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(54) **Fragile-product cage for vacuum packaging appliances**

(57) In order to protect the structural integrity of fragile products during the process of vacuum packaging, a protective cage is used. The protective cage may be constructed using a membrane supported by a suitable frame. In addition, the protective cage may include a suitable mechanism to allow gas to exit the protective

cage during the process of vacuum packaging. Further, the protective cage may be adapted to have a variable size, and thus may be adjusted to a desired size. To protect fragile products, the frame and the membrane are such that they, in combination, provide sufficient resistance to compressive forces that might occur during the vacuum packaging process.

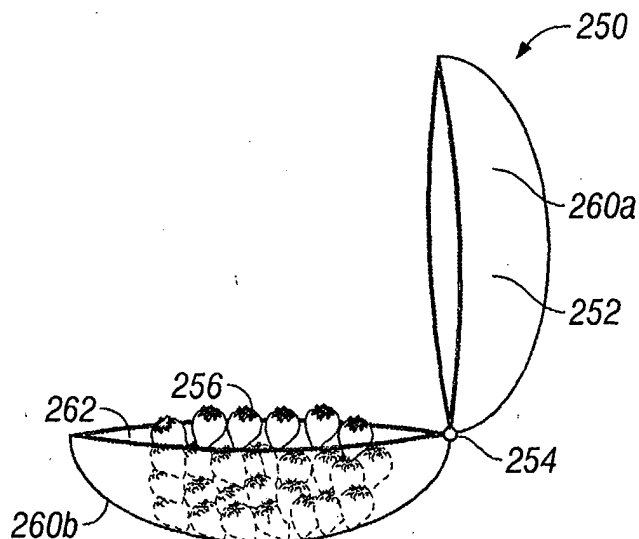


FIG. 4

Description**FIELD OF THE INVENTION**

[0001] The present invention generally relates to vacuum packaging appliances. More particularly, the invention is directed to cages for protecting fragile products when such products are vacuum packaged using vacuum packaging appliances.

BACKGROUND

[0002] Vacuum packaging is a process for removing oxygen and other gases from food and other products that deteriorate in the presence gases. For example, food spoilage can occur due to oxidation and valuable manuscripts deteriorate when exposed to air. Thus, vacuum packaging can extend the life of products that deteriorate in the presence gases by removing nearly all of the gases in a sealed container in which such products are stored. However, some products that are fragile in nature may get crushed during the vacuum packaging process if the container in which they are stored is flexible. For example, if berries are to be stored in a flexible storage bag, the compressive forces caused by the differential pressure between the interior and exterior of the flexible storage bag when the flexible storage bag is evacuated of gases is likely to crush the berries.

[0003] Based on the foregoing, there is a need to protect fragile products when such products are vacuum packaged.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] The present invention is illustrated by way of example, and not by way of limitation.

FIG. 1 is an isometric view that illustrates a vacuum packaging appliance 100;
 FIG. 2 is a side view of a cage for protecting fragile products according to certain embodiments;
 FIG. 3 is a top plan view of various frame configurations according to certain embodiments.
 FIG. 4 is a side view of a fragile-product cage in an open position;
 FIG. 5 is an isometric view of a vacuum packaging appliance sealing a storage bag containing a cage;
 FIG. 6 illustrates various shapes for cages according to certain embodiments;
 FIG. 7 illustrates suitable shapes for cages;
 FIG. 8 illustrates a cylindrical-shaped cage having a telescopic configuration;
 FIG. 9 illustrates a igloo-shaped cage having a telescopic configuration; and
 FIG. 10 illustrates an ellipsoid cage having a telescopic configuration.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0005] Cages for protecting fragile products for use with a vacuum packaging appliance and flexible storage containers, such as storage bags, are described. In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the present invention. It will be apparent, however, to one skilled in the art that the present invention may be practiced without these specific details. In other instances, well-known structures and devices are shown in block diagram form in order to avoid unnecessarily obscuring the present invention.

VACUUM PACKAGING APPLIANCE

[0006] FIG. 1 is an isometric view that illustrates a vacuum packaging appliance 100 in an open position. In FIG. 1, vacuum packaging appliance 100 includes a base 102 and a lid 150. Base 102 includes a vacuum channel 104 and a sealing strip 106.

[0007] According to certain embodiments, base 102 houses a vacuum pump (not shown), and includes a control panel 108 at the top frontal portion of the base. The control panel includes an accessory port for use in removing gases from storage canisters, an instant seal button to manually start sealing a storage bag, a vacuum button to start removing gases from storage bags or canisters.

[0008] In addition, the control panel may include indicator lights to signal the start or completion of various processes such as the sealing process, vacuum process and/or machine re-programming when transitioning from one process to the next.

[0009] Some examples of vacuum packaging appliances are the Tilia® FoodSaver® vacuum packaging system series. Some examples of storage bags used in conjunction with vacuum packaging appliances are Tilia FoodSaver bags. Tilia FoodSaver bags are suitable for storing products other than food.

PROTECTIVE FRAGILE-PRODUCT CAGES

[0010] FIG. 2 is a side view of a cage 150 for protecting fragile products according to certain embodiments of the invention. Cage 150 has a skin 152 and a frame 158. The skin may be a porous skin or porous membrane that is sufficiently gas permeable so as to allow substantially all the gas within the cavity of the cage to be evacuated during the vacuum packaging process. For example, the porous skin may be a wire mesh, mesh fabric or other suitable material. Further, the porous skin, in combination with the frame of the cage is such that the resulting cage has sufficient strength and rigidity to protect fragile products stored within the cage during the vacuum packaging process.

[0011] According to certain embodiments, a non-po-

rous skin may be used in combination with the frame to form a cage. Such a cage is adapted for evacuation during the vacuum packaging process by including a suitable mechanism to allow gases to be evacuated from the cage. Such a mechanism may be a one-way valve, for example. The one-valve would allow the gas to exit from the cage during the vacuum packaging process and when the cage is in the closed position. The mechanism for allowing gases to be evacuated from the cage may vary from implementation to implementation.

[0012] Cage 150 may be made of metal or a synthetic material, or a combination thereof, or other suitable material for protecting fragile products contained therein. In certain embodiments, cage 150 is made of a material that is non-reactive with food products, is non-poisonous to humans if accidentally ingested, and is washable. Cage 150 has a first portion 155a and a second portion 155b. First portion 155a is hinged to second portion 155b by a hinge mechanism 154. Hinge mechanism 154 allows for opening the cage in order to insert fragile products into the cavity of cage 150. According to certain other embodiments, first portion 155a may be attached to second portion 155b by suitable clasp, clamp, or latch mechanisms. According to yet another embodiment, first portion 155a may be constructed in a manner so as to act as a lid that fits snugly over the second portion 155b.

[0013] Fragile product 156 is contained within the cavity of cage 150 for protection during the vacuum packaging process. It is to be noted that cage 150 may be of any shape suitable for storing fragile products. The ellipsoid shown in FIG. 2 is but one example of a suitably shaped cage for protecting fragile products. FIG. 3 illustrates various frame configurations and shapes that may be suitable for cages according to certain embodiments of the invention. The frame configuration of a given cage is such that the frame in combination with the skin around the frame offers sufficient resistance for protecting fragile products during the vacuum packaging process.

[0014] FIG. 3 is a top plan view of various frame configurations for fragile-product cages according to certain embodiments. Frame configuration 170 includes two structural members 172 and 174, which structural members are in a relative orientation as illustrated. Frame configuration 180 includes three structural members 182, 184 and 186, which structural members are in a relative orientation as illustrated. Frame configuration 190 includes three structural members 192a, 192b, and 194, which structural members are in a relative orientation as illustrated. Each of the structural members as illustrated in FIG. 3 may be non-contiguous at junctures where the structural member crosses from the first portion of the cage to the second portion.

[0015] FIG. 6 illustrates various shapes 330, 335, and 340 for cages according to certain embodiments. Similarly, FIG. 7 illustrates suitable shapes for cages such as a cylindrical-shaped cage 420 and a pillow-shaped

cage 410. Cylindrical-shaped cage 420 includes a lidded opening 422. Fragile products can be placed into or removed from cylindrical-shaped cage 420 through lidded opening 422. Pillow-shaped cage 410 includes a first portion 404 and a second portion 406. First portion 404 and a second portion 406 are hinged together along one edge, such as edge 408. Cages 410 and 420 include suitable mechanisms to allow gases to be evacuated from the cage. Suitable mechanisms include a porous skin or suitable valves that allow gasses to escape from the cage. Cage shapes and frames may vary from implementation to implementation and are not limited to the cage shapes and frame configurations described herein with reference to FIG. 2, FIG. 3, FIG. 4, and FIG. 6-10.

[0016] Further, the cage frame may be adapted to create a cage with a variable size. In other words, the size of the cage may be adjusted according to a desired size by using an appropriate mechanism. Examples of such a mechanism is illustrated in FIG. 8, FIG. 9 and FIG. 10.

[0017] FIG. 8 illustrates a cylindrical-shaped cage having a telescopic configuration. In FIG. 8, cage 500 is shown in an open-space position 520 and a collapsed-space position 530. In FIG. 8, segments 502, 504, 506 are slidably interconnected by slide rails 510. Cage 500 has three segments. However, the number of segments can vary. The number of segments can vary. Segments 502-506 are suitably sized so as to nest when cage 500 is contracted from its fully extended position. Thus, the size of cage 500 can be configured to any desired size in the range from a fully extended configuration to a fully contracted configuration. In the fully contracted configuration, segments 502, 504 and 506 are completely nested. From the contracted configuration, cage 500 can be extended to any length up to the fully extended configuration. Like FIG. 8, FIG. 9 and FIG. 10 also illustrate cages having a telescopic configuration. FIG. 9 shows an igloo-shaped telescopic cage 600. Cage 600 is shown in an open-space position 620 and a collapsed-space position 630. Segments 602, 604, 606, 608 are slidably interconnected by slide rails 610. FIG. 10 shows an ellipsoid telescopic cage 700. Cage 700 is shown in an open-space position 720 and a collapsed-space position 730. Segments 701- 706 are slidably interconnected by slide rails 710.

[0018] When fragile products are vacuum packaged in flexible storage bags, the structural integrity of the fragile products might be compromised by the vacuuming process. For example, if fragile berries are vacuum packaged in a flexible container such as a flexible plastic storage bag, the berries are likely to get crushed when the sides of the flexible plastic storage bag press against the berries when all the air is evacuated out of the flexible plastic storage bag. To prevent the berries from being crushed, the berries can be placed in cage 150. Cage 150 is then placed in the flexible plastic storage bag before being vacuum packaged. As the air is evacuated from the flexible plastic storage bag and from

cage 150, the sides of the flexible storage bag might press against the cage. However, the cage is constructed in such a manner as to offer sufficient resistance to the compressive forces that occur during the vacuum packaging process. Thus, the cage is able to protect the fragile product during the vacuum packaging process. Cages for protecting fragile products are herein also referred to as fragile-product cages.

[0019] FIG. 4 is a side view of the fragile-product cage 250 in an open position for inserting fragile product 256 into the cavity 262 of the fragile-product cage 250. Fragile-product cage 250 is made of a porous skin 252 with frame, capable of offering sufficient resistance to compressive forces that occur during the vacuum packaging process in a flexible container such as a flexible storage bag. Fragile-product cage 250 includes a first portion 260a and a second portion 260b. The first portion 260a is hinged to the second portion 260b by a hinge mechanism. The first portion of a fragile-product cage may or may not be of the same volume as second portion of the fragile-product cage. As described herein, the first and second portions of a fragile-product cage may be attached to one another by various mechanisms and may vary from implementation to implementation. In some embodiments, the first portion of the fragile-product cage may be constructed in a manner so as to act as a lid that fits snugly over the second portion of the fragile-product cage. FIG. 5 is an isometric view of a vacuum packaging appliance 200 for sealing a storage bag 210 containing a cage 215. Cage 215 contains fragile product 216.

[0020] In the foregoing specification, embodiments of the invention have been described with reference to numerous specific details that may vary from implementation to implementation. Thus, the sole and exclusive indicator of what is the invention, and is intended by the applicants to be the invention, is the set of claims that issue from this application, in the specific form in which such claims issue, including any subsequent correction. Any express definitions set forth herein for terms contained in such claims shall govern the meaning of such terms as used in the claims. Hence, no limitation, element, property, feature, advantage or attribute that is not expressly recited in a claim should limit the scope of such claim in any way. The specification and drawings are, accordingly, to be regarded in an illustrative rather than a restrictive sense.

Claims

1. A cage for protecting fragile products when said fragile products are vacuum packaged in a flexible storage container using a vacuum packaging appliance.
2. The cage of claim 1, comprises a membrane adapted to prevent crushing of said fragile products when

said fragile products are vacuum packaged in a flexible storage container.

3. A cage for protecting fragile products when said fragile products are vacuum packaged in a flexible storage container using a vacuum packaging appliance, the cage comprising:

a membrane; and
a frame for supporting said membrane.

4. The cage of claim 3, wherein:

said frame in combination with said membrane are adapted to enclose a volume of space therein; and
said fragile products are inserted within said volume of space for protecting said fragile products.

5. The cage of claim 4, further comprising a first portion and a second portion, wherein:

said first portion corresponds to a first fraction of said volume of space;
said second portion corresponds to a remainder fraction of said volume of space; and
said first portion and said second portion are interconnected by a connectivity mechanism.

6. The cage of claim 5, wherein said connectivity mechanism is selected from the group consisting of a hinge, a clamp and a clasp.

7. The cage of claim 5, wherein said first portion is a lid that fits over said second portion.

8. The cage of claim 1 or claim 3, further being adapted to be of a variable size.

9. The cage of claim 8, being adapted to comprise nestable segments wherein said variable size is achievable by slidably interconnecting said nestable segments using slide rails.

10. The cage of claim 3, wherein said membrane in combination with said frame are adapted to prevent crushing of said fragile products when said fragile products are vacuum packaged in said flexible storage container.

11. The cage of claim 2 or claim 3, wherein said membrane is a mesh fabric.

12. The cage of claim 2 or claim 3, wherein said membrane is a gas permeable membrane.

13. The cage of claim 1 or claim 3, further includes a

mechanism for allowing gases to be evacuated from said cage when said fragile products are vacuum packaged.

14. The cage of claim 13, wherein said mechanism is a one-way valve for allowing said gases to be evacuated from said cage when said fragile products are vacuum packaged.

15. The cage of claim 2 or claim 3, wherein said flexible storage container is a flexible storage bag.

16. The cage of claim 1 or claim 3, wherein said cage is of a shape adapted for storing said fragile products.

17. The cage of claim 3, wherein said frame includes two or more structural members.

18. A method for protecting fragile products when said fragile products are vacuum packaged in a flexible storage container using a vacuum packaging appliance, the method comprising:

using a cage that is adapted to contain said fragile products;
after filling said cage with said fragile products, placing said cage in said flexible storage container before vacuum packaging said storage container; and
wherein said cage includes:

a membrane; and
a frame for supporting said membrane.

19. The method of claim 18, further comprising:

adapting said frame in combination with said membrane to enclose a volume of space therein; and
wherein said fragile products are inserted within said volume of space for protecting said fragile products.

20. The method of claim 19, further comprising the act of:

connecting a first portion of said cage with a second portion, wherein:

said first portion corresponds to a first fraction of said volume of space;
said second portion corresponds to a remainder fraction of said volume of space;
and
said act of connecting first portion and said second portion is accomplished by a connectivity mechanism.

21. The method of claim 20, wherein said connectivity mechanism is selected from the group consisting of a hinge, a clamp and a clasp.

22. The method of claim 20, wherein said first portion is a lid that fits over said second portion.

23. The method of claim 18, further adapting said cage to be of a variable size.

24. The method of claim 23, adapting said cage to comprise nestable segments wherein said variable size is achievable by slidably interconnecting said nestable segments using slide rails.

25. The method of claim 18, further comprising adapting said membrane in combination with said frame to prevent crushing of said fragile products when said fragile products are vacuum packaged in said flexible storage container.

26. The method of claim 18, further comprising using a mesh fabric membrane as said membrane.

27. The method of claim 18, further comprising using a gas permeable membrane as said membrane.

28. The method of claim 18, further comprising using a mechanism for allowing gases to be evacuated from said cage when said fragile products are vacuum packaged.

29. The method of claim 28, wherein said mechanism is a one-way valve for allowing said gases to be evacuated from said cage when said fragile products are vacuum packaged.

30. The method of claim 18, wherein said flexible storage container is a flexible storage bag.

31. The method of claim 18, further comprising using a shape for said cage, wherein said shape is adapted for storing said fragile products.

32. The method of claim 18, further comprising using two or more structural members for said frame.

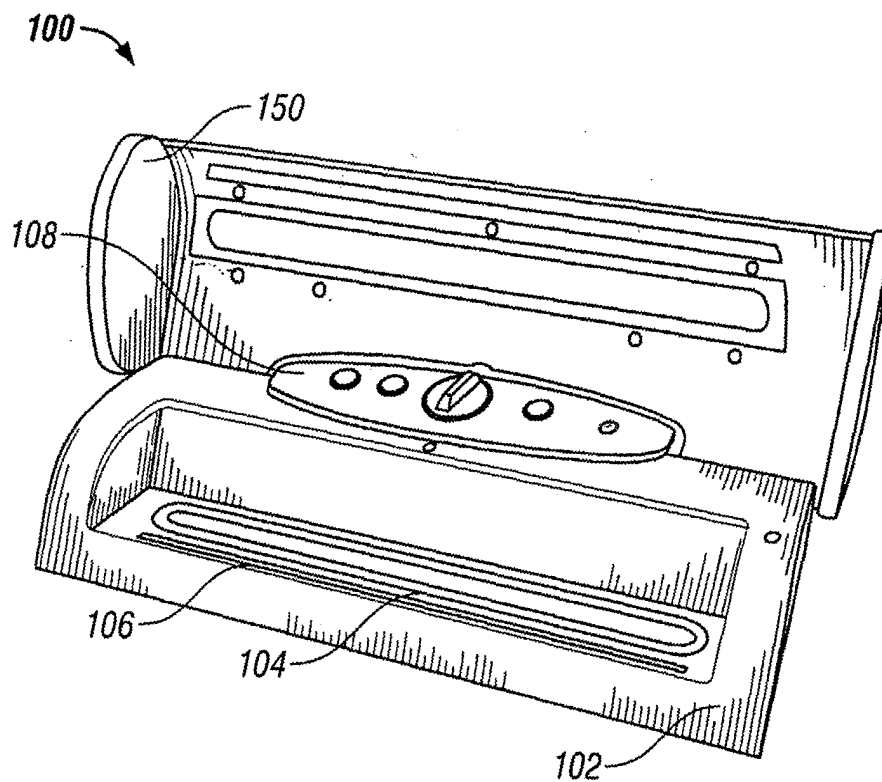


FIG. 1

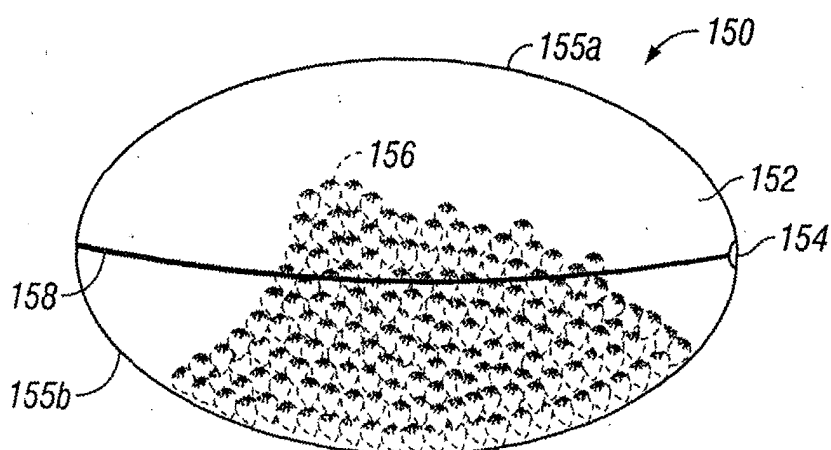


FIG. 2

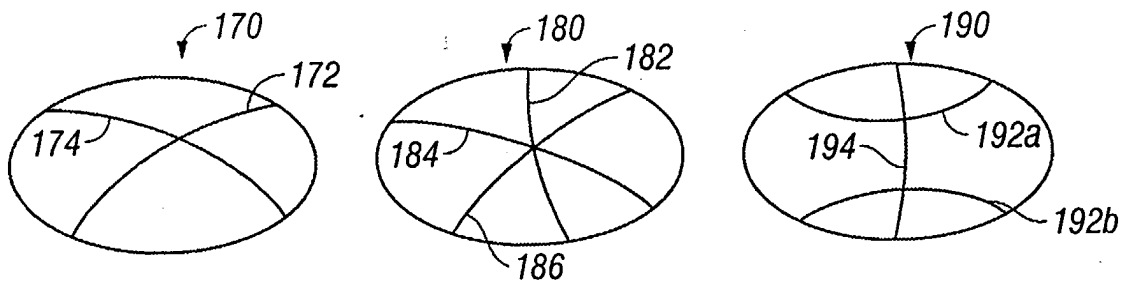


FIG. 3

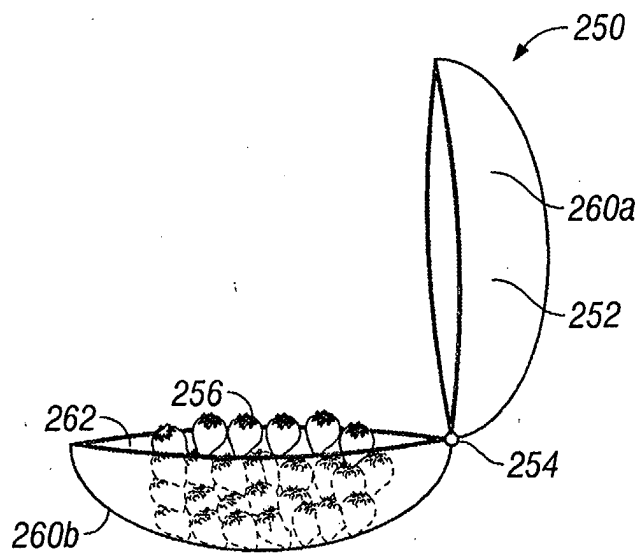


FIG. 4

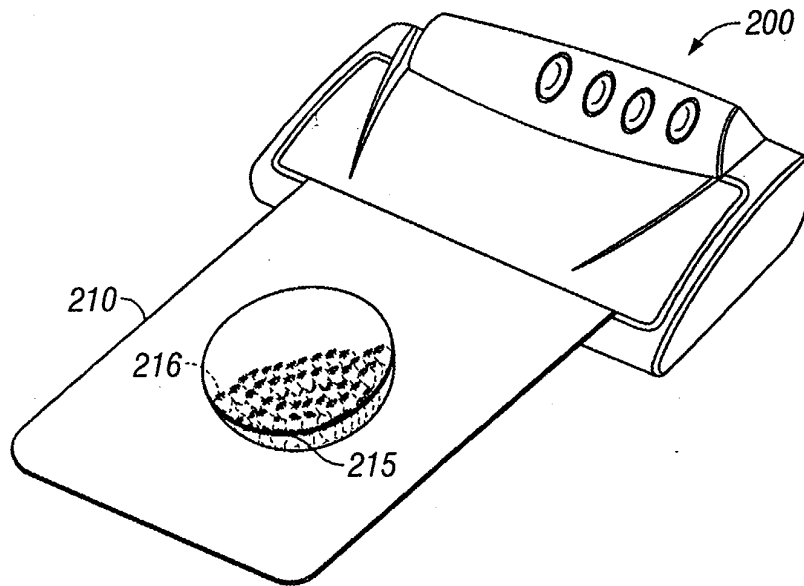


FIG. 5

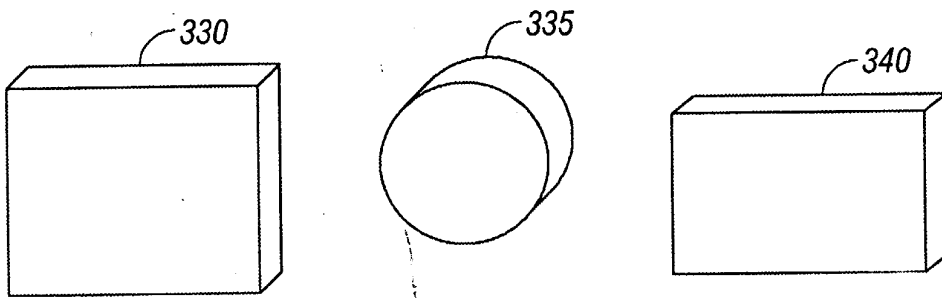
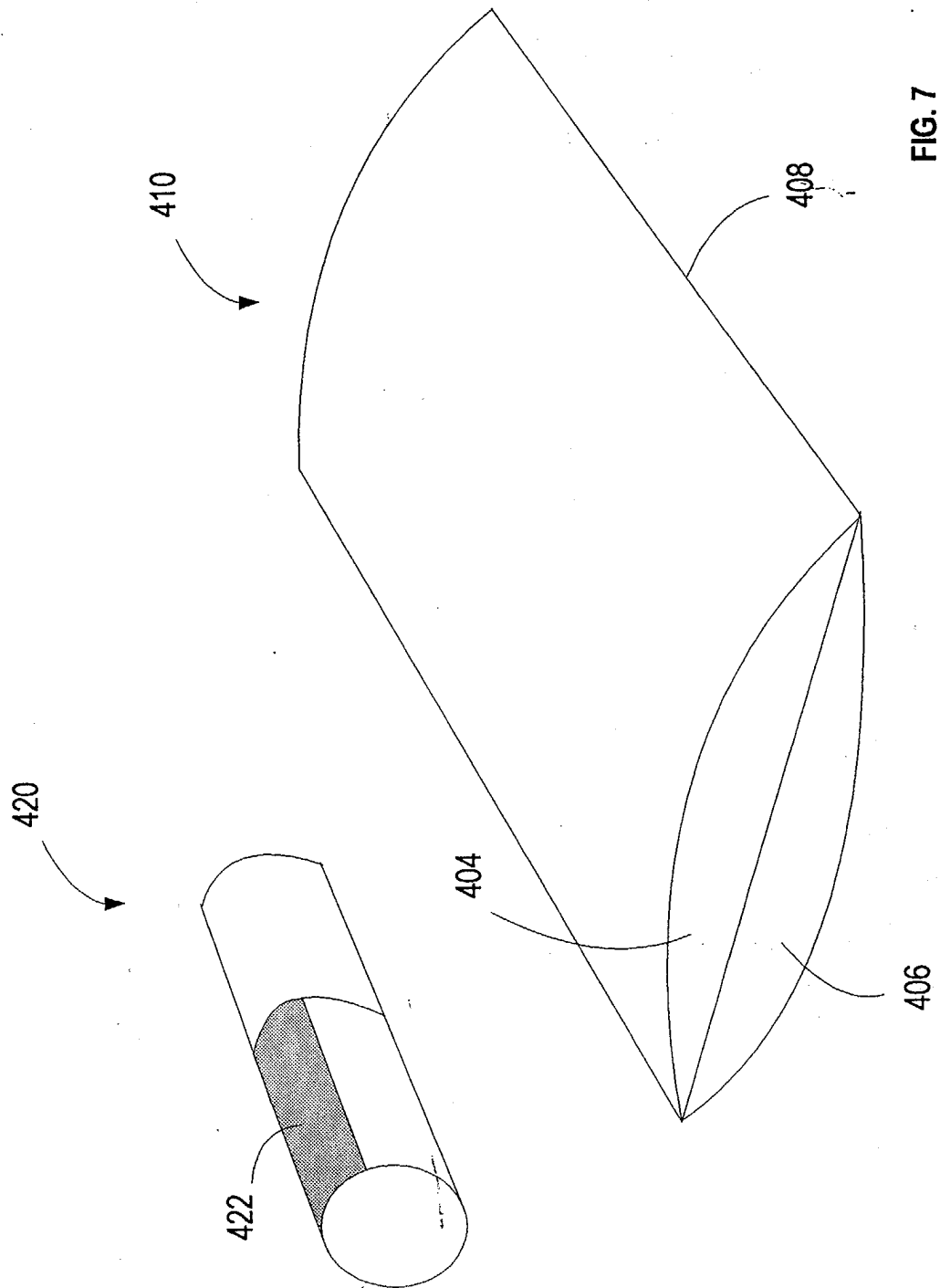


FIG. 6



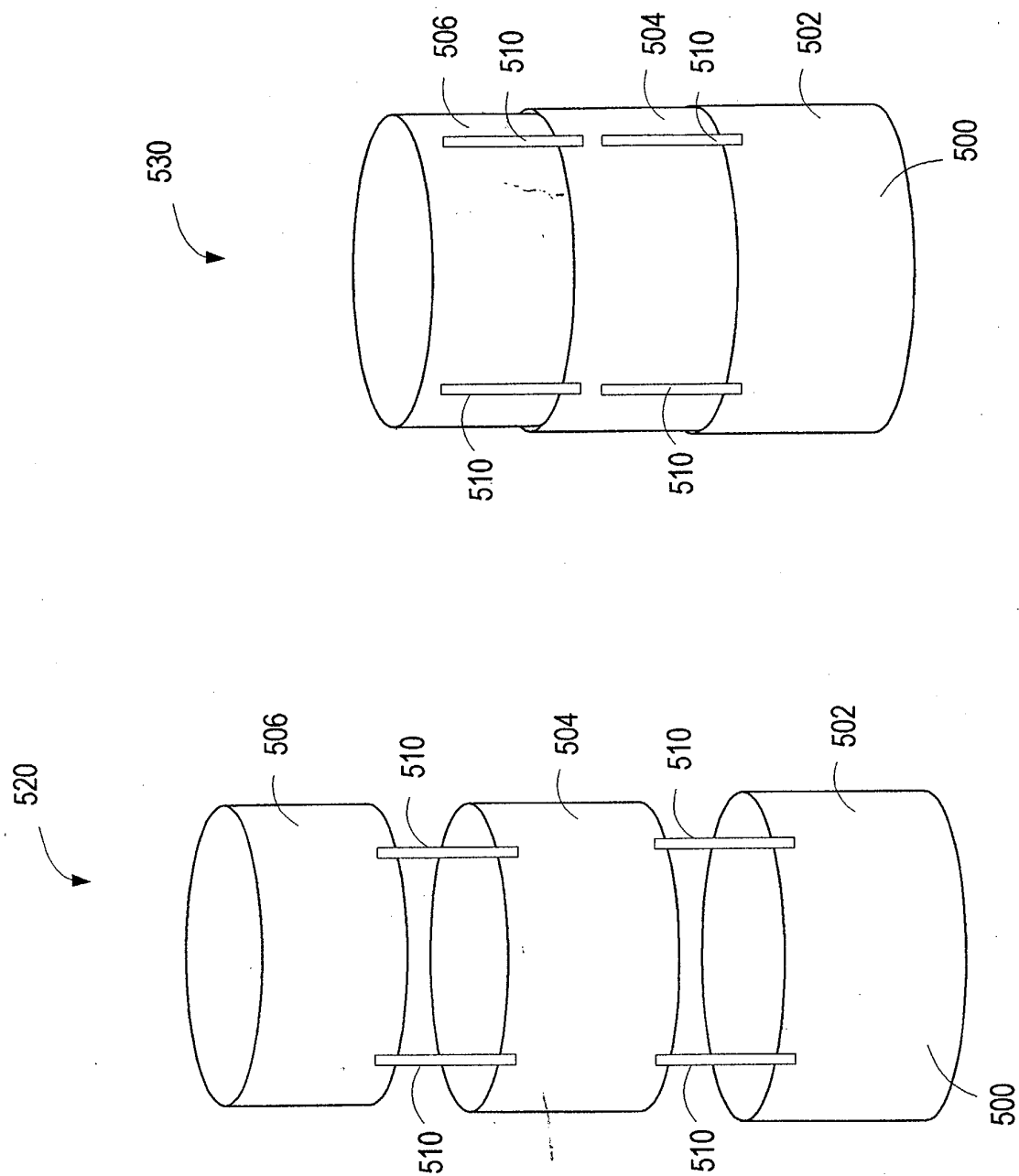


FIG. 8

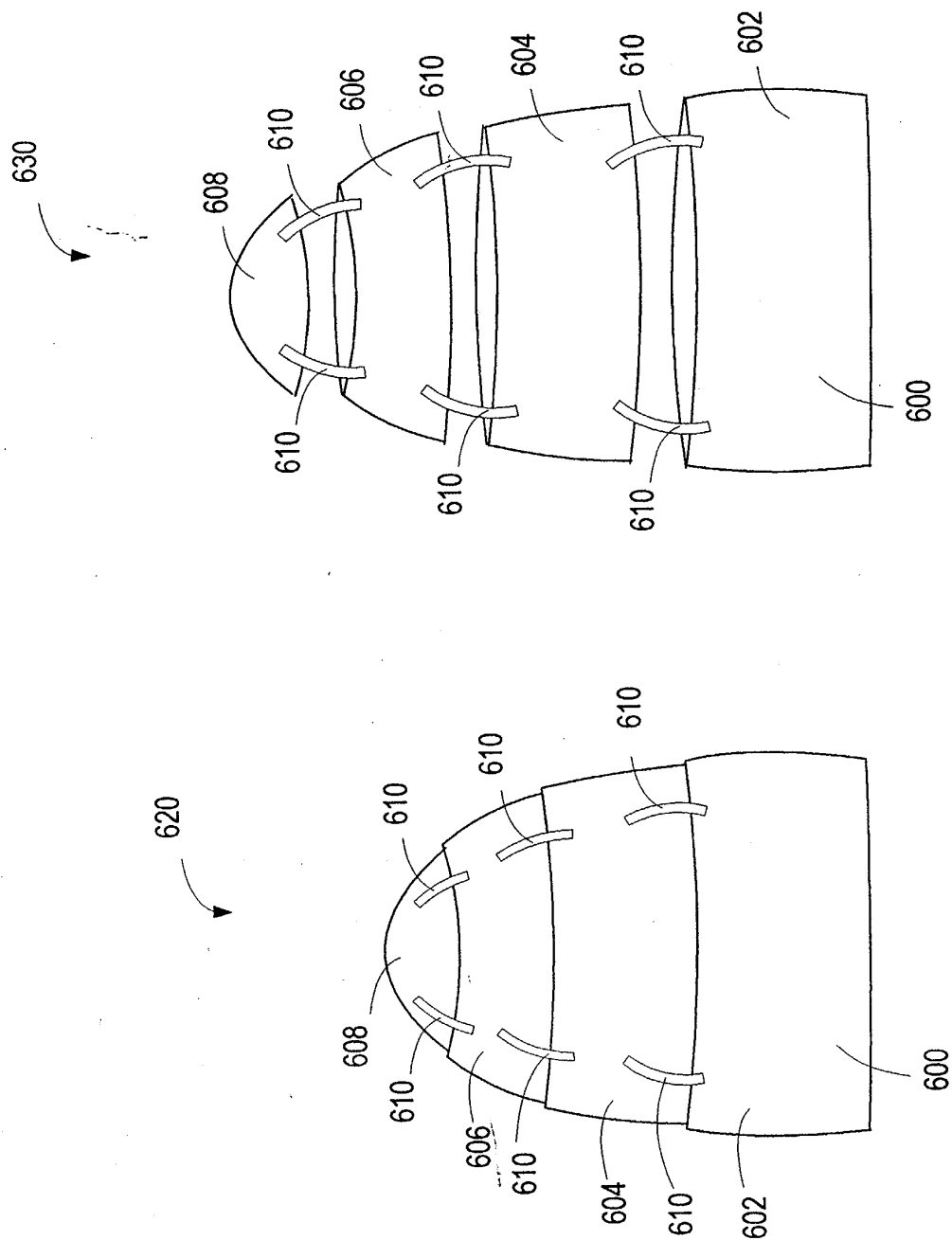


FIG. 9

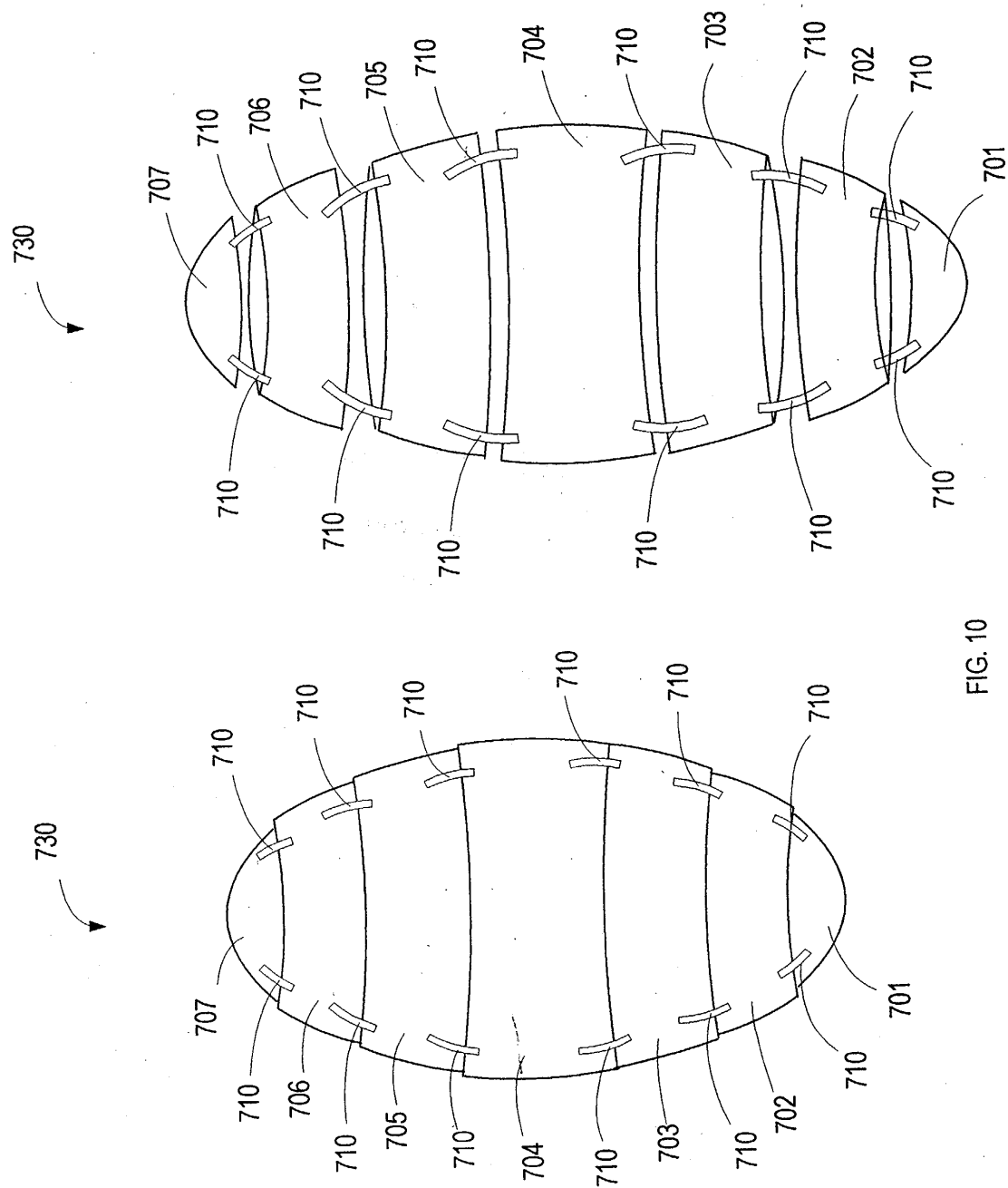


FIG. 10