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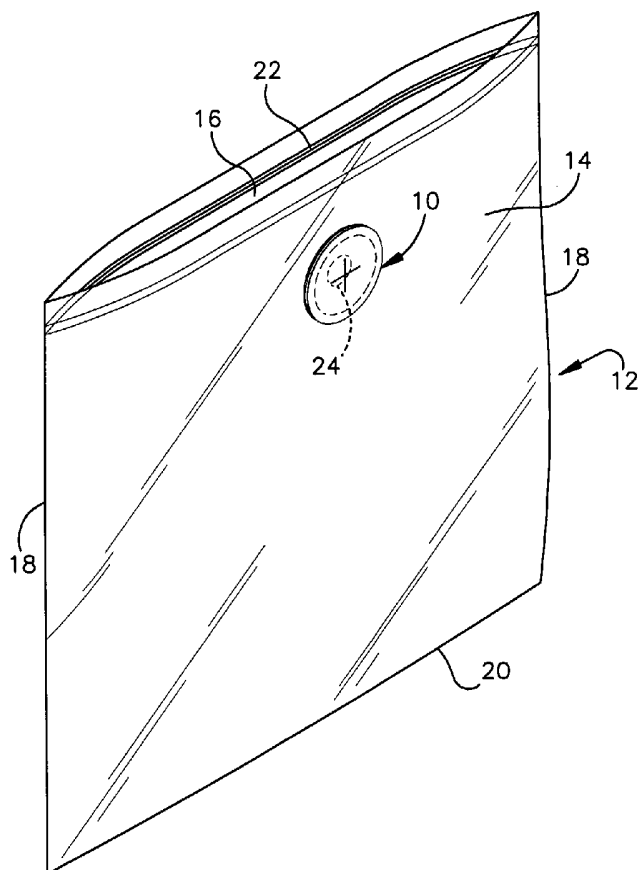
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(54) Title: FOOD BAG RELEASE VALVE



(57) Abstract: A release valve (10) for a food bag (12) comprising a vent layer (30) and a cover layer (32). The vent layer (30) is positioned over an opening (24) in a bag structure (13) of the food bag (12) and the cover layer (32) positioned over the vent layer (30) and attached thereto. A sealable area (52) forms a sealed passageway between the bag structure (13) and the vent layer (30), and a sealed area (56) forms a sealed passageway between the vent layer (30) and the cover layer (32). A slit (42) in the cover layer (32) forms an exit from the sealed area (56), whereby released gas passes from the area (52), through the vent layer (30), to the area (56), and exits through the slit (42).

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Title: FOOD BAG RELEASE VALVERELATED APPLICATIONS

For the purposes of the United States, this application claims priority under 35 U.S.C. §119(e) to U.S. Provisional Application No. 60/474,735 filed on May 30, 2003 and U.S. Provisional Application No. 60/516,791 filed on November 3, 2003.

5 The entire disclosures of these earlier provisional applications are hereby incorporated by reference. Also, a PCT Application (Attorney Docket AVERP3456WOB, Express Mail Label EV 434053255 US), and another PCT Application (Attorney Docket AVERP3456WOD, Express Mail Label EV 434053136 US), both entitled "FOOD BAG RELEASE VALVE", are being filed concurrently

10 herewith. The entire disclosures of these concurrently filed applications are also hereby incorporated by reference.

FIELD OF THE INVENTION

This invention relates generally, as indicated, to a food bag release valve and, more particularly, to a valve for selectively releasing unwanted gas from a food

15 bag.

BACKGROUND OF THE INVENTION

Food bags are commonly used by consumers and industries to store food for later use or consumption. A standard food bag construction comprises a pair of rectangular side panels made from a thermoplastic material and joined together

20 along side seams, a bottom seam, and a top seam. The side and bottom seams usually are permanent seals (e.g., heat sealed) and the top seam can be recloseable.

Food bags are often used to store food for freezing whereby such bags are frequently referred to as freezer bags. A major complaint surrounding the use of

25 freezer bags stems from what has come to be called "freezer burn;" that is, the dehydration that occurs when food is stored in the low humidity atmosphere of a freezer. Freezer burn can cause a complex deterioration of food quality involving undesirable texture changes, followed by chemical changes such as degradation of

pigments and oxidative rancidity of lipids. Taste, aroma, mouth feel, and appearance all can be ruined.

The elimination of air from the interior cavity of the freezer bag is known to dramatically decrease freezer burn. To this end, air release valves and/or special bag constructions have been used to minimize air within the bag. However, these solutions can substantially complicate (and slow-down) the bag-making process, and/or can significantly increase production costs.

SUMMARY OF THE INVENTION

The present invention provides a release valve for a food bag that supplies sufficient (and possibly superior) freezer-burn protection and can be easily fabricated and incorporated into existing food bag designs. The food bag does not require any special bag constructions, as almost any bag construction can be modified to accommodate the release valve by simply forming an appropriately placed opening. Moreover, the bag structure and the valve can be manufactured separately, by different manufacturers and at different locations. This allows bag-manufacturers to maintain conventional bag-making techniques and, quite significantly, not compromise current (and quick) bag-making speeds. Also, the bag structures and the valves can be inspected prior to integration whereby a defective valve (or batch) can be scrapped without having sacrifice an otherwise acceptable bag structure (or run). The flexible manufacturing option provided by the present invention results in lower total costs when compared to, for example, in-line production of both the valve and the bag structure.

More particularly, the present invention provides a release valve for a food bag comprising a vent layer positioned over an opening in the bag structure and a cover layer positioned over the vent layer and attached thereto. The vent layer is pervious with respect to expected gasses and is substantially impervious with respect to expected liquids. In this manner, when pressure is applied to the food bag, unwanted gas therewithin will pass through the vent layer for release from the bag. At the same time, liquids will be prevented from leaking from the bag if saturation and/or strategic squeezing is not performed.

A sealable area (having at least a portion aligned with the bag opening) forms a sealed passageway between the vent layer and the bag structure. A sealed area

(having at least a portion aligned with the sealable area) forms a sealed passageway between the vent layer and the cover layer. At least one slit through the cover layer provides an exit from the sealed area, whereby gas can be released from the bag structure, pass through the opening, through the vent layer and exit the cover layer through the slit(s). The slit(s) can form exit flap(s) which can lift relative to the rest of the cover layer during the release of gas from the bag structure. Alternatively, the slit(s) can provide a flapless exit (e.g., perforations or linear cuts).

The sealable area can be formed by an adhesive area (e.g., formed from a pressure-sensitive adhesive) on the inner surface, which can also be used to attach the valve to the bag structure. The sealed area can be formed by an adhesive area (e.g., formed from a curable adhesive), which also attaches the cover layer to the vent layer. The sealable area and the sealed area can be of substantially the same size and shape (e.g., circular) and substantially aligned with each other.

According to the present invention, the periphery of the cover layer does not extend beyond the periphery of the vent layer, and this feature of the invention contributes to efficient and economic integration of the valves into the bag structures. Specifically, for example, the valves and the bag structures can be manufactured separately at the same, but probably different, locations by the same, but probably different manufacturers. A plurality of the release valves can be provided on a release liner and then selectively removed therefrom for alignment and attachment to the bag structures. The removal, alignment, and/or attachment steps can be performed automatically (i.e., by a machine) or manually (i.e., by a person) depending on the requirements of the bag-manufacturer.

Preferably, the vent layer and the cover layer are of substantially the same shape (e.g., circular) and size, and are coextensive with each other, as this contributes to the efficient and economic mass-manufacturing of the valves. Specifically, a method of making a plurality of the valves can include the steps of overlaying a vent material (e.g., a non-woven polymer fabric) and a cover material (e.g., a polymer film), and cutting (e.g., die-cutting) these overlaid materials into shapes corresponding to the overall shape of the valves. The slits can be simultaneously formed in the cover layer during the same cutting step.

These and other features of the invention are fully described and particularly pointed out in the claims. The following description and drawings set forth in detail

certain illustrative embodiments of the invention, which are indicative of but a few of the various ways in which the principles of the invention may be employed.

DRAWINGS

Figure 1 is a perspective view of a food bag incorporating a release valve
5 according to the present invention.

Figure 2 is a close-up sectional view of the food bag, as seen along line 2-2 in Figure 1.

Figure 3 is a front view of the release valve isolated from the rest of the food bag.

10 Figures 4A-4D are schematic views showing a method of using the food bag to store food for later consumption.

Figures 5A -5F are isolated front views of modified versions of the release valve.

15 Figures 6A - 6J are schematic views showing a method of making the food bag according to the present invention.

DETAILED DESCRIPTION

Referring now to the drawings and initially to Figure 1, a release valve 10 according to the present invention is shown incorporated into a food bag 12. The food bag 12 can be intended for use as a freezer bag (*i.e.*, to store foods intended
20 to be frozen) and, as is explained in more detail below, the valve 10 supplies sufficient (or even superior) freezer-burn protection. The valve 10 can be easily fabricated and incorporated into existing food bag designs and may find application in "non-freezer-bag" applications as it can help improve freshness and/or reduce space.

25 The illustrated food bag 12 has a standard bag construction 13 with two side panels 14 and 16, each having a rectangular shape (although other geometries are certainly possible). The panels 14 and 16 can be made from a thermoplastic material or a blend of thermoplastic materials such as, for example, polyolefins such as high density polyethylene (HDPE), low density polyethylene (LDPE), linear low
30 density polyethylene (LLDPE), and polypropylene (PP); thermoplastic elastomers such as styrenic block copolymers, polyolefin blends, elastomeric alloys,

thermoplastic polyurethanes, thermoplastic copolyesters and thermoplastic polyamides; polymers and copolymers of polyvinyl chloride (PVC); polyvinylidene chloride (PVDC); saran polymers; ethylene/vinyl acetate copolymers; cellulose acetates; polyethylene terephthalate (PET); ionomer (Surlyn); polystyrene; polycarbonates; styrene acrylonitrile; aromatic polyesters; linear polyesters; and thermoplastic polyvinyl alcohols. That being said, the release valve 10 of the present invention may be used on other types of plastic bags or any other flexible plastic or non-plastic containers.

The panels 14 and 16 are joined together along side seams 18, a bottom seam 20, and a top seam 22. The preferably permanent seams 18 and 20 can be formed by heat sealing or another suitable technique, forming an air-tight union between the panels 14 and 16. The preferably re-closeable seam 22 can constitute, for example, male/female members, zipper-like members, adhesives, hook-and-loop fasteners, mechanical closures, slide locks, draw string arrangements, fold lock tops, magnetic connections, dead fold closures (*i.e.*, aluminum foil, wire folded, tape), heat seals, staples, handle strings, cable ties and/or twist ties. To prevent freezer burn, it may be important that the top seam 22 (as well as the other seams 18 and 20) be airtight to prevent the leakage of air therein. However, it is not crucial that the top seam 22 be recloseable, as the present invention could find application in a container having all permanently sealed seams.

The bag structure 13 includes an opening 24 on one of its panels (panel 14 in the illustrated embodiment) for registration with the release valve 10 of the present invention. In the illustrated embodiment, the opening 24 is located roughly centrally relative to the length of the panel 14 and the width of the panel 16. Also, it has a dimension (*e.g.*, diameter) in the range of about $\frac{1}{8}$ inch to about 2 inches, in the range of about $\frac{1}{4}$ inch to about 1 inch, in the range of about $\frac{3}{8}$ inch to about $\frac{7}{8}$ inch, in the range of about $\frac{1}{2}$ inch to about $\frac{3}{4}$ inch, and/or in the range of about $\frac{3}{8}$ inch to about $\frac{5}{8}$ inch. In the illustrated food bag 12, the opening 24 has a circular shape and is positioned centrally relative to the relevant panel 14. However, other shapes (*e.g.*, slits, slots) or other positions are possible with, and contemplated by, the present invention. In fact, this "opening" need not resemble a hole, but could simply constitute a portion of the bag structure 13 that is pervious to gas by virtue of material-make up, perforations, and/or weave.

Referring now to Figures 2 and 3, the release valve 10 is illustrated isolated from the bag structure 13. The release valve 10 comprises a vent layer 30 and a cover layer 32. When installed on the food bag 12, the vent layer 30 is the inner layer positioned closest to the bag panel 14 and the cover layer 32 is the outer layer positioned furthest therefrom. The vent layer 30 has an inner surface 34 and an outer surface 36, and the cover layer 32 has an inner surface 38 and an outer surface 40. (Figure 2.) A cross-shaped slit 42 extends through the thickness of the cover layer 32 (*i.e.*, from its inner surface 38 to its outer surface 40) thereby defining a plurality (*i.e.*, four) of flaps 44. (Figure 3.) As is best seen by referring briefly to Figure 4D, the flaps 44 are lifted relative to the rest of the cover layer 32 when gas is being released through the valve 10.

The release valve 10 has a circular shape (in plan) dictated by the circular shape of the vent layer 30 and the cover layer 32. (Figures 2 and 3.) Other valve and layer geometries are certainly possible with, and contemplated by, the present invention. However, preferably the size/shape of the layers 30 and 32, and their relative positioning relative to each other, is such that the circumference (*i.e.*, the periphery) of the cover layer 32 does not extend beyond the circumference (*i.e.*, the periphery) of the vent layer 30. (Figure 2.) In this manner, the inner surface 34 of the vent layer 30 can form the entire inner surface, or attachment surface, of the release valve 10. As is explained in more detail below, this feature of the invention contributes to efficient and economic integration of the valves 10 into the bag structures 13. More preferably, the layers 30 and 32 are of substantially the same shape and size, and are substantially aligned with each other. As is explained in more detail below, this contributes to the efficient and economic mass-manufacturing of the valves by allowing simultaneous cutting of the layers 30 and 32, and preferably also the slits 42.

The vent layer 30 is made of a material that allows expected gasses to escape from the food bag 12 while preventing the escape of expected liquids. ("Expected gasses" refers to gasses such as air and/or air mixed with gas from contents of the bag structure, and "expected liquids" refers to water and/or other liquids from the contents of the bag structure.) More specifically, the vent layer 30 is pervious with respect to the expected gasses while, at the same time, it is substantially impervious to the expected liquids. In the present situation

“substantially impervious” refers to the material’s ability to contain liquids should they casually come into contact therewith, but not necessarily the ability to prevent leakage should the material become saturated, should wicking action occur, and/or should strategic squeezing be performed to create a high pressure force in the vicinity of the opening 24.

Perhaps it should be noted at this point that liquid-leakage issues may not be significant in all relevant situations. For example, in situations where food that has already been frozen (e.g., frozen fish, frozen meat, etc.) is being repackaged for future freezing, the containment of liquid from within the bag 12 will not be a concern. In these circumstances, the liquid-imperviousness of the vent layer 30 would be less of a design consideration. Conversely, liquid-leakage issues may play more of a significant role in the desire for the food bag 12 to be compatible with non-freezer applications, such as temporarily storing liquid food substances such as soup or pasta sauce.

The cover layer 32 serves as a cover that guides escaping gas when pressure is placed on the closed food bag 12. The cover layer 32 can also serve as a supplemental liquid barrier so that, in combination with the liquid-impervious qualities of the vent layer 30, an increased shield is created.

An adhesive area 50 on the inner surface 34 of the vent layer 30 attaches the release valve 10 to the bag structure 13. (Figure 2.) In the illustrated embodiment, the adhesive area 50 has an annular shape bordering the periphery of the circular inner surface 34 and surrounding (and sealing) an adhesive-free central area 52. The adhesive-free area 52 includes at least a portion aligned with the bag opening 24 and can, as illustrated, extend therearound. Other shapes, more precise registration patterns, and/or less accurate alignment arrangements could be used instead for the adhesive area 50.

It may be noted that the two-fold purpose of the adhesive area 50 is to attach the vent layer 30 to the bag structure 12 and to seal the central area 52 so that expelled fluid will pass through the vent layer 30 to the central area 56 and exit through the flaps 44. Thus, any adhesive and/or any adhesive pattern that provides this attaching/sealing could be used. In fact, non-adhesive attachments/sealings accomplishing these same goals are possible with, and contemplated by, the present invention.

An adhesive area 54 on the outer surface 36 of the vent layer 30 attaches the cover layer 32 to the vent layer 30. (Figure 2.) In the illustrated embodiment, adhesive area 54 has an annular shape bordering the periphery of the circular outer surface 36 and surrounding (and sealing) an adhesive-free central area 56. A
5 portion of the adhesive-free area 56 is aligned with the adhesive-free area 52 and another (or the same) portion is aligned with the flaps 44. The adhesive area 54 is intended to attach the cover layer 32 to the vent layer 30 and to seal the central area 56 so that the released gas will pass through the flaps 44. As with the adhesive area 50, any adhesive or non-adhesive arrangement which provides such
10 attaching/sealing is possible with, and contemplated by, the present invention.

As shown in Figures 4A - 4D, the illustrated bag 12 can be used by a consumer, in a home setting, to store food for freezing. According to the present invention, food F is placed in the bag structure 13 and the top seam 22 is closed. (Figures 4A and 4B.) Pressure is then applied to the bag structure 13 (e.g. by
15 manually pushing or squeezing the bag structure 13) at a location lower than the release valve 10. (Figure 4C.) Gas (e.g. air) within the bag structure 13 then passes through the opening 24 to the adhesive-free area 52, through the vent layer 30 to the adhesive-free area 56, through the slits 42 thereby lifting the flaps 44 to escape to the atmosphere. (Figure 4D.) The adhesive-free areas 52 and 56 can
20 be viewed as "sealed areas" which provide passageways from the bag opening 24 to the exit slits 42.

In the valve 10 shown in Figures 1-4, the cross slit 42 forms four triangular flaps 44 which lift to release the expelled gas. Other types of slits 42, forming other types of flaps 44, are certainly possible with and contemplated by, the present
25 invention, such as those shown in Figures 5A - 5D. Specifically, for example, an overlapping-cross slit 42 can form eight triangular flaps 44 (Figure 5A), a half-capsule slit 42 can form a correspondingly half-capsule flap 44 (Figure 5B), a pair of ear-shaped slits 42 can form correspondingly ear-shaped flaps 44 (Figure 5C), and a series of semi-circular slits 42 can form a plurality of semi-circular flaps 44
30 (Figure 5D). Moreover, the slit(s) 42 need not form flaps 44, as they can have "flapless" design wherein the slit(s) 42 comprise, for example, perforations (Figure 5E) or linear cuts (Figure 5F), allowing the released gas to escape therethrough.

Referring now to Figures 6A - 6J, a method for mass-manufacturing a plurality of the food bags 12 according to the present invention is schematically shown. In this method, a plurality of the valves 10 is manufactured, a plurality of the bag structures 13 is manufactured separately and in a conventional manner, and the valves 10 are integrated into the structures 13 during the latter stages of bag production. While the illustrated schematic steps are shown with respect to a single row of valves 10 and/or bag structures 13, these steps can, of course, be performed simultaneously or intermittently to a plurality of rows for mass production purposes. In either or any event, a valve-manufacturer can provide a plurality of the valves 10 in roll or sheet form to a bag-manufacturer for integration into bag structures 13.

To manufacture the valves 10, a continuous web of cover material 60 is provided having an inner surface 62 and an outer surface 64. (Figure 6A.) A commercial indication, a name brand, a logo or other labeling indicia 66 is printed on the outer surface 64. (Figure 6B) An adhesive 68 is applied (e.g., printed) on the inner surface 62 of the cover material 60 in a pattern corresponding to the adhesive areas 54. (Figure 6C.) A continuous web of a vent material 70 having an inner surface 72 and an outer surface 74 is then positioned so that its outer surface 74 is adjacent the inner surface 62 of the cover material 60, whereby the adhesive 68 is positioned therebetween. (Figure 6D.)

An adhesive 76 is applied (e.g., printed) to the inner surface 72 of the vent material 70 in a pattern corresponding to the adhesive areas 50 in the valves 10. (Figure 6E.) A release liner 78 is positioned over the inner surface 72 of the vent material 70 so that the adhesive 76 is positioned therebetween. (Figure 6F.) The compilation of materials 60 and 70 is then die cut into squares corresponding to the overall shape of the valves 10 and, preferably simultaneously, the cover material 60 is cut to form the slits 42. (Figure 6G.) The die-cuts do not extend through the release liner 78 whereby a web 80 comprising a plurality of the valves 10 temporarily attached to the release liner 78 (via the adhesive 76 or the adhesive area 50) is produced. (Figure 6H.) The web 80 can be shipped from the valve-manufacturing location to the bag-manufacturing location in, for example, roll form.

The bag structures 13 are separately mass-manufactured in a continuous strip wherein the bottom seam 20 of one bag structure 13 abuts against the top seam 22 of the adjacent downstream bag structure 13. (Figure 6I). The valves 10

can be removed from the release liner 78, aligned with the openings 24 and secured to the bag structures 13 (Figure 6J). The removal, aligning, and securing step can be performed automatically (*i.e.*, by a machine, not shown) or can be performed manually (*i.e.*, by a person, not shown). The bag structures 13 are separated from each other by a severing device (not shown), either before or after the valve-securing step.

Thus, the present invention allows the bag structure 13 and the valve 10 to be manufactured as separate articles and integrated together during final production stages. This allows the bag structure 13 to be made in a conventional (and quick and proven cost-effective) manner whereby the integration of the valve 10 does not significantly affect the bag-making process. Additionally or alternatively, the valves 10 can be inspected prior to integration whereby potentially defective items can be pulled from the process without having to scrap entire otherwise acceptable bag structures 13. (Likewise, the bag structures 13 can be inspected prior to integration to avoid the scraping otherwise acceptable valves 10, however, the cost of the bag structure 13 will usually greatly outweigh the cost of the valve 10.) The flexible manufacturing option provided by the present invention results in lower total costs when compared to, for example, in-line production of both the valve and the bag structure.

The cover material 60 (and thus the cover layer 32) can be made from polymer film materials such as polystyrenes, polyolefins, polyamides, polyesters, polycarbonates, polyvinyl alcohol, poly(ethylene vinyl alcohol), polyurethanes, polyacrylates including copolymers of olefins such as ethylene and propylene with acrylic acids and esters, copolymers of olefins and vinyl acetate, ionomers and mixtures thereof. One particular example is a biaxially-oriented semi-crystalline polymer film comprising isotactic polypropylene, also referred to as biaxially-oriented polypropylene (BOPP).

The adhesive 68 (and thus the adhesive area 54) can be any suitable adhesive, such as a pressure-sensitive adhesive (*e.g.*, acrylic-based, rubber-based, or silicone-based) or a curable-adhesive, such as a UV-curable adhesive. (It may be noted that if a UV-curable adhesive is used for the adhesive 68, the cover material 60 may need to be transparent.)

The vent material 70 (and thus the layer 30) can be made from nylon, polyolefins (e.g., polyethylene, polypropylene, ethylene butylene copolymers), polyurethanes, polyurethane foams, polystyrenes, plasticized polyvinylchlorides, polyesters, polyamides, cotton, or rayon. The vent material can be woven, non-woven, knitted and/or an aperatured (or perforated) film. Preferably, the material used to fabricate the vent layer 30 should have a porosity or perviousness of at least about 5 cfm (cubic feet per minute), at least about 10 cfm, at least about 15 cfm, at least about 20 cfm and/or at least about 25 cfm with respect to air so that an acceptable level of gas flow can be obtained without the placement of excessive pressure on the bag.

The adhesive 76 (and thus the adhesive area 50) can be any suitable adhesive, such as a pressure-sensitive adhesive (e.g., acrylic-based, rubber-based, or silicone-based) and, more particularly, a hot melt pressure-sensitive adhesive.

The release liner 78 can be a single sheet of paper or polymeric film having a release coating, such as a silicone release coating.

It may be noted that another consideration for material selection with respect to the vent layer 30, the cover layer 32, the adhesive 50, the adhesive 54, and/or the release liner 78 may stem from the potential food-related use of the food bag 12. Specifically, the FDA may dictate that only certain materials and/or adhesives can be used when the possibility of food contact exists. Furthermore, if the food bag 12 is intended to be used as a freezer bag, the materials should be able to remain intact at the expected freezing temperatures. Also, with particular reference to the adhesive 50 (used to attach the valve 10 to the bag structure 13), an important consideration might be whether the valves 10 will be automatically or manually attached to the bag structures 13.

One now may appreciate that the present invention provides a release valve 10 that provides sufficient (or even superior) freezer-burn protection and can be easily fabricated and incorporated into existing food bag designs. Unlike prior art attempts to address the problem of freezer burn, the present invention does not require any special bag constructions and/or closing means. In fact, almost any food bag construction can be modified to accommodate the release valve of the present invention by simply forming the opening 24 in the appropriate place. Moreover, the release valve 10 need not be used solely in food bags, but could find

application in any flexible packaging container (for perishable and/or non-perishable items) wherein venting is necessary or desired. Additionally or alternatively, the venting action can be accomplished by the application of external pressure (*e.g.*, a compressible portion of the package is pushed) or by increased internal pressure
5 (*e.g.*, increased temperatures or chemical reactions causing the pressure within the container to elevate).

Although the invention has been shown and described with respect to certain preferred embodiments, it is evident that equivalent and obvious alterations and modifications will occur to others skilled in the art upon the reading and
10 understanding of this specification. The present invention includes all such alterations and modifications and is limited only by the scope of the following claims.

CLAIMS

1. A release valve (10) for a food bag (12) comprising:
a vent layer (30) positioned over an opening (24) in a bag structure (13) of the food bag (12), the vent layer (30) being pervious with respect to expected gasses
5 and substantially impervious with respect to expected liquids;
a sealable area (52) for forming a sealed passageway between the vent layer (30) and the bag structure (13), the area (52) having at least a portion positioned for alignment with the opening (24) in the bag structure (13);
a cover layer (32) positioned over the vent layer (30) and attached thereto,
10 the periphery of the cover layer (32) not extending beyond the periphery of the vent layer (30);
a sealed area (56) forming a sealed passageway between the vent layer (30) and the cover layer (32), the sealed area (56) having a least a portion aligned with the sealable area (52); and
15 at least one slit (42) through the cover layer (32) forming an exit from the sealed area (56), whereby released gas can pass from the area (52), through the vent layer (30) to the area (56), and exit the area (56) through the at least one slit (42).
2. A release valve (10) as set forth in the preceding claim, wherein the
20 vent layer (30) and the cover layer (32) are of substantially the same shape and size, and are coextensive with each other.
3. A release valve (10) as set forth in either of the preceding claims, wherein the vent layer (30) and the cover layer (32) are each of a substantially circular shape.
- 25 4. A release valve (10) as set forth in any of the preceding claims, wherein the vent layer (30) comprises a non-woven polymer fabric.
5. A release valve (10) as set forth in any of the preceding claims, wherein the cover layer (32) comprises a polymer film.

6. A release valve (10) as set forth in any of the preceding claims, wherein the sealable area (52) is formed by an adhesive area (50) on the inner surface (34) of the vent layer (30), the adhesive area (50) bordering the periphery of the inner surface (34) and surrounding, and sealing, the sealable area (52).

5 7. A release valve (10) as set forth in the preceding claim, wherein the adhesive area (50) can be used to attach the valve (10) to the bag structure (13).

8. A release valve (10) as set forth in either of the preceding two claims, wherein the adhesive area (50) is formed from a pressure-sensitive adhesive (62).

9. A release valve (10) as set forth in any of the preceding claims,
10 wherein the sealed area (56) is formed by an adhesive area (54) bordering the periphery of the outer surface (36) of the vent layer (30).

10. A release valve (10) as set forth in the preceding claim, wherein the adhesive area (54) also attaches the cover layer (32) to the vent layer (30).

11. A release valve (10) as set forth in either of the two preceding claims,
15 wherein the adhesive area (54) is formed from a curable adhesive (66).

12. A release valve (10) as set forth in any of the preceding claims, wherein the sealable area (52) and the sealed area (56) are of substantially the same size and shape, and wherein the sealable area (52) and the sealed area (56) are substantially aligned with each other.

13. A release valve (10) as set forth in any of the preceding claims,
20 wherein the sealable area (52) and the sealed area (56) each have a substantially circular shape.

14. A release valve (10) as set forth in any of claims 1 - 13, wherein the at least one slit (42) forms at least one flap (44) which lifts relative to the rest of the
25 cover layer (32) when released gas passes through the slit (42).

15. A release valve (10) as set forth in the preceding claim, wherein the at least one slit (42) forms a plurality of flaps (44) which lift relative to the rest of the cover layer (32) when released gas passes through the slit (42).

16. A release valve (10) as set forth in either of the preceding two claims,
5 wherein the at least one slit (42) comprises a plurality of slits (42).

17. A release valve (10) as set forth in any of claims 1 - 13, wherein the at least one slit (42) is of a flapless design.

18. A release valve (10) as set forth in claim 17, wherein the at least one slit (42) comprises a plurality of perforations.

10 19. A release valve (10) as set forth in claim 17, wherein the at least one slit (42) comprises a plurality of linear cuts.

20. A web (80) comprises a plurality of the release valves (10) set forth in any of the preceding claims and a release liner (78) to which the valves (10) are temporarily attached for selective removal therefrom for integration into the bag
15 structure (13).

21. A web (80) as set forth in claim 20 in a roll form.

22. A web (80) as set forth in claim 20 in a sheet form.

23. A web (80) as set forth in any of claims 20 - 22, when they depend
20 from claim 6, wherein the adhesive area (50) temporarily attaches the valves (10) to the release liner (80).

24. A method of making a plurality of the release valves (10) set forth in any of the preceding claims, said method comprising the steps of:

overlaying a vent material (70) and a cover material (60) so that an outer surface (74) of the vent material (70) is adjacent an inner surface (62) of the cover material (60);

5 positioning an adhesive (68) between the outer surface (74) of the vent material (70) and the inner surface (62) of the cover material (60) in a pattern corresponding to the baffle areas (56);

positioning an adhesive (76) on the inner surface (72) of the vent material (70) in a pattern corresponding to the sealable areas (52);

10 cutting the cover material (60) and the vent material (70) into shapes corresponding to the overall shape of the valves (10); and

cutting the cover material (60) with cuts corresponding to the slits (42).

25. A method as set forth in the preceding claim, wherein said step of positioning the adhesive (62) on the inner surface of the vent material (60) comprises the step of applying the adhesive (62) to the inner surface of the vent material (60).

26. A method as set forth in the preceding claim, further comprising the step of overlaying a release liner (64) over the adhesive (62) on the inner surface of the vent material (60).

20 27. A method as set forth in any of claims 24 - 26, wherein said step of overlaying the cover material (60) and the vent material (70) and said step of positioning the adhesive (76) between the cover material (60) and the vent material (70) comprises applying the adhesive (76) to the inner surface (62) of the cover material (60) and overlaying the vent material (70) over the adhesive (76).

25 28. A method as set forth in any of claims 24 - 27, wherein said slit-forming step is performed substantially simultaneously with said cutting step.

30 29. A food bag (12) comprising a bag structure (13) having an opening (24) and the air release valve (10) set forth in any of claims 1 - 19, wherein the vent layer (30) is positioned so that the sealable area (52) has at least a portion aligned

with the opening (24) in the bag structure (13) and wherein the vent layer (30) is attached to the bag structure (13) so that the sealable area (52) forms a sealed passageway between the vent layer (30) and the bag structure (13).

30. A food bag (12) as set forth in the preceding claim, wherein the bag structure (13) includes a recloseable seam (22).

31. A food bag (12) as set forth in the preceding claim, wherein the bag structure (13) comprises a plurality of thermoplastic panels (14, 16) and wherein the opening (24) is on one of the panels (14).

32. A method of using the food bag (12) set forth in any of claims 29 - 31, said method comprising the steps of:
placing a portion of food (F) into the bag structure (13);
closing the bag structure (13); and
applying pressure to the bag structure (13) to release air from its interior cavity through the air release valve (10).

33. A method as set forth in the preceding claim, further comprising the step of placing the closed bag structure (13) in a freezer after performing said pressure-applying step.

34. A method as set forth in either of the preceding two claims, wherein said placing, closing, and pressure-applying steps are performed by a consumer when storing food for later consumption.

35. A method as set forth in any of the preceding three claims, wherein said pressure-applying step comprises pushing a portion of the bag structure (13).

36. A method of making a plurality of the food bags (12) set forth in any claims 29 - 31, said method comprising the steps of:
manufacturing a plurality of the bag structures (13);
separately manufacturing a plurality of the release valves (10);

aligning the release valves (10) with the openings (24) in the bag structures (13) so that the sealable areas (52) will form sealed passageways between the vent layers (30) and the bag structures (13);

securing the aligned release valves (10) to the bag structures (13).

5 37. A method as set forth in the preceding claim, wherein the bag-manufacturing step is performed at a bag-manufacturing location and the valve-manufacturing step is performed at a different valve-manufacturing location.

10 38. A method as set forth in either of the preceding claim, wherein said valve-manufacturing step results in a web (80) comprising a plurality of the release valves (10) temporarily attached to a liner (78) for selective removal therefrom.

39. A method as set forth in the preceding claim, further comprising the step of removing the plurality of valves (10) from the liner (78) prior to said securing step.

15 40. A method as set forth in claim 39, wherein said removing step is performed automatically by a machine.

41. A method as set forth in claim 39, wherein said removing step is performed by hand.

20 42. A method as set forth in any of claims 36 - 41, wherein said aligning step and/or said securing step is performed automatically by a machine.

43. A method as set forth in any of claims 36 - 41, wherein said aligning step and/or said securing step is performed by hand.

25 44. A release valve (10) for a flexible container (13) comprising a vent layer (30), a cover layer (32), a passageway between the vent layer (30) and the cover layer (32), and an exit (42) for released gas; wherein the periphery of the cover layer (32) does not extend beyond the periphery of the vent layer (30).

45. A release valve (10) for a flexible container (13) comprising a vent layer (30), a cover layer (32), a passageway between the vent layer (30) and the cover layer (32), and an exit (42) for released gas; wherein the periphery of the cover layer (32) does not extend beyond the periphery of the vent layer (30);

1/6

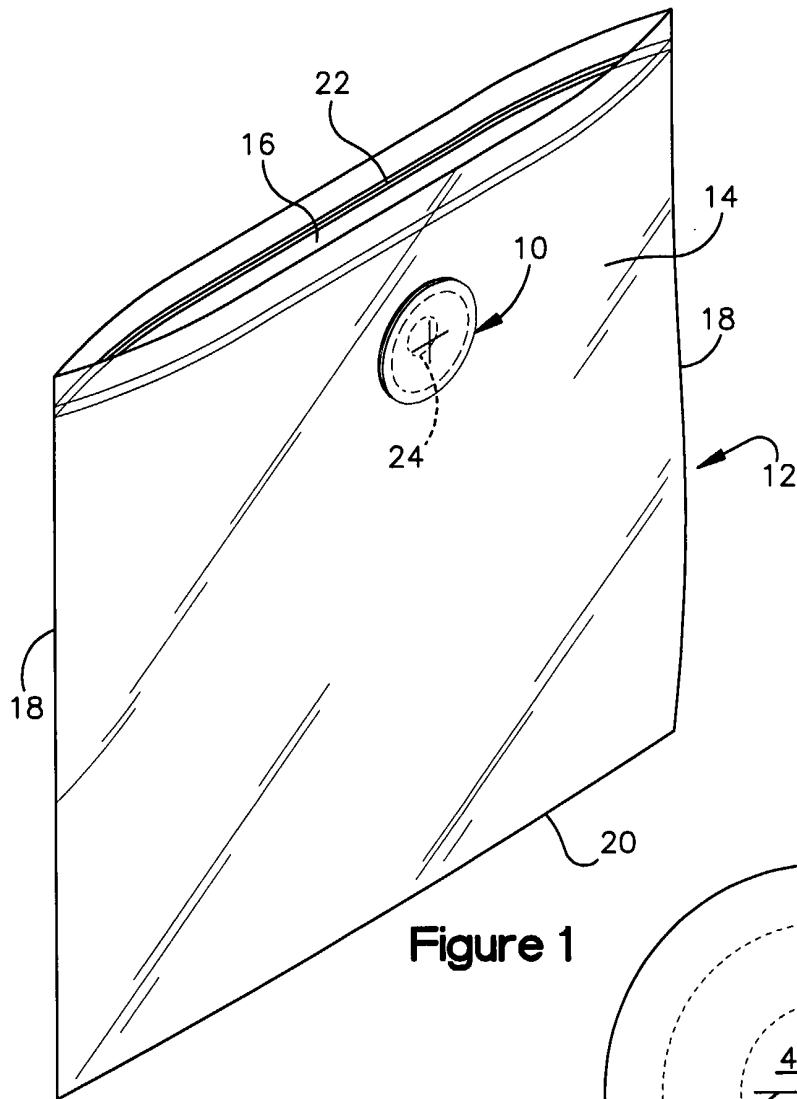


Figure 1

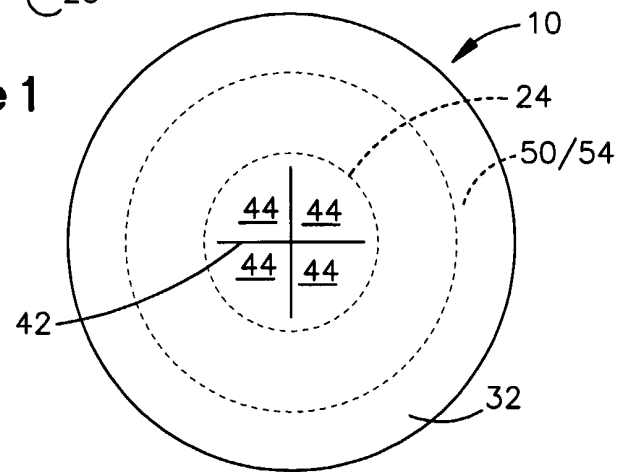


Figure 3

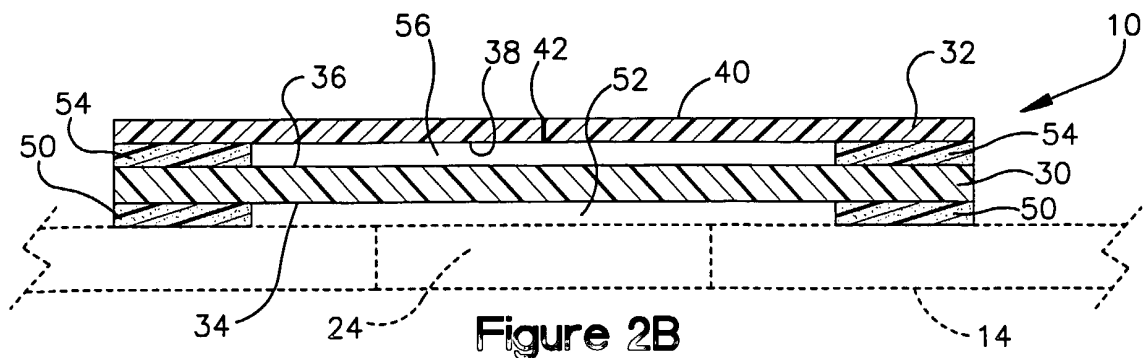


Figure 2B

2/6

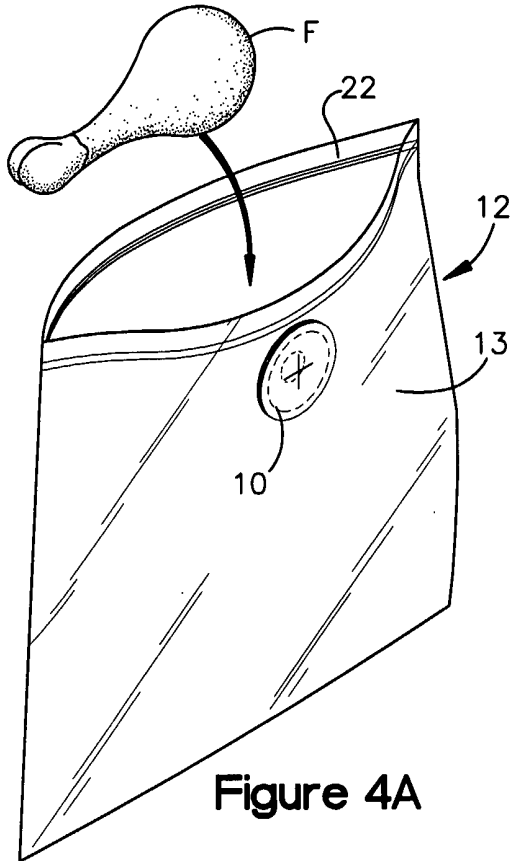


Figure 4A

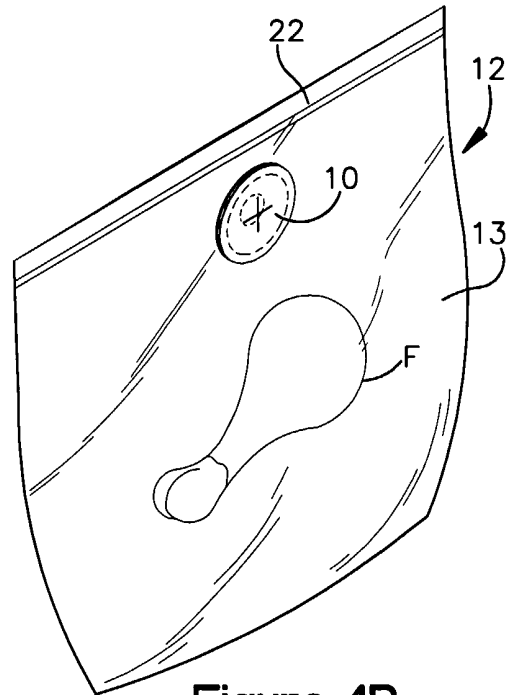


Figure 4B

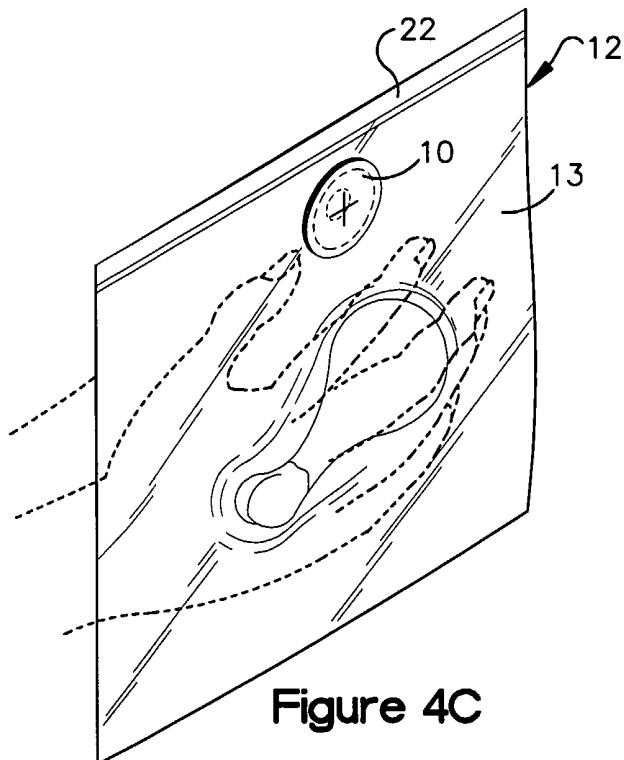


Figure 4C

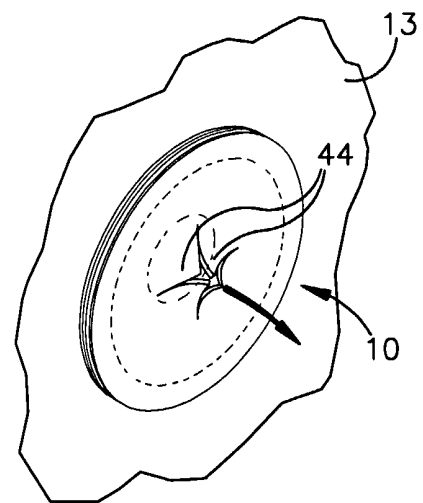


Figure 4D

3/6

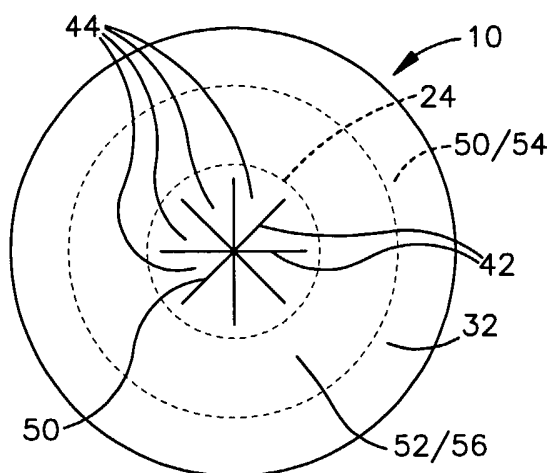


Figure 5A

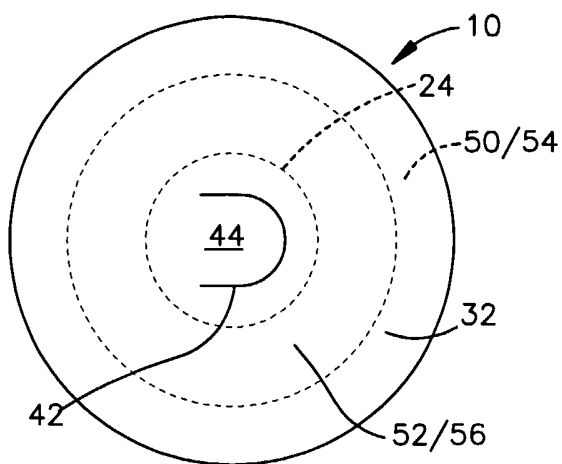


Figure 5B

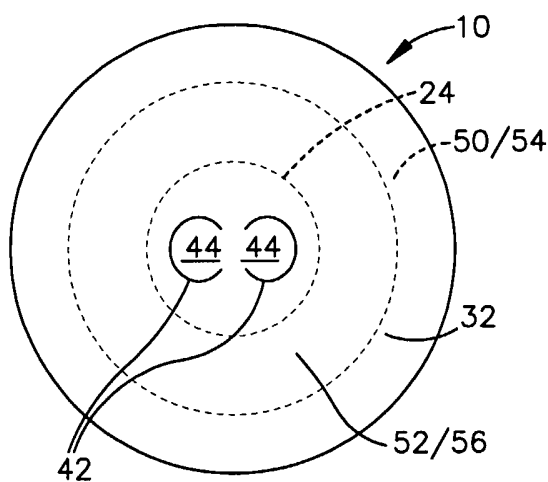


Figure 5C

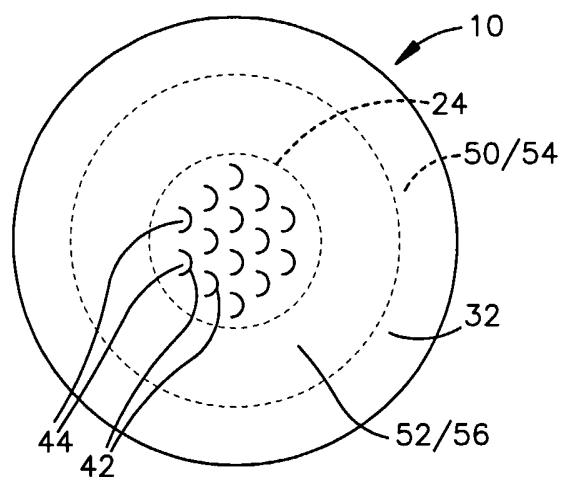


Figure 5D

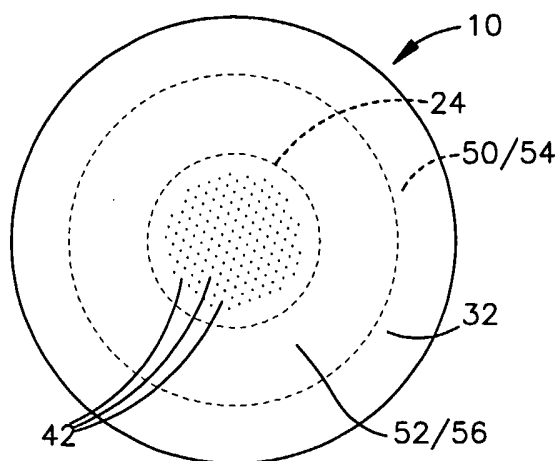


Figure 5E

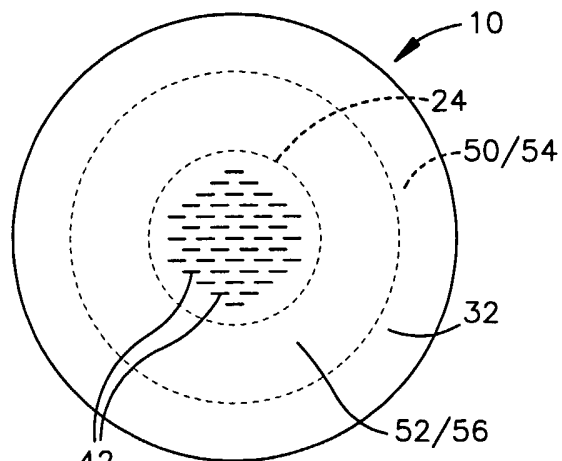


Figure 5F

4/6

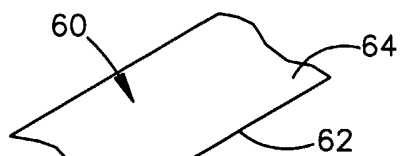


Figure 6A

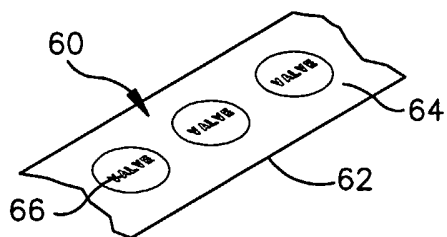


Figure 6B

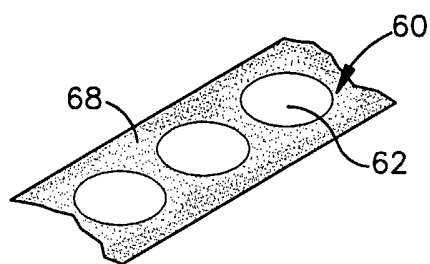


Figure 6C

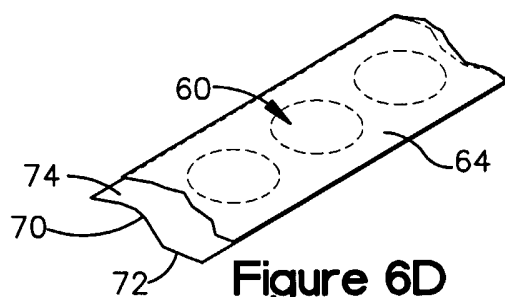


Figure 6D

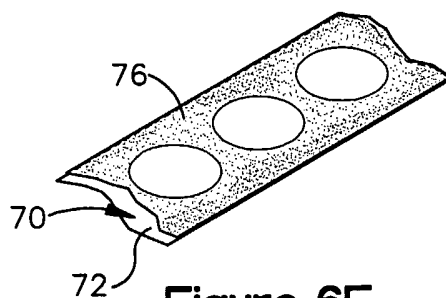


Figure 6E

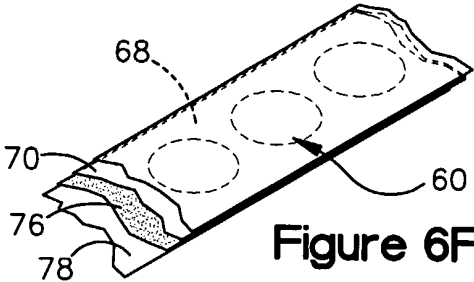


Figure 6F

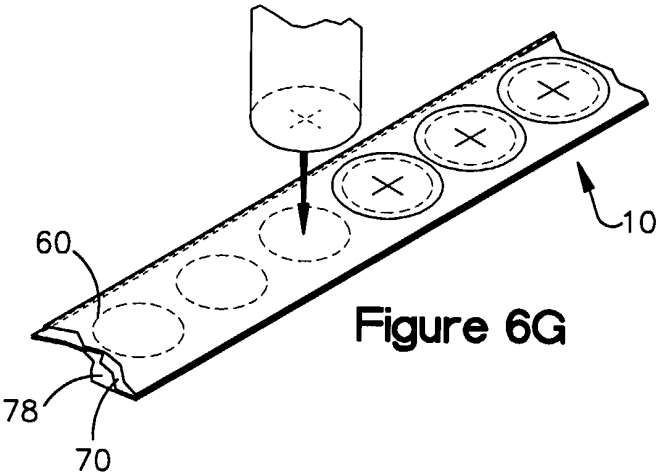


Figure 6G

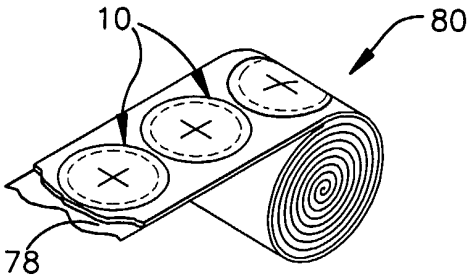


Figure 6H

6/6

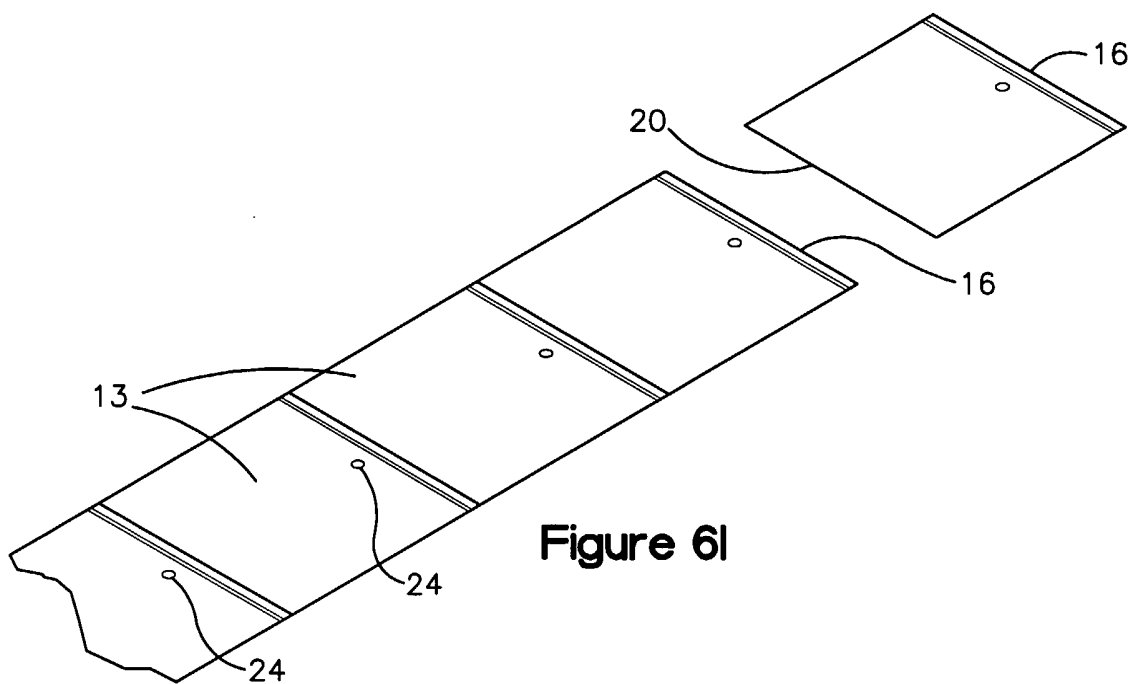


Figure 6I

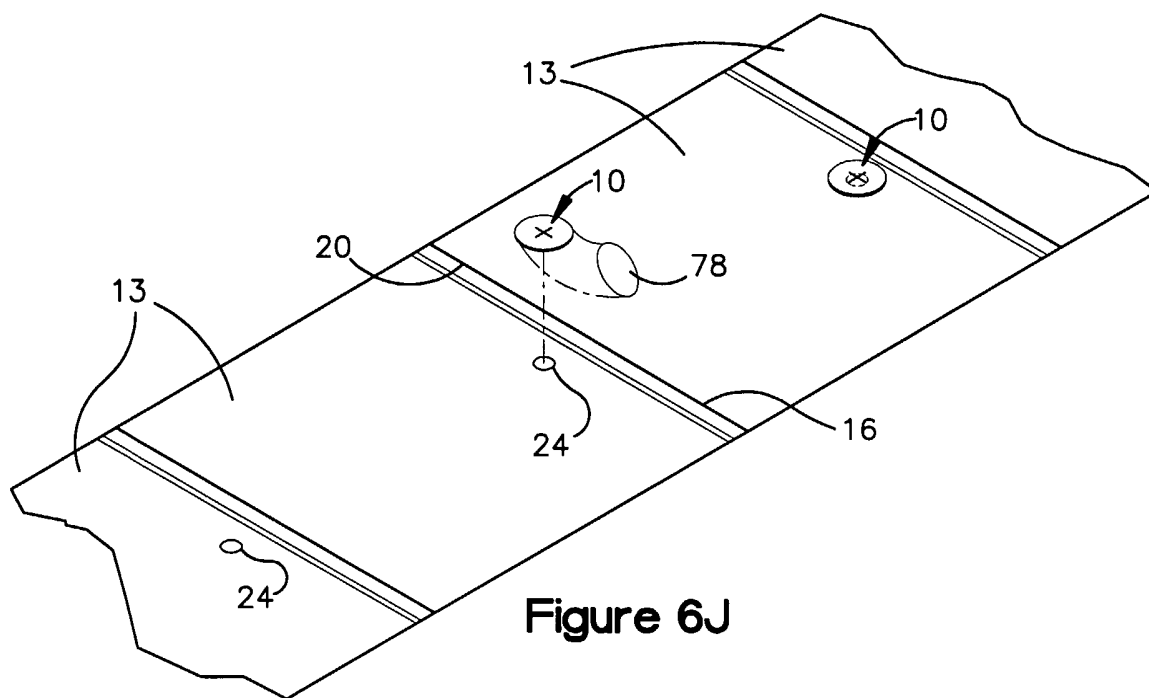


Figure 6J

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US2004/017145

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B65D77/22 B31B23/00 B31B19/84

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B65D B31B

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 989 608 A (MIZUNO MAKI) 23 November 1999 (1999-11-23)	1, 20, 24, 29, 32, 36
X	the whole document	44, 45
X	US 5 992 635 A (WALTERS WILLIAM J) 30 November 1999 (1999-11-30)	44, 45
A	the whole document	1
A	US 5 445 870 A (BUCHNER NORBERT ET AL) 29 August 1995 (1995-08-29)	24
A	the whole document	
P, A	US 2004/000502 A1 (WINIARSKI PEGGY B ET AL) 1 January 2004 (2004-01-01)	1
	figures	
A	DE 24 54 248 A (HESSER AG MASCHF) 20 May 1976 (1976-05-20)	1
	figures	

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

☒ Patent family members are listed in annex.

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- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *Z* document member of the same patent family

Date of the actual completion of the international search

18 October 2004

Date of mailing of the international search report

27/10/2004

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Fournier, J

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US2004/017145

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