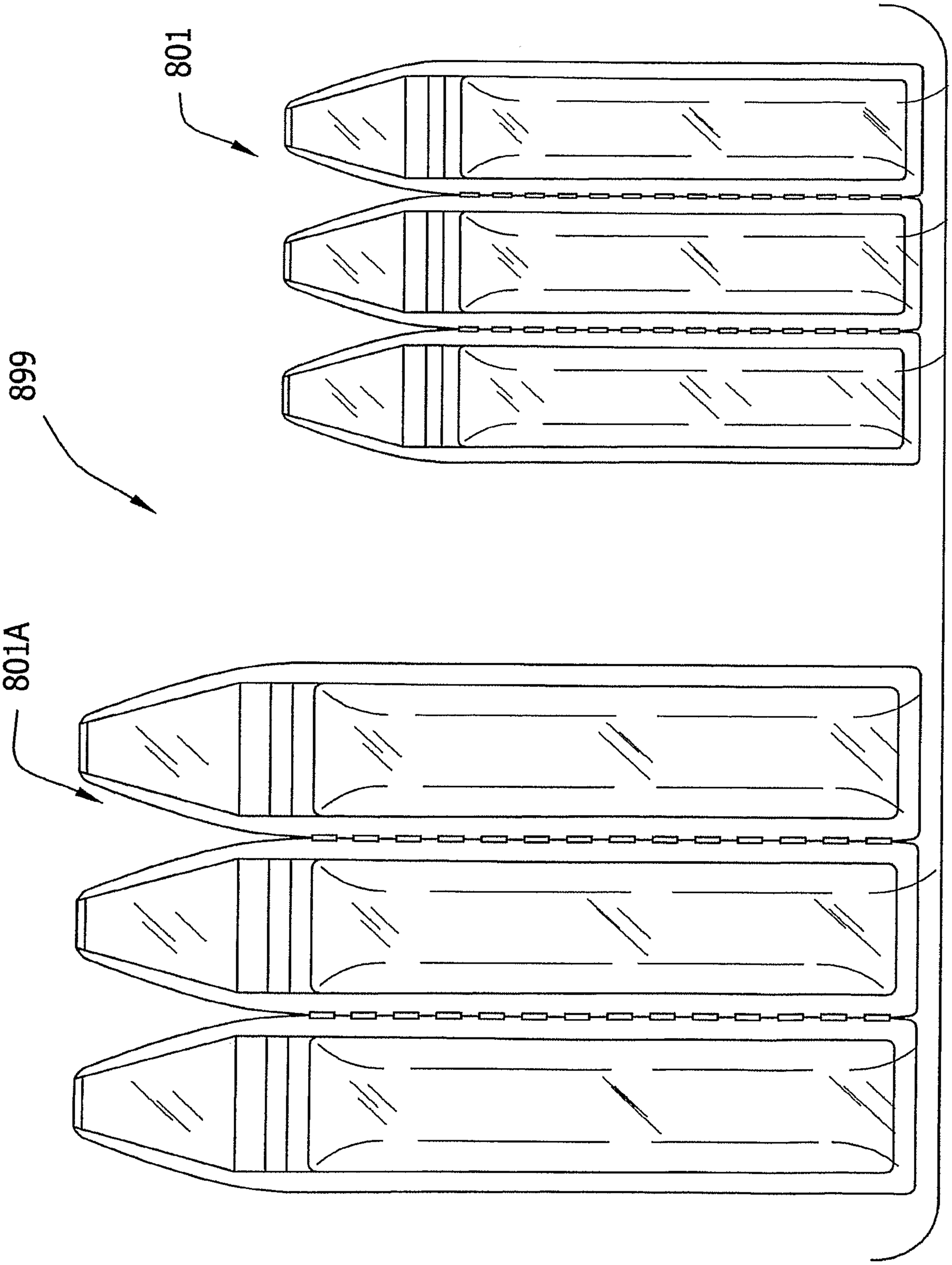


FIG. 13

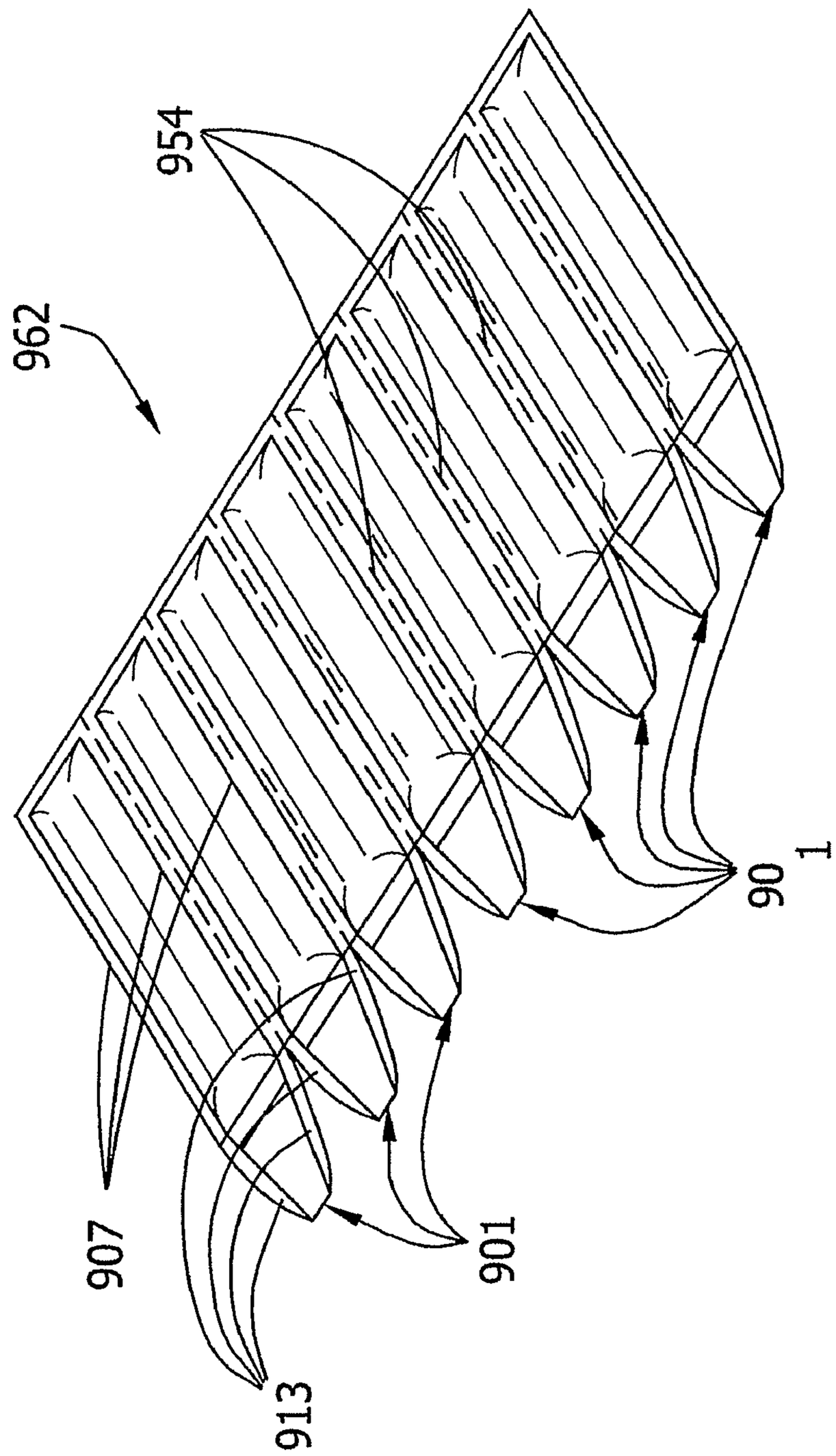
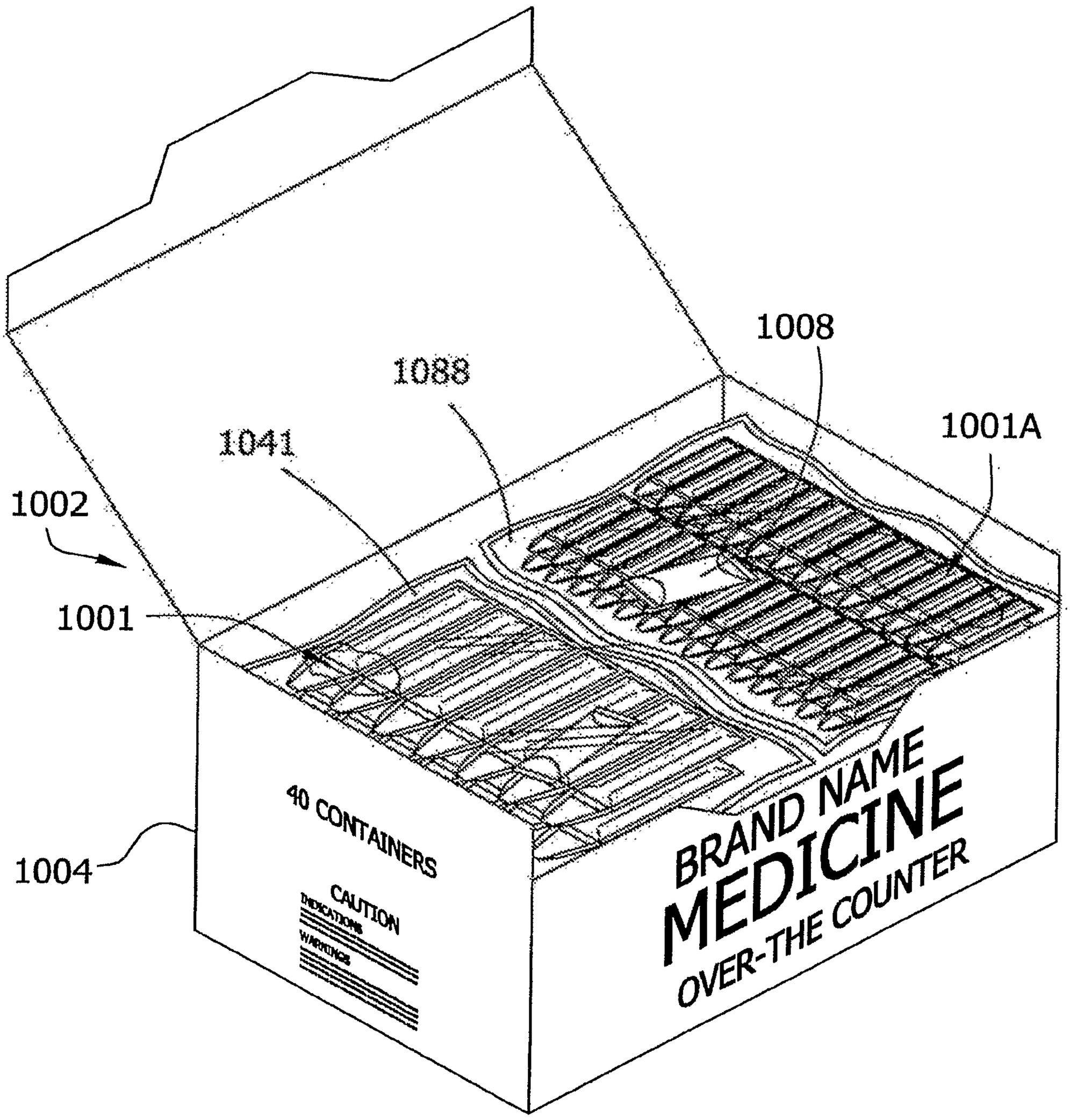
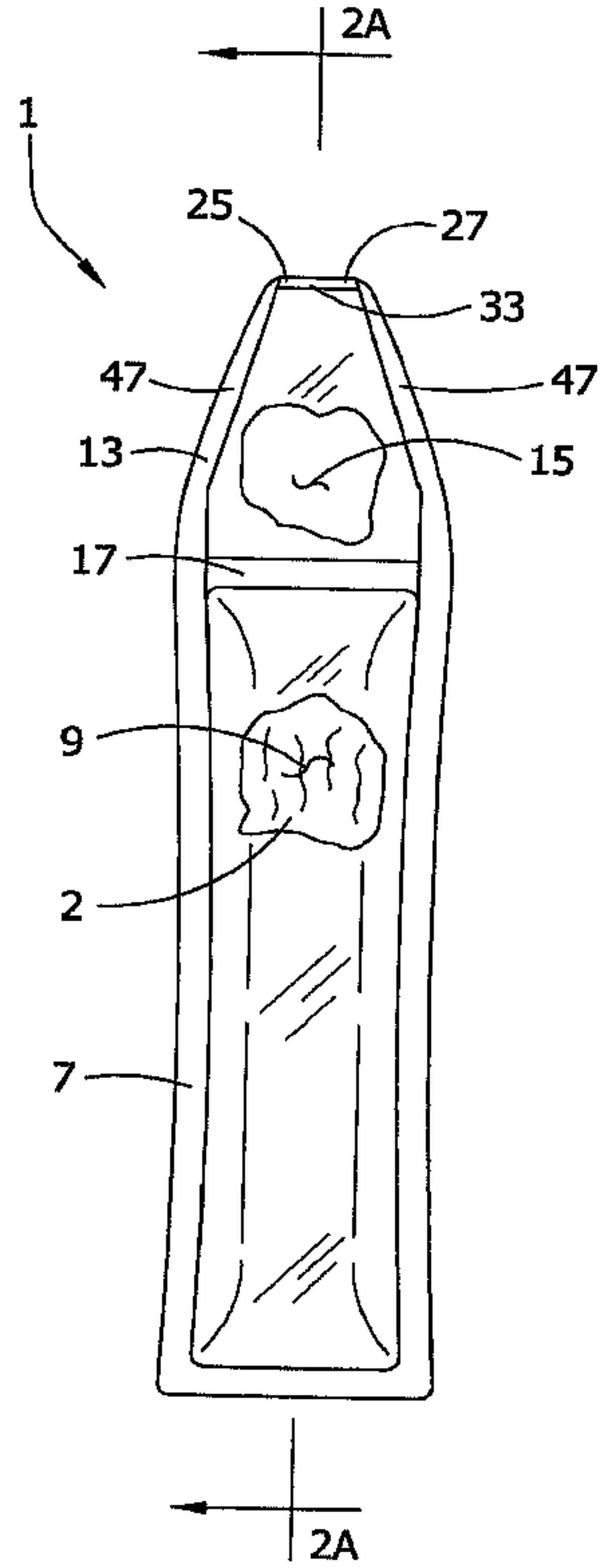
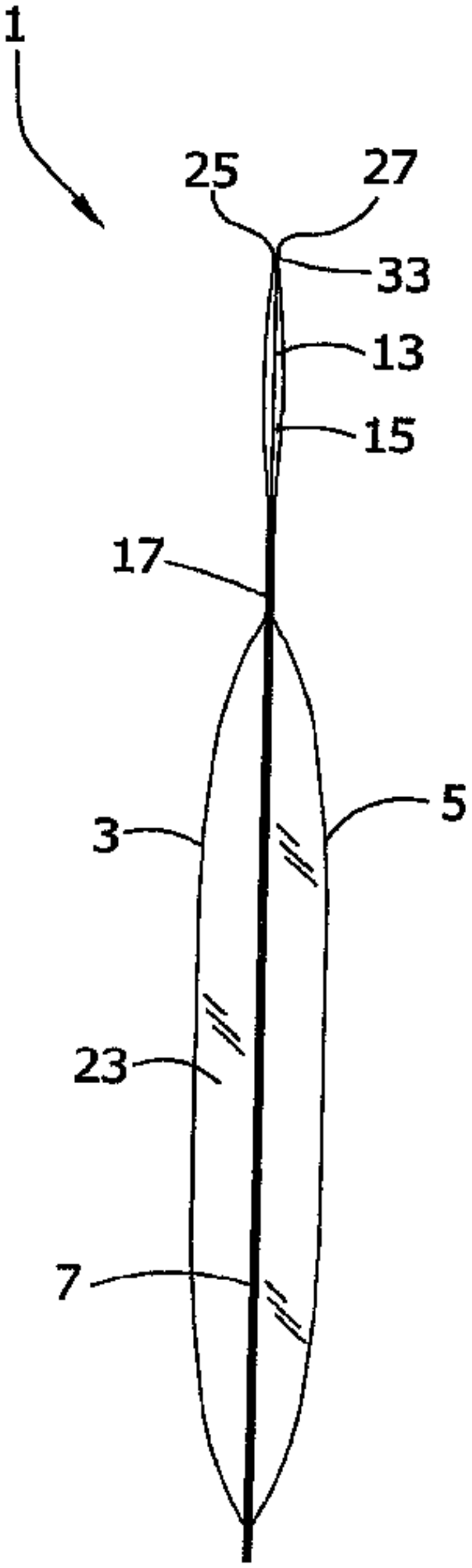


FIG.14

FIG. 15


1008
1088
1001A
1041
1002
1001
1004
40 CONTAINERS
CAUTION
BRAND NAME
MEDICINE
OVER-THE COUNTER


2A
1
25
27
33
47
47
13
15
17
9
2
7
2A


1
25
27
33
13
15
17
5
3
23
7