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(54) **POLYMERIC PACKAGE WITH RESEALABLE CLOSURE AND VALVE AND METHODS RELATING THERETO**

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Related U.S. Application Data

(63) Continuation-in-part of application No. 11/627,893, filed on Jan. 26, 2007.
Continuation-in-part of application No. 11/627,909, filed on Jan. 26, 2007, which is a continuation-in-part of application No. 11/186,131, filed on Jul. 20, 2005, now Pat. No. 7,290,660.
Continuation-in-part of application No. 11/382,143, filed on May 8, 2006.

(60) Provisional application No. 60/590,858, filed on Jul. 23, 2004. Provisional application No. 60/602,685, filed on Aug. 19, 2004. Provisional application No. 60/609,920, filed on Sep. 15, 2004. Provisional application No. 60/729,778, filed on Oct. 24, 2005. Provisional application No. 60/736,810, filed on Nov. 14, 2005. Provisional application No. 60/763,063, filed on Jan. 27, 2006.

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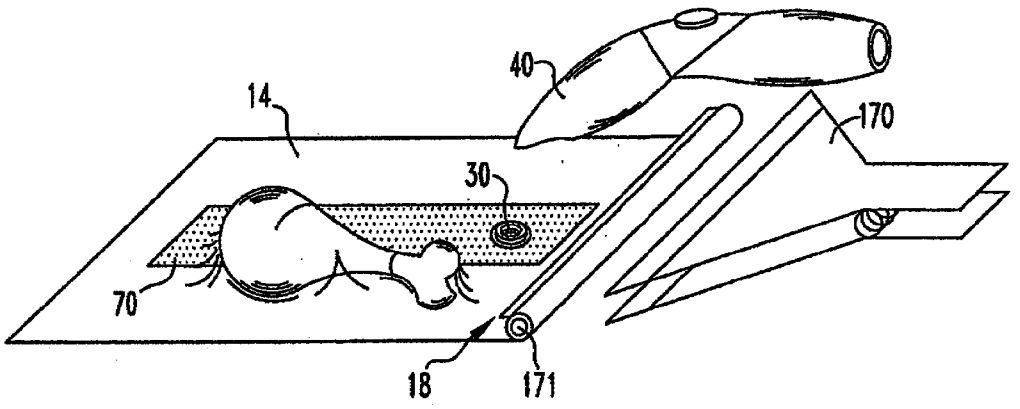
B65D 33/01 (2006.01)

(52) **U.S. Cl.** **383/103**; 383/210

(57) **ABSTRACT**

The present invention provides a vacuum storage bag system having a storage device having at least one polymeric sheet sealed along a portion of its' periphery to provide an opening to a storage space; a resealable closure structure adapted to seal the opening to the storage space, the resealable closure structure comprising selectively engaging male and female profiles and a sealing compound comprising liquid silicone and at least one filler in proportions suitable for at least incidental contact to food items contained within the storage space; a vacuum valve assembly disposed on the polymeric sheet; a stand-off structure disposed adjacent to the vacuum valve assembly, wherein the stand-off structure has a series of raised surfaces facing the vacuum valve assembly; a portable vacuum pump assembly structured to engage the vacuum valve assembly; and a liquid separator assembly coupled to the portable vacuum pump assembly.



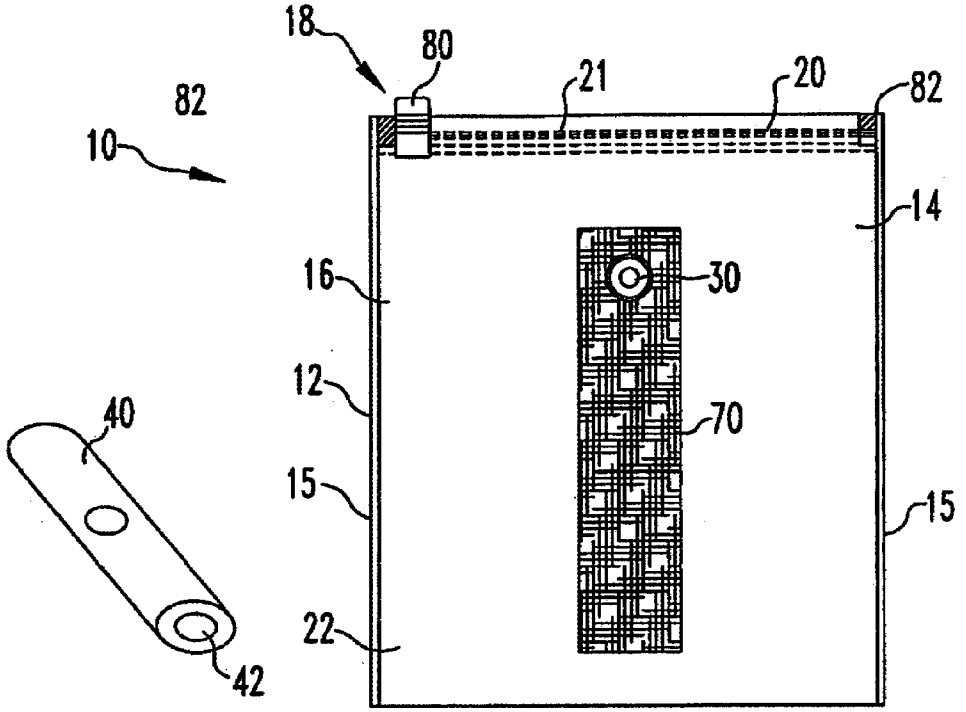


FIG.1a

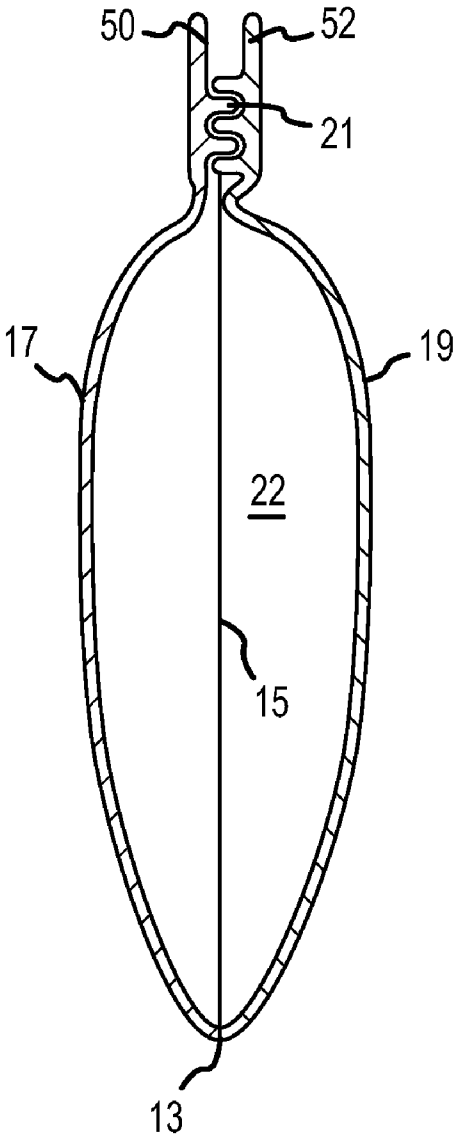


FIG.1b

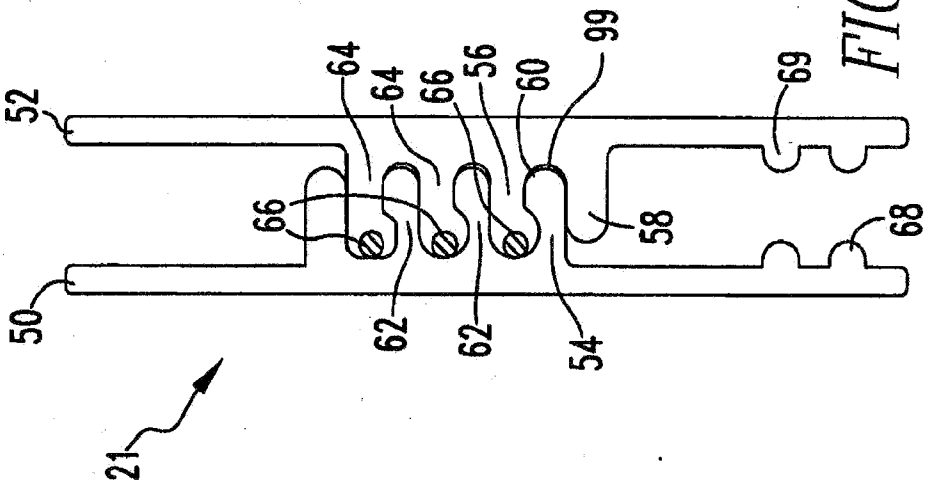


FIG.2

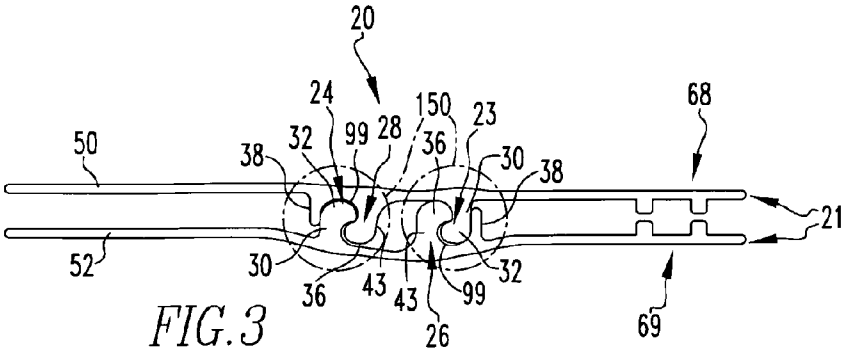


FIG.3

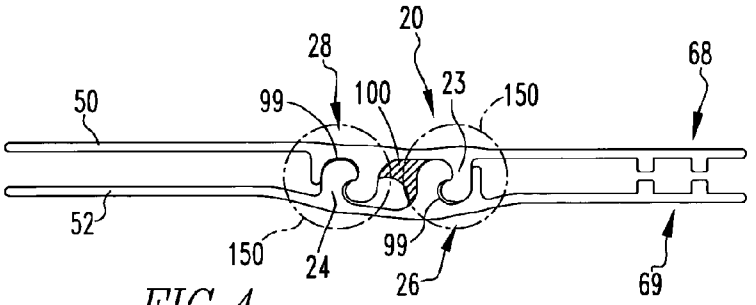


FIG.4

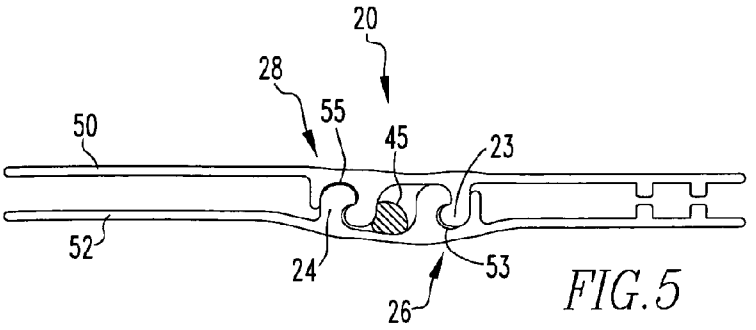


FIG.5

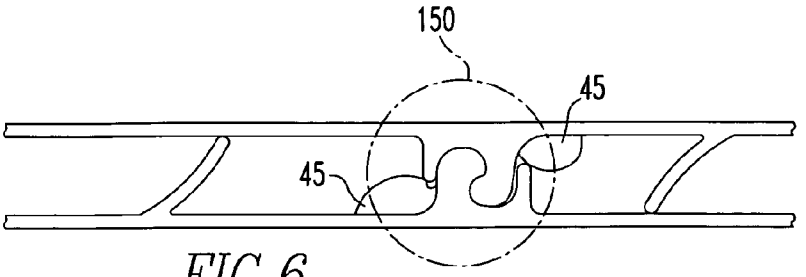

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FIG. 6

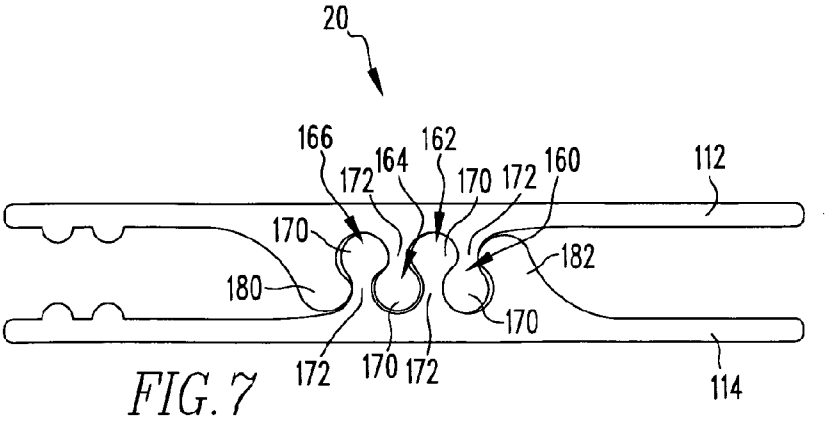
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FIG. 7

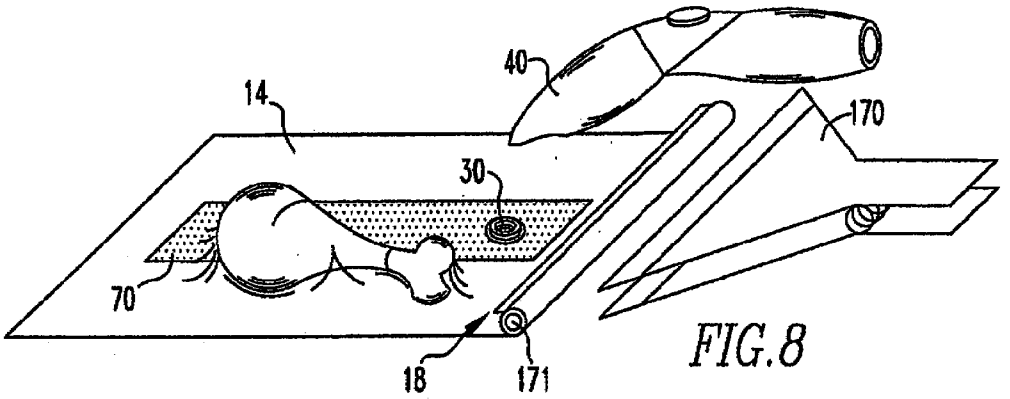

FIG.8

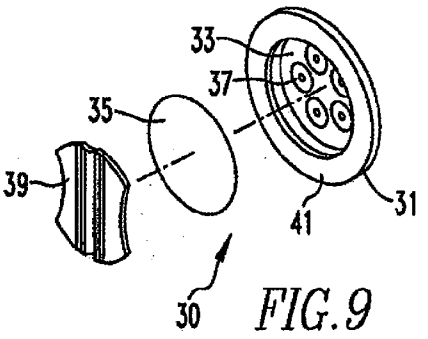

FIG.9

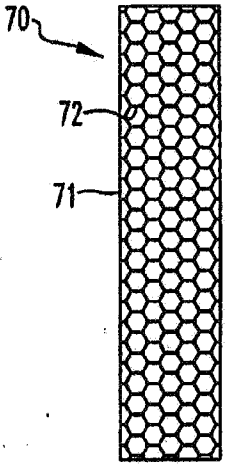

FIG.10a

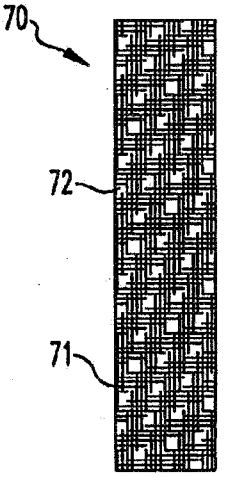

FIG.10b

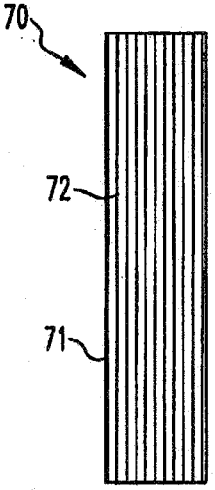

FIG.10c

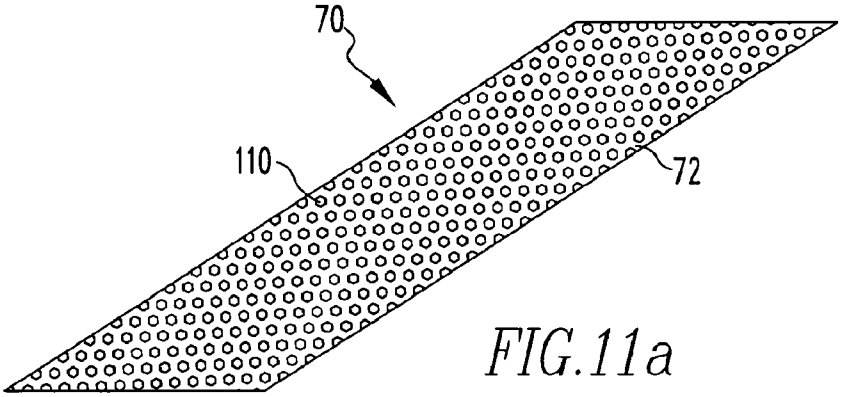

FIG.11a

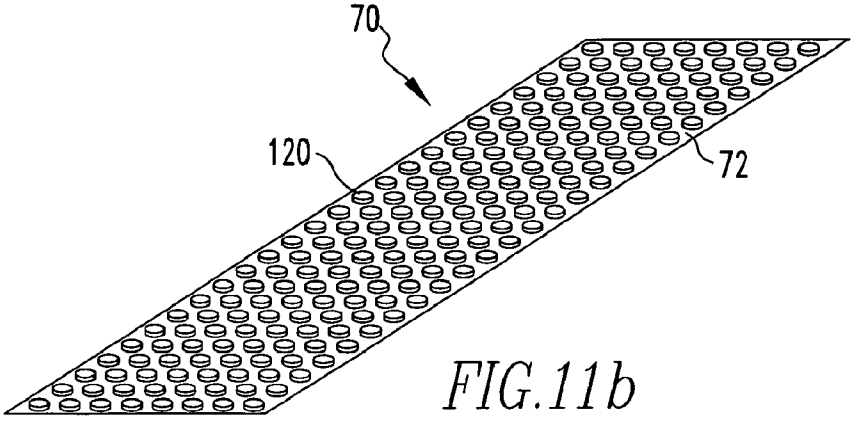

FIG.11b

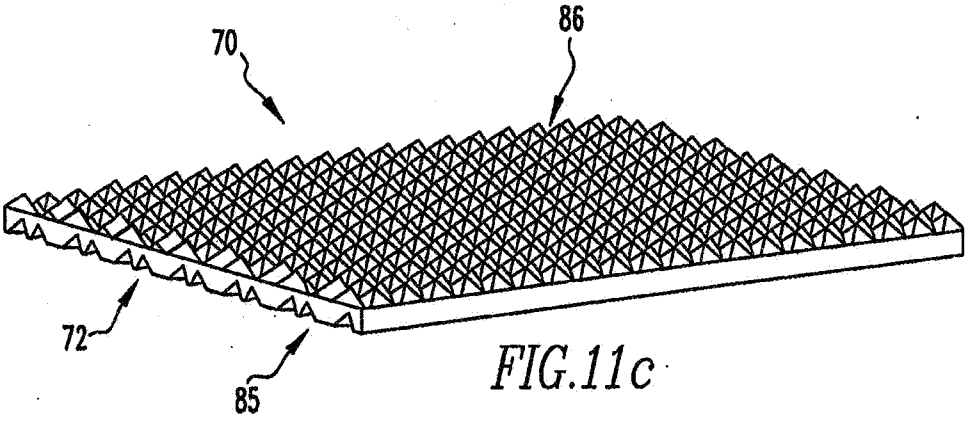

FIG.11c

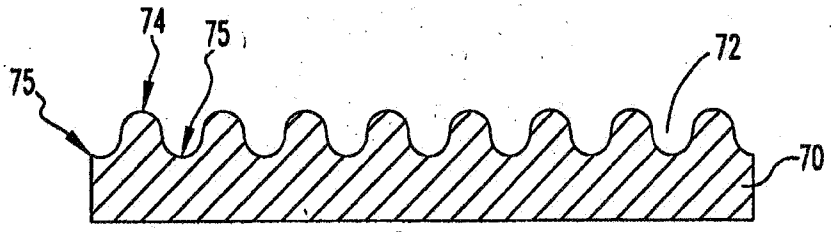

FIG.12a

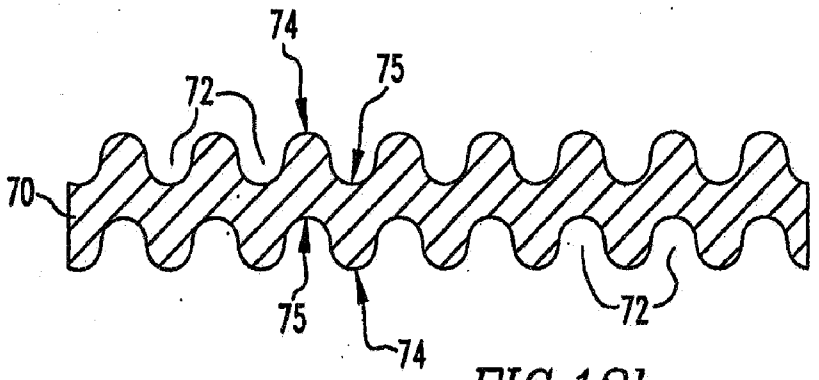

FIG.12b

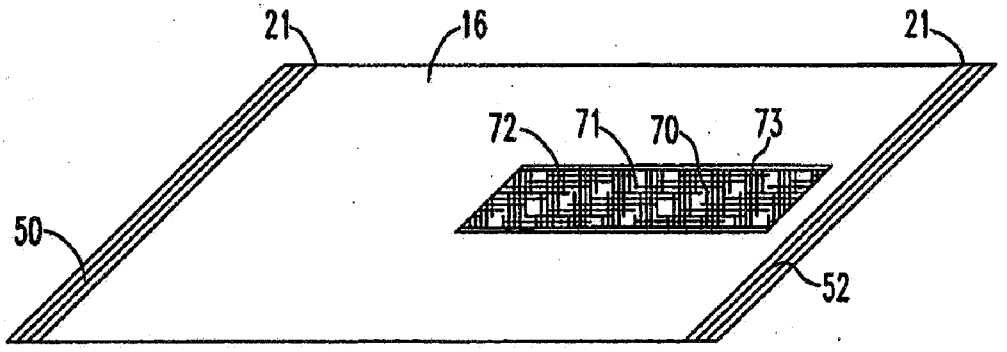

FIG.13a

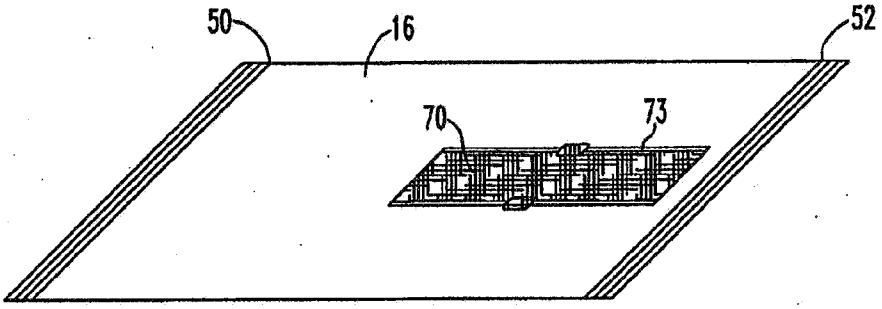

FIG.13b

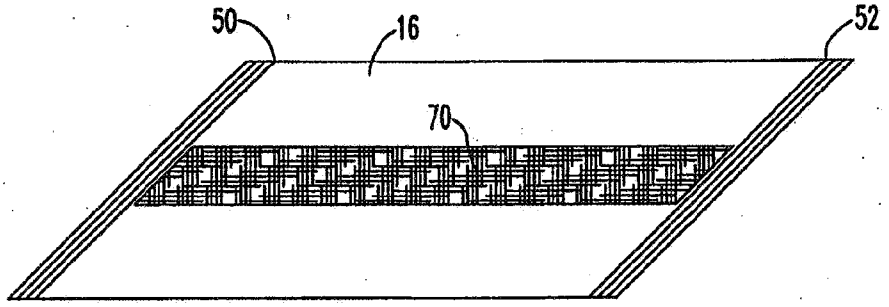

FIG.13c

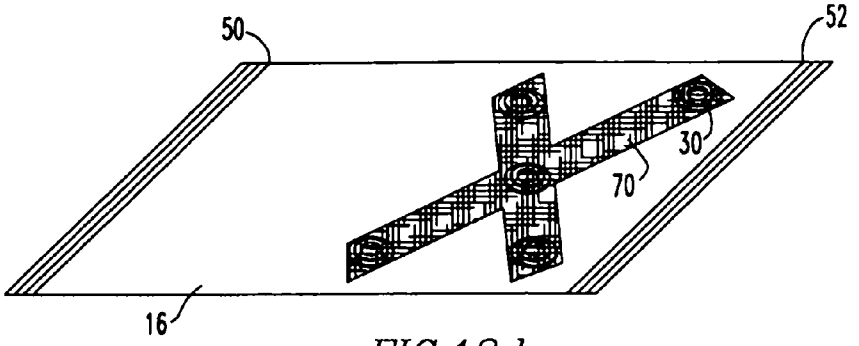

FIG.13d

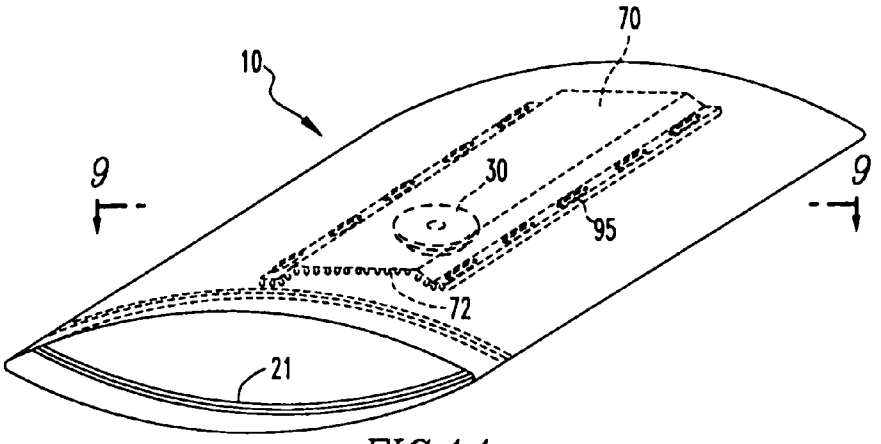

FIG.14

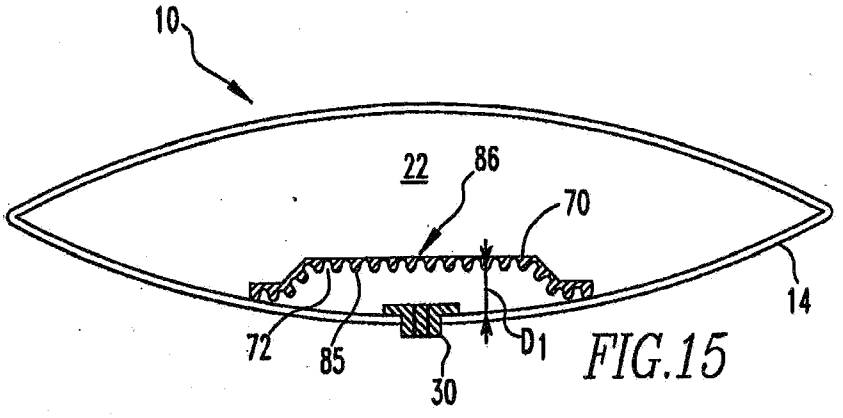

FIG.15

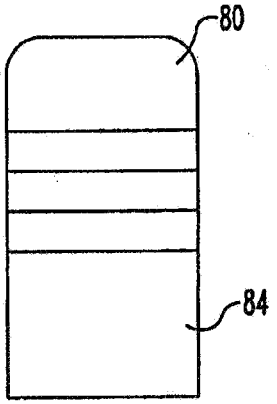

FIG.16a

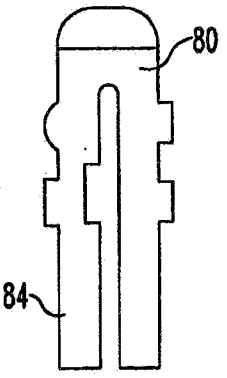

FIG.16b

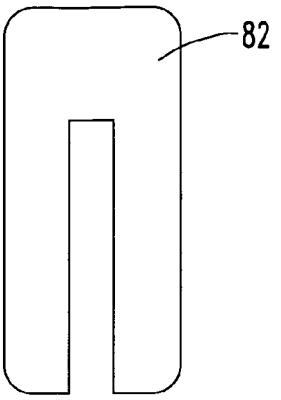

FIG.17

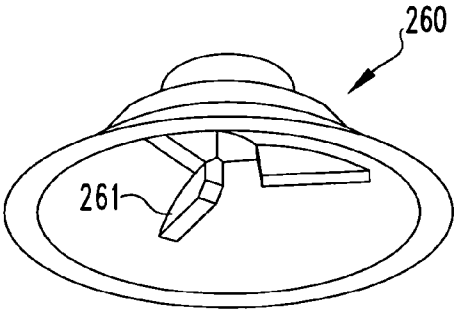

FIG.18a

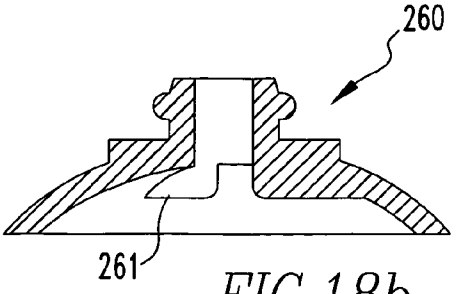

FIG.18b

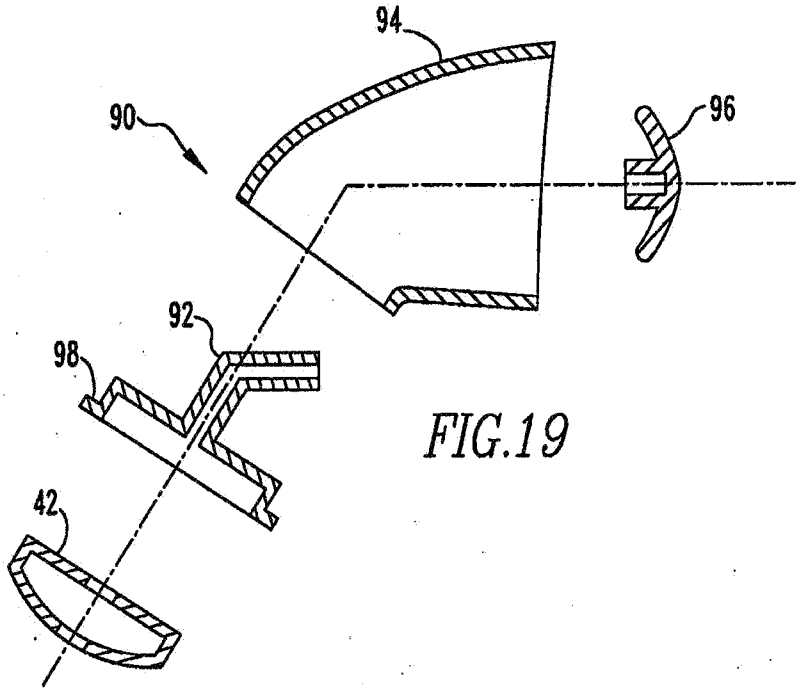

FIG.19

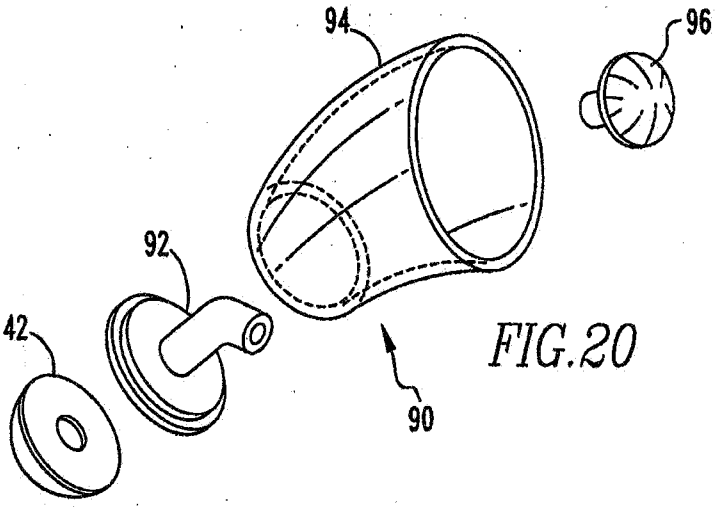

FIG.20

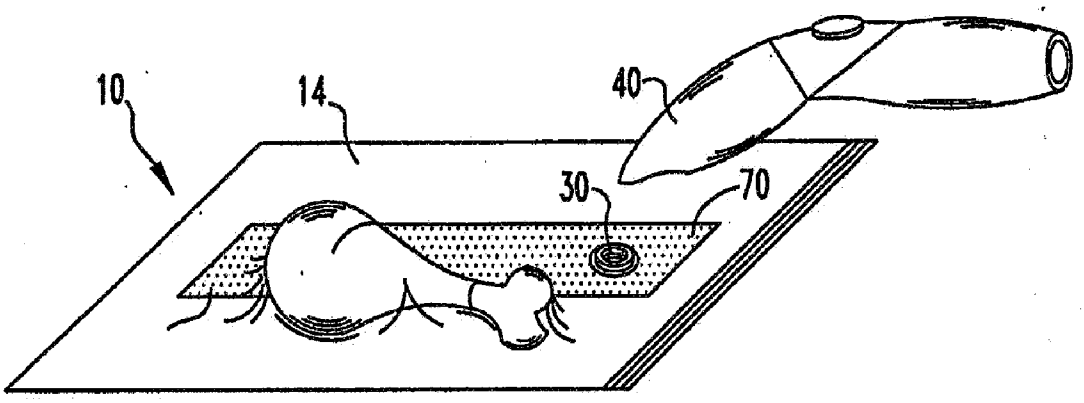

FIG.21

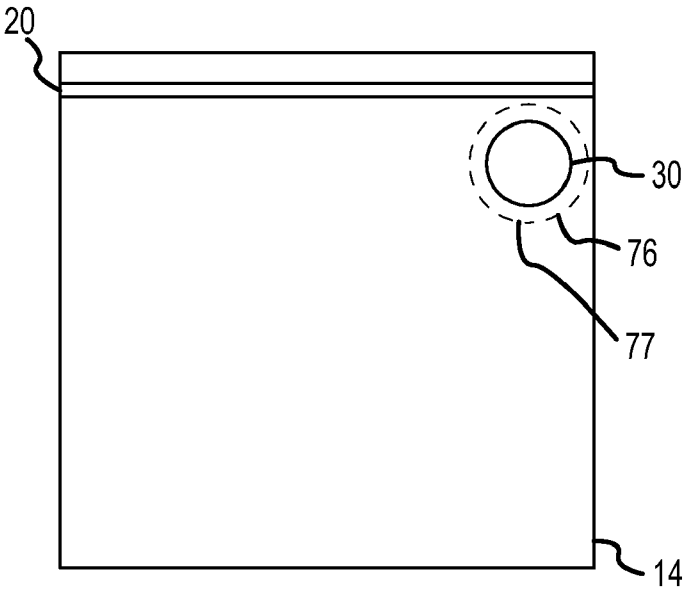

FIG.22a

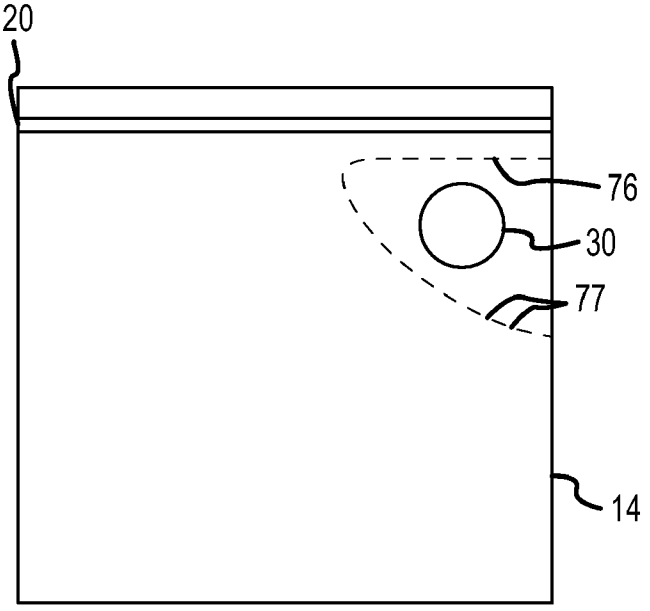

FIG.22b

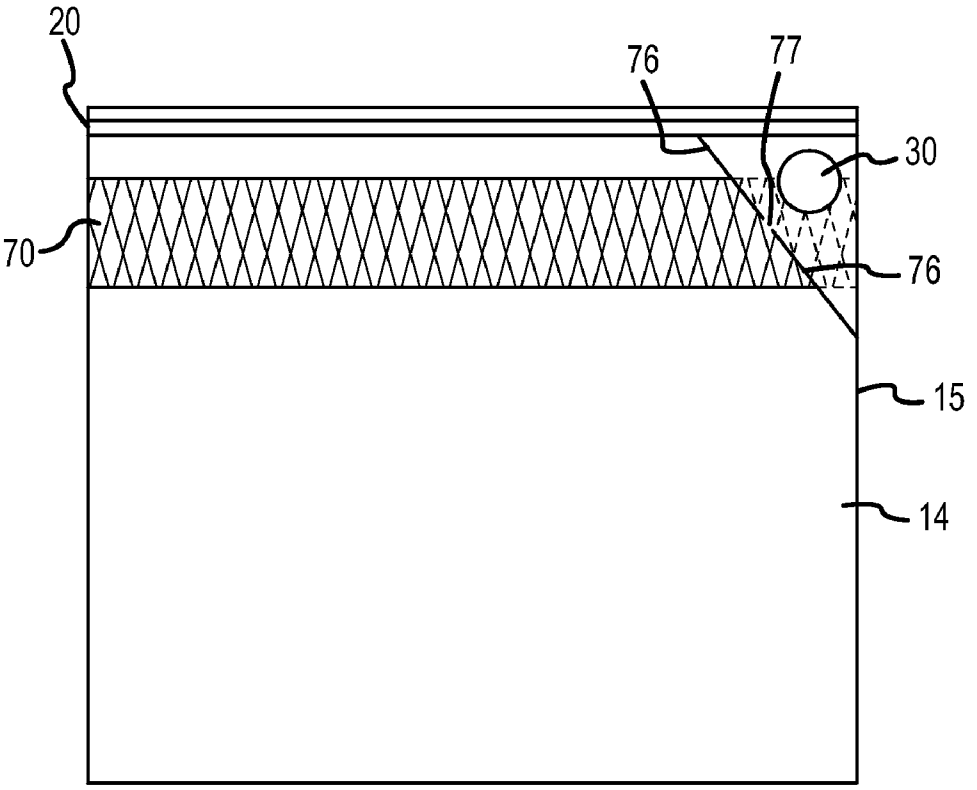

FIG.22c

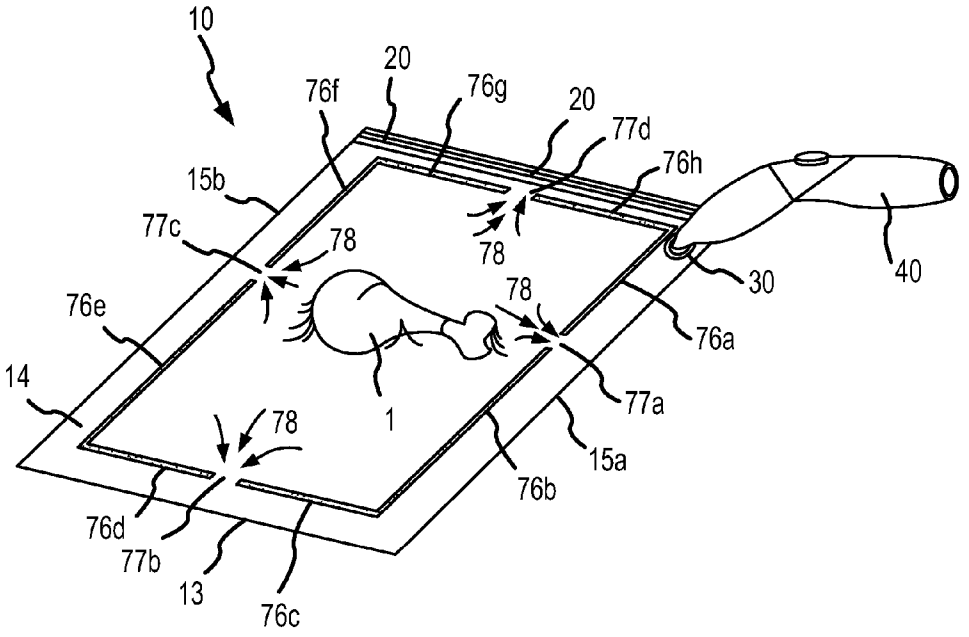
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FIG.22d

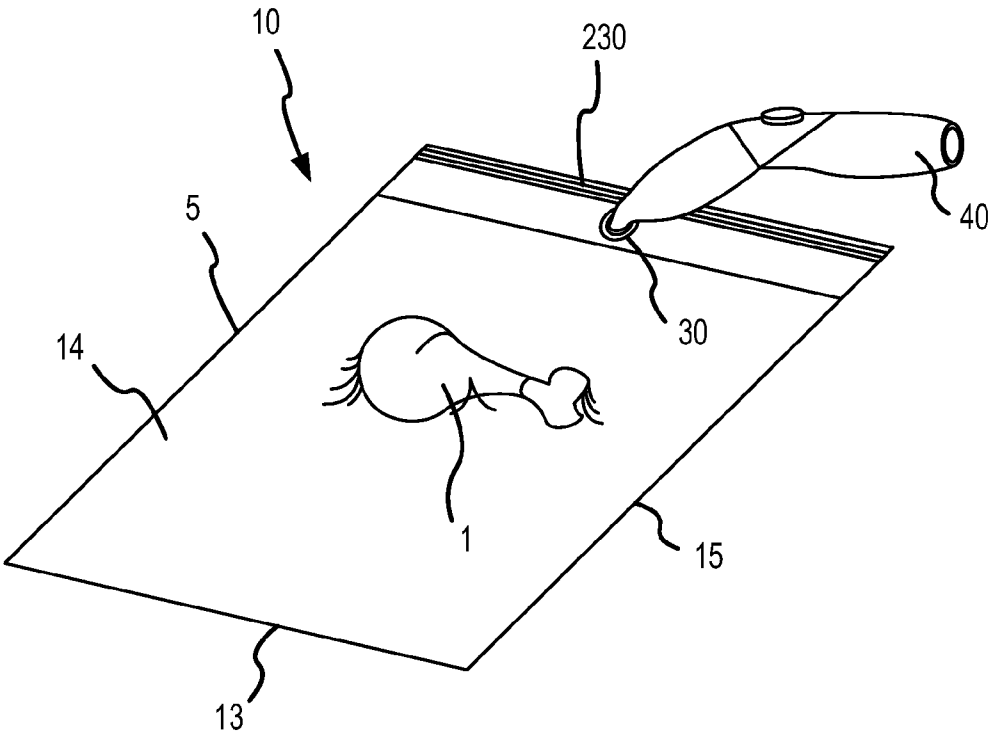

FIG.23

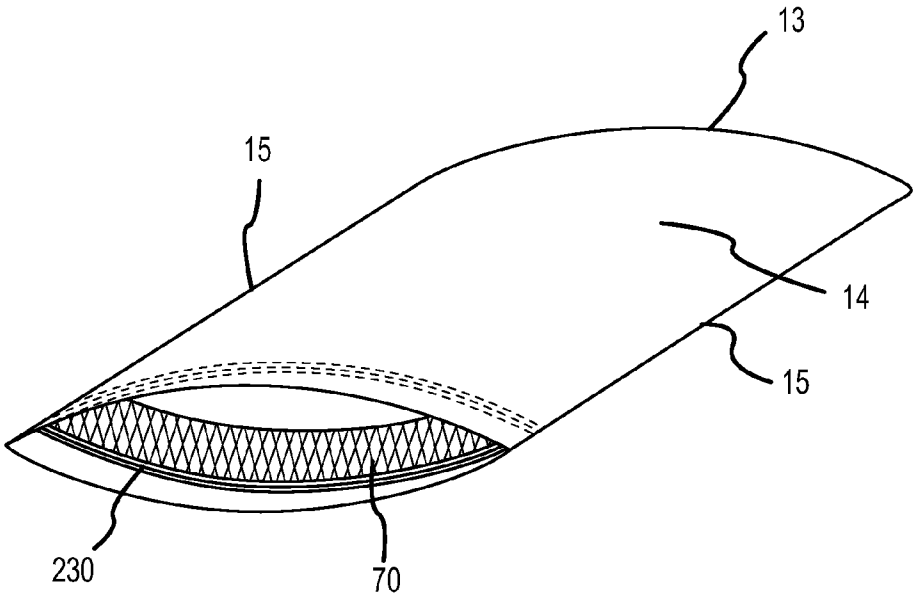

FIG.24

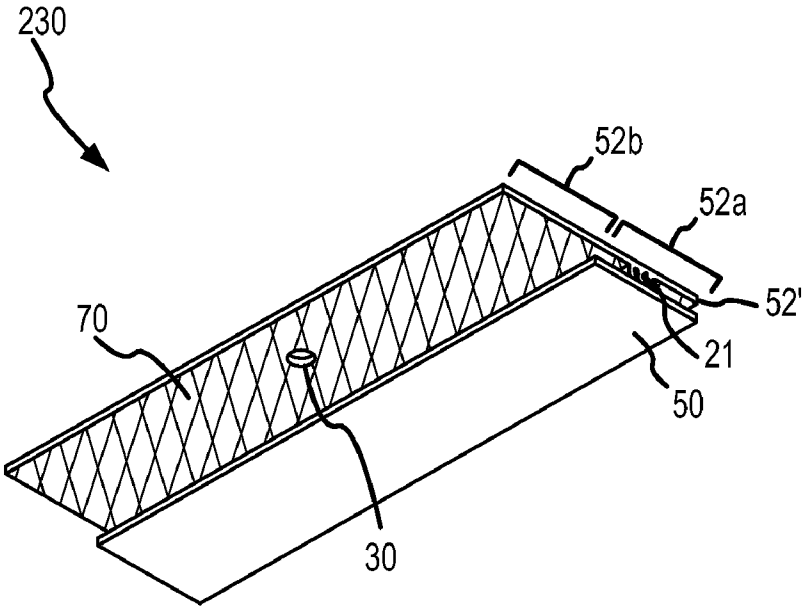

FIG.25a

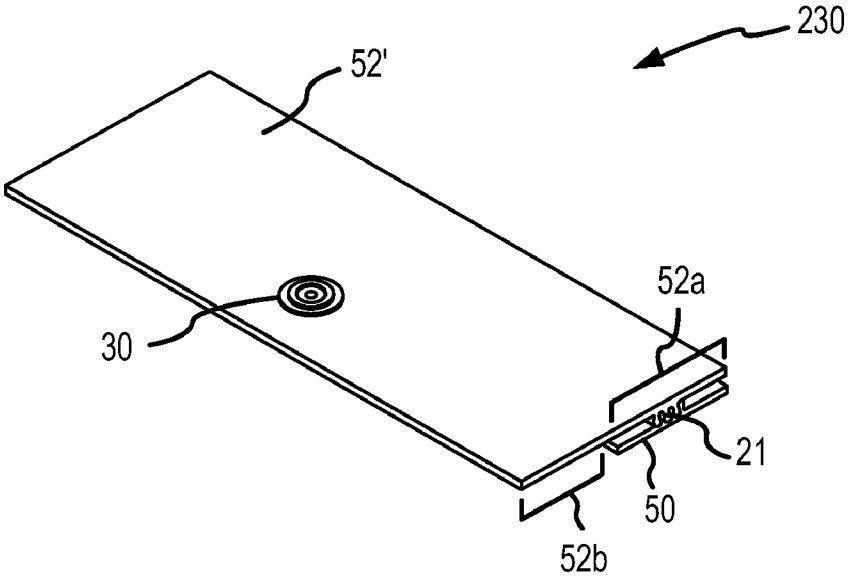

FIG.25b

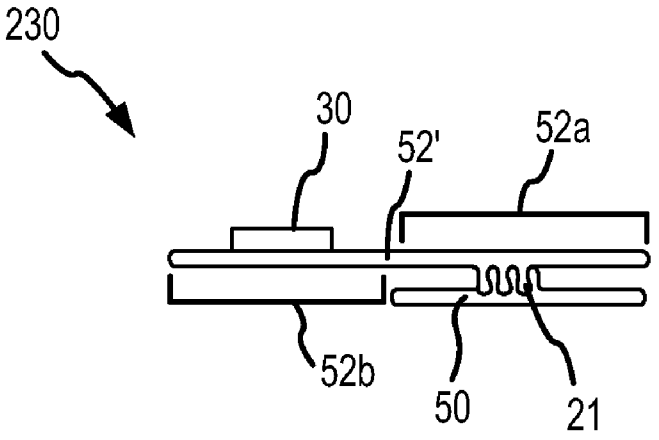

FIG.25c

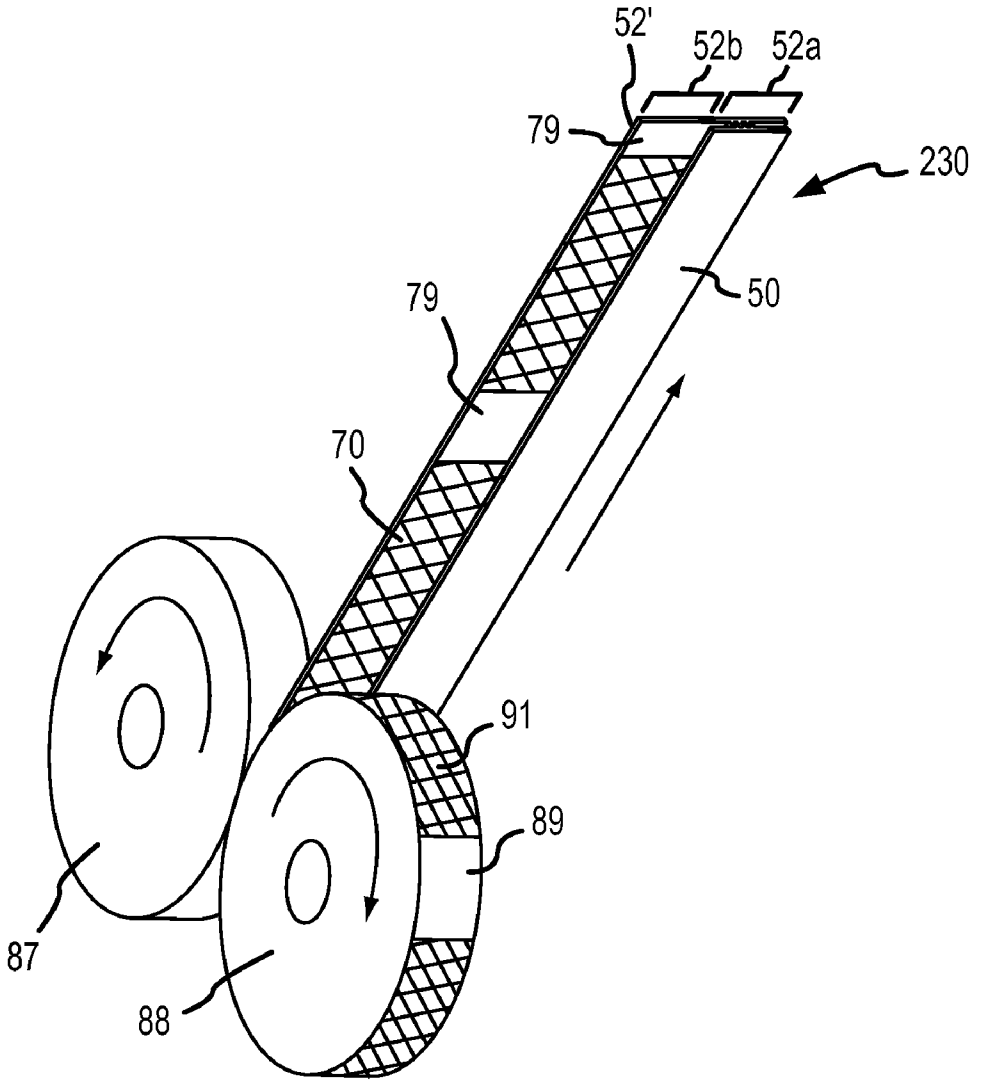

FIG.26

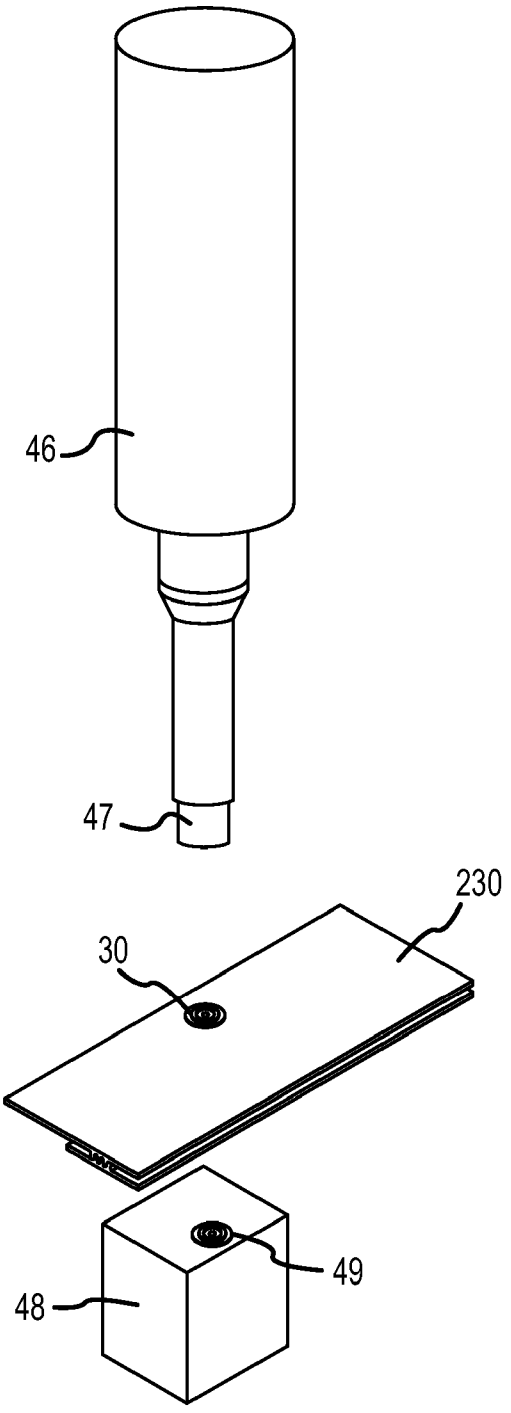

FIG.27a

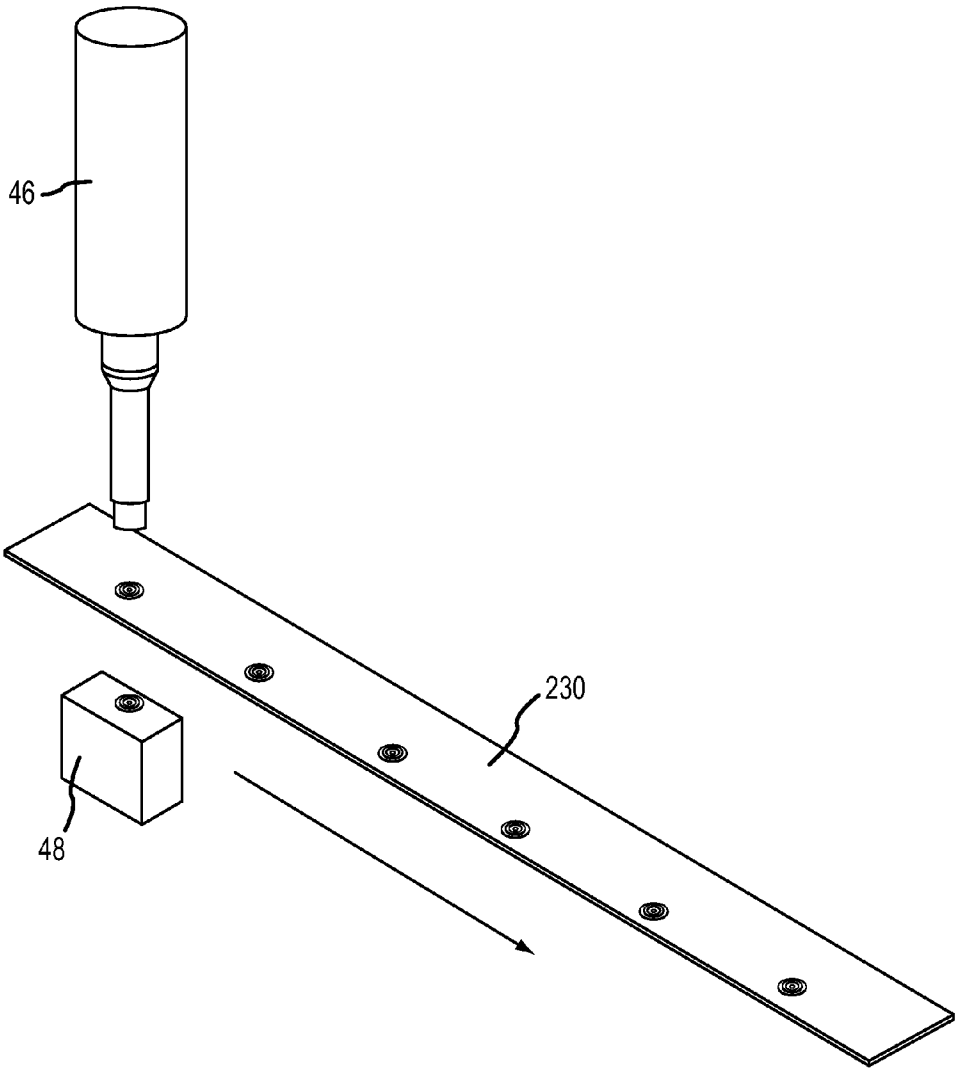

FIG.27b

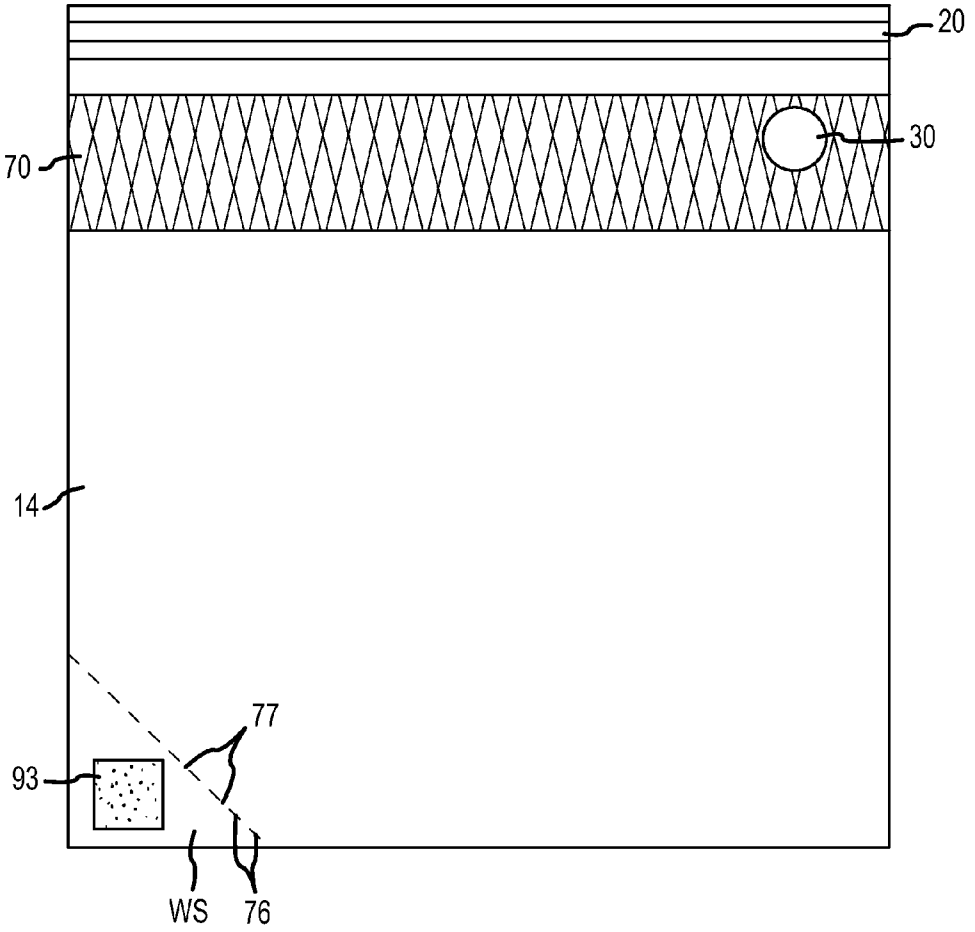

FIG.28

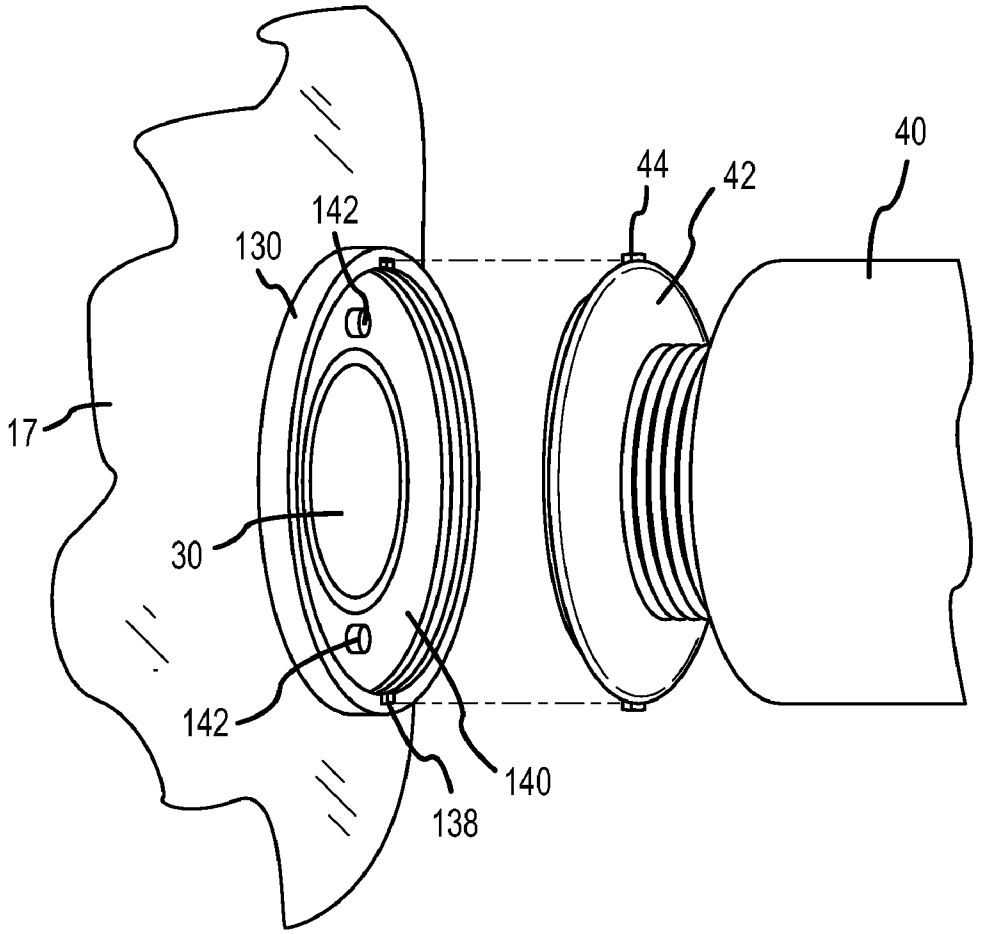

FIG.29

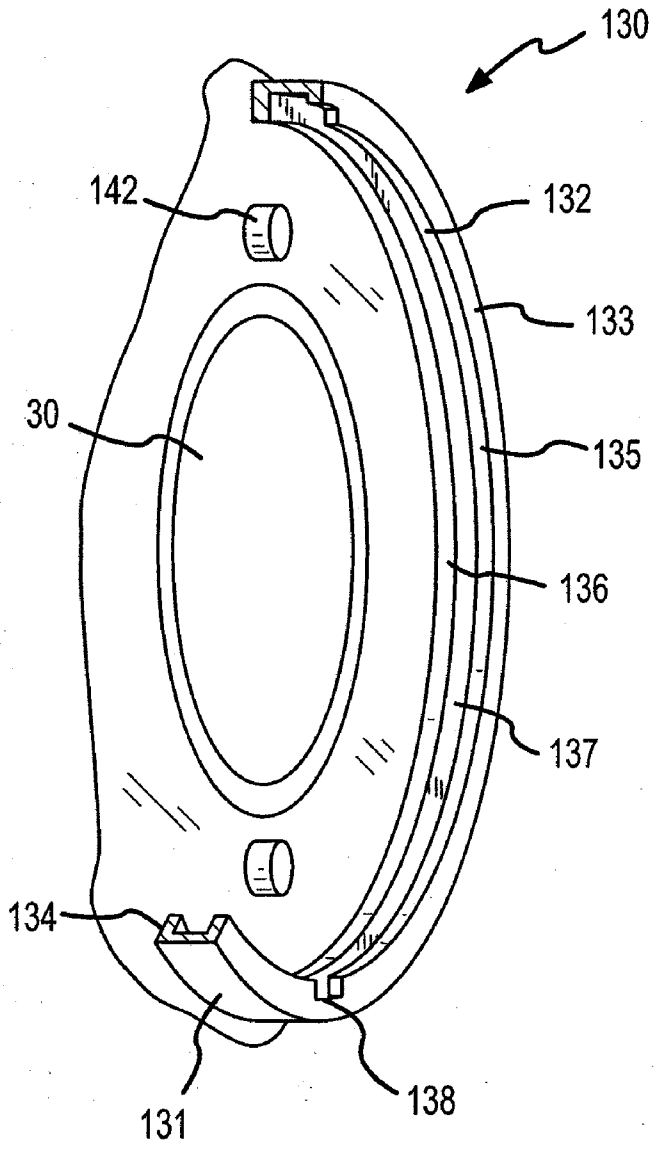

FIG.30

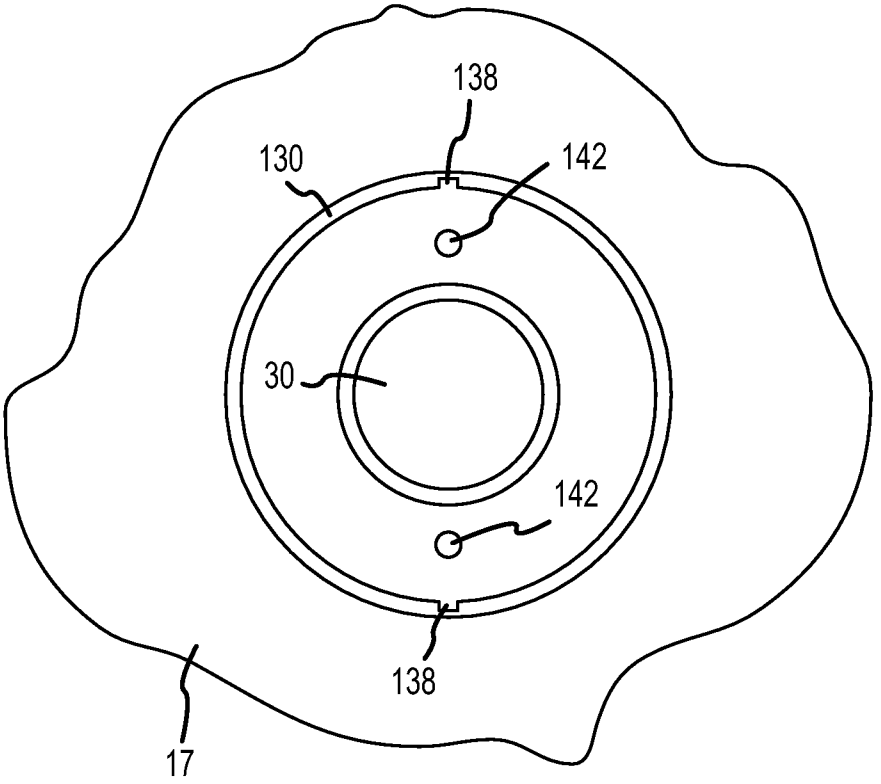

FIG.31

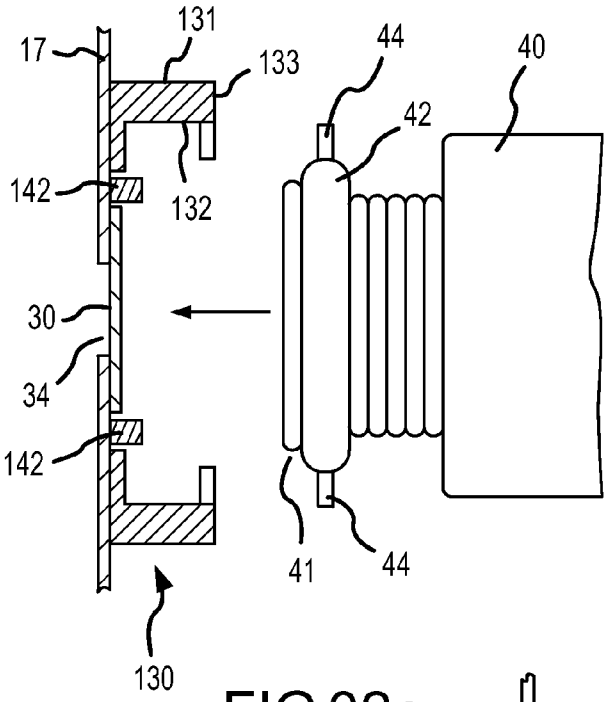

FIG.32a

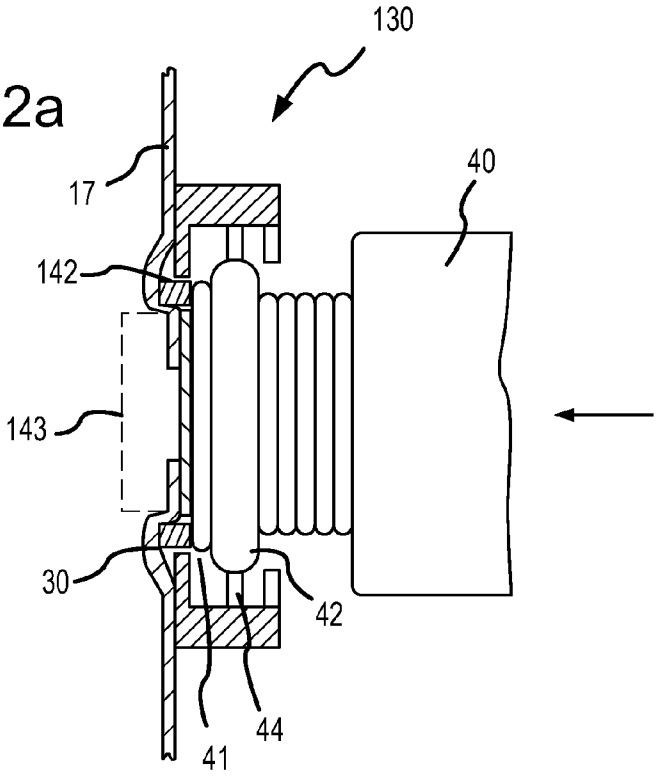

FIG.32b

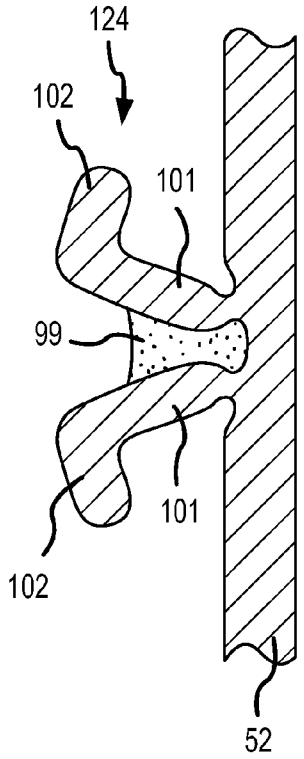

FIG.33a

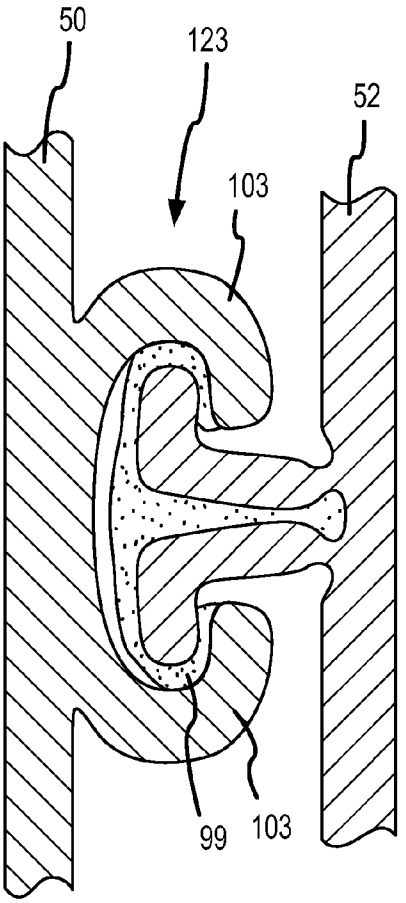

FIG.33b

Figure 34

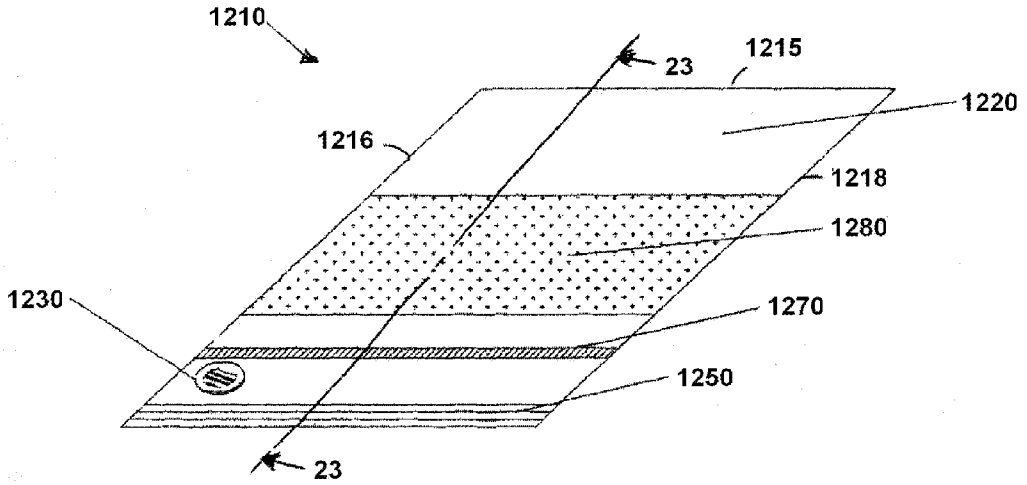

Figure 35

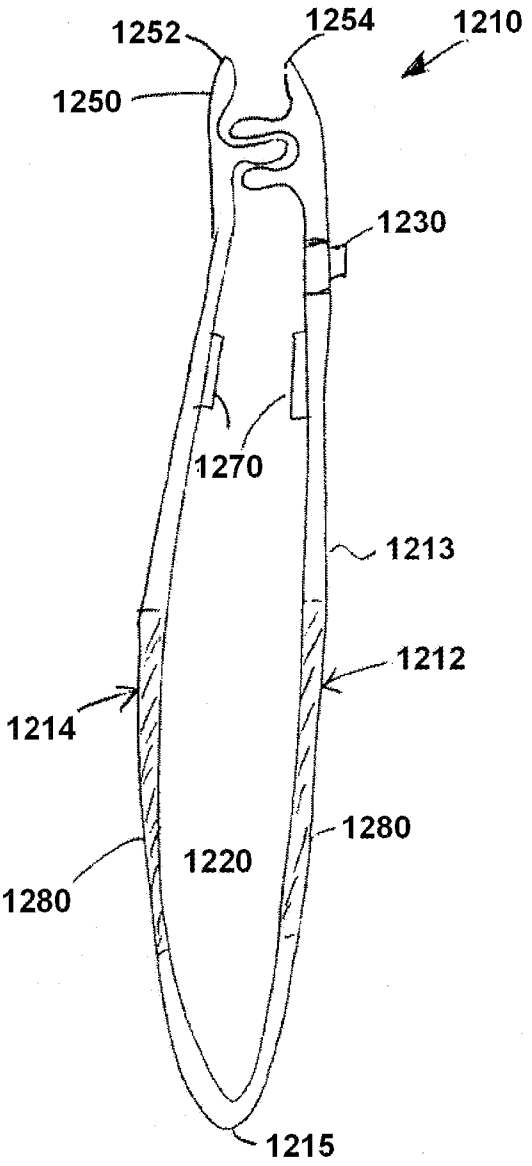
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Figure 36

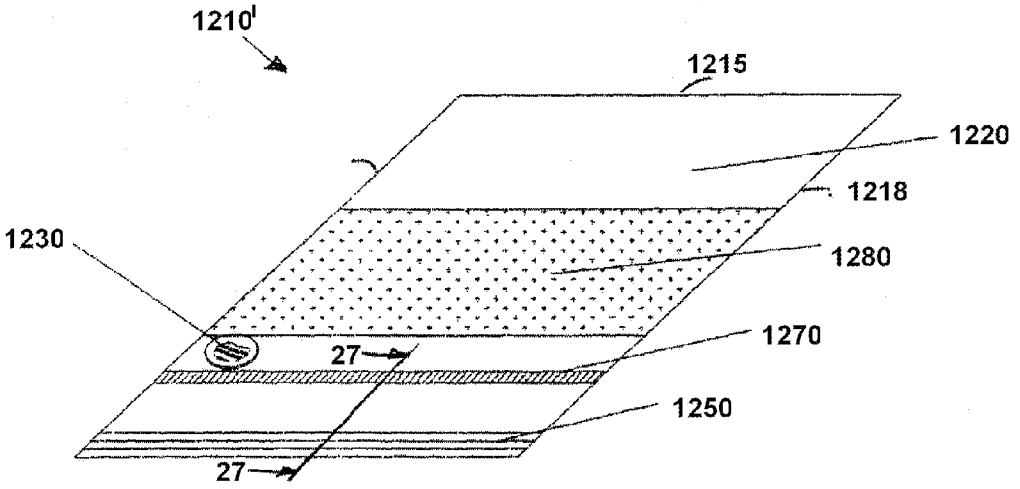

Figure 37

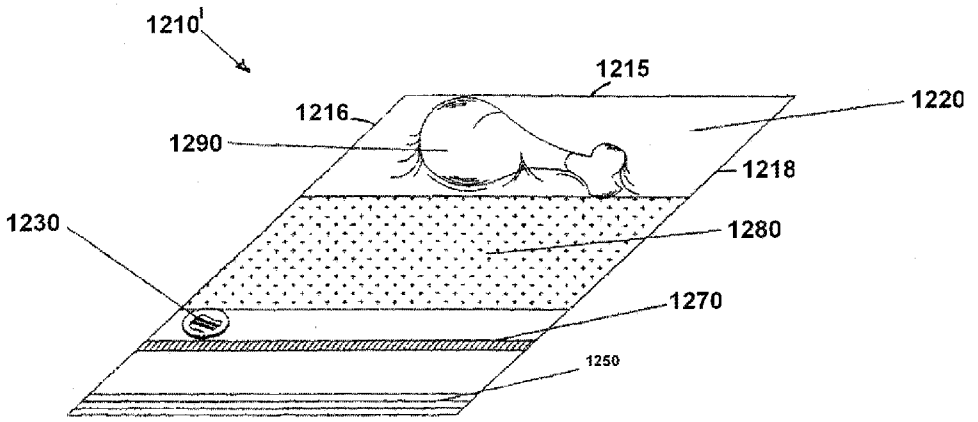

Figure 38

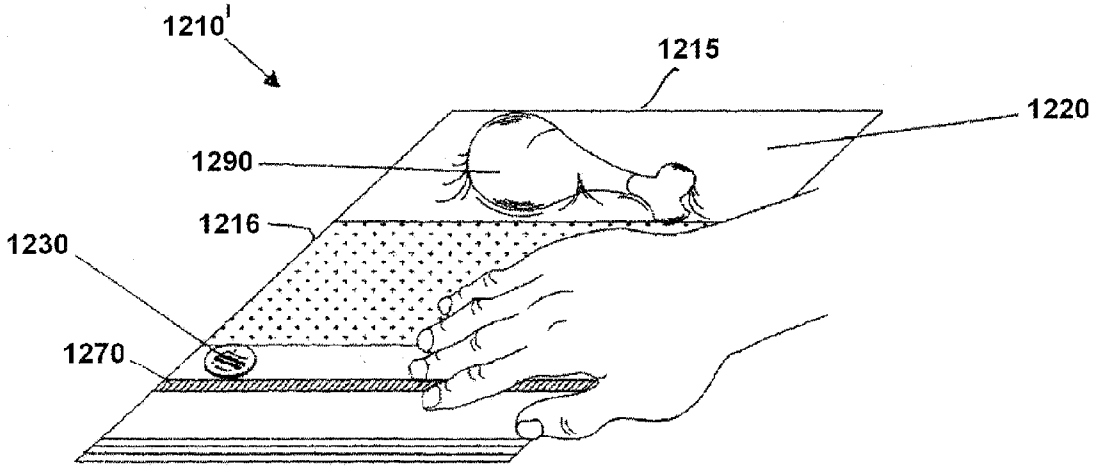

Figure 39

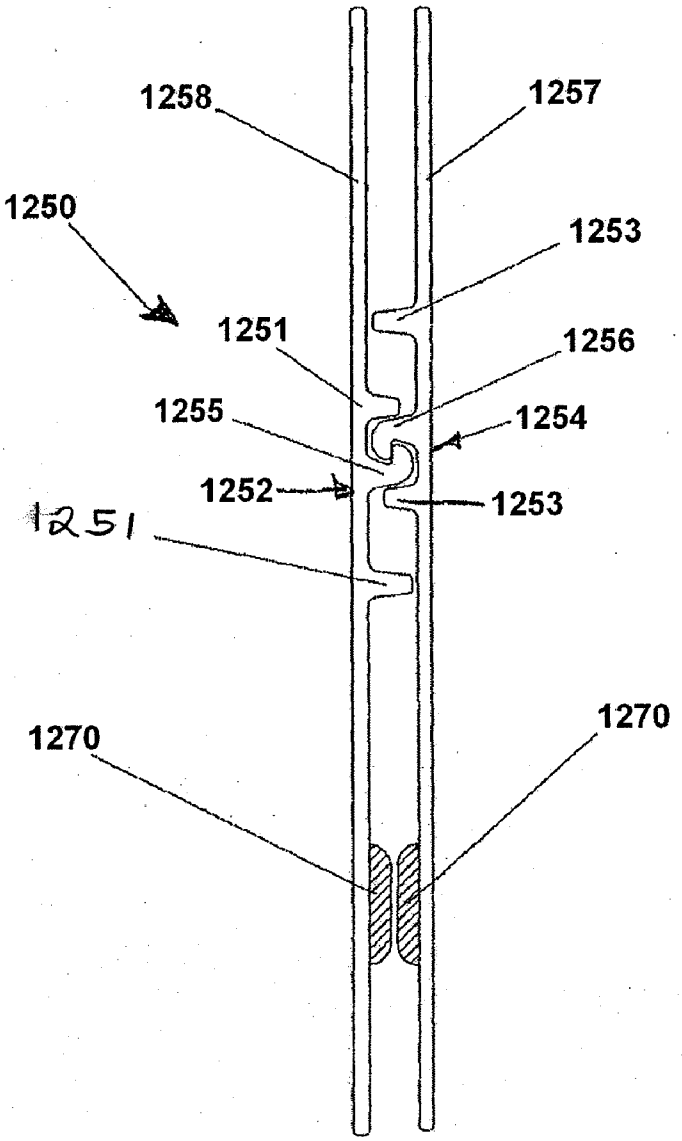
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Figure 40

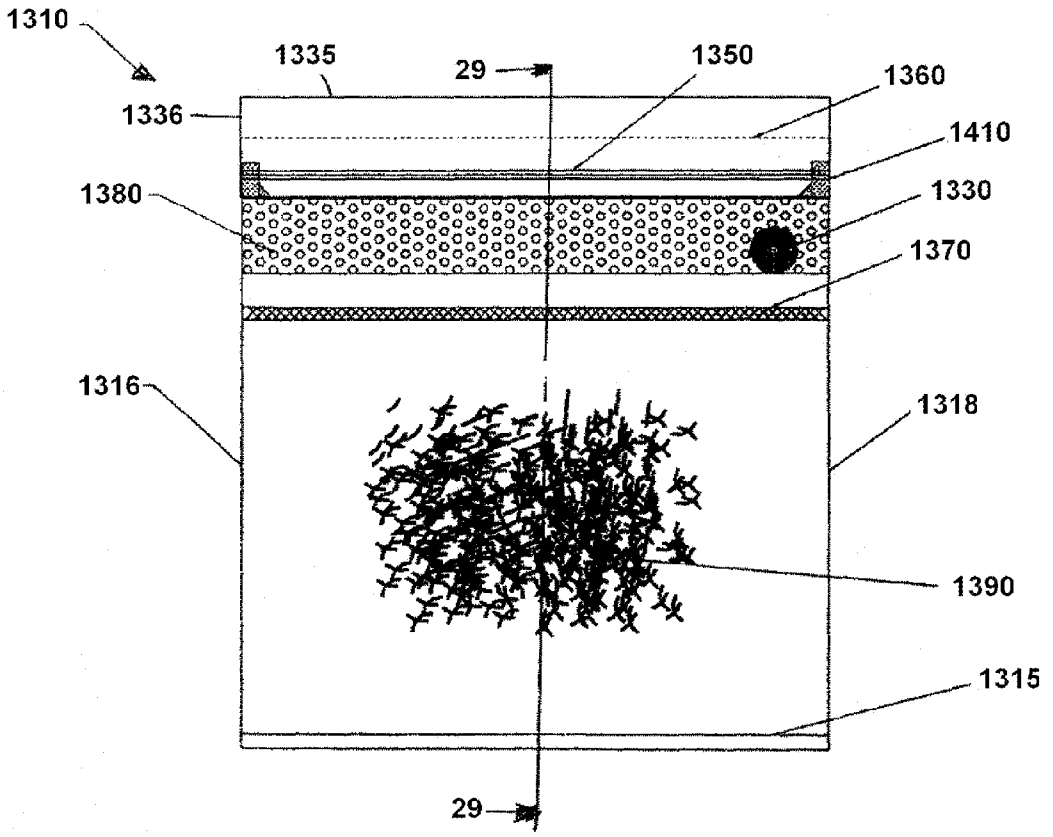
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Figure 41

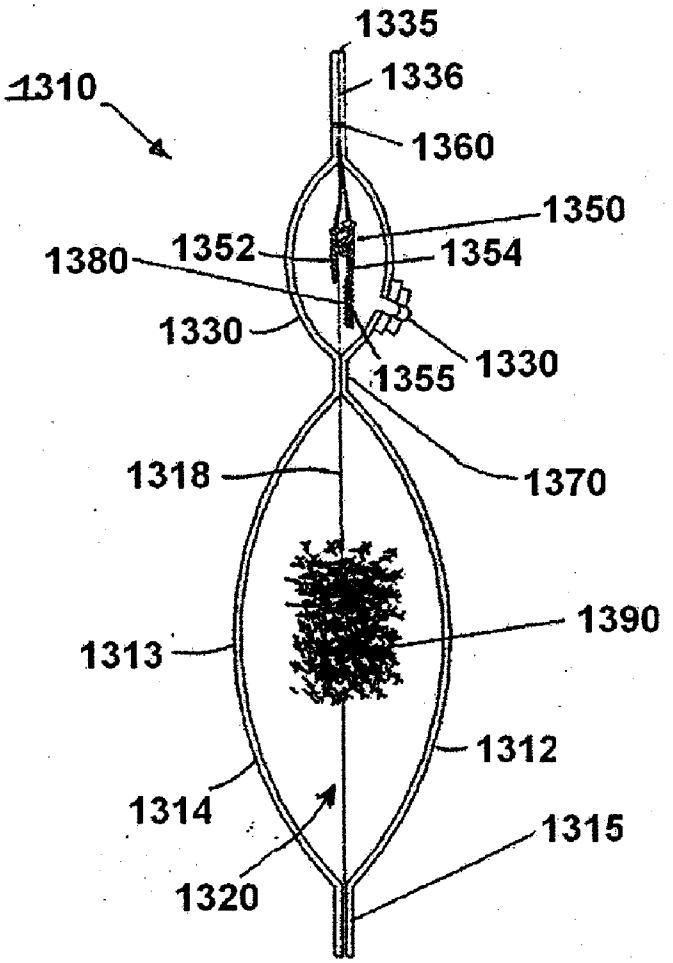
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Figure 42

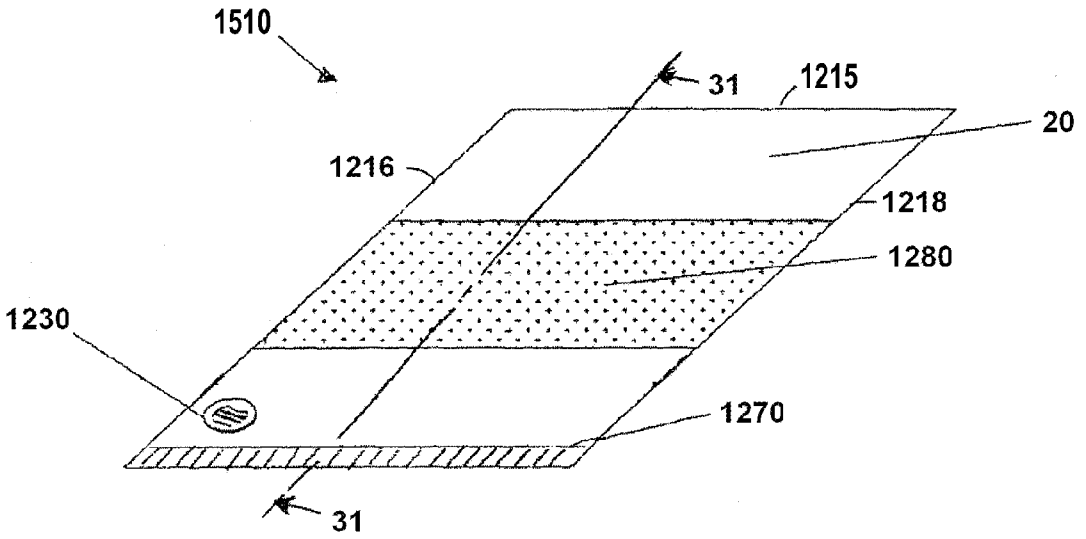
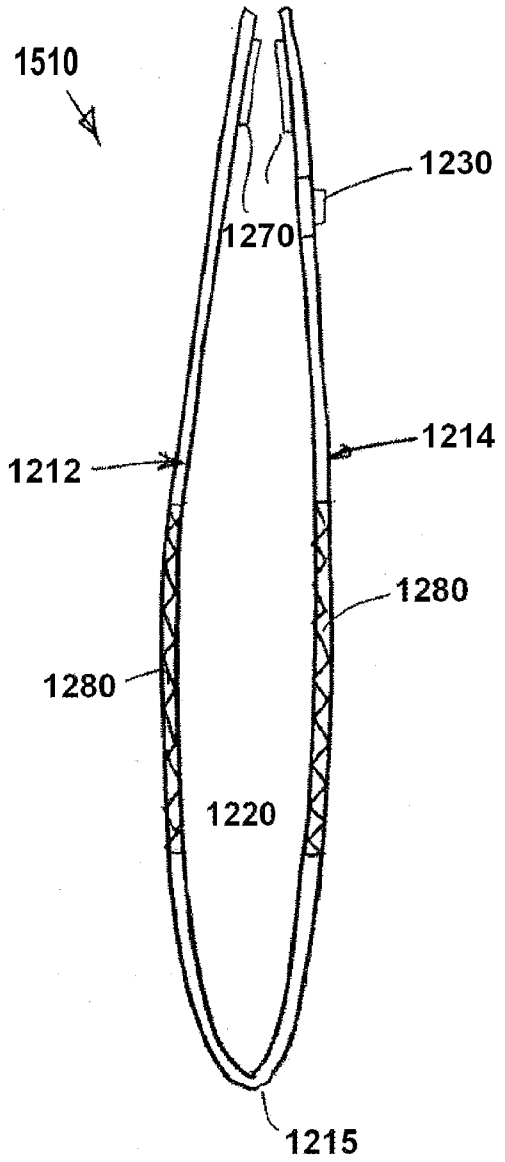


Figure 43



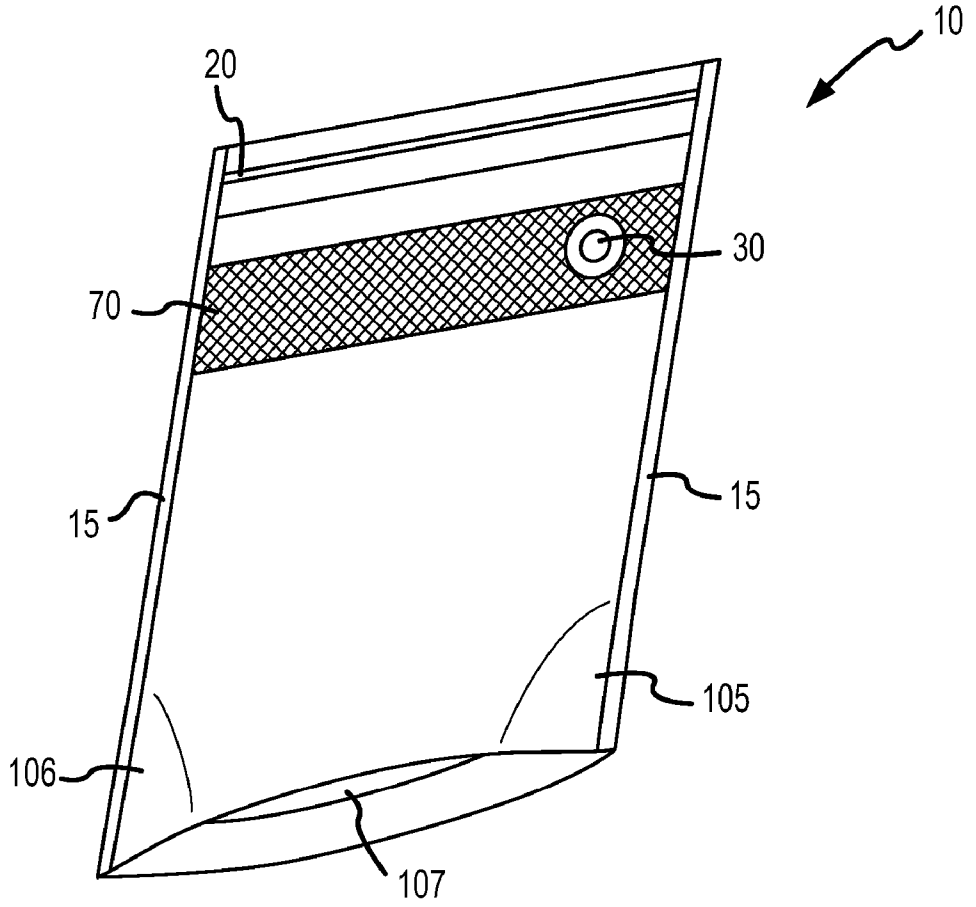


FIG.44

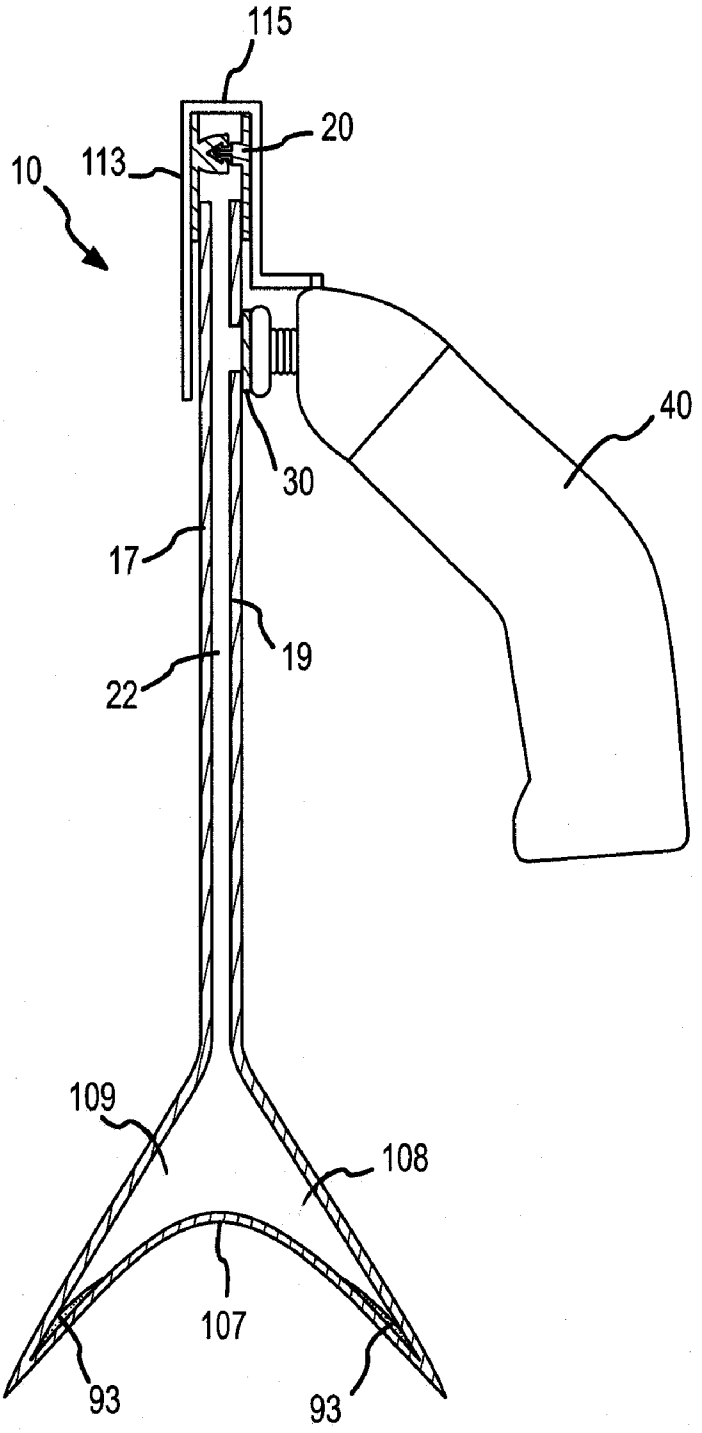


FIG.45

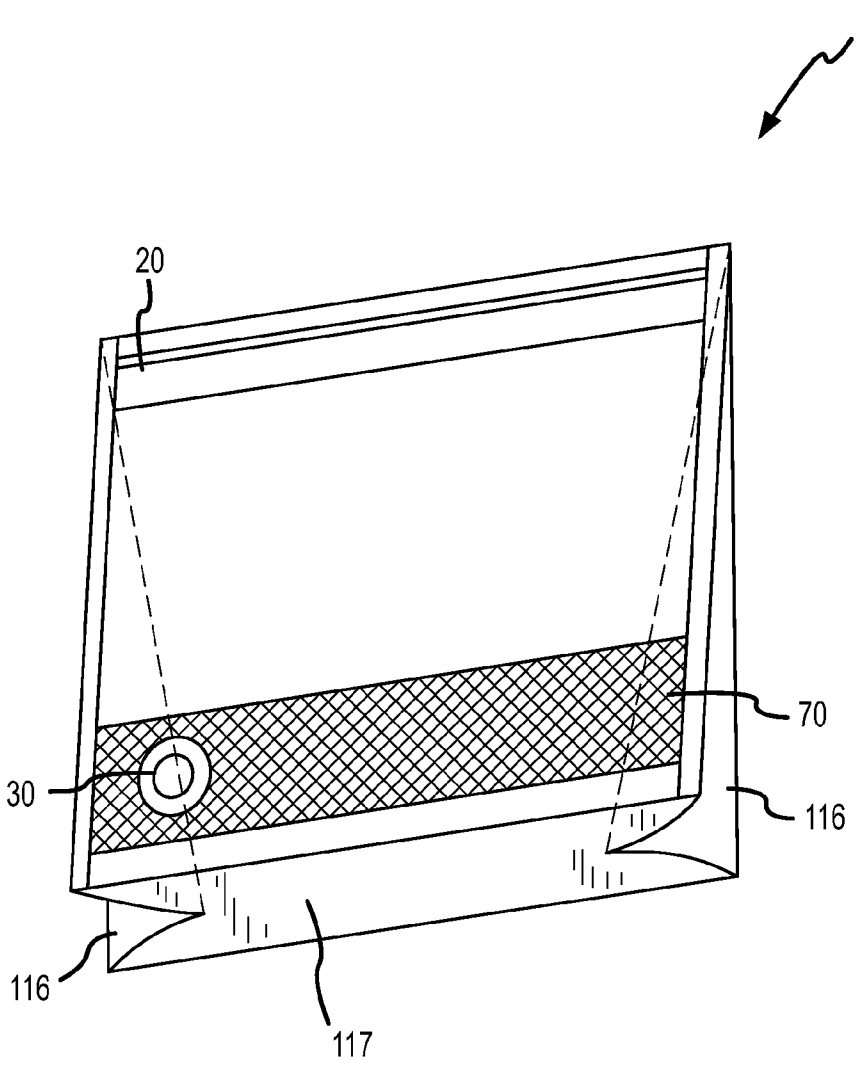


FIG.46

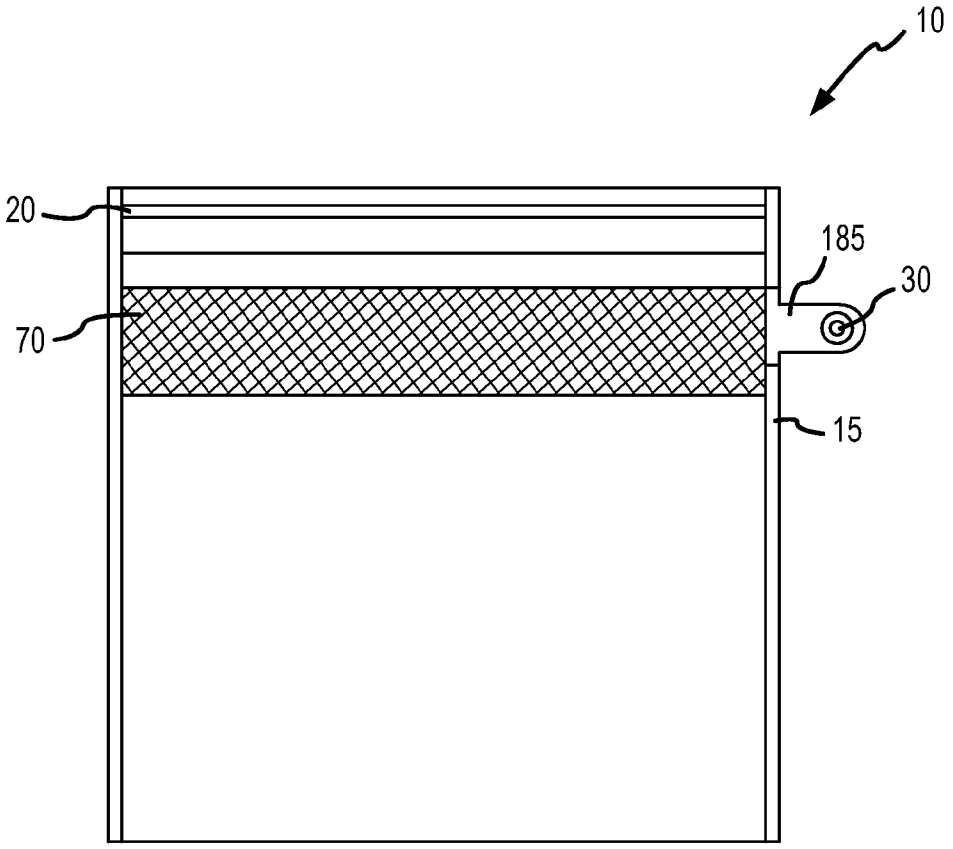


FIG.47

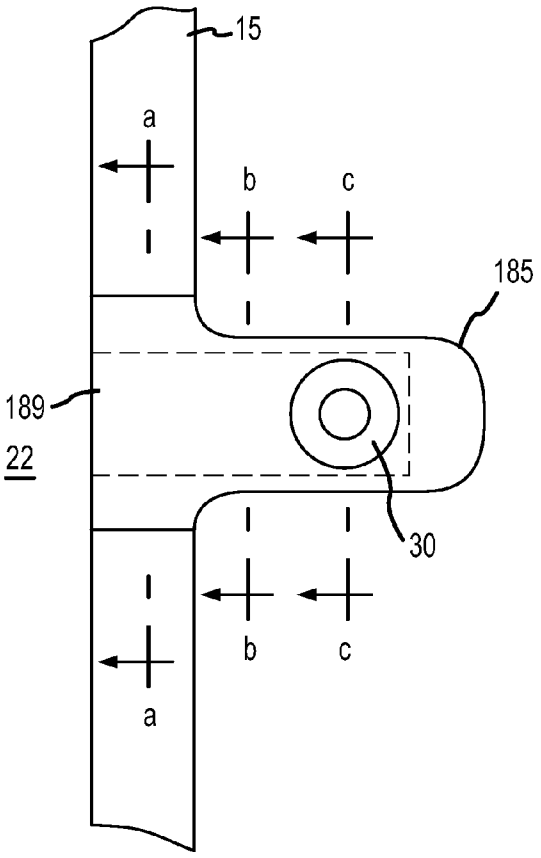


FIG.48

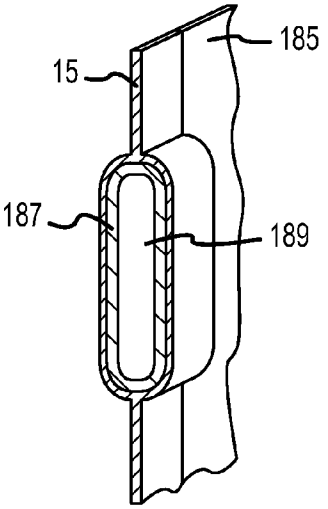


FIG.49a

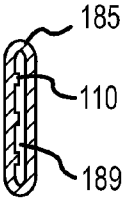


FIG.49b

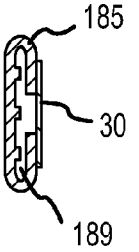


FIG.49c

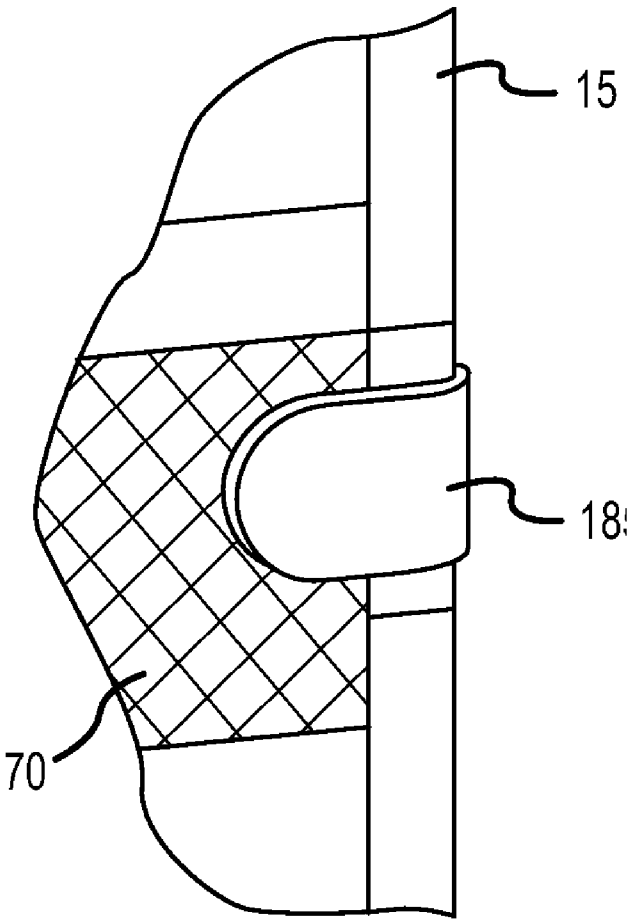


FIG.50

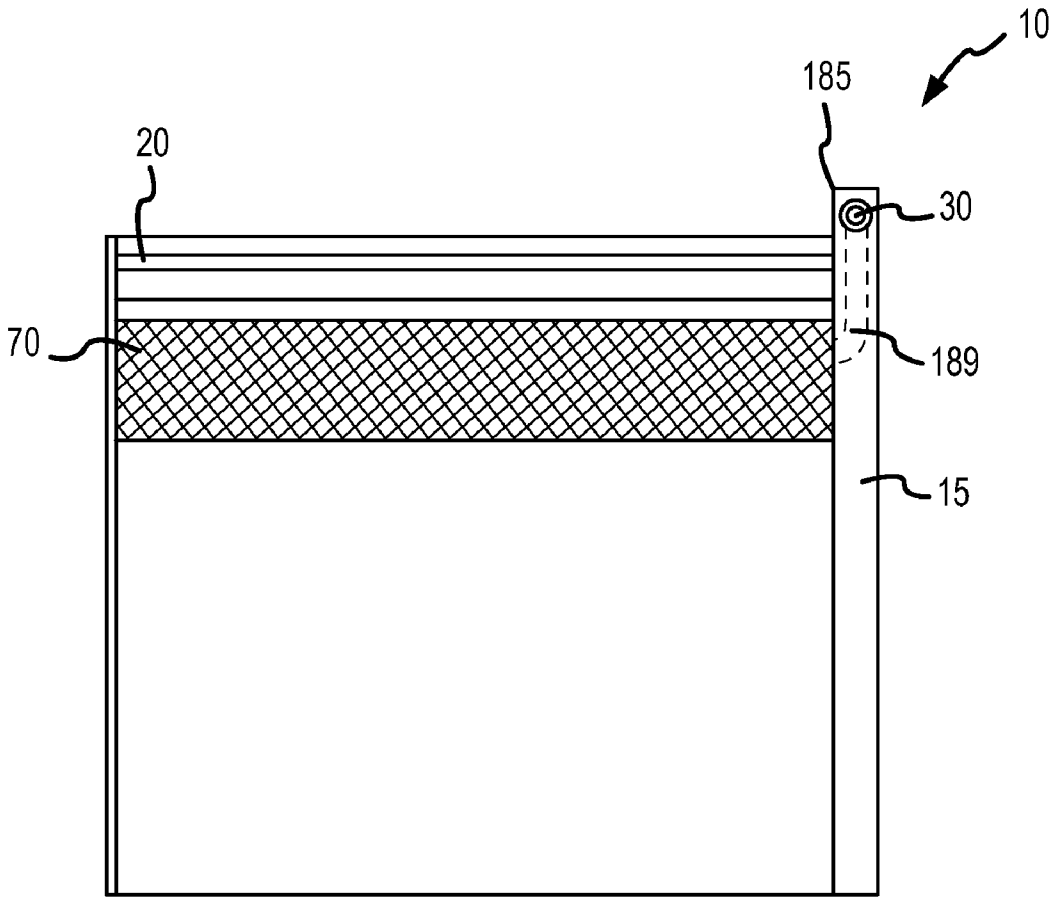


FIG.51

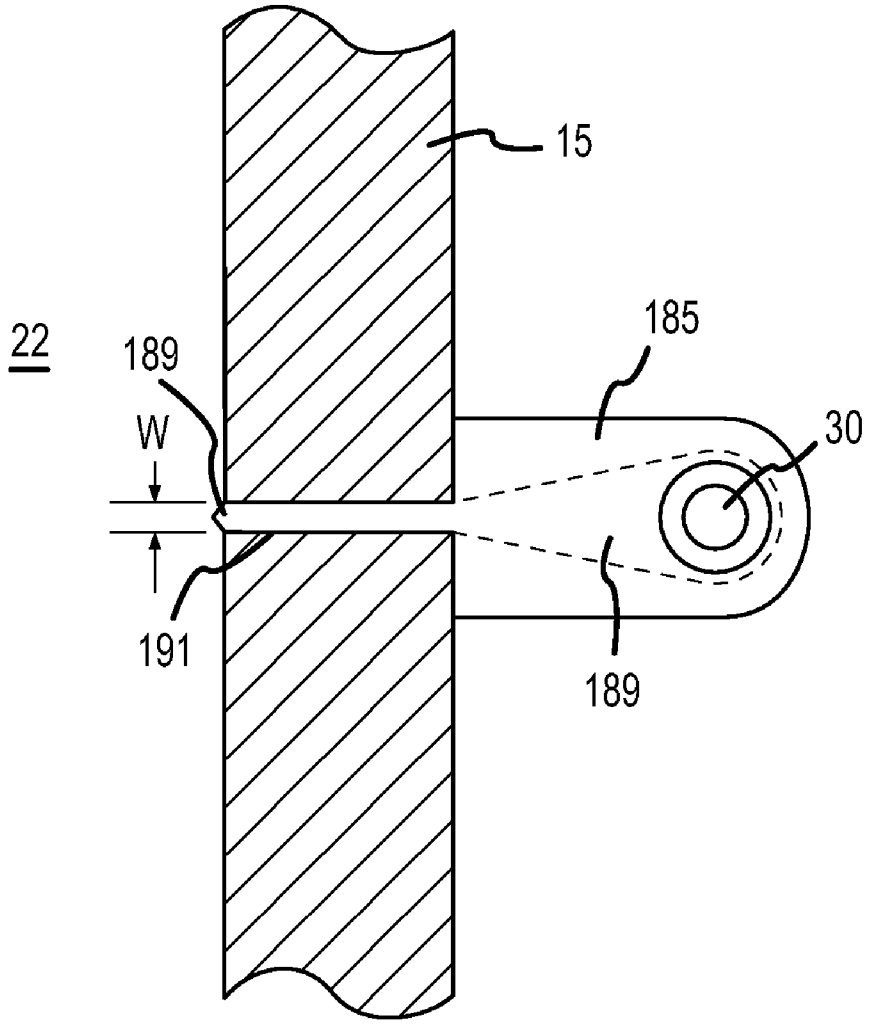


FIG.52

POLYMERIC PACKAGE WITH RESEALABLE CLOSURE AND VALVE AND METHODS RELATING THERETO

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation-in-part of U.S. patent application Ser. Nos. 11/627,893 and 11/627,909, both of which were filed Jan. 26, 2007, and each of which is a continuation-in-part of U.S. patent application Ser. No. 11/186,131, filed Jul. 20, 2005, which claims priority under 35 U.S.C. § 119(e) to U.S. Provisional Patent Application Nos., 60/590,858, filed on Jul. 23, 2004, 60/602,685 filed on Aug. 19, 2004, and 60/609,920, filed on Sep. 15, 2004. This application is also a continuation-in-part of U.S. patent application Ser. No. 11/382,143, filed May 8, 2006, which claims priority under 35 U.S.C. § 119(e) to U.S. Provisional Patent Application Nos., 60/729,778, filed Oct. 24, 2005, 60/736,810 filed Nov. 14, 2005, and 60/763,063 filed Jan. 27, 2006. Each of the above patent applications is incorporated herein by reference in its entirety.

FIELD OF THE INVENTION

[0002] The present invention relates to a flexible, inexpensive, evacuable storage device optionally having a resealable opening and a caulking composition. The present invention also relates to a vacuum storage device and a system for vacuum storage.

BACKGROUND OF THE INVENTION

[0003] Flexible, sealable storage devices, such as consumer storage bags are commonly used to store items such as, but not limited to, food. These devices typically have a bag body made from a thin, flexible plastic material and include a resealable closure. While inexpensive and easy to use, these devices also allow a quantity of air to be enclosed with the item being stored. Air within a storage device containing food is not desirable as the air reacts with the food and will cause spoliation. Additionally, when storage bags are placed in a below freezing environment, typically in a freezer, "freezer burn" may also damage the food items. Freezer burn occurs when moisture is drawn from the food item and forms ice, typically on the food item. Freezer burn is reduced when entrapped air is substantially eliminated from the storage device with concomitant contouring of the bag wall of the storage device around the food item. Consequently, less moisture will be drawn out of the food item.

[0004] Prior systems that evacuate flexible storage bags typically include a large device having a vacuum unit and a heat sealer structured to bond sheets of plastic together. The user typically cuts a length of plastic from a roll of plastic and uses the heat sealer to form the plastic into a bag with an opening. After an item has been placed in the bag through the opening, the vacuum unit is then used to remove substantially all of the air from the bag and the bag is sealed. Such systems have various disadvantages, including high materials costs due to once-use methodology and rigorous sealing requirements.

SUMMARY OF THE INVENTION

[0005] In view of the foregoing background, there is need for a vacuum storage system utilizing a portable vacuum device and optionally a resealable, evacuable, flexible storage device. Resealable closure systems are known, for example, interlocking profiles used in plastic bags. However, in a typical resealable closure, engagement of the sealing structures is rarely perfect, leaving gaps in the profile seal. Moreover, during manufacture of reclosable devices, frequently seals at the ends of the reclosable device distort the engaging portions of the closure which can also provide an unsealed region in the closure. As a consequence of these and other problems associated with resealable closures, a bag utilizing a resealable closure may not be air tight. Consequently when a bag utilizing a resealable closure is subjected to a pressure differential, for example, when it is evacuated or when there is a partial pressure differential of a particular gas between the inside and outside of the bag, gas can leak across the resealable closure and enter, or leave the sealed package through the closure. Thus, gases, for example, air may penetrate into a sealed bag, or for example water vapor may leak from a sealed bag. This is especially a problem when the interior of the bag is at a different pressure than the ambient air, for example, when the bag is under a vacuum, or when the bag contains a gas at a higher or lower partial pressure than the gas is present in the ambient.

[0006] Accordingly, there is a need for a flexible, resealable storage device wherein the sealing structure has a resistance to fluid permeability under a pressure differential across the sealing device. Moreover, there is a need for a pre-made, inexpensive, flexible, reusable storage device having a valve structured to operate with a portable vacuum pump. Additionally, there is a further need for a resealable closure that provides for reduction in entrapped air, a flexible bag wall to maintain item conformance, and an air tight seal providing reduced permeability to oxygen, atmosphere intrusion or transmission, bacteria, molds and/or other sources of contamination when used in combination with vacuum pump technology. There is also a need for vacuum pump technology which provides for portability and utility in evacuating a food storage flexible package.

[0007] These needs, and others, are met by the present invention that provides in one aspect a vacuum system comprising: (a) a vacuum pump having a suction side; (b) a vacuum conduit in fluid communication with said vacuum pump suction side, the vacuum conduit comprising: (i) a gas/liquid separator means; (ii) at least one vacuum valve optionally comprising a caulking compound (also termed herein a caulking composition) disposed therein; (iii) optionally, a standoff structure; (iv) optionally one or more quick-connect means; (c) an evacuable package defining an interior space in fluid communication with said vacuum conduit; and (d) optionally, a resealable closure defining an opening of said evacuable package. In some preferred embodiments the vacuum pump is portable.

[0008] In one embodiment, the vacuum system comprises a kit containing in one assembly the vacuum pump, a liquid separator means and a portion of the vacuum conduit terminated with one portion of a quick-connect means, and in a second assembly, an additional portion of the vacuum conduit comprising a cooperating portion of the quick-connect means, a vacuum valve, an evacuable package and optionally a stand-off structure. In some preferred embodiments, the vacuum pump assembly is provided in a break-apart form wherein one portion of the system comprises the

vacuum pump integrally assembled with some portions of the vacuum conduit, for example, the liquid/gas separator, terminating in a quick-connect means, and the remaining portions of the vacuum conduit are provided integral with the evacuable storage package, for example, a vacuum valve having a cooperating quick-connect means arranged in the remaining portion of the vacuum conduit and integral with the flexible package and optionally a stand-off structure.

[0009] In one embodiment the standoff structure comprises an embossed plastic sheet having a channel side and a projection side. In one embodiment the standoff structure is positioned within the evacuable package having the channel side in fluid communication with the vacuum conduit and vacuum valve, and having the projection side proximal to the interior space defined by the package.

[0010] In another aspect, the present invention provides an evacuable storage package defining an interior space, a vacuum valve in fluid communication therewith, optionally a standoff structure in fluid communication with the vacuum valve, and optionally a resealable closure defining an opening into the interior space of the package wherein the resealable closure comprises at least one set of interengaging profiles.

[0011] In some embodiments the resealable closure defining the opening of the inventive storage package comprises at least one pair of opposed interengaging profiles wherein at least one of said interengaging profiles has associated therewith a portion of the closure comprising a low density sealing material, thus providing a region in the closure having a high degree of conformance with the associated interengaging portion of the closure and as well as insuring that when the closure is end-sealed, a gap free seal is provided. In some embodiments the sealing material comprises a portion of one or both interengaging profiles. In some embodiments the sealing material comprises a portion of the flange or of a post of the closure. In some embodiments the sealing material comprises the entire length of the profiles. In some embodiments the sealing material comprises selected portions of the profiles, such as the periphery portions of one or both of the interengaging profiles. In some embodiments the portion of the closure comprising the sealing material is made from a polyolefin material having a density of not more than 0.925 g/cm^3, as defined according to ASTM D1505-03, entitled "The standard test method for density of plastics by density gradient techniques", Book of Standards Volume 08.01 (2005). In some embodiments the resealable closure is used in conjunction with a caulking composition. In one embodiment of the present invention, the caulking composition acts to fill one or more voids between the interengaging profiles, thus reducing the infiltration of ambient into the storage device when it is sealed and placed in a condition of reduced pressure.

[0012] In some embodiments the caulking composition is disposed proximal to the interengaging closure profiles such that it is infiltrated into any gaps existing in the closure when the closure profiles are engaged.

[0013] In some embodiments the caulking composition comprises a mixture suitable for at least incidental contact to food items. In some embodiments the caulking composition maintains chemical stability throughout a temperature range suitable for food storage and packaging.

[0014] In one embodiment the caulking composition is positioned on the first male profile and/or the first female profile. In one embodiment the caulking composition is placed proximal to the interengaging profiles of the closure in one or more positions that permit it to infiltrate gaps formed in the seal formed by the interengaged profiles, for example, as applied to the ends of the closure near the crush area, and as a continuous bead along the closure either on or between one or more of the interengaging profile portions.

[0015] In another embodiment of the present invention, the resealable closure device further comprises at least a second set of interengaging profiles positioned in close proximity and parallel to the first set of interengaging profiles. In one embodiment having multiple pairs of interengaging profiles, in addition to sealing material being positioned between each of the engaged portions of the interengaging profiles, a bead of caulking composition may be positioned within the space separating the substantially parallel sets of interengaging profiles.

[0016] In one embodiment, the caulking composition comprises constituents such that it maintains integrity, without decomposition, throughout a temperature range suitable for packaging and food storage. Temperatures suitable for packaging and food storage typically range from approximately −10° F. to approximately +160° F. In one embodiment the caulking composition comprises liquid silicone and a filler, e.g. fumed silica, in proportions to provide a grease with a grease consistency number of approximately 2.0, as characterized by National Lubricating Grease Institute (NGLI) standards. In one embodiment, the caulking composition comprises a soy adhesive, such as Pro-Cote® soy polymer available from DuPont™. In another embodiment, the caulking composition comprises soy oils, for example, those available from Cargill™. Industrial Oils & Lubricants. In one embodiment the caulking composition comprises two reactive constituents, each residing on a different portion of the closure, such that when the interengaging profiles of the closure are engaged the two constituents are admixed, providing a reaction product which infiltrates at least one void defined by the interengaging closure profiles.

[0017] In one aspect, a vacuum storage bag is provided, the vacuum storage bag including an evacuable package, a vacuum valve integral with the evacuable package, and a plurality of barriers positioned within the evacuable package. The evacuable package comprises at least one polymeric sheet sealed about a portion of its periphery defining first and second panels, an opening and an interior space. Each of the plurality of barriers interconnects a portion of the first panel of the evacuable package to a portion of the second panel of the evacuable package. The plurality of barriers also at least assist in defining at least one channel, which is in fluid communication with the vacuum valve and the interior space of the evacuable package.

[0018] The plurality of barriers may be of various configurations. For example, the plurality of barriers may be intermittently located about at least a portion of the periphery of the vacuum valve. In one approach, the vacuum valve is integral with the first panel and the plurality of barriers are intermittently located about at least a portion of the periphery of the vacuum valve. The plurality of barriers may be arranged such that the plurality of barriers define various portions of shapes, such as at least a portion of an ellipse. The plurality of barriers may be interconnected with the evacuable package in any suitable manner. For example, the

plurality of barriers may be integral with both the first and second panels of the evacuable package, such as via heat sealing of the first panel to the second panel. Thus, in this embodiment, each of the plurality of barriers may define an uninterrupted span from the first panel to the second panel. In another embodiment, the plurality of barriers may comprise a polymeric material bonded to the interior space of the evacuable package.

[0019] In one approach, the plurality of barriers are located proximal at least a portion of the perimeter of the evacuable package. In a particular embodiment, a first portion of the plurality of barriers may be substantially parallel to a lateral side of the evacuable package. In turn, a second portion of the plurality of barriers may be substantially orthogonal to the same lateral side of the evacuable package. In one embodiment, the first portion of the barriers may be interconnected to the second portion of barriers, such as when it is desired to define a corner channel portion of the evacuable package.

[0020] In a particular embodiment, the plurality of barriers may define a sealing line, and the sealing line may be transverse to a lateral side of the evacuable package. In one embodiment, the sealing line is visible from the exterior of the evacuable package and facilitates visual confirmation of a fill level for the evacuable package. In a related embodiment, a visual indicator (e.g., color or text) may be co-located with the sealing line and this visual indicator may facilitate visual confirmation of a fill level for the vacuum storage.

[0021] The plurality of barriers may be utilized in conjunction with various other components of the vacuum storage bag. In one approach, the storage bag may include a standoff structure positioned within the evacuable package. In one embodiment, the stand-off structure may be located proximal the plurality of barriers. In a particular embodiment, at least some of the plurality of barriers may overlap with the stand-off structure. That is, the plurality of barriers and stand-off structure may be co-located at various portions of the evacuable package. In a particular approach, at least one channel fluidly interconnects the stand-off structure and the vacuum valve, such when the plurality of barriers and/or the geometrical structures of the stand-off structure define the channel.

[0022] In one approach, the evacuable package may include a resealable closure comprising at least one set of interengaging profiles that facilitate repeated opening and closing of the evacuable package. This resealable closure may define the opening of the evacuable package. In a particular embodiment, the plurality of barriers may be located between the resealable closure and the vacuum valve. In a related approach, the storage bag may include a grease composition associated with the resealable closure. This grease composition may be positioned on the resealable closure to facilitate sealing of the evacuable package.

[0023] In another aspect, the vacuum storage bag may include materials to facilitate wicking of liquids contained therein. In one approach, the vacuum storage bag includes a wicking material in fluid communication with the interior space of the evacuable package. In one embodiment, this wicking material may be interconnected to at least one of the first panel and second panel of the evacuable package. For example, the wicking material may be adhesively bonded to at least one of the first panel and second panel of the evacuable package. In another embodiment, to restrict movement of the wicking material within the evacuable package, a plurality of barriers, such as those described above, may be utilized. In one embodiment, the vacuum storage bag includes a plurality of barriers proximal the periphery of the wicking material and surrounding at least a portion of the wicking material. In this embodiment, the plurality of barriers may define a wicking section of the evacuable package and restrict movement of the wicking material from this wicking section. As described above, the plurality of barriers may at least assist in defining at least one channel, this at least one channel being adapted to facilitate liquid communication between the interior space of the evacuable package and the wicking material. The wicking material may be any suitable material adapted to adsorb or absorb liquids, such as desiccants, cellulose-based materials, and others.

[0024] As noted above, the resealable closure generally facilitates repeated opening and closing of the evacuable package. The resealable closure may also include structures to facilitate removal of air from the evacuable package. In one aspect, the resealable closure may include a first flexible flange interconnected to the first panel of the evacuable package, the first flexible flange including a first interengaging profile. The resealable closure may further include a second flexible flange interconnected to the second panel of the evacuable package and opposite the first flexible flange. The second flexible flange may include a top portion and a skirt portion, the skirt portion being interconnected to/integral with the top portion. The top portion of the second flexible flange may include a second interengaging profile adapted to restrictably engage the first interengaging profile. The skirt portion of the second flexible flange may include one or more structures for facilitating removal of gases from the evacuable package. In one embodiment, the skirt portion may include a stand-off structure (e.g., an embossed structure). Thus, gases proximal the resealable closure may be more readily removed from the evacuable package via the channels of the skirt portion stand-off structure.

[0025] In another embodiment, the skirt portion may include a vacuum valve interconnected therewith. In this regard, the vacuum valve may be integral with the skirt portion of the second flexible flange. To facilitate attachment of the vacuum valve, the skirt portion of the second flexible flange may include differing materials and/or thicknesses relative to the top portion of the second flexible flange. For example, the top portion of the second flexible flange may include low density polyethylene (LDPE) and the skirt portion may include medium density polyethylene (MDPE). In a related approach, the top portion of the second flexible flange may include a first thickness and the skirt portion may include a second thickness that is greater than the first thickness. In a particular embodiment, the top portion comprises a thickness of not greater than about 3 mil, and the skirt portion of the second flexible flange comprises a thickness of at least about 10 mils. In another related approach, the ratio of the thickness of the skirt portion to the thickness of the top portion may be tailored to facilitate interconnection of structures to the skirt portion of the second flexible flange while restricting the thickness of the top portion. For example, the ratio of the thickness of the skirt portion to the thickness of the top portion may be at least about 1.5:1.

[0026] The skirt portion may also include non-structured portions. For example, the skirt portion may include non-textural portions adjacent a lateral edge of the skirt portion. These non-textured portions may facilitate sealing of the evacuable package about the periphery.

[0027] Methods for forming resealable closures comprising structures are also provided. In one approach, the method includes the step of feeding at least a portion of the resealable closure through an anvil and an embossing wheel, and contacting at least some of the skirt portion of the resealable closure with an embossing portion of an embossing roll. The embossing roll may include structures that facilitate development of the stand-off structure (e.g., protrusions and/or cavities). The method may also include the step of contacting the skirt portion of the resealable closure with a non-embossed portion of the embossing roll to facilitate production of non-embossed portions of the skirt portion of the resealable closure.

[0028] In another aspect, a docking ring may be utilized to facilitate interconnection of the vacuum pump to the valve. In one approach, an evacuable package includes at least one polymeric sheet sealed along a portion of its periphery, thereby defining an evacuable package comprising an opening and an interior space. The evacuable package further includes a vacuum valve disposed on a first panel of the evacuable package, the vacuum valve being in fluid communication with the interior space and defining a sealable passage through which fluids may be drawn. The evacuable package also includes a docking ring coupled thereto. In a particular embodiment, the docking ring includes an outer surface, an inner surface, an upper surface and a lower surface. The lower surface of the docking ring is attached to the first panel of the evacuable package, and the inner surface of the docking ring circumscribes the vacuum valve, thereby defining a passageway communicable with the vacuum valve and an engagement end of a pump. In one embodiment, this passageway is aligned relative to the vacuum valve so as to align the engagement end of the pump with the vacuum valve when the engagement end of the vacuum valve is interconnected with the docking ring. In one embodiment, the docking ring includes a first complementary aligning feature for receiving a second complementary aligning feature of the pump. In this regard, the first complementary feature may restrict receipt of the engagement end of the pump into the receiving cavity unless the second complementary feature is aligned with the first complementary feature. In a particular embodiment, the first complementary aligning feature is one of a male member and a female member, and the second complementary feature is the other of the male member and the female member. In one embodiment, the first complementary feature is disposed on at least one of the outer surface and the upper surface of the docking ring.

[0029] In one approach, the docking ring may include one or more features adapted to restrictively engage one or more features of the pump so as to facilitate interconnection between the pump and the valve. In one embodiment, the docking ring includes at least one thread adapted to receive and restrictively engage an engagement feature of the pump. In a particular embodiment, the thread(s) is/are disposed on the inner surface of the docking ring. The thread(s) may also/alternatively be disposed on the outer surface of the docking ring. In one embodiment, the thread(s) include a downward taper, which may facilitate engagement of the pump and valve.

[0030] In one approach, additional features may be included proximal the docking ring and/or sidewall(s) of the bag to facilitate evacuation of the evacuable package. In one embodiment, at least one rib is attached to a first panel of the evacuable package, the rib(s) being disposed within the passageway of the docking ring and extending towards the upper surface of the docking ring. In one embodiment, the rib(s) is/are positioned with the passageway so as to physically engage a portion of the engagement end of the pump when the engagement end of the pump is interconnected with the docking ring. In turn, when the engagement end of the pump is in interconnected with the docking ring, a portion of the engagement end of the pump may physically engage the rib(s), and the rib(s) may be pushed toward a second panel of the evacuable package, thereby defining a space between the vacuum valve and the second panel of the evacuable package.

[0031] As may be appreciated, various aspects, approaches and/or embodiments noted hereinabove may be combined to yield various different configurations of the vacuum storage system and corresponding methods. These and other aspects, advantages, and novel features of the invention are set forth in part in the description that follows and will become apparent to those skilled in the art upon examination of the following description and figures, or may be learned by practicing the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0032] FIG. **1***a* is a front view of one of embodiment of a storage device.

[0033] FIG. **1***b* is a side, cross-sectional view of one embodiment of a storage device.

[0034] FIGS. **2-7** and **33***a*-**33***b* are cross-sectional views of embodiments of resealable closure devices including a caulking composition and/or sealing material.

[0035] FIG. **8** (perspective view) depicts one embodiment of a clamping means.

[0036] FIG. **9** is an exploded view of one embodiment of a vacuum valve assembly.

[0037] FIGS. **10***a*-**10***c* are front views of embodiments of stand-off structures.

[0038] FIGS. **11***a*-**11***c* are isometric views of embodiments of stand-off structures.

[0039] FIGS. **12***a*-**12***b* are cross-sectional views of embodiments of stand-off structures.

[0040] FIGS. **13***a*-**13***d* are isometric views of embodiments of a storage device in an unfolded condition.

[0041] FIG. **14** is an isometric view of one embodiment of a storage device in a folded condition.

[0042] FIG. **15** is a cross-sectional view of the storage device depicted in FIG. **14** along section line **9**-**9**.

[0043] FIGS. **16***a*-**16***b* illustrate the front view of one embodiment of a closing clip and the side view of the closing clip.

[0044] FIG. **17** is a side view of one embodiment of an end stop.

[0045] FIG. **18**(*a*) is an isometric view of one embodiment of a suction cup tip of a portable vacuum pump

[0046] FIG. **18**(*b*) depicts a side cross-sectional view of the suction cup tip depicted in FIG. **18**(*a*).

[0047] FIG. **19** is an exploded, cross-sectional view of one embodiment of a liquid separator.

[0048] FIG. **20** is an exploded, isometric view of one embodiment of a liquid separator.

[0049] FIG. **21** is an isometric view of one embodiment of an evacuable bag in use, wherein the bag includes a stand-off structure and vacuum valve assembly.

[0050] FIGS. **22***a*-**22***d* illustrate various embodiments of an evacuable package having a barrier structure.

[0051] FIG. **23** is a perspective view of one embodiment of an evacuable package having a vacuum valve assembly interconnected with a resealable closure.

[0052] FIG. **24** is a perspective view of an evacuable package having a resealable closure that includes a stand-off structure.

[0053] FIGS. **25***a*-**25***c* illustrate various views of one embodiment of a resealable closure including a stand-off structure and an interconnected vacuum valve assembly.

[0054] FIG. **26** is a perspective view of one embodiment of a process for producing a resealable closure having a stand-off structure.

[0055] FIG. **27***a* is a perspective view of one embodiment of a process for producing a resealable closure having a vacuum valve interconnected therewith.

[0056] FIG. **27***b* is a perspective view of one embodiment of a process for producing a plurality of resealable closures, each having a vacuum valve interconnected therewith.

[0057] FIG. **28** illustrates one embodiment of an evacuable package including a wicking material.

[0058] FIG. **29** illustrates one embodiment of a docking ring-pump interconnection arrangement.

[0059] FIG. **30** is a perspective, partial cut-away view of the docking ring of FIG. **29**.

[0060] FIG. **31** is a top view of the docking ring of FIG. **29**.

[0061] FIG. **32***a* is a cross-sectional, side view of one embodiment of a docking ring-pump interconnection arrangement.

[0062] FIG. **32***b* is a cross-sectional, side view of one embodiment of a docking ring-pump interconnection arrangement.

[0063] FIG. **33***a* is cross-sectional view of one embodiment of a male profile.

[0064] FIG. **33***b* is a cross-sectional view of one embodiment of a male profile engaged with a female profile.

[0065] FIG. **34** is a perspective view of another embodiment of a polymeric package.

[0066] FIG. **35** is a cross-sectional view of the package of FIG. **34** taken along line **23**-**23**.

[0067] FIG. **36** is a perspective view of another embodiment of a storage device.

[0068] FIG. **37** is a perspective view of the storage device of FIG. **36** illustrated with a food item contained therein.

[0069] FIG. **38** is a perspective view of the storage device of FIGS. **36** and **37** illustrating a method of closing the adhesive seal of the storage device.

[0070] FIG. **39** is a cross-sectional view of the storage device of FIG. **36** taken along line **27**-**27**.

[0071] FIG. **40** is a perspective view of another embodiment of a storage device.

[0072] FIG. **41** is a cross-sectional view of the storage device of FIG. **40** taken along line **29**-**29**.

[0073] FIG. **42** is a perspective view of another embodiment of a storage device in accordance with the present disclosure.

[0074] FIG. **43** is a cross-sectional view of the storage device shown in FIG. **42** taken along line **31**-**31**.

[0075] FIG. **44** is a perspective view of one embodiment of a storage device having a stand-up feature.

[0076] FIG. **45** is a cross-sectional, side view of the storage device of FIG. **44** with a pump interconnected therewith.

[0077] FIG. **46** is a perspective view of one embodiment of a storage device comprising gussets.

[0078] FIG. **47** is a perspective view of one embodiment of a storage device comprising a vacuum valve located external to the side panels of the storage device.

[0079] FIG. **48** is a close-up view of the extension portion of the storage bag of FIG. **47**.

[0080] FIG. **49***a* is a cross-section view of the FIG. **48** taken along line a.

[0081] FIG. **49***b* is a cross-section view of the FIG. **48** taken along line b.

[0082] FIG. **49***c* is a cross-section view of the FIG. **48** taken along line c.

[0083] FIG. **50** is a perspective view of one embodiment of a flexible extension portion of a storage device.

[0084] FIG. **51** is a perspective view of another embodiment of a storage device comprising a vacuum valve located external to the side panels of the storage device.

[0085] FIG. **52** is a cross-sectional view of an extension comprising a needle for insertion into a sidewall of a storage device.

DETAILED DESCRIPTION

[0086] The present invention is now discussed in more detail referring to the drawings that accompany the present application. In the accompanying drawings, like and/or corresponding elements are referred to by like reference numbers. In one embodiment of the present invention, a vacuum system is provided that may include a portable

vacuum pump and an evacuable package in communication through a vacuum conduit. The evacuable package may optionally include a stand-off structure and a resealable closure having a caulking composition disposed thereon. In one embodiment, the resealable closure comprises interlocking profiles on which the caulking composition is disposed to provide a gas permeation resistant seal in the resealable closure. The vacuum conduit provides communication between the portable pump and the storage portion of the evacuable bag, wherein the vacuum conduit comprises at least a valve assembly and optionally a stand-off structure. In one embodiment, the stand-off structure provides a means to substantially eliminate the incidence of trapped air within the storage area of the evacuable package. Each of the aspects of the interlocking profiles, the caulking composition, the vacuum valve assembly, the stand-off structure, and the vacuum pump are now discussed in greater detail.

[0087] Referring to FIGS. **1***a*-**1***b*, in one embodiment, the flexible, resealable storage device **10** comprises a flexible material **12** shaped as an evacuable package **14** (also referred to as evacuable bag). The flexible material **12** is preferably a plastic sheet **16**, such as polyolefin. The sheet **16** is, preferably, rectangular. In one embodiment, the sheet **16** is folded over upon itself and two lateral sides **15** are sealed adjacent to the periphery to provide an opening **18** to a storage space **22**. As such, the periphery of the bag **14** is substantially sealed. In another embodiment of the present invention, the entire periphery of the evacuable bag **14** is heat sealed.

[0088] In one embodiment of the present invention, the evacuable package **14** may be a multilayer bag comprising an inner sealant layer and a barrier/strength layer. The inner sealant layer may comprise LDPE (low density polyethylene) or LLDPE (linear low density polyethylene) and the barrier/strength layer may comprise Nylon, PP (polypropylene) or PET (Polyester). As used herein the term "low density" in conjunction with polyethylene denotes a material having a density of no greater than 0.925 g/cm^3, as defined by ASTM standard D-15005-03, wherein the density may be adjusted with the addition of ethylene vinyl acetate (EVA). Another example of a multilayer bag and a method of forming a multilayer bag is described in U.S. Pat. No. 4,267,960, titled "Bag For Vacuum Packaging of Meats or Similar Products", filed Aug. 29, 1979, which is incorporated herein by reference.

[0089] In the embodiments of the present invention in which the evacuable bag **14** has an opening **18** to the storage space **22**, the bag opening **18** includes a resealable closure **20**. The resealable closure **20** may include a set of interlocking profiles. In one example, the set of interlocking profiles **21** may include resilient, selectively engaging male and female profiles **21** (tongue-and-groove closure), structured to seal the opening **18**. It will be appreciated that there are numerous interlocking profile geometries known, which can be employed in the present invention.

[0090] With reference to FIG. **2**, in one embodiment, the selectively engaging profiles of closure **21** (also termed herein sometimes for convenience as interengaging profiles) are positioned along two opposing flexible flanges (also termed herein sometimes for convenience as "panels") including a first flange **50** and a second flange **52**. As shown in FIG. **2**, the two flanges **50**, **52** may include a raised surface **68**, **69** on the inside surface of the panels disposed outside the resealable closure. The first flange **50** includes a male profile having at least one protrusion **54** that extends laterally across the bag **14**. The second flange **52** includes a female groove **60** defined by at least two protrusions (**56**, **58**).

[0091] Still referring to FIG. **2**, there may be multiple protrusions **62**, **64**, extending from the first and second flanges **50**, **52** and forming multiple corresponding male profiles and female grooves (also termed herein sometimes for convenience as a female profile). The protrusions **54**, **56**, **58**, **62**, **64** are generally formed from a polyolefin material with a density of not less than approximately 0.925 g/cm^3, preferably those described as a High Melt Index polyolefin (HMI). More specifically, the protrusions **54**, **56**, **58**, **62**, **64** may comprise High Melt Index (MI) Polyethylene materials and Ethylene Vinyl Acetate (EVA) Copolymers, particularly those having a vinyl acetate content of from about 4 weight percent to about 12 weight percent. In addition, portions of the interengaging profiles and/or surrounding closure structures may include one or more features comprising low melt index or Ultra Low Density (ULD) Polyolefins. As used herein, the term "Ultra Low Density" denotes a density no greater than approximately 0.925 g/cm^3. As will be appreciated, the density may be adjusted with the addition of EVA. At least one protrusion **54**, **56**, **58**, **62**, **64** may include a bead **66** of polyolefin material with a density of not more than approximately 0.925 g/cm^3. In some embodiments a bead **66** of softer material is disposed at the tip of a protrusion **54**, **56**, **58**, **62**, **64** and is structured to engage the opposing flanges **50**, **52**. The bead **66** of softer material is hereafter referred to as a bead of sealing material **66**.

[0092] As discussed above, the bead of sealing material **66** may have a lower density than the protrusions **54**, **56**, **58**, **62**, **64**. During the engagement of resealable closure **20**, the lower density and hence more compliant bead of sealing material **66** conforms to the geometry of the higher density and more rigid material comprising the portion of the closure against which the head of the profile abuts upon engagement. The softer material abuts the closure with increased conformance to the abutting surface, advantageously providing a more effective seal against fluid exchange between the interior of the package and the ambient, for example, the intrusion of gas and the exterior atmosphere into the evacuable bag **14**. Regardless of the above described embodiments, the resealable closure **20** and its associated interlocking structures can comprise resilient materials of varying densities and melt indexes. Accordingly, embodiments within the scope of the present disclosure, including combinations of materials selected to achieve sealant conditions under vacuum and reduced temperature conditions.

[0093] The protrusions forming the male profile may also be referred as a profile having a male head. The protrusions defining the female profile (also referred to as a groove) may also be referred to as profile having a female head and a fillet positioned to provide a groove. The resealable closure **20** may further include a closing clip structured to ensure the complete engagement of the closure profiles. Specifically, the closure clip functions to ensure that the interengaging profiles are engaged as the clip is disposed along a first

direction, but does not affect the engagement of the profiles when disposed along the direction opposite to that of the first direction.

[0094] Regardless of the specific details of construction or interaction of the profiles **21** of resealable closure **20**, the interengaging portions of the resealable closure of the present invention preferably includes a caulking composition **99** (also sometimes referred to as sealing compound **99**). For example, the caulking composition **99** may be positioned on at least one protrusion **54** on the first flange **50** and/or at least one protrusion **56**, **58** on the second flange **52** of the closure **21**, wherein the caulking composition **99** assists in creating an air tight seal to the storage space **22**. Specifically, during engagement of the first and second flange protrusions **54**, **56**, **58**, **62**, **64** of the male and female profiles, the caulking composition **99** sits within the groove **60** to ensure an air-tight seal of the male and female profile. Specifically, the caulking composition **99** is positioned to infiltrate the void space defined between the engaged interlocking profiles **21** of the resealable closure **20**. Without being bound by theory, it is believed that that the caulking composition **99** acts to infiltrate gaps between the male and female profiles, thus reducing the infiltration of ambient into the storage device **10** when it is placed in a condition of reduced pressure.

[0095] Accordingly, the resealable closure **20** is prepared before sealing by introducing the caulking composition **99** onto one or more members of the interengaging profiles **21** or onto a surface of the resealable closure **20** proximal to the interengaging profiles **21**, by methods such as deposition or injection, where it will be distributed during the interlocking process within incipient gaps left between the interengaging profiles **21** after interlocking. Alternately, prior to sealing the resealable closure **20**, the caulking composition **99** can be placed proximal to known areas in which the sealing profile is prone to exhibit gapping, for example, the ends of the male and female profiles **21** at the bag's periphery. The portions of the male and female profiles at the bags periphery are engaged by crush seal, which is often the site of leakage in the closure device. The voids caused by the crush seal engagement at the male and female profile may be filled with the sealing compound **99** to substantially reduce the incidence of leakage.

[0096] The caulking composition **99** may comprise any material that provides a selectively reversible air tight seal between the interlocking profiles **21** of the resealable closure **20**, in which the caulking composition **99** is suitable for at least incidental contact to food items inserted through the opening to the storage space. Preferably, the caulking composition **99** maintains its chemical structure throughout the operable temperature range of storage device **10**. The term "suitable" for at least incidental contact denotes compounds that are eligible for compliance with or equivalent to being in compliance with the Federal Food Drug and Cosmetic Act (Title 21 of the Code of Federal Regulations) standards for being generally recognized as safe (GRAS). The term "at least incidental contact" includes at least the unanticipated contact of food items being passed through the opening on which the closure strip is positioned as the food items are being inserted into the storage space. Although indirect contact between the caulking composition and the food items is preferred, in some embodiments the caulking composition may more directly contact the food, so long as the interaction between the food items and the caulking composition is in accordance with the regulations of the Federal Food Drug and Cosmetic Act.

[0097] It is noted that caulking compositions that are suitable for at least incidental food contact may be consistent with the classification of materials for "lubricants with incidental food contact" according to Title 21 of the United States Code of Federal Regulations § 178.3570 (revised as of Apr. 1, 2003), so long as the materials are consistent with the Federal Food Drug and Cosmetic Act and have an operable temperature range suitable for food storage and packaging. In some preferred embodiments, the operable temperature range of the storage device is defined as the temperature range that the storage bag is typically subjected to in shipping, packaging and food storage applications, for example, food storage applications ranging from approximately −10° F. to approximately 160° F. One example of a caulking composition that is listed as a "lubricant with incidental food contact" according to Title 21 Of the United States Code of Federal Regulations § 178.3570 and has an operable temperature range suitable for food storage and packaging comprises dimethylpolysiloxane. Another example is soy-based oils, for example, those distributed by Cargill Corp., and soy-based adhesives, for example, those distributed by DuPont as Pro-Cote™ soy polymers.

[0098] In order to provide an air tight seal, in some embodiments the caulking composition **99** should be selected to have a work penetration of about 290 to about 340, in which the work penetration is measured at 60 strokes and a temperature of 77° F. in accordance with the National Lubricating Grease Institute (NLGI) system for rating greases by penetration and ASTM D217-97 titled "Standard Test Methods for Cone Penetration of Lubricating Grease" (1997). The NLGI classifies greases by consistency numbers as measured by worked penetration. In a preferred embodiment, the caulking composition **99** has a work penetration on the order of about 290 to about 340 and is classified as a grease having a NLGI consistency number equal to approximately 2. Although it is preferred that the caulking composition **99** have NLGI consistency number equal to approximately 2, greases having lower or higher NLGI consistency numbers may alternatively be utilized, so long as the caulking composition **99** may be applied to the interengaging profiles **21** of the resealable closure **20** using conventional injection methods and that the caulking composition **99** is contained within the resealable closure **20** when exposed to temperatures consistent with food storage container applications.

[0099] One example of a caulking composition **99**, which meets the above requirements is silicone grease. Silicone grease is an amorphous, fumed silica thickened, polysiloxane-based compound. Silicone grease is formed by combining liquid silicone with an inert silica filler. One example of liquid silicone that may be utilized in forming silicone grease having suitable work penetration properties is polydimethylsiloxane having a specific gravity on the order of about 0.973 and a viscosity greater than about 300 centistokes, preferably on the order of about 350 centistokes. Fumed silica, an inert silica filler, has a chain-like particle morphology and when incorporated into liquid silicone forms three dimensional networks that trap the liquid and effectively increases the liquid's viscosity.

[0100] Silicone grease may provide desired work penetration values and temperature range to produce an adequately air tight seal between the interengaged profiles **21** of the resealable closure **20** by selecting the proper proportions of inert silica filler to liquid silicone. The proportion of inert silica filler to liquid silicone is generally selected to ensure that separation of liquid from solid in the silicone grease is substantially eliminated throughout the operable temperature range of the bag as applied to food container storage. In general, proportions of inert silica filler to liquid silicone are selected to yield a silicone grease viscosity that would not inhibit the application of the silicone grease onto the resealable closure **20**. The proportion of inert silica filler to liquid silicone is preferably less than approximately 30% by weight. Even more preferably, the proportion of inert silica filler to liquid silicone is on the order of 6% by weight.

[0101] In one highly preferred embodiment, the silicone grease is provided by Clearco™ Silicone Grease (food grade) provided by Clearco Products Co., Inc., Bensalem Pa. Clearco™ Silicone Grease (food grade) has a work penetration value of about 290 to about 340, in which the work penetration is measured at 60 strokes and a temperature of 77° F. Clearco™ Silicone Grease (food grade) comprises 94% dimethylpolysiloxane and 6% fumed silica by weight % and has a specific gravity on the order of about 1.1. Clearco™ Silicone Grease may be utilized at temperatures ranging from approximately −40° F. to approximately 400° F. without chemical decomposition and is therefore well suited for food storage applications. In this embodiment of the present invention, the silicone grease **99** may be positioned along at least one of the male and female profiles **21** of the resealable closure **20**, wherein incidental contact to food being inserted into the storage space of the storage device typically accounts for less that 5.0 ppb of silicone grease being incorporated into the food item being stored. In one embodiment, at least about 0.01 grams of caulking composition per linear foot of resealable closure is utilized, such as at least about 0.03 grams of caulking composition per linear foot of the resealable closure. Generally, not greater than about 0.07 grams of caulking composition is used per linear foot of the resealable closure.

[0102] In another embodiment of the present invention, the caulking composition **99** may comprise a soy adhesive. Similar to the above-described caulking compositions, the soy adhesive preferably is suitable for incidental food contact and has an operable temperature range suitable for food packaging and storage. One example of a soy adhesive is Pro-Cote® soy polymer, which is available from DuPont™. In general, soy adhesive is prepared by extracting and refining soy oil from dehulled, flaked soybeans. The extracted material contains isolated soy protein in its native or globular form; and soluble, low molecular weight sugars. The extract is then processed in a controlled pH environment at tightly controlled temperatures to uncoil globular native soy protein into smaller units, and fractionating the material into uniform polymer fractions. The isolated protein molecule fractions are highly reactive and are chemically treated to modify the protein chain to provide desired adhesive properties. Unmodified soy-based oils may also be employed as a caulking composition. An alternative source of soy based oils and adhesives is the soy products available from Cargill™ Industrial Oils & Lubricants.

[0103] As will be appreciated, numerous reactive materials may also be employed as caulking compositions. In particular, materials which may be coated as separate reactants onto separate interengaging portions of the closure which are admixed upon engagement of the interengaging portions of the closure may be utilized. Accordingly, when the closure parts are engaged the admixed reactants will be combined, reacting and forming in-situ a caulking composition which is infiltrated into a least one void defined by the engaged interengaging portions of the closure. One example of such a system comprises a free-flowing reactive polymer liquid and a liquid cross-linking agent, each coated on separate portions of the closure. In this example, when the closure is engaged, the separate portions contact, admixing the polymer and cross-linking agent, providing a viscous, cross-linked polymer caulking composition which is infiltrated into voids in the closure defined by the interengaged portions of the closure. Other examples include the provision of a free-flowing liquid and a gelling agent on separate portions of the closure to form a viscous caulking agent upon admixture, and the provision of a two-part adhesive material which react to form an adhesive upon admixture, for example, formation of a pressure-sensitive adhesive. Other types of chemical transformations will also be apparent to those of skill in the art.

[0104] Referring now to FIG. **3**, in another embodiment of the present invention, the resealable closure structure includes at least two sets of opposed interlocking profiles **150** respectively having interengaging profiles **24**, **28** and **23**, **26** selectively engaged in sealing the opening **18** to the storage space **22**. Each pair of interengaging profiles comprise a geometry having an asymmetrical head **32**, **36** extending from a stem **43**. Each asymmetrical head is preferably offset on the stem to complimentarily fit into the void space defined by stem **43**, post **38** and asymmetrical head **36**. The term "asymmetrical head" denotes that the centerline of the head portion of the profile is substantially offset from the centerline of the stem portion of the profile to which it is affixed.

[0105] The void space defined by stem **43**, post **38** and asymmetrical head **36** comprises a groove configured to selectively engage the asymmetrical head **32** of the corresponding interengaging profile **23**, **24**. Stem **43**, post **38** and asymmetrical head **36** are spaced to selectively engage corresponding interengaging profiles **23**, **24**. The spacing between the post **38** and stem **43**, and between post **38** and asymmetrical head **36** is sufficiently narrow to bias asymmetrical head **32** toward asymmetrical head **36** when profiles **23**, **24**, **26**, and **28** are engaged. The biased positioning of the asymmetrical head **36** in combination with the spacing of post **38** to correspond to the width of asymmetrical heads **23**, **24** defining a grove that reversibly interlocks asymmetrical head **23**, **24** into the groove when the profiles are engaged.

[0106] Still referring to FIG. **3**, the resealable closure further includes a caulking composition **99** positioned on at least one of asymmetrical heads **23**, **24**, **26**, and/or **28**. The caulking composition **99** may be deposited or injected onto the profiles **23**, **24**, **26**, and/or **28** insuring that an air tight seal is obtained when the profiles **23**, **24**, **26**, **28** are interengaged under varying temperature and pressure conditions. The caulking composition **99** may be positioned along the entire length of the opposed interlocking profiles **150** or only a portion of the opposed interlocking profiles

150, such as the end portions of the opposed interlocking profiles **150** at the bag's periphery.

[**0107**] In another embodiment, shown in FIG. **4** (without showing certain reference numbers for clarity), the resealable closure **20** includes a bead of caulking composition **100** in the gap between two parallel sets of opposed interlocking profiles **150**. In application, as each set of opposed interlocking profiles **150** are interengaged, the bead of caulking composition **100** contacts the ends of each set of opposed interlocking profiles **150**. In a preferred embodiment, the bead of caulking composition **100** fills the void separating the parallel sets of opposed interlocking profiles **150** and contacts the female profiles grooves **26**, **28** in each set of opposed interlocking profiles **150**, thereby creating a seal. In a further embodiment of the present invention, the resealable closure structure **20** includes a bead of caulking composition **100** in the gap between two parallel sets of opposed interlocking profiles **150** and additional caulking composition **99** between at least one set of interengaging profiles (**23**, **26**) and (**24**, **28**).

[**0108**] In another embodiment, shown in FIG. **5** (without showing certain reference numbers for clarity), the resealable closure **20** includes a bead of sealant material **45** in the gap between two parallel sets of opposed interlocking profiles **150**. The sealant material **45** is a composition of high EVA & high MI polymers selected to provide a high-conformance region in the closure, as described above. Additionally, a bead of sealant material **53**, **55** may be applied to the distal tip of each male profile **23**, **24**. In general, suitable sealant material comprises compositions of polymers as described above or alternatively ultra-low density (ULD) polymers (as defined above) with EVA additives at a 2% or higher loading. Beads of sealant material **45**, **53**, **55** ensure that an air-tight barrier exists between substantially the entire length of interengaging profiles (**23**, **26**) and (**24**, **28**) when the resealable closure structure **20** is engaged. A bead of sealing material **45** may also be positioned on both sides of a single set of opposed interlocking profiles **150**, as depicted in FIG. **6**. Similar to the above described embodiments, a bead of caulking composition may be employed between parallel sets of opposed interlocking profiles and/or the caulking composition may be employed between at least one set of interengaging profiles (**23**, **26**) and/or (**24**, **28**).

[**0109**] Referring now to FIG. **7**, in yet another embodiment of the present invention, the resealable closure **20** may be provided by resealable closure strips having independent and substantially symmetric profiles **160**, **162**, **164**, **166**, unlike the embodiments above utilizing asymmetrical structures. Accordingly, the heads (described below) are not offset relative to the stems. That is, each symmetric element **160**, **162**, **164**, **166** includes a head **170** and a stem **172**. The head **170** is disposed generally symmetrically on the stem **172**. The symmetric profiles **160**, **162**, **164**, **166** are disposed with two elements of each panel flange **112**, **114** and are spaced and configured so that the gap between adjacent elements defines a void region which has a shape corresponding to the shape of the symmetric profiles **160**, **162**, **164**, **166**. This embodiment further includes outer elements **180**, **182**. The outer elements **180**, **182** are offset toward the symmetric profiles **160**, **162**, **164**, **166** and bias the symmetric profiles **160**, **162**, **164**, **166** into each other. The outer elements **180**, **182** are sized and shaped to correspond to the outer most two symmetric profiles **160**, **166**. Similar to the above described embodiments, a bead of caulking composition may be employed between one or more of the symmetric profiles **160**, **162**, **164**, **166**. Additionally or alternatively the profiles may incorporate a region of sealing material, as described above, for example, by co-extrusion of the sealing material with the base material comprising the profile. Resealable closures **20**, interengaging profiles **21**, and profile members are well known, and a variety of configurations are useable in accordance with the principles of this disclosures; see, for example, U.S. Pat. Nos. 6,524,002; 6,152,600; 5,839,831; and 5,252,281, each of which is incorporated herein by reference in its entirety.

[**0110**] Additionally, although not depicted in FIG. **7**, multiple sets of opposing interlocking profiles may be employed incorporating independent and substantially symmetric profiles, wherein a bead of caulking composition may be position between two sets of opposing interlocking profiles. The bead of caulking composition may be employed separately or in conjunction with caulking composition disposed between each of the symmetric profiles. It is noted that the present invention is not limited to profile geometries disclosed above, as any profile geometry may be utilized and is within the scope of the present disclosure, so long as the geometry of the profiles is compatible with the caulking composition in a manner that provides an air-tight seal.

[**0111**] In another embodiment, at least one of the interlocking profiles may comprise a male profile containing the caulking composition **99** disposed on surfaces thereof. In this regard, when the male profile is engaged with the female profile, the caulking composition **99** may be at least partially displaced from the male profile and at least partially into the incident gaps between the male profile and female profile, thereby sealing such gaps. For example, and with reference to FIGS. **33***a* and **33***b*, a male profile **124** may be interconnected with the second flange **52** and include caulking composition **99** disposed between two arms **101** thereof. As the male profile **124** and female profile **123** are engaged, arms **101** and fingers **102** of the male profile **124** are pressed toward one another, thereby displacing the caulking composition **99** contained therebetween. More particularly, the arms **103** of the female profile **123** engage the fingers **102** of the male profile **124**, thereby depressing the arms **101** towards one another as the female profile **123** and male profile **124** engage. In turn, the caulking composition **99** between the arms **101** of the male profile **124** is displaced from the male profile **124** and into gaps between the male profile **124** and female profile **123**. The amount of caulking composition **99** included with the male profile **124** should be of sufficient volume so that when the female profile **123** and male profile **124** are engaged, as illustrated in FIG. **33***b*, the caulking composition **99** is at least partially displaced from its location between the two arms **101** of the male profile **124**, and into filling incident gaps between the male profile **124** and female profile **123**.

[**0112**] Referring to FIG. **8**, in one embodiment of the present invention, the resealable closure **20** comprises a opening and a clamping means. The clamping means may comprise a clip **175** that is separate from the evacuable bag **14**, in which the clip **175** seals the opening **18** of the bag **14** in clamp seal engagement. In another embodiment the clamping means may further include a mandrel **171**, wherein the opening **18** of the evacuable bag **14** is rolled around the

mandrel **171** and the clip **170** compresses the portion of the evacuable bag **14** rolled about the mandrel in clamp seal engagement.

[**0113**] Referring back to FIG. **1***a*, the storage device **10** further includes a vacuum conduit having one end in fluid communication with the interior of the storage space **22** and which includes a vacuum valve assembly **30**. The vacuum valve assembly **30** is in fluid communication with the storage space **22** and defines a sealable passage through which liquids and/or gases may be drawn. The vacuum valve **30** is often a one-way evacuation valve, allowing fluid flow therethrough in only one-direction; generally, the direction is from storage space **22** of evacuable package **14** to the exterior of evacuable package **14**.

[**0114**] Referring to FIG. **9**, in one embodiment the vacuum valve assembly **30** includes a base **31** having a flat surface **33** with at least one opening **37** there through, a resilient valve element **35**, and an alignment device **39**. The base **31** is sealingly engaged to the evacuable bag **14**. The valve element **35** is generally flat and disposed adjacent to the flat surface **33**. The alignment device **39** is coupled to the base **31** and is structured to bias the valve element **35** against the flat surface **33**. The valve element **35** is structured to move between a first position, wherein the opening **37** is open, and a second position, wherein the opening **37** is sealed. The valve element **35** is normally biased to the second position. The base **31** has a defined shape, such as, but not limited to a concave disk. The outer surface **41** of the base **31** is a generally flat torus.

[**0115**] The vacuum valve **30** can be any suitable valve, including those known as "Goglio" type or "Raackmann" type. Goglio-type valves are available, for example, from Bosch, Wipf, and Wico; Raackmann-type valves are available, for example, from Amcor. Other examples of suitable vacuum valves **30** include those described in U.S. Pat. Nos. 6,913,803; 6,733,803; 6,607,764; and 6,539,691, each of which is incorporated herein by reference in its entirety. In one embodiment of the present invention, the vacuum valve assembly may be consistent with any of the valves disclosed in U.S. patent application Ser. No. 11/100,301, entitled "EVACUATABLE CONTAINER", filed Apr. 6, 2005, or U.S. patent application Ser. No. 11/238,566, entitled "FOOD BAG RELEASE VALVE", or U.S. patent application Ser. No. 11/100,014, entitled "EVACUATABLE CONTAINER". It is noted that the sealing nature of the valve element **35** may be enhanced by incorporating a sealing material and/or a caulking composition into the sealing members of the valve assembly. In another embodiment, the vacuum valve assembly **30** may further include at least one rib (not depicted) extending from the interior side of the valve assembly base **31**, wherein the rib extending from the base **31** ensures that the valve assembly is not obstructed during application of the vacuum.

[**0116**] As shown in FIGS. **1***a*-**1***b*, **10***a*-**10***c*, **11***a*-**11***d*, and **15**, the storage device **10** further includes a stand-off structure **70**. The stand-off structure **70** provides a communicating passage for the removal of liquids and gases. This is, preferably, a strip **71** of film having a pattern of channels **72** embossed, or cut, therein. The stand-off structure channels **72** are designed not to collapse even when the bag **14** is placed under a vacuum. The channels **72** may be in any shape, such as, but not limited to a honeycomb pattern (FIG. **10***a*), a grid or partial grid (FIG. **10***b*), a series of parallel grooves (FIG. **10***c*) or a series of triangular columns (FIG. **11***c*). Referring to FIG. **15**, the cavity face **85** of the stand-off structure **70** faces the vacuum valve assembly **30** and the protrusion face **86** of the stand-off structure **70** faces the storage space **22**.

[**0117**] The honeycomb pattern of channels is depicted in isometric view in FIG. **11***a*, in which the channels **72** that provide the communicating passage for the removal of liquids and gases is defined by a series of polyhedron structures **110**. Referring now to FIG. **11***b*, in another embodiment of the stand-off structure **70**, the pattern of channels **72** for the removal of liquids and gasses may be provided by a series of curvilinear columns **120**.

[**0118**] Regardless of the geometry selected for providing the channels, the stand-off structure **70** produces a passage for the removal of liquids and gases by providing a cross-section with a series of raised surfaces and recessed surfaces. In one embodiment, the standoff structure is integral with a fluid conduit providing fluid communication between the interior of the storage device and a vacuum system by which the storage device is evacuated, and which comprises a vacuum valve, the standoff structure, optionally a quick-connect device, optionally a liquid/vapor separator and the suction side of a vacuum pump. Referring to FIG. **12***a*, channels **72** are provided in the area defined between the raised surfaces **74** and recessed surfaces **75** of the stand-off structure's **70** cross-section. The stand-off structure **70** may have a series of channels **72** on one side of the standoff structure **70**, as depicted in FIG. **12***a*, or on both sides of the stand-off structure **70**, as depicted in FIG. **12***b*. Referring to FIG. **11***c*, in one embodiment of the present invention, the cavity face **85** of the stand-off structure **70** comprises channels **72** and the protrusion face **86** comprises a series of communicating passages produced by a plurality of polyhedron structures.

[**0119**] As shown in FIGS. **13***a*-**13***d*, **14** and **15**, the stand-off structure **70** may be bonded to the inner side of the bag **14**, on the same side of the evacuable bag **14** as the vacuum valve assembly **30**. Although thermal bonding of the stand-off structure **70** to the side of the evacuable bag **14** is preferred, any conventional bonding method may be utilized as known by those skilled in the art. The stand-off structure **70** is positioned at a location corresponding to the location of the vacuum valve assembly **30**. Multiple valve assemblies **30** and multiple stand-off structures **70** may be utilized in a single storage device **10**, as depicted in FIG. **13***d*.

[**0120**] As shown in FIG. **13***a*, the coupling of the stand-off structure **70** may be accomplished prior to folding over the plastic sheet **16**, wherein the entire side periphery **73** of the stand-off structure is bound to the plastic sheet **16**. Referring to FIG. **13***b*, in another embodiment, the coupling of the stand-off structure **70** to the storage device **10** may be accomplished by bonding only selected portions of the stand-off's side periphery **73** to the plastic sheet **16**. Additionally, as opposed to limiting the stand-off structure **70** to a single side of the storage device **10**, the stand-off structure **70** may be coupled to extend across both sides of the bag **14**, as shown in FIG. **13***c*. In another example, the stand-off structure **70** may be positioned to extend diagonally across the plastic sheet as depicted in FIG. **13***d*. It is noted that examples depicted in FIGS. **13***a*-**13***d* have been provided for

illustrative purposes and that other configurations in the positioning of the stand-off **70** are within the scope of the present invention, so long as the stand-off **70** is positioned to be in fluid communication with the vacuum valve assembly **30** in a manner that allows for the removal of liquids and gasses from the storage device **10**.

[**0121**] FIG. **14** depicts the positioning of the stand-off structure **70** once the plastic sheet **16** is folded over upon itself and two lateral sides **15** are sealed adjacent to the periphery forming the storage space **22**. In the illustrated embodiment, the stand-off structure **70** is depicted as being bound to the face of the plastic sheet **16** within the storage space **22**, wherein the channels **72** of the stand-off structure **70** face the surface of the plastic sheet **16** to which the stand-off structure **70** is bound. In an alternate embodiment, the stand off structure **70** may include channels **72** on both sides of the stand off structure **70** (FIG. **12***b*), in which the channels on a first side of the stand off structure **70** face the surface of the plastic sheet **16** to which the stand-off structure **70** is bound and the channels **72** on the second side of the stand off structure **70** face the opposing plastic sheet.

[**0122**] FIG. **15** illustrates the cross-section of the storage device **10** depicted in FIG. **14** along reference line **9-9**, in which the channels **72** of the stand-off structure **70** are clearly depicted as facing away from the storage space **22** and towards the vacuum valve assembly **30** as well as the surface of the plastic sheet **16** to which the stand-off structure **70** is bound. Prior to the application of a vacuum, the portion of the stand-off structure **70** opposing the vacuum valve assembly **30** may be separated from the vacuum valve assembly **30** by a distance D**1** ranging from about 0.003" to about 0.25".

[**0123**] In one application, a vacuum pump is attached to the vacuum conduit which includes at least one vacuum valve and in fluid communication therewith, at least one standoff structure. The vacuum pump is operated, applying a vacuum to the interior of the storage device through the vacuum valve assembly **30** and standoff assembly causing the storage space **22** to collapse upon a food article contained therein. During the application of the vacuum, the stand-off structure **70** separates the food article from the vacuum valve assembly **30**, ensuring that the food article does not obstruct the flow of air or liquids to be removed from the storage space **22**, and insuring that the walls of the storage device conform tightly to the food article. Additionally, as the vacuum causes the portion of the plastic sheet **16** opposing the stand off structure **70** to collapse upon the raised portions of the stand-off structure **70**, any remaining liquid and air may be removed via the stand-off structure's **70** recessed channels. During the application of the vacuum, the distance D**1** separating the vacuum valve assembly **30** from the opposing raised surfaces of the stand-off structure **70** may be substantially eliminated while maintaining an effective passageway for removing the remaining air and liquids from the storage device through the stand-off structure's **70** recessed channels.

[**0124**] The evacuable package **14** may be produced via any suitable processes. For example, the evacuable package may be made by a horizontal process (e.g., where the flexible material **12** forming side panels **17**, **19**, and resealable closure **20** move in a generally horizontal direction), a vertical process (e.g., where the flexible material **12** forming side panels **17**, **19**, and resealable closure **20** move in a generally vertical direction), and combinations thereof.

[**0125**] In one general embodiment of a horizontal process, two extended lengths of the flexible material **12**, each forming a side panel **17**, **19** move in a generally horizontal direction. An extended length of resealable closure **20** may be attached to side panels **17**, **19** or may already be integral with the flexible material **12**. A stand-off structure **70** can be attached to one or more of the side panels **17**, **19**, or can be integral with side panels **17**, **19**, or can be side panels **17**, **19**. A vacuum valve **30**, and an optional corresponding hole, are typically installed into/produced in one of the extended lengths of flexible material **12** at predetermined intervals, to correspond to one vacuum valve **30** per evacuable package **14**. After the various elements have been joined to form an extended length, seals, which will result in lateral sides **15** and bottom edge **13** may be made. Lateral seal portions (not illustrated) which are seals located proximal the overlap of the lateral sides **15** and the resealable closure **20**, are usually made (e.g., crushed) simultaneously with the lateral sides **15** seals, but could be made in a separate step.

[**0126**] In alternate embodiment of a horizontal process, one extended length of flexible material **12** moves in a generally horizontal direction. This flexible material is folded to form both side panels **17**, **19** and bottom edge **13**. Any order of applying resealable closure, stand-off structure **70** and vacuum valve **30** can be used. Similar to the above embodiment, after the various elements have been joined to form an extended length, the lateral sides **15** and lateral seal portions ma y be made.

[**0127**] In one embodiment of a vertical process, two extended lengths of the flexible material **12**, each forming a side panel **17**, **19** move in a generally vertical downward direction. Similar to above, an extended length of resealable closure **20** may be attached to the side panels **17**, **19**, before, after, or concurrently with the bottom **13** being sealed, or the resealable closure **20** may already be integral with the flexible material **12**. A stand-off structure **70** can be attached to one or more of the side panels **17**, **19**, or can be side panels **17**, **19**. A vacuum valve **30**, and an option corresponding hole, are typically installed into/produced in one of the extended lengths of flexible material **12** at predetermined intervals, to correspond to one vacuum valve **30** per evacuable package **14**. After the various elements have been joined to form an extended length, seals, which will result in lateral sides **15** may be made. Lateral seal portions (not illustrated) which are seals located proximal the overlap of the lateral sides **15** and the resealable closure **20**, are usually made (e.g., crushed) simultaneously with the lateral sides **15** seals, but could be made in a separate step.

[**0128**] In alternate embodiment of a vertical process, one extended length of flexible material **12** moves in a generally vertical direction. This flexible material is folded to form both side panels **17**, **19** and bottom edge **13**. Any order of applying resealable closure, stand-off structure **70** and vacuum valve **30** can be used. Similar to the above embodiment, after the various elements have been joined to form an extended length, the lateral sides **15** and lateral seal portions may be made.

[**0129**] It will be appreciated that the resealable closure structure **20**, shown in FIG. **1***a*, may be operated by hand, however, as shown in FIGS. **1**, **16***a* and **16***b*, the resealable

closure **20** may also include a closing clip **80** and end clips **82**. The closing clip **80** is a rigid U-shaped member **84** structured to fit snugly over at least the first and second side protrusions **54**, **56**, **58**. The U-shaped member **84** is structured to bias the male protrusion **54** into the groove **60** formed by the other protrusions **56**, **58** as the U-shaped member **84** is moved over the protrusions **54**, **56**, **58**. In the embodiments of the present invention incorporating multiple protrusions, the U-shaped member **84** may be structured to also fit snugly over multiple protrusions **62**, **64**, wherein the U-shaped member also biases at least one additional male protrusion **62** into at least one additional groove formed by the other protrusions **64**. The closure clip **80** functions to ensure that the interlocking profiles **21** are engaged as the clip **80** is disposed along a first direction, but does not affect the engagement of the interlocking profiles **21** when disposed along the direction opposite to that of the first direction. More specifically, the closure clip **80** does not separate the interlocking profiles when being traversed over engaged interlocking profiles **21**. The end clips **82** are bonded to the ends of the resealable closure **20** and arrest the motion of the closing clip as it traverses the bag **14**. The cross-section of an end clip is depicted in FIG. **17**.

[**0130**] As mentioned above, in one embodiment the reclosable storage device comprises a portion of a system which includes a vacuum device having a low pressure side attached to a vacuum conduit which is in fluid communication with the interior of the storage device and which conduit includes a vacuum valve (described above). Optionally, the assembly includes also a quick-disconnect means in the vacuum conduit between the vacuum pump and the storage device and optionally includes a gas/liquid separator means in the vacuum conduit between the suction side of the vacuum pump and the storage device.

[**0131**] As will be appreciated, any number of vacuum devices can be utilized to evacuate a reclosable storage device in accordance with the present invention, however, in some embodiments, it is preferred to employ a hand-held or portable vacuum pump. An example of one suitable portable device is illustrated in FIG. **21**. The portable vacuum pump assembly illustrated in FIG. **21**, pump **40**, includes a power source, such as a battery, a vacuum pump having a suction side and an exhaust side, and a motor, (all not shown). The vacuum pump may be connected to the fluid conduit connected to the interior of the storage device by a quick-connect means, wherein one portion of the quick-connect means is integral with the vacuum pump assembly and another portion of the quick-connect means is integral with the flexible storage device. An example of this is illustrated in FIG. **1** as engagement end **42** of vacuum pump **40**. As illustrated, engagement end **42** has a defined shape, for example, a convex disk, concave disk or a disk shaped to fit within the medial opening of the outer surface of a vacuum valve assembly's defining one end of a fluid conduit associated with a storage device. The engagement end **42** has a defined shape structured to engage the vacuum valve assembly **30** and defines a passage that is in fluid communication with the vacuum pump **40**. Thus, the engagement end of the portable vacuum pump **40** may function as a quick-connect means, for example, as illustrated in FIGS. **18**(*a*) and **18**(*b*) a suction cup tip **260**, in which the suction cup tip **260** incorporates integrated stand off structures **261** to maintain suction during application of the vacuum as depicted in FIGS. **18**(*a*) and **18**(*b*). It is noted that other quick-connect means, for example, vacuum tips (engagement end **42**) have been contemplated and are within the scope of the present invention, so long as the engagement end **42** geometry provides a quick connect engagement with the vacuum valve assembly. A "quick connection engagement" generally requires sealing of the vacuum valve assembly **30** and engagement end **42** without separate fasteners or the removal of separable sealing members. It will be appreciated that the system may also utilize more conventional coupling means to join the vacuum system to the fluid conduit to provide fluid communication between the suction side of the vacuum pump and the interior of the storage device.

[**0132**] As shown in FIGS. **19** and **20**, the assembly may also include a liquid separator assembly **90**. The liquid separator assembly **90** is structured to collect a liquid, while allowing gases to be drawn into the suction side of the vacuum pump assembly **40**. In one embodiment, the liquid separator assembly **90** includes a tube **92**, and accumulator housing **94** and a diverter **96**. The tube **92** further includes a base **98** structured to sealingly engage both the attachment end **42** and the accumulator housing **94**. The accumulator housing **94** is shaped as a cup and is structured to contain a liquid. The diverter **96** is structured to engage the distal end of the tube **92** and redirect the fluid flow from an axial direction in the tube **92** into the accumulator housing **94**. Thus, when assembled, the attachment end **42** is coupled to the lower side of the tube base **98** and the accumulator housing **94** is coupled to the upper side of the tube base **98**. The diverter **96** is disposed at the distal end of the tube **92**. Thus, there is a fluid passage from the attachment end **42** into the accumulator housing **94**.

[**0133**] In operation, the portable vacuum pump **40** is structured to engage the vacuum conduit connected to the interior of the storage device, for example, as illustrated, the outer surface of the vacuum valve assembly **30**. When the portable vacuum pump **40** is engaged and actuated the vacuum valve assembly **30** is actuated by the resultant pressure differential, the valve element **35** moves into the first position (described above) and the vacuum conduit passage is open and fluid (gas and liquid) is withdrawn from the bag **14** through the vacuum conduit into the suction side of the vacuum pump. The fluid may be both liquid and gas. When a separator assembly is present in the vacuum conduit, liquid and gas are drawn into the liquid separator assembly **90**, the liquid contacts the diverter **96** and is deposited in the accumulator housing **94**. Thus, the liquid is not drawn with the gas towards the vacuum pump. The gas is exhausted via the vacuum pump from the vacuum pump assembly **40**. When the accumulator housing **94** needs to be emptied, a user may simply remove the tube **92** and base **98** allowing the liquid to drain from the vacuum pump assembly **40**.

[**0134**] When a portable vacuum pump **40** is actuated, air is withdrawn from the storage space **22**. Thus, as shown in FIG. **21**, an item, such as a food article **1** shown in ghost, may be placed in a storage device **10**. The stand-off structure **70** is structured to prevent the plastic sheet that forms the evacuable bag **14**, or an item within the bag **14**, from obstructing the vacuum valve assembly **30**. That is, the channels **72** on the stand-off structure **70** provide a path for liquids and gases within the bag **14** to reach the vacuum valve assembly **30**. In the embodiments of the invention in which the stand-off assembly has channels positioned on both sides of the stand-off structure **70**, the channels con-

tacting the item contained within the bag ensures that liquids and gasses are not trapped between the stand-off structure **70** and the item contained within the storage space.

[**0135**] To further assist in facilitating the removal of fluids from the evacuable package **14** to form a vacuum, it may be useful to restrict flow of solids and/or liquids proximal the valve **30**. Thus, in one embodiment, one or more barriers may be utilized proximal at least a portion of the vacuum valve **30**. These barriers may be a part of the stand-off structure **70**, or may be separate from the stand-off structure **70**. One embodiment of a useful barrier arrangement is illustrated in FIG. **22***a*. In the illustrated embodiment, the evacuable package **14** includes a vacuum valve **30** surrounded by a plurality of barriers **76**. The plurality of barriers **76** at least assist in defining a plurality of channels **77**, which assist in providing fluid communication between the vacuum valve **30** and the storage space **22** of the evacuable package **14**. The barriers **76** generally interconnect a first side of the evacuable package **14** to a second opposing side of the evacuable package **14**, thereby restricting movement of fluids and/or liquids into and/or proximal the vacuum valve **30**.

[**0136**] The plurality of barriers **76** may be formed by any suitable methods. For example, at least a portion of the first side panel **17** of the evacuable package **14** may be bonded to a portion of the second side panel **19** of the evacuable package **14** (e.g., via heat sealing and/or an adhesive), thereby creating one or more barriers **76** integral with both these first and second side panels **17**, **19**. Thus, the barriers **76** may comprise an uninterrupted span from the first side panel **17** to the second side panel **19** of the evacuable package **14**. In one embodiment, the barriers **76** consist essentially of portions of the first and second side panels **17**, **19** of the evacuable package **14**. In another embodiment, a polymeric material may be bonded to each of the first and second side panels **17**, **19** of the evacuable package **14** to provide the barriers **76**. In the illustrated embodiment, the plurality of barriers **76** are intermittently spaced about at least a portion of the vacuum valve **30**. Thus, the plurality of barriers **76** at least assist in defining a portion of one or more of the channels **77**.

[**0137**] The barriers **76** may be spaced about the valve **30** in any suitable arrangement. By way of example, the barriers **76** may define at least a portion of an ellipse, as illustrated in FIG. **22***a*. In another example, and with reference to FIG. **22***b*, the barriers **76** may be located in a non-linear and/or non-elliptical fashion about at least a portion of the periphery of the valve **30**. In another embodiment, and with reference to FIG. **22***c*, at least some of barriers **76** may be disposed on a line, thereby defining a sealing line. This sealing line may be oriented in any manner relative the valve **30**, but is generally oriented transverse to at least one lateral side **15** of the evacuable package **14**. One particularly useful aspect of this embodiment is that the sealing line may assist in providing a visual indicator to a user of the evacuable package **14** regarding the filling limits of the evacuable package **14**. More particularly, the sealing line may be visible from the exterior of the evacuable package **14**, thereby facilitating visual confirmation of a fill level for the evacuable package **14** by a user.

[**0138**] In a related embodiment, a separate visual indicator may be utilized on the exterior of the evacuable package **14**. This visual indicator may correspond with the orientation of the sealing line. Thus, the fill level of the evacuable package **14** may be further emphasized. In one embodiment, the visual indicator is a color indication and/or a textural indication. This visual indicator may also be utilized without the use of barriers **76**, thereby providing an external visual indicator to a user of the fill level of the evacuable package.

[**0139**] As illustrated in FIGS. **22***a* and **22***b*, the barriers **76** may be utilized without a stand-off structure **70**, thereby reducing material costs associated with production of the evacuable package **14**. In another embodiment, a stand-off structure **70** may be used in conjunction with the barriers **76**. For example, a stand-off structure **70**, such as described above, may be utilized proximal the barriers **76**. In a particular embodiment, and as illustrated in FIG. **22***c*, at least a portion of some of the plurality of barriers **76** may overlap with the stand-off structure **70**, thereby providing various fluid evacuation pathways and further assisting in removal of fluids from the evacuable package **14**. In one embodiment, the barriers **76** are a portion of the stand-off structure **70**.

[**0140**] The plurality of barriers **76** may be located in any suitable location within the evacuable package **14**. As described above, the plurality of barriers **76** may be located proximal the periphery of the vacuum valve **30**. In another embodiment, and with reference to FIG. **22***d*, the barriers **76** may be located proximal at least a portion of the perimeter of evacuable package **14**. In this embodiment, a plurality of barriers **76***a*-**76***h* may at least assist in defining a plurality of pathways **78** and channels **77***a*-**77***d* via which fluids may flow to the vacuum valve **30**. In the illustrated embodiment, a first barrier **76***a* is located proximal the vacuum valve **30** and is substantially parallel to a lateral side **15***a* of the evacuable package **14**. A second barrier **76***b* is also located proximal the lateral side **15***a* of the evacuable package **14** and is offset from the first barrier **76***a*, thereby defining at least a portion of a channel **77***a* through which fluids may flow to the vacuum valve **30**. A third barrier **76***c* is interconnected to the second barrier **76***b* and is substantially orthogonal to the second barrier **76***b*. Thus, the third barrier **76***c* is located substantially parallel to the bottom **13** of evacuable package **14** and is substantially orthogonal to the lateral sides **15***a*, **15***b* of the evacuable package **14**. A fourth barrier **76***d* is also located substantially parallel to the bottom **13** of the evacuable package **14** and is offset from the third barrier **76***c*, thereby defining a channel **77***b* through which fluids may flow to the vacuum valve **30**. In turn, barriers **76***e*, **76***f*, **76***g* and **76***h* may also be utilized to define channel **77***c* and channel **77***d* through which fluids may flow to the vacuum valve **30**. These barriers may be formed as described above, such as by a heat sealing and/or an adhesive. A vacuum pump **40** may be utilized in conjunction with the vacuum valve **30** to remove at least a portion of the fluids within the evacuable package **14** via pathways **78**, channels **77***a*, **77***b*, **77***c* and **77***d*.

[**0141**] As may be appreciated, a resealable closure **20** may also be utilized in accordance with any of the above referenced barrier embodiments. For example, and with continued reference to FIG. **22***d*, a resealable closure **20** may be utilized in conjunction with the evacuable package **14** and plurality of barrier structures **76***a*-**76***h*. The resealable clo-

sure **20** may also be used with any of the embodiments as described above and with any of the embodiments illustrated in FIGS. **22***a*-**22***c*.

[**0142**] As noted above, a stand-off structure **70** may be utilized within the evacuable package **14** to facilitate fluid communication between the interior of the evacuable package **14** and the vacuum valve **30**. As may be appreciated, extra materials and/or handling time may be required to interconnect the stand-off structure **70** to the interior of the evacuable package **14**. Thus, in one embodiment of the present invention, a resealable closure comprising a stand-off structure may be used. One embodiment of such a resealable closure is illustrated in FIGS. **23**, **24** and **25***a*-**25***c*, in which the evacuable package **14** may include a resealable closure **230** that includes at least a portion of the stand-off structure **70** and/or the vacuum valve **30**. The use of such resealable closure **230** may facilitate restricted manufacturing time and/or decrease material costs, as will be described in further detail below.

[**0143**] Referring now to FIGS. **25***a*-**25***c*, in this embodiment, the evacuable package **14** includes a resealable closure **230** that includes a first flange **50**, such as described above, and a second flange **52'**. The second flange **52'** includes a top portion **52***a*, such as the second flange **52** described above. The second flange **52'** also includes a skirt portion **52***b* interconnected to, and often integral with, the top portion **52***a*. The skirt portion **52***b* comprises a stand-off structure **70**, such as any of the stand-off structures described above. In one embodiment, the stand-off structure **70** is an embossed structure, as will be described in further detail below. Each of the flanges **50**, **52'**, may include the interengaging profiles **21**, such as any of the interengaging profiles described above.

[**0144**] The second flange **52'** may include a vacuum valve **30** interconnected therewith. In this regard, any of the vacuum valve assemblies described above may be utilized in conjunction with the skirt portion **52***b* of the second flange **52'**. For example, a hole may be punched in the skirt portion **52***b* followed by interconnection of a vacuum valve **30** to the skirt portion **52***b* relative to the punched hole. In another embodiment, and as described in further detail below, the vacuum valve **30** may be integral with the skirt flange portion **52***b*, where the vacuum valve **30** is formed via ultrasonic welding and/or thermal heating techniques.

[**0145**] The top portion **52***a* and skirt portion **52***b* of the resealable closure **230** may comprise any suitable material. For example, the top portion **52***a* may comprise a first polymeric material (e.g., low-density polyethylene (LDPE) or linear-low density polyethylene (LLDPE) having a melting point of about at least about 350° F., such as at least about 370° F. The skirt portion **52***b* may comprise this same first polymeric material, or the skirt portion **52***b* may comprise a second polymeric material. For example, it may be desirable to facilitate bonding of a vacuum valve **30** to the skirt portion **52***b* without substantial degradation of the skirt portion. Thus, in one embodiment, the skirt portion **52***b* may comprise a polymeric material having a melting point of at least about 275° F., such as at least about 350° F., or at least about 400° F., or even at least about 420° F. to facilitate ultrasonic welding of and/or thermal bonding of the vacuum valve **30** to the skirt portion **52***b*. One useful material in this regard is medium density polyethylene (MDPE).

[**0146**] In a related approach, the top portion **52***a* may have an average thickness, excluding the interengaging profiles **21**, such as at least about 3 mils. The skirt portion **52***b* may have an average thickness, such as at least about 10 mils, 20 mils or even at least about 30 mils. In the latter regard, bonding of the vacuum valve **30** to the skirt portion **52***b* may be facilitated due to the increased thickness of the skirt portion **52***b*. In one approach, the ratio of the thickness of the skirt portion **52***b* to the thickness of the top portion **52***a* is at least about 1.5:1, such as at least about 3:1, at least about 5:1, or even at least about 10:1.

[**0147**] The first flange **50** and second flange **52'** of the resealable closure **230** may be produced by any known or developed techniques. One embodiment for creating a resealable closure **230** comprising a stand-off structure **70** is illustrated in FIG. **26**. In the illustrated embodiment, the second flange **52'** is fed between an anvil roll **87** and an embossing roll **88**, the embossing roll **88** including an embossing portion **91** and a non-embossed portion **89**. As the second flange **52'** is fed through the anvil roll **87** and the embossing roll **88**, the embossing portion **91** embosses the skirt portion **52***b* of the second flange **52'**, thereby providing a stand-off structure **70** thereon. The intermittent non-embossed portion **89** of the embossing roll **88** facilitates production of non-embossed portions **79** of the skirt portion **52***b* of the second flange **52'**. Such non-embossed portions **79** facilitate a hermetic seal at the lateral edges **15** of the evacuable bag **14** by providing a relatively smooth surface for welding of ends of the resealable closure **230** to the flexible material **12** of the evacuable bag **14**.

[**0148**] The embossing may be accomplished while the resealable closure **230** is in a cold form, such as prior to the resealable closure **230** being interconnected with the flexible material **12**, which results in construction of the evacuable package **14**. Alternatively, the skirt portion **52***b* may be embossed while the resealable closure **230** is being manufactured. In this regard, the resealable closure **230** could then be immediately fed to an apparatus for interconnection of the resealable closure **230** to the flexible material **12**, thereby facilitating increased manufacturing efficiency.

[**0149**] As noted above, a vacuum valve **30** may be utilized in conjunction with the resealable closure **230** and stand-off structure **70**. In one approach, a vacuum valve assembly **30** may be interconnected to the resealable closure **230**, such as via thermal welding, chemical bonding, or adhesives. In this regard, a hole may be punched through a portion of the resealable closure **230**, after which a vacuum valve **30** may be positioned relative to the hole and bonded thereafter to the resealable closure **230**.

[**0150**] In another embodiment, a vacuum valve may be formed integral with the resealable closure **230**. One system for forming such a vacuum valve is illustrated in FIG. **27***a*. In the illustrated embodiment, a valve forming source **46**, such as an ultrasonic forming source or a thermal forming source, is used to form the vacuum valve **30** via tip **47** and anvil **48**. More particularly, the resealable closure **230** may be placed between the anvil **48** and the valve forming source **46**. A portion of the resealable closure **230** (e.g., a skirt portion) may be contacted by a die **49** of the anvil **48**, while an opposing side of the same portion of the resealable closure **230** is subjected to energy from the valve forming source. The energy (e.g., ultrasonic and/or thermal) provided

to that portion of the resealable closure **230**, in conjunction with the die **49**, mold that portion of the resealable closure **230** into the desired valve shape. For example, the thermoplastic molding techniques described in any of U.S. Pat. Nos. 6,569,368; 6,981,936; 6,840,675; 6,733,622; 6,662,410; 6,036,796; and 5,948,337 may be used to form the vacuum valve **30**. Valves of this type are available from ENR Group, Inc. of Slinger, Wis. As may be appreciated, this process may be applied to a single resealable closure **230**, as illustrated in FIG. **27***a*, or may be applied to a strip containing a plurality of resealable closures **230**, as illustrated in FIG. **27***b*.

[0151] As may be appreciated, various types of food products may be utilized in accordance with the present invention. For example, raw meats may often be utilized within the evacuable package **14**. Such meats may include various liquids, such as blood, which, while non-frozen, may appear normal to a user. However, upon removal of fluids from the evacuable package **14**, such as via the vacuum pump **40** described above, followed by freezing of the meat, portions of liquids within the evacuable package **14** may streak and/or otherwise provide a undesirable visual appearance to a user. Thus, in one embodiment of the present invention, a wicking material may be utilized in conjunction with the evacuable package **14** to facilitate wicking of liquids away from food products, thereby restricting possible undesired visual effects. One embodiment of such an evacuable package **14** is illustrated in FIG. **28**. In the illustrated embodiment, the evacuable package **14** includes a resealable closure **20**, such as described above, a vacuum valve **30**, such as described above, and a stand-off structure **70**, such as described above. The evacuable package **14** also includes a plurality of barriers **76**, which at least assist in defining a plurality of channels **77**, such as described above. The plurality of barriers **76** define wicking section WS, which allows for the wicking of liquids into a wicking material **93**. More particularly, fluids from the storage space **22** of the evacuable package **14** may be drawn to and/or flow through channels **77** and into the wicking section WS. The wicking material **93** collects such liquids, thereby removing those liquids from the central portion of the storage space **22** of the evacuable package **14**, which may assist in reducing undesired visual effects from freezing of a material. The barriers **76** also restrict the wicking material **93** from movement outside of the wicking section WS of the evacuable package **14**.

[0152] In another embodiment, the wicking material **93** is utilized within the storage space **22** of the evacuable package **14** without the use of barriers **76**. In this embodiment, an adhesive or other suitable type of bonding material may be utilized to adhere the wicking material **93** to one or more of the side panels **17**, **19** of the evacuable bag, thereby restricting movement of the wicking material **93** within the evacuable package **14**.

[0153] The wicking material **93** may be may be any material adapted to wick, adsorb or absorb liquids. For example, the wicking material **93** may be a cellulose-based material, such as paper, or a synthetic absorbent (e.g., a sponge), a desiccant material, or any other material adapted to wick, adsorb or absorb liquids. The wicking material **93** may be associated with the evacuable package **14** at any suitable time. In one approach, the wicking material **93** is applied to at least one side of the flexible material **12** during the production of the evacuable bag **14**. For example, a label-type applicator may be utilized to apply a paper-type wicking material to the flexible material **12** at any suitable time during a horizontal or vertical bag manufacturing process, as described above.

[0154] As noted above, a pump **40** may be utilized in conjunction with the vacuum valve **30** to facilitate removal of fluids therefrom. As described above, the pump **40** may be utilized with the vacuum valve **30** via a quick connect engagement, wherein separate fasteners are not used to connect the pump to the valve. In another approach, a docking ring may be utilized to facilitate alignment an interconnection of the pump **40** and the vacuum valve **30**. One embodiment of a docking ring arrangement is illustrated in FIGS. **29-31**. In the illustrated embodiment, the docking ring **130** is interconnected to the first panel **17** of the evacuable package **10** (not fully illustrated) and circumscribes the vacuum valve **30**, thereby defining cavity **140**. The docking ring **130** is aligned relative to vacuum valve **30** so that when the engagement end **42** of the pump **40** is interconnected therewith (e.g., at least partially disposed within cavity **140**), a nose portion **41** of the pump **40** is properly aligned relative to the vacuum valve **30**.

[0155] In particular, the docking ring **130** comprises an outer surface **131**, an inner surface **132**, an upper surface **133**, and a lower surface **134**, and generally comprises a rigid polymeric material adapted to restrictively engage the nose **41** of the pump while the nose **41** is disposed therein. For example, the docking ring **130** may comprise medium density polyethylene (MDPE) or liner low-density polyethylene (LLDPE) or similarly rigid polymeric materials. For conventional consumer-type food storage bags, the docking ring **130** may have a height (i.e., width of the outer surface **131**) of from about on-sixteenth of an inch to about one-quarter of an inch. The lower surface **134** is fixedly interconnected to the first panel **17** of the evacuable package (e.g., via an adhesive). The inner surface **133** circumscribes the vacuum valve **30** and defines the cavity **140**. In one approach, the engagement end **42** of the pump **40** is sized to restrictively engage the inner surface **132**, and hence the cavity **140** of the pump **40** when the engagement end of the is placed therein, as illustrated in FIGS. **32***a*-**32***b*. In another approach (not illustrated), the engagement end **42** of the pump **40** is sized to restrictively engage the outer surface **131** of the docking ring **130**.

[0156] To facilitate alignment of the engagement end **42** of the pump, the docking ring **130** may include a one or more complementary features for engaging a complementary feature of the pump **40**. In the illustrated embodiment, the docking ring **130** comprises at least one female member **134** for receiving at least one male member **44** of the engagement end **42** of the pump **40**. The male member(s) **44** may be a rigid material, such as a rigid plastic material. To place the engagement end **42** of the pump **40** within the cavity **140**, the male member(s) **44** and female member(s) **134** are aligned. Once aligned, the engagement end **42** of the pump **40** may be inserted into the cavity **140**.

[0157] To further facilitating interconnection of the pump **40** and valve **30**, other complementary features may be used. For example, the docking ring **130** may comprise one or more female threads adapted to restrictively engage male threads, a male member or other complementary features of

the pump **40**. In the illustrated embodiment, the docking ring **130** comprises a female thread **137** defined by upper lip **135** and lower lip **136**. After receipt of the engagement end **42** of the pump **40** into the docking ring **130** via the female members **134** and male members **44**, the engagement end **42** of the pump **40** may be rotated, thereby moving male members **44** into female thread **137**. Thus, the engagement end **42** of the pump **40** may be further restrictively engaged.

[**0158**] In one embodiment, the female thread **137** may be tapered, such as in a downward direction relative to the upper surface **133** of the docking ring **130**. Thus, as the engagement end **42** of the pump **40** is rotated, the nose **41** may be axially pressed downward toward, and in some instances against, the vacuum valve **30**, first panel **17** and/or ribs **142** (described below). The taper of the female thread **132** may be designed so as to facilitate application of a desired amount of force by the nose **41**, or other portion of the pump **40**, on the vacuum valve **30** and or ribs **142**.

[**0159**] While the foregoing description and illustrations depict a female thread **137** utilized on the inner surface **132** of the docking ring **130**, various other configurations may be utilized. For example, one or more female threads may also/alternatively be utilized on the outer surface **131** and/or upper surface **133** of the docking ring. Likewise, a male thread may be utilized with the docking ring **130**, either on the inner surface **132**, outer surface **131** and/or upper surface **133**. A taper may also/alternatively be utilized with a male thread. Furthermore, other complementary engaging features may be utilized (e.g., tongue-groove) with respect to the aligning of the pump **40** and/or provision of force to the vacuum valve **30** and/or ribs **142** by the nose **41**. In some embodiments, the docking ring may be utilized without any complementary engaging features, wherein the nose **41** of the pump **40** may be engaged with and disengaged from the docking ring **130** without the need to align/engage features of either the docking ring **130** and/or pump **40**. In these embodiments, the inner surface **132** of the docking ring **130** may be substantially smooth (e.g., bare of complementary feature(s)) and the engagement end **42** of the pump **40** may be absent of complementary features.

[**0160**] With continued reference to FIGS. **29**-**32***b*, optional ribs **142** may attached to the outer surface of the first panel **17**, in between the outer edges the vacuum valve **30** and the inner surface **131** of the docking ring **130**. As illustrated in FIGS. **32***a*-**32***b*, the ribs **142** may be utilized to further facilitate evacuation of the storage device **10** by creating a space **143**. More particularly, as nose **41** of the pump **40** engages the ribs **142**, ribs **142** will be pressed and move toward the second panel **19** (not illustrated) of the evacuable package **10**, thereby creating space **143**. Thus, during operation of pump **40**, the second panel **19** of the evacuable package **10** will be restricted from physically communicating with hole **34** in the first panel **17** and/or vacuum valve **30**. Hence, the probability of plugging/blocking of hole **34** and vacuum valve **30** may be reduced.

[**0161**] Referring now to FIGS. **34** and **35**, another package embodiment is illustrated. Package **1210** has a first side panel **1212** and an opposite side panel **1214** that are connected by side edges **1215**, **1216**, **1218**. For clarity herein, side edge **1215** can be referred to as a bottom edge **1215**. Side panels **1212**, **1214** and side edges **1215**, **1216**, **1218** define a surrounding wall **1213** with an interior **1220** therebetween. Various other configurations of surrounding walls are known. Interior **1220** is configured for receiving a food item or other items for storage within package **1210**.

[**0162**] At the top end of package **1210**, that is, the side of package **1210** opposite bottom edge **1215**, a resealable zipper **1250** is present. Zipper **1250** is present across a mouth of package **1210** that provides access to interior **1220**. Zipper **1250** includes a first profile member **1252** and a second profile member **1254**, wherein the first and second profile members **1252**, **1254** are configured to engage and disengage with each other. In other words, first and second profile members **1252**, **1254** are sealable and resealable. First profile member **1252** is connected to first side panel **1212** and second profile member **1254** is connected to second side panel **1214**. Profile members **1252**, **1254** could be integral with their respective side panel **1212**, **1214** or could be attached thereto, for example, by a heat seal or adhesive. Zippers **1250** and profile members **1252**, **1254** are well known in the art. For example, see U.S. Pat. Nos. 6,524,002; 6,152,600; 5,839,831, and 5,252,281, each of which is incorporated herein by reference.

[**0163**] Referring to FIG. **34**, package **1210** includes a valve **1230**, positioned in side panel **1212** to allow escape of air from interior **1220** to the exterior of package **1210**. Valve **1230** is preferably a one-way valve, allowing flow of fluid therethrough in only one direction; preferably, that direction is from interior **1220** of package **1210** to the exterior of package **1210**. The fluid to pass through valve **1230** can be either or both gaseous or liquid. In most uses of package **1210**, the fluid passing through valve **1230** will be air. Valve **1230** can be any suitable valve, including those known as "Goglio" type or "Raackmann" type. Goglio-type valves are available, for example, from Bosch, Wipf and Wico; Raackmann-type valves are available, for example, from Amcor. Other examples of suitable valves **1230** include those described in U.S. Pat. Nos. 6,913,803; 6,733,803; 6,607,764, and 6,539,691, each of which is incorporated herein by reference.

[**0164**] Package **1210** also includes sealant stripe **1270** present on the interior of at least one of side panels **1212**, **1214**. Sealant stripe **1270** is preferably a peal seal, which can be sealed, readily opened, and resealed. Examples of peal seals include those described in U.S. Pat. Nos. 6,290,393; 6,210,038, and 6,131,248, each of which is incorporated herein by reference. Sealant stripes and resealable zippers may be generally referred to as "closures" useful for closing portions of a package or storage device.

[**0165**] One particular application for package **1210** illustrated in FIGS. **34** and **35** is as a freezer bag. Package **1210** includes a textured standoff area **1280**, which can be integral with each of side panels **1212**, **1214**. In other embodiments, textured standoff area **1280** can be attached to a surface of panels **1212**, **1214**. Preferably, textured standoff area **1280** is present on the interior of each of panels **1212**, **1214**. Such a textured standoff area **1280** is beneficial for freezer bags, where it is desired to maintain a slight air gap or spacing between any items positioned within package **1210** and side panels **1212**, **1214**.

[**0166**] Returning to package **1210**, in detail, various specific details of package will now be described. It is understood however, that the following descriptions are not limiting to features of package **1210**, with alternate materials,

constructions, and the like could be used to provide a package according to the present disclosure.

[0167] Package **1210** has side panels **1212** and **1214**, which form the overall package **1210**. Side panels **1212**, **1214** are flexible sheets, typically polymeric film. Examples of suitable films for use as panels **1212**, **1214** are well known, and include polyethylene, polypropylene, and the like.

[0168] As provided above, side panels **1212**, **1214** meet at bottom edge **1215** and side edges **1216**, **218**. Any or all of edges **1215**, **1216**, **1218** maybe seals or maybe folds. In the embodiment illustrated in FIG. **35**, bottom edge **1215** is a fold between side panel **1212** and side panel **1214**; that is, a sheet of material has been folded to form panels **1212**, **1214** and bottom edge **1215**. Typically, in constructions having bottom edge **1215** being a fold, side edges **1216**, **1218** are sealed edges; that is, side panels **1212**, **1214** are sealed to one another, for example by heat sealing. In other embodiments, side edge **1216** is a folded edge and bottom edge **1215** and side edge **1218** are sealed. In yet another embodiment, each of side edges **1216**, **1218** are folded and bottom edge **1215** is sealed. Still further, embodiments of package **1210** could have each of edges **1215**, **1216**, **1218** being sealed. These various edge configurations are known in the art and any of these are suitable for package **1210**.

[0169] As provided above, zipper **1250** has first profile **1252** and second profile **1254**, which engage and disengage from each other to provide access to interior **1020** of package **1210**. Profiles **1252**, **1254** are constructed to be repeatedly sealed (e.g., closed, engaged, mated, etc.) and unsealed (e.g., opened, disengaged, unmated, etc.), for example, by pressure exerted by the user's fingers. In some embodiments, profiles **1252**, **1254** are configured to provide an indication, for example by color change, when they are seal. Although not illustrated in FIG. **34** or **35**, zipper **1250** may be open and closed by a slider element, as are well known. See for example U.S. Pat. Nos. 6,679,027; Des. 480,988; Des. 479,467, and 6,450,686, each of which is incorporated herein by reference, for examples of suitable slider elements.

[0170] As provided above, sealant stripe **1270** is present on the interior of at least one of panels **1212**, **1214**. In some embodiments, sealant stripe **1270** is integral with or part of panel **1212**, **1214**. Alternately, sealant strip **1270** may be present on a surface of side panel **1212**, **1214**; see FIG. **35** where sealing stripe **1270** is illustrated as a piece of material adhered to each of panels **1212**, **1214**. Sealant stripe **1270** allows panels **1212**, **1214** to be sealed together, preferably with a fluid-impermeable or hermetic seal. Sealant stripe **1270** preferably extends from side edge **1216** to side edge **1218**, and may be any suitable width (taken in the direction from bottom edge **1215** to zipper **1250**).

[0171] Package **1210** preferably includes textured standoff area **1280**, particularly if package **1210** is intended to be a freezer bag. By the term "freezer bag," it is meant a package that is intended to be used for storing items at temperatures below 30° F., often at temperatures below 20° F. Such a textured standoff area **1280** is beneficial for freezer bags, where it is desired to maintain a slight air gap or spacing between any items positioned within package **1210** and side panels **1212**, **1214**, to inhibit freezer burn. Textured standoff area **1280** is preferably present on each of panels **1212**, **1214** and may occupy any area. For example, textured standoff area **1280** may extend to any side edges **216**, **18** or may stop short of edges **216**, **218**. Similarly, textured standoff area **1280** may extend to bottom edge **1215** or may stop short of bottom edge **1215**. The width of textured standoff area **1280** (taken in the direction from bottom edge **1215** to zipper **1250**) is usually at least 5 cm wide, and often at least 7.5 cm wide. Preferably, textured standoff area **1280** is not present in the area of sealant strip **1270**. It is understood that the area of textured standoff area **1280** will be dependent on the overall size of package **1210** and side panels **1212**, **1214**.

[0172] Referring again to FIGS. **34** and **35**, package **1210** includes valve **1230**, which is positioned between zipper **1250** and sealant stripe **1270**. An alternate embodiment of a package according to the present disclosure is illustrated in FIGS. **36-39**, as package **1210'**. Package **1210'** is similar to package **1210** and that it includes first panel **1212**, second panel **1214**, bottom end **215**, side edges **216**, **218**, valve **1230**, sealant stripe **1270** and textured standoff region **1280**. Package **1210'** differs from package **1210**, however, in that for package **1210'**, sealant stripe **1270** is positioned between zipper **1250** and valve **1230**. That is, valve **1230** is positioned closer to interior **1220** then to zipper **1250**, Valve **1230** allows fluid, usually air, to pass from interior **1220** of package **1210**, **210'** to the exterior, and inhibits air (or other fluid) from entering into interior **1220**.

[0173] FIG. **39** illustrates an example embodiment for zipper **1250**. Zipper **1250** includes zipper profiles **1252**, **1254** having posts **1251**, **1253**, lock members **1255**, **1256**, and zipper flanges or tabs **258**, **259**. Many other zipper configurations are possible for use with the packages **1210**, **1210'**. In some embodiments, the packages include at least one sealant stripe and no zipper for closing the package. For example, FIGS. **42** and **43** illustrate a package **1510** that includes a sealant stripe **1270** positioned at an end of the package opposite the bottom end **215**. The package **1510** includes a valve **1230** in communication with an interior **1220** of the package, and a standoff area **1280** on opposing side panels **1212**, **1214** of the package.

[0174] FIGS. **37** and **38** illustrate package **1210'** in use, retaining an item **1290** therein. Item **1290** is illustrated as a food item, particularly, a chicken leg. To place item **1290** in package **1210'** (or in package **1210**), the general following procedure is followed. Zipper **1250** is opened, if necessary, by un-mating, unsealing, etc. first and second profiles **1252**, **1254**. Side panels **1212**, **1214** are spread sufficiently far to place item **1290** therebetween. Sometimes, it may be necessary to unseal sealant strip **1270** to pass item **1290** past stripe **1270** toward bottom edge **1215**. Item **1290** should be positioned between bottom edge **1215** and sealant strip **1270**. In some embodiments; item **1290** may be positioned in the area of textured standoff area **1280**, however, this is not necessary.

[0175] After positioning item **1290** in package **1210'**, it is optional to push or otherwise urge air present in package **1210'** out via zipper **1250**. Sealant stripe **1270** is sealed, providing an air-tight seal across package **1210'**. Zipper **1250** is also sealed, providing a seal across package **1210'**. It is understood that sealant stripe **1270** may be sealed before or after zipper **1250** is closed. When pressure is applied to package **1210'** in an area between bottom edge **1215** and sealant stripe **1270**, at least some of the air remaining in

package **1210'** is pushed through valve **1230** and out from interior **1220** of package **1210'**.

[**0176**] Due to the construction of package **1210** of FIGS. **34** and **35**, the order of steps for sealing an item **1290** in package **1210** may differ. For example, after positioning item **1290** in package **1210**, it is optional to push or otherwise urge air present in package **1210** out via zipper **1250**. Zipper **1250** is then sealed, providing a seal across package **1210**. When pressure is applied to package **1210** in an area between bottom edge **1215** and zipper **1250**, at least some of the air remaining in package **1210** is pushed through valve **30** and out from interior **1220** of package **1210**. Sealant stripe **1270** is sealed, providing an air-tight seal across package **1210**. Preferably, sealant stripe **1270** is sealed after zipper **1250** is closed and after the air has been evacuated from interior **1220** of package **1210**.

[**0177**] Packages **1210**, **1210'** may be made by generally any suitable process. For example, packages **1210**, **1210'** may be made by a horizontal process (e.g., where the film forming side panels **1212**, **1214** moves in a generally horizontal direction) or a vertical process (e.g., where the film forming side panels **1212**, **1214** moves in a generally vertical direction). As mentioned above, any or all of edges **1215**, **1216**, **1218** may be folds or seals between side panels **1212**, **1214**. Profile members **1252**, **1254** may be attached to side panels **1212**, **1214** before or after bottom edge **1215** is formed. Similarly, a slider device (if present) may be applied to profile members **1252**, **1254** before or after incorporation with side panels **1212**, **1214**. Packages **1210**, **1210'** may include side gussets or gussets in panels **1212**, **1214** to provide increased interiors **1220**. Various other configurations and methods of making packages **1210**, **1210'** are suitable.

[**0178**] Referring now to FIGS. **40** and **41**, another example package **1310** in accordance with the present disclosure is illustrated. Package **1310** has a first side panel **1312** and an opposite side panel **1314** that are connected by side edges **1315**, **1316**, **1318**. For clarity herein, side edge **1315** can be referred to as a bottom edge **1315**. Side panels **1312**, **1314** and side edges **1315**, **1316**, **1318** define a surrounding wall **1313** with a storage interior **1320** therebetween. Seal **1370** also defines a portion of storage interior **1320**; seal **1370** is described below. Various other configurations of surrounding walls **1313** are known and are useable in accordance with the principles of this disclosure. Storage interior **1320** is configured for receiving a foodstuff item **1390** or other item(s) for storage within package **1310**. In FIGS. **40** and **41**, food item **1390** is a collection of small food items, such as shredded cheese, meats, fruits, or vegetables.

[**0179**] In the one depicted in the drawings, at the top end of package **1310**, that is, the side of package **1310** opposite bottom edge **1315**, is top edge **1335**. A surrounding wall **1330** is defined by first side panel **1312**, second side panel **1314**, side edges **1316**, **1318**, top edge **1335** and by seal **1370**.

[**0180**] Present within the interior formed by surrounding wall **1330** is a resealable zipper closure **1350**. Zipper closure **1350** extends from side edge **1316** to side edge **1318**, and includes a first zipper profile **1354** having a first profile member and a second zipper profile **1352** having a second profile member; wherein the first and second zipper profiles **1354**, **1352** are configured to engage and disengage with each other. In other words, first and second zipper profiles **1354**, **1352** are selectively sealable and resealable.

[**0181**] In the embodiment shown, first zipper profile **1354** is connected to first side panel **1312**, and second zipper profile **1352** is connected to second side panel **1314**. Zipper profiles **1354**, **1352** could be integral with their respective side panel **1312**, **1314** or could be attached thereto, for example, by a heat seal or adhesive. Zippers **350**, zipper profiles **1354**, **1352** and profile members are well-known in the art, and a variety of configurations are useable in accordance with the principles of this disclosure. For example, see U.S. Pat. Nos. 6,524,002; 6,152,600; 5,839,831, and 5,252,281, each of which has been incorporated herein by reference. In the one shown, zipper closure **1350**, at each side edge **1316**, **318**, includes a crush area **1410**, where zipper profiles **1354**, **1352** are sealed together and may be partially crushed or deformed.

[**0182**] At top edge **1335**, package **1310** includes header **1336**, which extends between top edge **35** and zipper closure **1350** and forms a portion of surrounding wall **1330**. In this particular embodiment, header **1336** is detachable from package **1310** via weakness **1360**. Weakness **1360** may be a perforation, a tear-strip, string or thread, a laser scope, a die line, a thinner area, or other configuration that allows header **1336** to be removed from side panels **1312**, **1314**. Header **1336** is an element that provides a quick indication whether or not access has been gained to zipper closure **1350**. That is, access is not readily gained to the interior of surrounding wall **1330**, which has zipper closure **1350** therein, without breaching header **1336** or side panels **1312**, **1314**. To gain access to zipper closure **1350**, header **1336** is removed via weakness **1360**.

[**0183**] As mentioned above, package **1310** includes seal **1370**, which is positioned between bottom edge **1315** and top edge **1335**, and partially defines storage interior **1320** of surrounding wall **1313** and the interior of surrounding wall **1330**. Seal **1370** is present on the interior of at least one of side panels **1312**, **1314** and allows panels **1312**, **1314** to be sealed together, preferably with a fluid-impermeable or hermetic seal. Seal **1370** may be a repeatably reclosable seal or a one-time seat, such as an adhesive seal or a mechanical seal. Additional details regarding seal **1370** are provided below.

[**0184**] Package **1310** includes a valve **1330**, positioned in one of side panels **1312**, **1314** to allow escape of air, gas or other fluid from storage interior **1320** to the exterior of package **1310**; in FIG. **41**, valve **1330** is illustrated in side panel **1312**. Valve **1330** is preferably a one-way evacuation valve, allowing flow of fluid therethrough in only one direction; preferably, that direction is from storage interior **1320** of package **1310** to the exterior of package **1310**. The fluid to pass through valve **1330** can be either or both gaseous or liquid. In most uses of package **1310**, the fluid passing through valve **1330** will be air. Valve **1330** can be any suitable valve, such as those described above for valve **1230**. Valve **1330** may be a manually activated valve or may be configured for use with an external device, such as the vacuum pump described above with reference to resealable storage device **10**.

[**0185**] Located in close proximity to valve **1330** is a textured standoff material **1380**. Standoff material **1380** can extend from zipper closure **1350**, typically from one of

zipper profiles **1354**, **1352**; in FIG. **41**, standoff material **1380** extends from an end of zipper profile **1354**, forming a skirt-like construction **1355**. It is also foreseen that standoff material **1380** may be positioned on, or integral with, a side of zipper profiles **1354**, **1352**, (for example, positioned in an area close to where the zipper profile members are), rather than extending away from an end of the profile. Textured standoff material **1380** has at least one surface, preferably the one closest to valve **1330**, that is textured, for example, with protrusions, dots, bumps, detents, grooves, etc., or other structures that provide a surface that is not smooth. Generally, the textured features of standoff material **1380** are at least 0.01 mm high, often at least 0.05 mm high, for example, about 0.1 mm high, or more, such as about 0.5 mm high or even 1 mm high. Such a textured standoff material **1380** is desirable in package constructions to maintain a slight air gap or spacing between zipper members **1354**, **1352** and valve **1330**, to inhibit valve **1330** being blocked by zipper profiles **1354**, **1352** or by side panel **1314**, so that air, gas or other fluid can pass through valve **1330**.

[**0186**] Returning to package **1310**, in detail, various specific details of package **1310** will now be described. It is understood however, that the following descriptions are not limiting to features of package **1310**; alternate materials, elements, configurations, constructions, and the like, such as the configuration package **1210**, could be used.

[**0187**] Package **1310** has side panels **1312** and **1314**, which form the overall package **1310**. Side panels **1312**, **1314** are flexible sheets, typically polymeric film. Examples of suitable films for use as panels **1312**, **1314** are well known, and include polyethylene, polypropylene, and the like. Laminated materials may also be used, which can include, but are not limited to, low density polyethylene (LDPE) and nylon or LDPE and polypropylene.

[**0188**] As provided above, side panels **1312**, **1314** meet at bottom edge **1315**, side edges **1316**, **1318** and top edge **1335**. Any or all of edges **1315**, **1316**, **1318**, **1335** maybe seals or may be folds. In the embodiment illustrated in FIG. **41**, bottom edge **1315** is a seal between side panel **1312** and side panel **1314** and top edge **1335** is a seal between side panel **1312** and side panel **1314**. Side edges **1316**, **1318** could be either seals or folds. For example, one piece of material could be folded to form panels **1312**, **1314**, thus forming one folded side edge and one sealed side edge. In an alternate configuration, a tube of material can be used, thus forming two folded side edges. Still further, package **1310** could have each of edges **1315**, **1316**, **1318**, **1335** being sealed. These various edge configurations are known in the art and any of these are suitable for package **1310**.

[**0189**] As provided above, zipper closure **1350** has first zipper profile **1354** and second zipper profile **1352**, which engage and disengage from each other to provide access to storage interior **1320** of package **1310**. Profiles **1354**, **1352** are constructed to be repeatedly sealed (e.g., closed, engaged, mated, etc.) and unsealed (e.g., opened, disengaged, unmated, etc.), for example, by pressure exerted by the user's fingers. In some embodiments, zipper profiles **1354**, **1352** are configured to provide an indication, for example by color change, when they are sealed. Although not illustrated in FIG. **40** or **41**, zipper closure **1350** may be opened and closed by a slider element, as is well known. See for example U.S. Pat. Nos. 6,679,027; Des. 480,988; Des. 479,467, and 6,450,686, each of which is incorporated herein by reference, for examples of suitable slider elements.

[**0190**] As provided above, seal **1370** is present on the interior of at least one of panels **1312**, **1314**. Seal **1370** allows panels **1312**, **1314** to be sealed together, preferably with a fluid-impermeable or hermetic seal. Seal **1370** preferably extends from side edge **1316** to side edge **1318**, and may be any suitable width (taken in the direction from bottom edge **1315** to zipper closure **1350**). Seal **1370** can be a material, e.g., adhesive, applied to a surface of panel(s) **1312**, **1314** or seal **1370** may be integral with or formed by panel(s) **1312**, **1314**.

[**0191**] Seal **1370** may be a repeatably reclosable seal or a one-time seal, such as an adhesive seal or a mechanical seal that is not reclosable. For example, seal **1370** may be an adhesive peal seal, which can be sealed, readily opened, and resealed. Examples of peal seals include those described in U.S. Pat. Nos. 6,290,393; 6,210,038, and 6,131,248, each of which is incorporated herein by reference. Seal **1370** may alternately be a non-resealable adhesive peal, that is, a seal that, once broken, cannot be resealed.

[**0192**] Still further, seal **1370** may be a mechanical connection between panels **1312**, **1314** formed, for example, by a melting and joining of their materials, due to the application of heat and pressure in the area. Seal **1370** could alternately be a physical or mechanical interaction, such as a sealed farmed by material that separates or delaminates between layers, and cannot be resealed. Examples of non-resealable seals include those described in U.S. Pat. No. 6,004,032, which is incorporated herein by reference.

[**0193**] Package **1310** preferably includes textured standoff material **1380** in locations where it is desired to maintain a slight distance, gap or spacing, for example, such as against valve **1330**. Textured standoff material **1380** is preferably present on any element of package **1310** that might inhibit flow through valve **1330**. In the embodiment illustrated in FIG. **41**, standoff material **1380** is connected to zipper profile **1354**; standoff material **1380** could be integral with or sealed to zipper profile **1354**. Textured standoff material **1380** could alternately be positioned in or on side panel **1314** or other portion of package **1310** that might inhibit flow through valve **1330**.

[**0194**] Textured standoff material **1380** may extend the width of package **1310** from side edges **1316**, **1318**, as illustrated in FIG. **40**, or may stop short of edges **1316**, **1318**. Textured standoff material **1380** could be present only in the area proximate to valve **1330**.

[**0195**] The Figures illustrate unopened package **1310** retaining food item **1390** therein. Package **1310**, as illustrated, is unopened, because header **1335** remains intact.

[**0196**] Package **1310**, with food item **1390** therein, is produced by processes often referred to as 'form fill and seal'. In these processes, the package, particularly storage interior **1320**, is manufactured (e.g., formed), the item is placed within storage interior **1320** (e.g., filled), and then any last seals, such as bottom edge **1315**, are made (e.g., sealed). "Form fill and seal" will be referred to as "FFS" hereinafter. Package **1310** may be made by a horizontal FFS process (e.g., where the film forming side panels **1312**, **1314** and zipper closure **1350** move in a generally horizontal direction) or a vertical FFS process (e.g., where the film

forming side panels **1312**, **1314** and zipper closure **1350** move in a generally vertical direction). Typically, with horizontal FFS processes, the unfilled package **1310** progresses through the process up-side-down. That is, bottom edge **1315** is positioned above top edge **1335**. With vertical FFS process, the unfilled package progresses either up-side-down or sideways.

[**0197**] In one embodiment of a horizontal FFS process, two extended lengths of the film, each forming a side panel **1312**, **314**, move in a generally horizontal direction. An extended length of zipper closure **1350** may be attached to side panels **1312**, **1314**, before, after, or concurrently with the film being sealed together to form top edge **1335**. Standoff material **1380** can be attached to zipper closure **1350** prior to zipper closure **1350** being attached to side panels **1312**, **1314**. Valve **1330** will typically be installed into one of the extended lengths of film at predetermined intervals, to correspond to one valve **1330** per package **1310**. Seal **1370** can be formed between side panels **1312**, **1314** before, after, or concurrently with edge **1335** being farmed or with zipper closure **1350** being attached. Weakness **1360** may be formed close to edge **1335** either after edge **1335** has been sealed or before.

[**0198**] After the various elements have been joined to form an extended length, seals, which will result in side edges **1316**, **1318**, are made. Crush areas **1410** are usually made simultaneously with these side edge seals, but could be made in a separate step. After storage interior **1320** has been made (i.e., between side panels **1312**, **1314** having side edges **1316**, **1318**, seal **1370**), food item **1390** is placed, for example, dropped, into storage interior **1320**, and then bottom edge **1315**, which is positioned above the rest of package **1310**, is sealed.

[**0199**] In an alternate embodiment of a horizontal FFS process, one extended length of film moves in a generally horizontal direction. This film is folded to form both panels **1312**, **1314** with folded edge **1335** therebetween. Any order of applying zipper closure **1350**, standoff material **1380**, valve **1330**, seal **1370** and weakness **1360** can be used. Similar to the first embodiment, after the various elements have been joined to form an extended length, side edges **1316**, **1318** and crush areas **1410** are made. Food item **1390** is placed into storage interior **1320**, and then bottom edge **1315** is sealed.

[**0200**] In one embodiment of a vertical FFS process, two extended lengths of film, each forming a side panel **1312**, **314**, move in a generally vertically downward direction. Similar to above, an extended length of zipper closure **1350** may be attached to side panels **1312**, **1314**, before, after, or concurrently with the film being sealed together to form top edge **1335**. Standoff material **1380** can be attached to zipper closure **1350** prior to zipper closure **1350** being attached to side panels **1312**, **1314**. Valve **1330** will typically be installed into one of the extended lengths of film at predetermined intervals, to correspond to one valve **1330** per package **31.0**. Seal **1370** can be formed between side panels **1312**, **1314** before, after, or concurrently with edge **1335** being formed or with zipper closure **1350** being attached. Weakness **1360** may be formed close to edge **1335** either after edge **1335** has been sealed or before. Bottom seal **1315** can also be formed at any stage in this process.

[**0201**] After the various elements have been joined to firm an extended length, a seal, which results in, for example, side edge **1318** and a crush area **1410**, is made. After this step, storage interior **1320** has been made between side panels **1312**, **1314**, edge **1315**, seal **1370** and side edge **1318**; see FIG. **41**, which is representative of a top view of the package during such as vertical FFS process. Food item **1390** is placed, for example, dropped, into storage interior **1320**, and then side edge **1316**, which is positioned above the rest of package **1310**, is scaled. Such a FFS process moves in a generally downward vertical direction.

[**0202**] In an alternate embodiment of a vertical FFS process, one extended length of film moves in a generally horizontal direction. This film is folded to form both panels **1312**, **1314** with folded edge **1335** or edge **1315** therebetween. Any order of applying zipper closure **1350**, standoff material **1380**, valve **1330**, seal **1370** and weakness **1360** can be used. Similar to the first embodiment, after the various elements have been joined to form an extended length, side edge **1318** and crush areas **1410** are made. Food item **1390** is placed into storage interior **1320**, and then side edge **1316** is sealed. Alternately, a tube of film could be used, thus resulting in two folded edges **1315** and **1335**.

[**0203**] Prior to use, the consumer removes header **1336** via weakness **1360**. To gain access to storage interior **1320**, zipper profiles **1354**, **1352** are separated and seal **1370** is breached, which allows access to item **1390**.

[**0204**] To close package **1310**, it is preferred to remove air from interior **1320**, for example by flattening package **1310** prior to mating zipper profiles **1354**, **1352**. After zipper closure **1350** is closed, additional air can be removed from interior **1320** via valve **1330**. The air may be manually forced through valve **1330**, for example, by hand pressure or other squeezing applied to the region between edge **1315** and zipper closure **1350**, or may be attached to an external device, such as a vacuum pump. After removal of the desired air, gas or fluid, seal **1370** may be resealed, if so configured. Removal of air, gas or fluid from interior **1320** decreases the opportunity for spoilage of food item **1390** and extends its life. When seal **1370** is resealed, it provides an air-tight seal across package **1310**. Zipper closure **1350** is also sealed, providing a seal across package **1310**.

[**0205**] As mentioned above, any or all of edges **1315**, **1316**, **1318**, **1335** may be folds or seals between side panels **1312**, **1314**. A slider device (if present) may be applied to zipper profiles **1354**, **1352** before or after incorporation with side panels **1312**, **1314**.

[**0206**] Package **1310** may include side gussets or gussets in panels **1312**, **1314** to provide increased volume for interior **1320**. Various other configurations and methods of making package **1310** are suitable.

[**0207**] For example, and with reference to FIG. **44**, the storage device **10** may be a standup-type bag having legs **105**, **106** interconnected to lateral sides **15**, and a bottom **107**. The configuration of the legs **105**, **106** and bottom panel **107** facilitate propping of the storage device **10** in an upright condition, such as during evacuation of the storage device **10**. Methods of producing such standup-type bags are discussed in, for example, U.S. Pat. No. 4,954,124, which is incorporated herein by reference.

[**0208**] One embodiment of a storage device **10** propped in an upright condition via legs **105**, **106** and bottom panel **107** is illustrated in FIG. **45**. Wells **108**, **109** are defined in part

by legs **105**, **106** and bottom panel **107**. In the illustrated embodiment, a pump **40** is interconnected with the vacuum valve **30**, to facilitate evacuation of gases from the storage space **22** of the storage device **10**. In this regard, the pump **40** includes a bracket **115** for interconnection with the upper portion of the storage device **10**. The bracket **115** includes a plurality of members adapted to facilitate interconnection of the pump **40** with the storage device **10** without removing the storage device **10** from its upright condition (e.g., facilitate removal of gases from the storage device **10** while maintaining the storage device in an upright position). More particularly, the bracket **115** may be adapted to slide over an upper portion of the storage device **10** so that when the pump **40** is pressed against the second panel **19** containing the vacuum valve **30**, a restraining member **113** of the bracket restrains the first panel **17** and/or second panel **19** from movement from its upright position. In this regard, the bracket **115** may include, and restraining member **113** may be interconnected with, a spring (not illustrated) or other resilient means adapted to force restraining member **113** toward panel **17**.

[**0209**] The standup-type storage container **10** may include additional features. For example, the container may include a wicking material **93** within wells **108**, **109**, such as any of the wicking materials described above. In another embodiment, one or more of the wells **108**, **109** may include a resilient span (not illustrated) disposed therein so as to facilitate resiliency in the bottom portion of the storage device **10**. For example, the resilient span may comprise a rigid material interconnected with one or more of the wells **108**, **109** and extending the length of such wells **108**, **109**. The resilient span may extend between the lateral sides **15** of the storage device **10**, or between any portion thereof.

[**0210**] Many of the above-described features can be combined in various orientations/configurations. For example, the storage device **10** may include various combinations/orientations of resealable closures **20**, vacuum valves **30**, stand-off structure **70**, and gussets, to name a few. In one embodiment, and with reference to FIG. **46**, a storage device **10** may include a resealable closure **20** proximal the opening of storage device **10**. The storage device **10** may further include gussets **116** within the sides of such storage container **10**. A bottom panel **117** may be interconnected with gusset portions **116**. The valve **30** and stand-off structure **70** may be oriented proximal the bottom panel **117**, as illustrated in FIG. **46**, or may be proximal the resealable closure **20**, as described above, or any portion therebetween. Many other combinations of the features of the storage device **10** may be utilized, and all such combinations are expressly contemplated herein.

[**0211**] As described above, the vacuum valve **30** may be located on a panel of the storage device **10** and in fluid communication with the storage space **22**. In other embodiments, the vacuum valve **30** may be in fluid communication with the storage space **22** of the storage device **10**, but may be absent from either one of the side panels **17**, **19**, of the storage device **10**. For example, the vacuum valve **30** may be fluidly interconnected to the storage space **22** via a channel located on a side portion of the storage device **10**. One embodiment of such a configuration is illustrated in FIGS. **47-49***c*. In the illustrated embodiment, the vacuum valve **30** is interconnected to the storage device **10** via extension **185** interconnected with a lateral side **15** of the storage device **10**. With particular reference to FIG. **48** and FIGS. **49***a*-**49***c*, the vacuum valve **30** may be fluidly interconnected with the storage space **22** of the storage device **10** via a channel **189** at least partially contained within the extension **185**. In the illustrated embodiment, channel **189** is defined by a manifold **187** and an internal space of extension **185**. Channel **189** extends from, at least, the vacuum valve **30** to an opening into storage space **22**. Manifold **187** may be, for example, a rigid member, such as a high density plastic. Internal walls of the extension **185** may include a plurality of polyhedron structures **110**, such as described above, to facilitate removal of gasses from the storage space **22** of the storage device **10**. Thus, when pump **40** is utilized in conjunction with vacuum valve **30**, gases within storage space **22** may be evacuated therefrom via channel **189** and/or manifold **187**. While channel **189** has been described as being at least partially defined by manifold **187**, in other embodiments manifold **187** may be omitted.

[**0212**] Extension **185** may be a rigid material, such as a high density plastic. In other embodiments, and with reference to FIG. **50**, extension **185** may comprise a flexible material, such as LDPE. In this embodiment, extension **185** may be folded over onto the body of storage device **10**, such as during shipment and/or storage.

[**0213**] Channel **189** may extend substantially linearly into storage device **10** as illustrated in FIGS. **47-49***c*. In other embodiments, channel **189** may comprise a tortuous path through a lateral side **15** of the storage device **10**. For example, and with reference to FIG. **51**, channel **189** may comprise at least one turn therein. In this regard, the vacuum valve **30** and corresponding extension **185** may be located on a side portion and/or upper portion of the storage device **10**, as illustrated in FIG. **51**.

[**0214**] In other embodiments, channel **189** may be produced via a reconnectable physical connector of the extension **185**. For example, extension **185** may have a needle interconnected therewith, and channel **189** may be at least partially defined by the needle. The needle may be adapted to penetrate a side portion of the storage device **10** to facilitate removal of gases therefrom. In a particular embodiment, and with reference to FIG. **52**, extension **185** may be interconnected with a needle **191**, the needle **191** having a distal width W sufficient to facilitate removal of fluids from storage space **22** of the storage device **10**. The width W may also be small enough such that when needle **191** is removed from a lateral side **15** of the storage device **10**, the material of lateral side **15** reforms, thereby sealing storage space **22** from exterior fluids. In another embodiment, a one-way O-ring valve (not illustrated) may be located in a lateral side **15** of the storage device **10** so as to facilitate insertion and removal of pin **191**. In this regard, when needle **191** is inserted into the O-ring, fluid communication between vacuum valve **30** and storage space **22** is effected.

[**0215**] While illustrative embodiments of the invention are disclosed herein, it will be appreciated that numerous modifications and other embodiments may be devised by those skilled in the art. Therefore, it will be understood that the appended claims are intended to cover all such modifications and embodiments that come within the spirit and scope of the present invention.

What is claimed is:

1. An evacuable package comprising:

at least one polymeric sheet sealed along a portion of its periphery, thereby defining an evacuable package comprising an opening and an interior space;

a vacuum valve disposed on a first panel of the evacuable package, the vacuum valve being in fluid communication with the interior space and defining a sealable passage through which fluids may be drawn; and

a docking ring comprising an outer surface, an inner surface, an upper surface and a lower surface, wherein the lower surface is attached to the first panel of the evacuable package, and wherein the inner surface circumscribes the vacuum valve, thereby defining a passageway communicable with the vacuum valve and an engagement end of a pump.

2. The evacuable package of claim 1, wherein the passageway is aligned relative to the vacuum valve so as to align the engagement end of the pump with the vacuum valve when the engagement end of the vacuum valve is interconnected with the docking ring.

3. The evacuable package of claim 1, wherein the docking ring comprises a first complementary aligning feature for receiving a second complementary aligning feature of the pump, wherein the first complementary feature restricts receipt of the engagement end of the pump into the receiving cavity unless the second complementary feature is aligned therewith.

4. The evacuable package of claim 3, wherein the first complementary aligning feature is one of a male member and a female member, and wherein the second complementary feature is the other of the male member and the female member.

5. The evacuable package of claim 4, wherein the first complementary feature is disposed on at least one of the outer surface and the upper surface of the docking ring.

6. The evacuable package of claim 1, wherein the docking ring comprises at least one thread adapted to receive and restrictively engage an engagement feature of the pump.

7. The evacuable package of claim 6, wherein the at least one thread is disposed on the inner surface of the docking ring.

8. The evacuable package of claim 6, wherein the at least one thread is disposed on the outer surface of the docking ring.

9. The evacuable package of claim 6, wherein the at least one thread comprises a downward taper.

10. The evacuable package of claim 1, further comprising:

at least one rib attached to the first panel of the evacuable package, wherein the at least one rib is disposed within the passageway of the docking ring and extends towards the upper surface of the docking ring.

11. The evacuable package of claim 10, wherein the at least one rib is positioned with the passageway so as to physically engage a portion of the engagement end of the pump when the engagement end of the pump is interconnected with the docking ring.

12. The evacuable package of claim 10, wherein when the engagement end of the pump is in interconnected with the docking ring, a portion of the engagement end of the pump physically engages the ribs, wherein the ribs are pushed toward a second panel of the evacuable package, thereby defining a space between the vacuum valve and the second panel of the evacuable package.

13. The evacuable package of claim 1, further comprising:

a standoff structure coupled to one of the first panel and a second panel of the evacuable package, the standoff structure comprising a plurality of raised geometric surfaces defining channels for passage of fluids from the interior space of the evacuable package to the vacuum valve, wherein the channels face the interior surface of the first panel of the evacuable package.

14. The evacuable package of claim 13, further comprising:

a resealable closure attached to the opening of the evacuable package, the resealable closure comprising at least one set of interengaging profiles.

15. The evacuable package of claim 14, further comprising:

a caulking composition placed proximal to the interengaging profiles of the resealable closure.

16. The evacuable package of claim 14, wherein the caulking composition is placed on at least a first one of the interengaging profiles of the resealable closure.

17. The evacuable package of claim 16, further comprising a sealant stripe on the interior of at least one side panel of the evacuable package.

18. The evacuable package of claim, **17**, wherein the sealant stripe is a peal seal.

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