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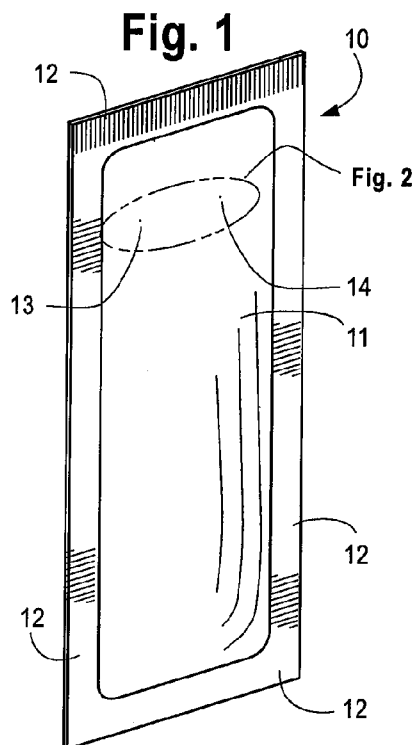
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(54) Title: VENTED PACKAGE



(57) Abstract: Disclosed are a vented package (10) and a method for preparing same. In one embodiment, the package (10) is composed of a laminar sheet material that at least partially defines an enclosed volume and that includes at least one vent (13, 14). When used for packaging of baking powder, the vent includes at least one punctured aperture such that the total vent area in said package (10) is sufficient to vent carbon dioxide released from the baking powder. In another embodiment, the package (100) is composed of a container (102) sealed with a laminar sheet material (108) and that includes at least one vent (110). When transported over varying altitudes, the vent helps to avoid deformation of the package while also limiting ingress of moisture.



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VENTED PACKAGE

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This patent claims benefit to United States Provisional Application No. 61/182,941, entitled Vented Package, filed on June 1, 2009, which application is hereby incorporated by reference in its entirety.

TECHNICAL FIELD

[0002] Generally, the invention is in the field of packaging. Some embodiments of the invention are directed toward packages, and other embodiments are directed toward methods for preparing a package.

BACKGROUND

[0003] Vented packages have long been known. Such packages are used commonly in many industries, in particular the food industry. Many food products release gases upon transport and storage, and accordingly it is often desired to provide a porous or vented package to permit egress of such gases from the package.

[0004] For instance, some food products are packaged in a barrier film material that is provided with a vent equipped with a mechanical valve. Such mechanical valves, which are used frequently in packages for coffee, typically are simple one-way valves that open when pressure inside the package exceeds ambient pressure by a sufficient amount.

[0005] In other cases, particularly in the packaging of medicines and household products, the vent may take the form of a gas-permeable membrane. Membranes are intended to permit release of gases from the package, but are designed to prevent ingress of moisture that would otherwise intrude via ambient humidity.

[0006] In some cases, food products are packaged in porous packages, in particular paper packages. For example, baking powder often is provided in a paper package or polyethylene terephthalate and polyethylene package. The shelf-life of the baking powder in such a package, particularly after the package has been opened, in some cases is undesirably short. Baking powder is believed to require venting or a porous package in light of the reaction that can occur

between the soda and calcium phosphate components of the baking powder, which forms calcium dioxide as a byproduct, and in light of the degradation of the soda component of baking powder, which also releases carbon dioxide.

[0007] In other embodiments, food products can be provided within a package having a sheet material seal disposed over an opening of the package. This seal can break when the package is transported from high to low altitudes, or vice versa. When a package is sealed in an area of high altitude, *i.e.*, an area of low pressure, and then is subsequently transported to areas of lower altitude, *i.e.*, areas having a higher pressure, the outer walls of the sealed package can implode or collapse inwardly.

[0008] Likewise, where a package is sealed in areas of low altitude, *i.e.*, an area of high pressure, and then is subsequently transported to areas of higher altitude, *i.e.*, areas having lower pressure, an increase of internal pressure can take place. As the altitude increases, the gas in the head space of the sealed container can expand. This can create an increase in internal pressure, which can cause a pillowing effect in the film seal overlay or deformation of the walls of the container. If the material expands too much, the increased pressure can compromise the seals of the container, causing them to fail. A resulting leak in a sealed package can result in a significantly shorter shelf life for the food product packaged therein.

[0009] Thus, in some instances a vented or porous package can be provided to permit the egress of air in an effort to avoid this pressure differential between the interior of a sealed container or package and the exterior atmosphere. Although a vented package can allow for the air inside of the package to equilibrate with ambient atmospheric pressure, the vent also can allow moisture outside of the package to enter, thus introducing moisture to the package and the food product. This introduction of moisture to the interior of the package can also result in a significant shortening of the shelf life of the food product packaged therein.

SUMMARY

[0010] In some embodiments, a package is provided. The package is suitable for contents that require venting, in particular (but not exclusively) food products, such as baking powder. The package is composed of a laminar sheet material that at least partially defines an enclosed volume. The sheet material is composed of at least first and second laminae, the first lamina

providing a moisture barrier and the second lamina being polymeric and permitting the creation of a welded seal, such as a thermally or sonically welded seal. The laminar sheet may be composed of, for instance, metalized polyester, in particular, aluminum vacuum-deposited polyethylene terephthalate.

[0011] The package includes at least one vent, the vent comprising an aperture, such as a needle punctured aperture, that extends through the first and second laminae. The punctured aperture is suitably dimensioned for the purposes described herein. When the package contains baking powder, the package has a vent area sufficient to vent carbon dioxide released from said baking powder, and to exhibit at least a twelve-week available carbon dioxide level under accelerated conditions of at least 10.5%, under the guidelines discussed hereinbelow. The vent area may result from a single vent or from plural vents in the package. Surprisingly, via the use of punctured vents in a laminar sheet material, the package may provide exceptional baking powder shelf life while permitting escape of carbon dioxide formed during storage and transport.

[0012] In other embodiments, not mutually exclusive with respect to the heretofore described embodiments, the package includes at least one vent having a vent area in the first lamina that is greater than the vented area in the second lamina, the vent having an effective vent area through both laminae in the range of about 750-5000 square microns.

[0013] In still other embodiments, not mutually exclusive with respect to the heretofore described embodiments, a package may be prepared as described, the package including at least one vent having a porosity of at least 190 to 240 seconds, preferably at least 200-230 seconds, when evaluated under the parameters described herein.

[0014] In yet additional embodiments, methods for preparing or filling a package are provided. Generally, the method comprises providing a laminar sheet material having at least one punctured vent as described hereinabove, and forming a package from the sheet material. A method for filling a package may comprise providing a package as described above, placing baking powder into the package, and sealing the package.

[0015] In another embodiment, a sealed container is provided. The container can comprise a rigid or semi-rigid wall that has an opening that can be sealed with a sheet material having at

least first and second laminae, the first lamina providing a moisture barrier and the second lamina being a polymeric sealable material and permitting the creation of a seal with the container. The sheet material can include at least one vent, the vent comprising an aperture, such as a needle punctured aperture as described above and herein, that extends through the first and second laminae. This vent provides for venting of the pressure inside of the container, such as during transport from high altitude locales to low altitude locales. The pressure inside of the container can equilibrate with the pressure external to the sealed package to help retain the package's overall shape and prevent deformation. The vent is provided with a vent area that limits ingress of moisture to acceptable levels depending on the food product packaged therein and on the desired shelf life.

[0016] The sheet material and wall material can be composed of separate materials that allow the sheet material to be easily separated from the wall material. This imparts a peel-away property, whereby the inner lamina of the sheet material connects to a rim of the container in a manner that permits ready manual peeling away of the sheet material from the container rim to expose the opening and the packaged product therein.

[0017] Additionally, the first lamina can be metallized. The addition of the metallized component to the first lamina can provide a light-impeding function for avoiding light damage or degradation of the packaged product. The light-impeding function can shield the packaged product inside of the container and help to maintain the product shelf life for products that are sensitive to light exposure.

[0018] Methods for forming a package and filling a package are also provided in some embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] FIG. 1 is a perspective view of a package prepared in accordance with one embodiment.

[0020] FIG. 2 is a perspective view, enlarged with respect to FIG. 1, of a portion of the package illustrated in FIG. 1.

[0021] FIG. 3 is a plan view, enlarged with respect to FIG. 2, of one of the vents of the package illustrated in FIGS. 1 and 2.

[0022] FIG. 4 is a representation of the laminar structure of the sheet material illustrated in FIG. 1.

[0023] FIGS. 5a and 5b are perspective views of an apparatus for forming a puncture in the sheet material in connection with a process for preparing a package, the figures illustrating respectively retracted and advanced steps in the puncturing process.

[0024] FIG. 6 is a representation of a cross-sectional illustration of a needle creating a punctured vent in a laminar sheet material in connection with the apparatus of FIG. 5.

[0025] FIG. 7 is a perspective view of a package assembly prepared in accordance with an embodiment of the invention, the assembly comprising four packages of the type illustrated in FIG. 1.

[0026] FIG. 8 is a perspective view of a package prepared in accordance with a second embodiment.

[0027] FIG. 9 is a perspective view of the package of FIG. 8 having an overcap removed.

[0028] FIG. 10 is a break-away representation of the package of FIG. 9.

[0029] FIG. 11 is a representation of the laminar structure of a sheet material useful in connection with some embodiments of the invention.

[0030] The Figures are not intended to be scale figures. Terms of orientation are provided for reference to the drawings and are not intended to be limiting.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0031] Baking powder presents particular packaging challenges. Generally, baking powder comprises soda and an acid or acid salt, such as cream of tartar or monocalcium phosphate. Over time, and particularly in the presence of moisture, the acid and soda can react, causing carbon dioxide to be released prematurely. In addition, the soda can itself degrade to release carbon dioxide, especially if the package is exposed to elevated temperatures (e.g., if stored near a kitchen oven). If stored in a sealed film package, the package can swell if not vented, resulting in an undesirable appearance. Providing a vent in a sealed baking powder package,

however, can result in moisture ingress, which can hasten the degradation of the soda and render the baking powder unsatisfactory after an undesirably short shelf life. In some embodiments, the invention is intended to address the foregoing, and provides a package for contents that consist essentially of baking powder. In other embodiments, the invention more generally provides a package that can be used for other contents that require venting. It is contemplated that the package may be useful in connection with any number of food, medicinal, nutraceutical, industrial, commercial, or other contents that require venting.

[0032] Generally, a laminar sheet material is used to compose a package in accordance with the present teachings. The particular form of the laminar material is not deemed to be critical, and it is contemplated that numerous laminar materials may be provided. In many embodiments, the first lamina of the laminar material provides a moisture barrier function and the second lamina provides a sealing function, such that the package may be sealed via application of a thermal or sonic weld. In some cases, the package may not be completely composed of the laminar material. For instance, the laminar sheet material may be provided as a cover over the mouth of a container made of a different material. An example of this is shown in FIGS. 8-10, to be discussed herein.

[0033] One sheet material believed to be particularly suitable for use in conjunction with some embodiment of the invention is a polyethylene/aluminum/polyethylene terephthalate sheet. The sheet may have nominal dimensions of 10 microns polyethylene terephthalate, 7 microns of aluminum, and 30 microns of polyethylene. In this embodiment, the aluminum is deemed to serve as the moisture barrier layer, and the polyethylene layer is deemed to serve as the sealing material. The polyethylene terephthalate layer is believed to provide strength. It is contemplated that a laminar structure that is not made with polyethylene terephthalate also may be used in conjunction with the invention.

[0034] More generally, it is contemplated that other materials may be provided in the laminar film. With respect to the lamina that is intended for sealing, it is contemplated, for instance, that thermoplastic polymer or thermoplastic polymer blends may be employed. Representative polymers include for instance styrene block copolymers; rubbers, polyolefins, such as polyethylene, polypropylene and polybutylene; ethylene/vinyl acetate (EVA copolymers; ethylene acrylic acid copolymers (EAA); ethylene acrylate copolymers (EMA, EEA, EBA);

polybutadiene; nylons; polycarbonates; polyesters; polyethylene oxide; polypropylene oxide; ethylene-propylene interpolymers, such as ethylene-propylene rubber and ethylene-propylene-diene monomer rubbers; chlorinated polyethylene; thermoplastic vulcanates; ethylene ethylacrylate polymers (EEA); ethylene styrene interpolymers (ESI); polyurethanes; as well as functionally modified polyolefins, such as silane-graft or maleic anhydride graft-modified olefin polymers; and combinations of two or more of these polymers.

[0035] Similarly, it is contemplated that the moisture barrier lamina may include, for instance, any suitable polymeric or other material as discussed herein. In many embodiments, the moisture barrier lamina will include a metalized layer of aluminum or other metal. Aluminum is deemed useful inasmuch as it is believed that the metalized lamina will not stretch to the extent that the polymeric sealing layer will stretch upon puncturing with a needle to create a vent. Additionally, an aluminum layer will in many embodiments impede the transmission of light through the sheet material. This is believed to result in a vent that has a greater vent area in the aluminum lamina than in the polymeric lamina, to allow for the preparation of a small aperture using a needle puncturing apparatus as hereinafter described. It is contemplated that the stretched region of polymer proximal the vent may in some embodiments cause the vent to function as a valve, permitting egress of gases but inhibiting ingress of moisture. In some embodiments, the puncture may be created via other techniques, such as via a radiation beam.

[0036] The layers may be disposed in any orientation with respect to the interior of the package, such that the barrier layer may be outwardly disposed with respect to the sealing layer, or vice versa. In some embodiments, the sealing layer is inwardly disposed with respect to the package and the metalized aluminum or other barrier layer is outwardly disposed with respect thereto. A package prepared using such material may be composed of a single folded sheet of the material, sealed at opposing edges to form a pouch, or may comprise two (or more) sheets sealed at appropriate connection points.

[0037] With reference now to FIGS. 1-3, a package 10 is provided, the package comprising two sealed sheets of a laminar sheet material (one shown at 11) that together at least partially define an enclosed volume. In the illustrated embodiment, the sheet material completely defines the enclosed package volume, with four welded seals 12 between front and rear individual sheet portions of the package. Depicted is a package for baking powder, but as

indicated above it is contemplated that a package may be prepared to be suitable for other contents.

[0038] As illustrated, the package 10 includes at least one vent, and, in the illustrated embodiment, includes two vents 13, 14. One vent is normally sufficient for purposes of venting of gases, but it is preferred to provide at least one additional vent to accommodate tolerances and errors in the vent formation process. As illustrated particularly in FIGS. 2 and 3, the vent is a small, uncovered aperture that extends through the first and second laminae of the sheet material 11. With particular reference to FIG. 3, the aperture often will take the form of a series of channels 16, 17, 18 radiating from a central region 19, although this form is not deemed to be critical.

[0039] Although it is not intended to limit the invention to a particular theory of operation, it is believed that by forming a vent as hereinafter described, the vent area in one of the lamina is greater than the vent area in the other of the lamina, and in particular, the vent area in the first (relatively outward) lamina will be greater than the vent area in the second (relatively inward) lamina when the outermost lamina is a metalized aluminum layer and the innermost lamina is a polymeric layer such as polyethylene. This is because the polymeric layer is believed to stretch more than the outermost aluminum lamina such that a portion of the stretched polymeric material will occlude some of the vented areas in the first lamina. In practice, the second lamina may occlude roughly 20-90% of the vent area of the outermost lamina. The total vented area may be deemed to comprise the non-occluded area. It has been observed that a total vent aperture area in the range of about 750-5,000 sq microns through both laminae provide a satisfactory vent in embodiments wherein the package is composed of the polyethylene/aluminum/polyethylene terephthalate film heretofore described. In some embodiments, this vent area may be greater or smaller depending on factors such as the number of laminae, the thickness of the laminae, and possibly the adhesion between the laminae.

[0040] The vent also may be characterized in terms of its porosity, which, can be quantified in terms of a time value. This time value for porosity can be measured on a Gurley porosity tester (Gurley Precision Instruments, Troy, NY), and it represents the time (in seconds) for 100 cubic centimeters (about 6.1 cubic inches) of air to flow through 1 square inch area of test material under pressure gradient of 1.2 kilo-Pascals (about 4.9 inches of water). This value (measured

in seconds) commonly is referred to as the porosity of the material, and is sometimes known as the Gurley value or Gurley porosity. In accordance with the subject matter described herein, the porosity may be in the range of 190-240 seconds, and in some embodiments in the range of 200-230 seconds, and in some embodiments 208-220 seconds. In some embodiments the porosity is at least 190 seconds, and in other embodiments at least 200 seconds. Greater porosity values (corresponding to smaller vented apertures) also are contemplated to be useful. A porosity of 215 seconds is deemed useful in conjunction with some embodiments of the present invention. Porosity measurements should be conducted in general accordance with TAPPI procedure T 460 om-06.

[0041] When used in conjunction with the packaging of baking powder, the vent should have a vent area in the package affected to provide a baking powder shelf life sufficient to sustain an available carbon dioxide release level of at least 10.5% after storage for twelve weeks or more under accelerated conditions. In some embodiments, the package sustains an available carbon dioxide release level of at least 10.5% for a longer time, such as at least 12 weeks; at least 14 weeks, at least 16 weeks, at least 20 weeks, at least 26 weeks, at least 30 weeks, at least 34 weeks, at least 40 weeks, at least 44 weeks, at least 48 weeks, or at least 52 weeks. This parameter may be evaluated according to AOAC Official Method 948.06 (2005) and should be evaluated based on 11 g of baking powder in the package upon storage at 32° C at 85% relative humidity. This simulates storage for twelve months. It is believed that an available carbon dioxide level of at least 10.5% is adequate for the baking of a conventional household cake.

[0042] The measurement of available carbon dioxide release level is well known in the food sciences arts. Generally, this method entails subtraction of the “residual” carbon dioxide value obtained in conjunction with AOAC Official Method 948.05 (2005) from the “total” carbon dioxide method obtained in conjunction with AOAC Official Method 923.02 (2005), corrected in accordance with correction values indicated in AOAC Table 909.04. All of these standards are hereby incorporated by reference in their entireties. These methods entail use of a Chittick apparatus for gasometric determination of carbon dioxide. Generally, in measuring total carbon dioxide, a displacement solution is prepared by dissolving 100 g NaCl or Na₂SO₄·10H₂O in 350 mL water. About 1 g NaHCO₃ and 2 mL methyl orange (0.5% aqueous solution) is added, and then enough H₂SO₄ or HCl to make the acid solution pink in color. A test portion of 1.7 g

is weighed into a decomposition flask, and is added to 10ml of H_2SO_4 (1 + 5) or HCl (1 + 2) to the decomposition reaction. The amount of CO_2 is measured. The CO_2 by weight, % is taken as the CO_2 reading divided by 10. Residual CO_2 determination is measured similarly after drying of a sample. Multiple samples may be evaluated to determine residual, total, and available carbon dioxide.

[0043] To prepare a package 10 in accordance with the present teachings, a laminar sheet material, as illustrated in FIG. 4 with respect to lamina 22, 23, 24, may be provided. A puncturing apparatus 26, as illustrated in FIGS. 5a and 5b, may be employed to puncture the sheet material 11. In the illustrated embodiment, the sheet material 11 is provided on a roll 28. The sheet material is fed from the roll onto a rubber backing roll (shown at 32 in FIG. 6). The apparatus 26 is provided with a series of needles 27, each retained on one end by a carriage bar 29 and extending through a press bar 30, the carriage bar 29 and press bar 30 being connected in operation and comprising a reciprocating needle carrier assembly 31. The needles may be any suitable needles and may have any suitable tip dimension and geometry. In some embodiments, the needles may have a fairly blunt end.

[0044] As illustrated in FIGS. 5a, 5b, and 6, upon reciprocating motion of the carrier assembly 31, the needles 27 will create a series of punctured vents of predetermined size in the roll 26 of sheet material 11. The roll of material is advanced in synchronization with the frequency of reciprocation of the carrier assembly 31 to cause a series of vents to be formed at predetermined intervals in the sheet material. Reciprocation is driven pneumatically by drivers 35, 36 in the illustrated embodiment, but may be driven by any suitable drive mechanism

[0045] As heretofore indicated, the tips of the needles extend a predetermined distance beyond the press bar. It is believed that a target puncture depth of approximately 0.8 millimeters is desirable when the heretofore described polyethylene terephthalate / aluminum/ polyethylene film is used, to account for possible increase in diameter of the needle. The depth may be any suitable value and may range, for instance, from 0.6 mm to 1 mm. This may depend on the geometry and configuration of the needle. The distance of extension, and hence the depth of the needle puncture, may be adjusted via manual adjustment screws 37. In practice, calibration rods may be provided to set the depth. The apparatus may be provided with a magnetic or

other form of metal detector, to detect metallic fragments on the sheet should a needle tip break.

[0046] The puncture may be performed in any direction in the film, and in many instances is performed inwardly to outwardly with respect to the disposition of the lamina in the final package, as further illustrated in FIG. 6 (24 being the innermost lamina). Thus, if the polyethylene film is intended for use as the innermost layer of the package, the material may be oriented to cause the needle to advance first through the polyethylene layer, followed subsequently by penetration through the other layers.

[0047] Subsequently, the rolled material is recovered and formed into an unsealed opened package in accordance with conventional techniques, typically by thermally welding separate sheets of the material together. Typically, only one of the sheets will be provided with vents. The unsealed package at this point is filled with the package contents, such as baking powder, and the other end of the package then is sealed.

[0048] The packages may be provided in the form of a package assembly 40, as illustrated in FIG. 7. The assembly includes four individual tear-apart packages 41-44, but a greater or smaller number of packages may be provided in the assembly. The assembly is formed by providing sheets of laminar material, at least one of which includes a vent, sealing an end wall 45 and the individual package side walls 46, and filling each package with contents, and sealing the other end wall 47.

[0049] When used in connection with baking powder, these embodiments are deemed suitable for providing single-serving amounts of baking powder, by which is contemplated in the amount of baking powder intended for use with a single baked good, such as a cake. The amount of powder may, for instance, range from 10 to 13 grams. It is contemplated that a group of the heretofore-described packages or package assemblies containing baking powder may be provided for consumer use. Thus, for instance, a consumer who is expected to prepare two baked goods per week might purchase a group of twenty of the packages, or five of the four-serving package assemblies described above. Because of the satisfactory product shelf life afforded by the packages, it is contemplated in these embodiments that the product used in the tenth week will be satisfactory.

[0050] In another aspect, a sealed food package 100 is provided, as shown in FIG. 8. The package has a container having a wall surface that defines an interior with an opening in the container defined by a terminal boundary of the wall surface. The package, in one aspect, may have a rigid or semi-rigid container 102 that contains food products 130 disposed therein. The package 100 may be provided with an overcap 118. The container 102 is sealed with a sheet material 108, shown in FIG. 9, the sheet material comprising a similar laminar sheet material as disclosed previously. The sheet material 108 contains a vent 110 therein. In many embodiments, the sheet material will be flexible.

[0051] The container 102 can be defined by a bottom wall 104 and an upstanding sidewall 106 that together can define an interior area 112 for receiving a food product 130 therein. At an upper end 114 of the sidewall 106 can be an opening 116 opposite the bottom wall 104 and for providing access to the interior 112 of the container 102. The container 102 can be sealed by joining the sheet material 108 to the upper ends 114 of the sidewall 106 at a rim 120 thereat to close and cover the opening 116. The film 108 can be joined to the container 102 by any known sealing methods, such as by application of a thermal or sonic weld. The container 102 can optionally contain an overcap 118 initially placed over the sheet material 108 which can be reused to provide a reclosable container 102 after removal of the sheet material 108. The container 102 can be essentially hermetically sealed when the sheet material 108 is affixed to the rim 120 of the container 102 except in the region of the vent 110.

[0052] The sheet material 108 can comprise at least two laminae. As previously described in the prior embodiment, the first lamina can provide a moisture barrier function and the second lamina can provide a sealing function. In one aspect, the second lamina 122 is provided at an inner, or inside, surface of the sheet material 108, as illustrated in FIGS. 10 and 11, so that the second lamina can be inwardly disposed with respect to the first lamina 124 and can seal to the container 102 at a rim or edge 120 surrounding the opening 116.

[0053] The first lamina 124 can be provided with a metallized layer, as illustrated in FIG. 11. To form the metallized layer, a mist or spray of metal may be placed onto the first lamina layer 124. The metallized layer 126 can impart a light-impeding (*i.e.*, fully or partially light-blocking) function to the moisture barrier layer 124. Thus, the sealing layer (second lamina) 122 may be provided at the inner surface of the sheet material 108, the metallized portion 126

at the outer surface with the moisture barrier layer (first lamina) 124 in between. Other configurations likewise are possible. For instance, in some embodiments the order of the first and second laminae may be reversed. The metallized portion 126 can be regarded as a third lamina layer that is present adjacent the first lamina 124 on the outer surface of the film 108, as illustrated in FIG. 10. Alternatively, a third metal lamina layer may be provided in place of or in addition to metallizing the first lamina.

[0054] The second lamina, or sealing layer, may also comprise the sealable thermoplastic polymers or thermoplastic polymer blends previously disclosed with respect to the previous embodiment. Likewise, the first lamina, or the moisture-barrier layer may comprise any suitable polymeric or other material, as previously disclosed.

[0055] By way of example, the sheet material 108 can comprise a metallized biaxially-oriented polypropylene (BOPP)/polyethylene (PE) sheet, such that the PE layer is the second lamina having sealing properties and the BOPP layer is the first lamina having moisture barrier properties. The metallized BOPP layer can also provide light-impeding properties. In one aspect, the metal used to metallize the first layer can be an aluminum metal.

[0056] The package 100 may include at least one vent 110, where the vent 110 can comprise a small, uncovered aperture that extends through all of the laminae layers provided, as discussed with respect to the previous embodiments. For instance, if two laminae layers are provided, then the aperture 110 will extend through both of the laminae layers. It is similarly believed that the vent area in one of the lamina or layers can be greater than the vent area in the other of the lamina, such as where the vent area in the metallized first lamina can be greater than the vent area in the second lamina. The vent may have the other properties discussed hereinabove.

[0057] The vent 110 can be similarly formed in the sheet material 108 by a needle puncture or injection as previously discussed with the prior embodiment. In one aspect, the vent 110 can comprise an aperture having a nominal diameter of about 3mm or less, however, the vent 110 can generally be sized to have a vent area that allows for equalization of pressures inside and outside of the container 102 while also limiting the ingress of moisture into the interior 112 of the container 102 such that a desirable shelf-life can be maintained, where the shelf-life is dependent upon the food product 130 packaged therein. In another aspect, an appropriately-sized vent 110 can limit the ingress of moisture such that the food product 130 stored therein

maintains a moisture level at or below a certain appropriate range depending on the food product. In the case of some wafer or cookie food products, the vent 110 can have a vent area that limits the ingress of moisture such that the wafer or cookie has a moisture level less than about 1.5% while in the sealed container 102 during its shelf-life, *i.e.*, at least about eight months, when exposed to ambient humidity under expected conditions. The ambient conditions will change depending upon the geographic location that the packages are stored in.

[0058] In some embodiments, the sealed, vented package can have sufficiently low overall moisture permeability such that the package permits a chocolate-covered wafer product to maintain a moisture level of less than about 1.5% when the package is exposed to about 80% relative humidity at about 22°C (71°F) for at least five months, preferably for at least six months, preferably for at least seven months, and preferably for at least eight months. The moisture permeability is deemed to be a property of the package irrespective of the type of product contained in the package.

[0059] Additionally, the vent 110 further provides for a more stable package 100 when sealing the package and transporting from high altitudes exceeding at least 4,000 feet, and in some aspects up to at least 8,000 feet, to lower altitudes, and vice versa, such that the sheet material 108 does not separate from the container 102 due to a pressure differential between the interior of the sealed package 100 and the outside atmosphere, and the container 102 itself does not become deformed. Deformation and/or imploding of the container 102 can be mitigated by allowing the air inside and outside of the sealed package to equilibrate.

[0060] The container 102 can comprise a rigid or semi-rigid body having any appropriate size and shape to store the desired food product 130 therein, such that the container has the ability to generally retain its shape during normal handling. In one aspect, the container 102 can have a cup-like appearance with a volume of about 430ml. In another aspect, the container 102 can have a volume of about 250ml. The container 102 can be used to package any type of food or confectionary item. The food product can be a baked food product. In some embodiments, the food item can be a chocolate wafer, biscuit, or cookie product. The container 102 can be small, such as when providing single size servings, or it can be large for bulk packing of food.

[0061] The material of construction of the container 102 can likewise contain moisture barrier properties in order to aid in maintaining a moisture level of the food product 130 at desired

levels. In one aspect, the container 102 can comprise a multi-layer film, such as a multi-layer film having three layers. In another aspect, the container 102 can comprise a first, or inner, layer of low density polyethylene (LDPE), a middle layer of ethyl vinyl alcohol (EVOH), and an outer layer of polypropylene (PP). The thickness of the container can be any appropriate thickness and, in one aspect, can be up to about 2200 μ thick and, preferably, is between about 1500 to about 2000 μ .

[0062] The sheet material 108 and the container 102 can be composed of a material that results in a certain desired oxygen and water vapor transmission rate. For instance, the container may have an oxygen transmission rate of about 3.0 $\text{cm}^3/\text{m}^2/\text{bar}/\text{day}$ measured per ASTM D3985 and a water vapor transmission rate of 0.65 $\text{g}/\text{m}^2/\text{day}$ measured per ASTM F1249. Similarly, when the sheet material 108 comprises metallized BOPP/PE, where the BOPP is about 17 μ thick and the PE is about 27 μ thick, the sheet material 108 can have an oxygen transmission rate of about 30 $\text{cm}^3/\text{m}^2/\text{bar}/\text{day}$ at about 23°C (73°F) and 0% relative humidity (RH), and a water vapor transmission rate of about 0.6 $\text{g}/\text{m}^2/\text{day}$ at about 38°C (100°F) and 90% RH. Generally, the container wall material can have an oxygen transmission rate of about 0.3 to about 3.0 $\text{cm}^3/\text{m}^2/\text{bar}/\text{day}$ and the sheet material can have an oxygen transmission rate of not greater than about 80 $\text{cm}^3/\text{m}^2/\text{bar}/\text{day}$. The container can have a water vapor transmission rate of about 0.65 to about 1.7 $\text{g}/\text{m}^2/\text{day}$ and the sheet material can have a water vapor transmission rate of not greater than about 0.6 $\text{g}/\text{m}^2/\text{day}$. These parameters describe the oxygen and water vapor transmission rates of the container and sheet material in the absence of a vent.

[0063] The optional overcap 118 can be initially placed over the sealed container 102, *i.e.*, over the sheet material 108. Upon opening the container 102, the consumer first removes the overcap 118 and then removes the sheet material 108 to reveal the opening 116 in the container 102 and provide access to the food product 130 stored therein. The sheet material 108 can optionally contain a pull tab or extension of film 128 to aid in removing the sheet material 108 by providing a grasping point for the consumer. After removing the sheet material 108, the consumer may discard the sheet material 108. If the consumer desires to reclose the container 102 and to store the remainder of the food product 130 therein, the overcap 118 may be placed over the opening 116 in the container 102 to cover the opening 116.

[0064] The overcap or lid 118 can comprise a polymer or polymer blend material. In one aspect, the overcap 118 can comprise about 90% PP and about 10% LDPE. The overcap 118 may have any suitable thickness. The overcap 118 can preferably be sized and shaped to complement and cover the opening 116 in the container 102.

[0065] The container 102 and overcap 118 can be made by any appropriate method, such as thermoforming or injection molding.

[0066] To prepare a package 100 in accordance with the present teachings, a laminar sheet material may be provided having at least a first and second laminae as disclosed above. A vent 110 can be provided in the sheet material extending through the sheet material, in a manner similar to that disclosed in FIGS. 5a-6 creating a needle punctured aperture, or any other appropriate method may be used. A rigid or semi-rigid container 102 having an opening 116 can be filled through the opening 116 with a food product 130. The opening 116 can thereafter be sealed with the sheet material including the vent 110 to form a sheet material 108.

[0067] The following nonlimiting Examples are provided to illustrate certain embodiments of the packages 10 and 100.

[0068] EXAMPLE 1

[0069] Vented packages were prepared from the polyethylene / aluminum / polyethylene terephthalate film described above. Each package included three vents having a porosity in the range of 208-220 seconds, and was filled with baking powder. The packages were subjected to a simulated aging test by storing the packages at 70°C (158°F).

[0070] The packages did not swell noticeably, thus indicating that carbon dioxide was vented adequately.

[0071] COMPARATIVE EXAMPLE 1

[0072] For comparison, similar baking powder packages made without vents were prepared. These packages swelled considerably and were deemed commercially unsuitable.

[0073] EXAMPLE 2

[0074] Packages prepared in accordance with Example 1 were stored for several weeks at about 32°C (89°F) at 85% relative humidity. The packages made with vents having a porosity

in the range of 208-220 seconds exhibited an available carbon dioxide release level in excess of 10.5% after fifteen weeks' storage under accelerated conditions.

[0075] COMPARATIVE EXAMPLE 2

[0076] Baking powder packages were prepared in accordance with Example 1, except that the packages were provided with visibly larger vents. These packages exhibited an available carbon dioxide release level of less than 10.5% after seven weeks storage under accelerated conditions.

[0077] EXAMPLE 3

[0078] A two month moisture study was performed on four different packages each sealed with a similar construction sheet material, having metallized BOPP/PE laminac. A first sample, P-1, was a standard non-vented package. A second sample, P-2, was the standard package having one vent or puncture in the sheet material. A third sample, P-3, was a package made by injection-molding without a vent in the sheet material. A fourth package, P-4, was a package having a container without any EVOH material in it, *i.e.*, without any barrier material, and no vent in the sheet material, and a fifth package, P-5, was a package having a container with EVOH in it and no vent in the sheet material, *i.e.*, a duplicate sample of P1.

[0079] Each package included a container that was composed of PP/EVOH/PE, with the exception of sample four, P-4, which did not contain EVOH. The packages were all filled with a food product, in this case chocolate covered and filled wafers, and sealed with the sheet material. The percent moisture inside the wafer was then measured at three time points: at the beginning of the test, one month later, and two months later. The packages were all kept at room temperature during the test period, or at a temperature of about 23°C (73°F).

[0080] The moisture content of the chocolate wafer product was determined by the absolute difference in weight before and after drying. The moisture content is expressed as the loss in weight, as a percentage of weight, after drying the product. The moisture test results are presented below in Table 1.

[0081] TABLE 1: Moisture Results in Wafer Product

Package Sample	Initial Moisture Reading	One Month Moisture Reading	Two Month Moisture Reading
P-1	1.11%	1.10%	1.11%
P-2	1.05%	1.06%	1.08%
P-3	0.81%	0.83%	1.04%
P-4	0.91%	0.98%	1.07%
P-5	0.86%	0.88%	0.98%

[0082] Using the requirement that the moisture level be less than 1.5% within a wafer product, it is seen that all of the samples met that requirement. Notably, Sample P-2, also was able to maintain a desirable moisture level in the wafer, *i.e.*, less than 1.5%, despite having a punctured aperture in its sheet material.

[0083] EXAMPLE 4

[0084] A five month moisture study was performed on two different samples of packages both sealed with a similar construction sheet material. The container and film used were as in Example 3 as was the wafer product that was packaged. The first sample, S-1, was a non-vented package and the second sample, S-2, was provided with a vent. The packages were kept at room temperature, about 22°C (71°F), in a climate-controlled chamber that maintained the relative humidity at about 80%.

[0085] The moisture levels in the wafers were measured at the various time points over a five month period using the same test method as in Example 3. The time period between results was approximately one month. These results are presented below in Table 2 (where the month/date/year is also indicated for the time point tested).

[0086] TABLE 2: Climate-Controlled Moisture Results in Wafer Product

Package Sample	Day One 8/7/09	One Month: 9/11/09	Two Months: 10/9/09	Three Months: 11/26/09	Four Months: 12/22/09	Five Months: 1/20/10
S-1	0.80%	0.86%	0.90%	0.96%	1.06%	1.17%
S-2	0.82%	0.96%	1.03%	1.03%	1.06%	1.24%

[0087] Sample S-2 had slightly higher moisture levels in the wafer than the same package without a vent (sample S-1), however, the moisture levels of S-2 were still within desirable ranges for a wafer product, *i.e.*, less than 1.5%. Based on these results, it is believed that the data presented in Table 2 would be consistent for maintaining the moisture level in the wafer below 1.5% for at least eight months.

[0088] EXAMPLE 5

[0089] Vented packages were prepared having a container made from polypropylene/ethyl vinyl alcohol/polyethylene with a sheet material having a metallized BOPP/PE laminae containing a vent therein, similar to the package in Example 3. The package was initially sealed at an altitude of about 3,040 feet (about 934 meters above sea level) and then transported to a region of lower altitude, *i.e.*, to about 0 feet (about 2 meters above sea level).

[0090] The packages did not collapse or implode, thus indicating that packages were vented adequately by providing the vent in the sheet material.

[0091] COMPARATIVE EXAMPLE 5

[0092] For comparison, similar packages made without a vent were prepared. These packages collapsed or imploded considerably and were deemed commercially unsuitable.

[0093] It is thus seen that vented packages may be provided. In some embodiments, baking powder packages are provided. Generally, it is observed that in some embodiments the package is useful for contents that require the release of one gas, while inhibiting the ingress of a different gas, wherein the package contains at least one vent through the at least two laminae, the vent having flow preferentiality with respect to the two gases. The package is sufficient to provide the package contents with an extended shelf life relative to a package with a vent that does not exhibit the flow preferentiality.

[0094] Uses of singular terms such as “a,” “an,” are intended to cover both the singular and the plural, unless otherwise indicated herein or clearly contradicted by context. The terms “comprising,” “having,” “including,” and “containing” are to be construed as open-ended terms. Any description of certain embodiments as “preferred” embodiments, and other

recitation of embodiments, features, or ranges as being preferred, or suggestion that such are preferred, is not deemed to be limiting. The invention is deemed to encompass embodiments that are presently deemed to be less preferred and that may be described herein as such. All methods described herein can be performed in any suitable order unless otherwise indicated herein or otherwise clearly contradicted by context. The use of any and all examples, or exemplary language (*e.g.*, “such as”) provided herein, is intended to illuminate the invention and does not pose a limitation on the scope of the invention. Any statement herein as to the nature or benefits of the invention or of the preferred embodiments is not intended to be limiting. This invention includes all modifications and equivalents of the subject matter recited herein as permitted by applicable law. Moreover, any combination of the above-described elements in all possible variations thereof is encompassed by the invention unless otherwise indicated herein or otherwise clearly contradicted by context. The description herein of any reference or patent, even if identified as “prior,” is not intended to constitute a concession that such reference or patent is available as prior art against the present invention. No unclaimed language should be deemed to limit the invention in scope. Any statements or suggestions herein that certain features constitute a component of the claimed invention are not intended to be limiting unless reflected in the appended claims. Neither the marking of the patent number on any product nor the identification of the patent number in connection with any service should be deemed a representation that all embodiments described herein are incorporated into such product or service.

CLAIMS

What is claimed is:

1. A vented package comprising:
a container having a wall surface that defines an interior;
an opening in said container defined by a terminal boundary of said wall surface;
a sheet material covering said opening, said sheet material comprising at least first and second laminae, said first lamina comprising a material that provides a moisture barrier and said second lamina comprising a sealable polymeric material; and
at least one vent in said sheet material, the vent area in one of said laminae being greater than the vent area in the other of said laminae.
2. A vented package according to claim 1, the package containing a food product.
3. A vented package according to claim 1, said package having a moisture permeability sufficiently low to allow a chocolate covered biscuit food product to maintain a moisture level less than about 1.5% moisture while inside of the package when exposed to a relative humidity at about 80% and a temperature of about 22°C for a period of at least five months.
4. A vented package according to claim 2, said food product being a baked product.
5. A vented package according to claim 1, said first lamina comprising a metallized biaxially-oriented polypropylene material and said second lamina comprising polyethylene, said first lamina being outwardly disposed relative to said container.
6. A vented package according to claim 1, including a reclosable overcap placed over the opening of said container.

7. A vented food package according to claim 1, the sheet material including a metallized layer, said metallized layer imparting a light-impeding property.

8. A vented food package according to claim 1, said sheet material having an oxygen transmission rate of about $30 \text{ cm}^3/\text{m}^2/\text{bar}/\text{day}$ or less at 23°C and 0% relative humidity and a water vapor transmission rate of $0.6 \text{ g}/\text{m}^2/\text{day}$ or less at 38°C and 90% relative humidity, and said container having an oxygen transmission rate of about $3.0 \text{ cm}^3/\text{m}^2/\text{bar}/\text{day}$ or less and a water vapor transmission rate of about $0.65 \text{ g}/\text{m}^2/\text{day}$ or less.

9. A vented food package according to claim 1, said vent comprising a needle punctured aperture.

10. A method comprising:

providing a sheet material, said sheet material comprising at least first and second laminae, said first lamina comprising a material that provides a moisture barrier and said second lamina comprising a sealable polymeric material, said sheet material having at least one vent, the vent area in one of said laminae being greater than the vent area in the other of said laminae;

providing a container having a wall surface that defines an interior and an opening in said container defined by a terminal boundary of said wall surface and a food product disposed within said container; and

covering the opening of said container with said sheet material.

11. A method according to claim 10, said package having a moisture permeability sufficiently low to allow a chocolate covered biscuit food product to maintain a moisture level less than about 1.5% moisture while inside of the package when exposed to a relative humidity at about 80% and a temperature of about 22°C for a period of at least five months.

12. A method according to claim 10, said sheet material comprising a metallized layer that imparts a light-impeding property.

13. A method according to claim 10, said first lamina comprising a metallized biaxially-oriented polypropylene material and said second lamina comprising polyethylene, said first lamina being outwardly disposed relative to said container.

14. A method according to claim 10, said food product being a baked product.

15. A method according to claim 10, said vent comprising a needle punctured aperture.

16. A vented baking powder package comprising a laminar sheet material that at least partially defines an enclosed volume, said enclosed volume containing contents consisting essentially of baking powder, said sheet material comprising at least first and second laminae, said first lamina comprising a material that provides a moisture barrier and said second lamina comprising a sealable polymeric material, said sheet material including at least one vent, said vent comprising an aperture that extends through said sheet material and that has a vent area sufficient to vent carbon dioxide released from said baking powder, said baking powder in said package exhibiting an available carbon dioxide level of at least 10.5% after storage of said package at 32°C at 85% relative humidity for twelve weeks.

17. A vented package according to claim 16, wherein, for said at least one vent, the vent area in one of said lamina is greater than the vent area in the other of said lamina, the vent having a total vent area in the range of 750-5000 square microns.

18. A vented package according to claim 16, the vent area in said first lamina being greater than the vent area in second lamina.

19. A vented package according to claim 16, said second lamina being relatively inwardly disposed with respect to said first lamina.

20. A vented package according to claim 16, said laminar sheet comprising a polyethylene/aluminum/polyethylene terephthalate sheet.

21. A vented package according to claim 16, enclosing an amount of baking powder ranging from 10-13 g.

22. A vented package according to claim 16, said vent having a porosity of at least 190 seconds.

23. A vented package according to claim 16, said vent having a porosity of at least 200 seconds.

24. A vented package according to claim 16, said vent comprising a needle punctured aperture.

25. A method for preparing vented baking powder packages, comprising:
providing a plurality of unsealed packages comprising a sheet material, said sheet material comprising at least first and second laminae, said first lamina comprising a material that provides a moisture barrier and said second lamina comprising a sealable polymeric material, and said sheet material including a plurality of vents, each of said vents comprising an aperture that extends through said sheet material and that has a vent area, each of said unsealed packages including at least one of said vents, the vent area in each of said packages sufficient to vent carbon dioxide released from said baking powder and to provide an available carbon dioxide level of at least 10.5% after storage of said package at 32° C at 85% relative humidity for twelve weeks,

providing contents in said packages, said contents consisting essentially of baking powder; and

sealing said packages.

26. A method according to claim 25, comprising forming said packages from said sheet material.

27. A method according to claim 25, wherein for said at least one vent the vent area in one of said lamina is greater than the vent area in the other of said lamina, the vent having a total vent area in the range of 750-5000 square microns.

28. A method according to claim 25, the vent area in said first lamina being greater than the vent area in second lamina for at least one of said vents.

29. A method according to claim 25, said second lamina being relatively inwardly disposed with respect to said first lamina for at least one of said vents.

30. A method according to claim 25, said laminar sheet comprising a polyethylene/aluminum/polyethylene terephthalate sheet.

31. A method according to claim 25, including providing from 10-13 g of baking powder.

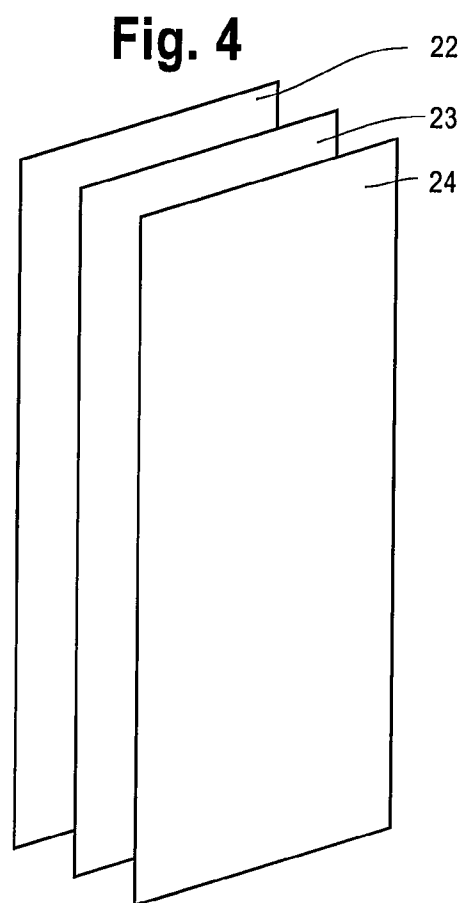
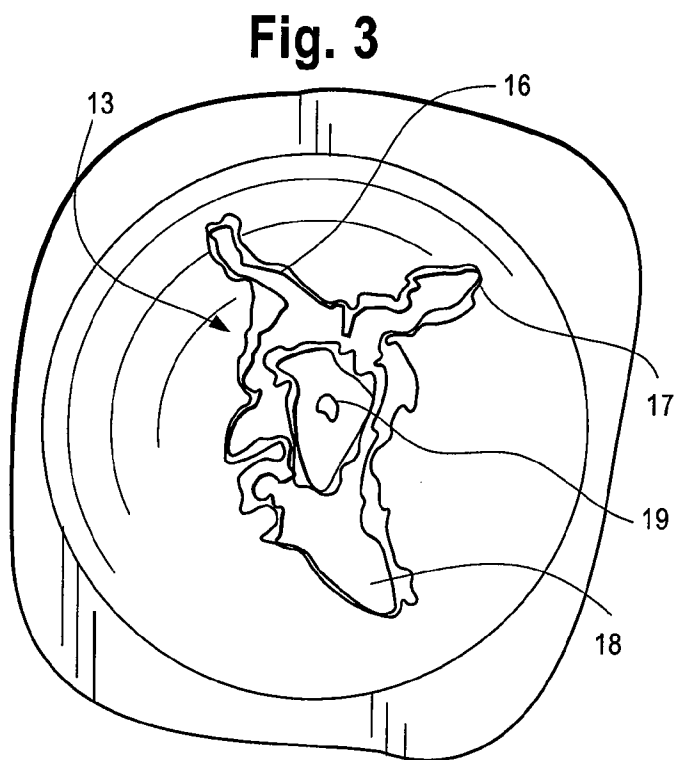
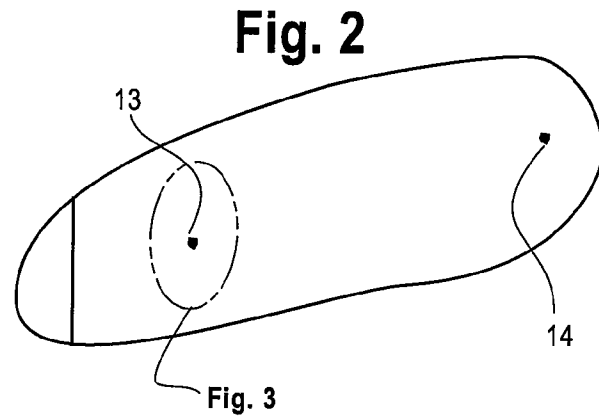
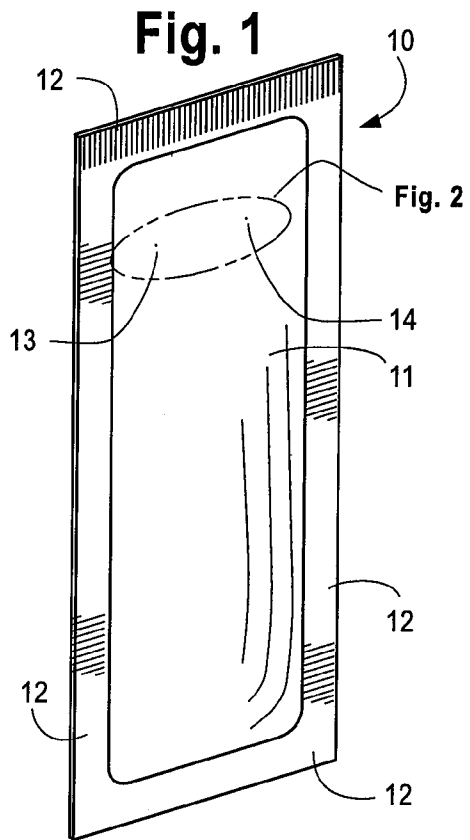
32. A method according to claim 25, said vents each having a porosity of at least 190 seconds.

33. A method according to claim 25, said vents each having a porosity of at least of 200 seconds.

34. A method according to claim 25, said vent comprising a needle punctured aperture.

35. A vented package comprising:
a laminar sheet material that at least partially defines an enclosed volume, said enclosed volume containing contents consisting essentially of baking powder, said sheet material comprising at least first and second lamina, said first lamina comprising a material that provides a moisture barrier and said second lamina comprising a sealable polymeric material, said sheet material including at least one vent, said vent comprising a punctured aperture that

extends through said sheet material and that has a porosity of at least 190 seconds, wherein for said at least one vent the vent area in one of said lamina is greater than the vent area in the other of said lamina, the vent having a total vent area in the range of 750-5000 square microns.



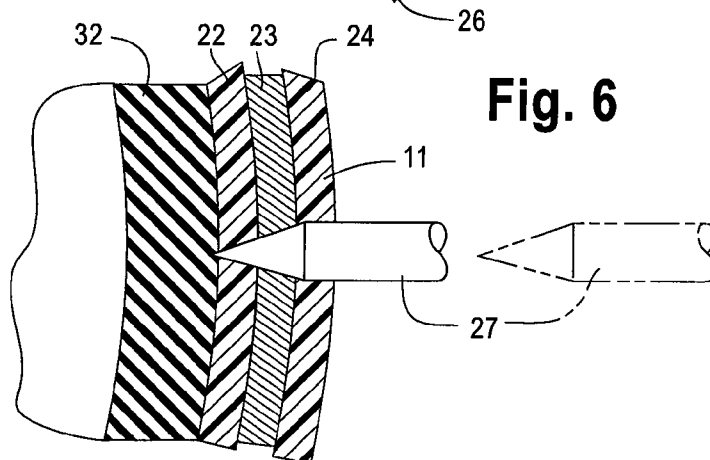
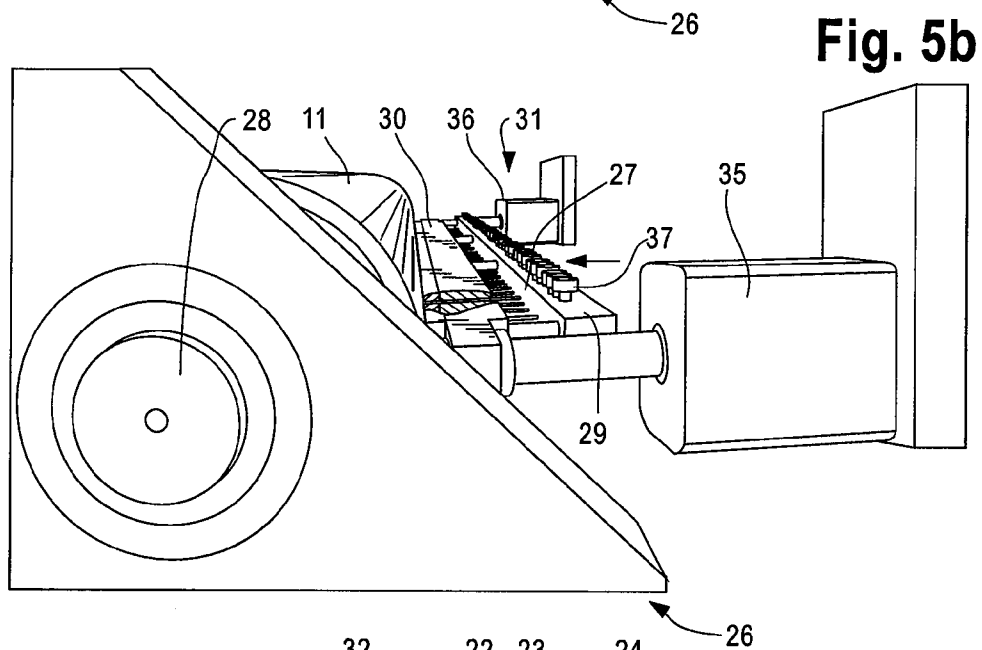
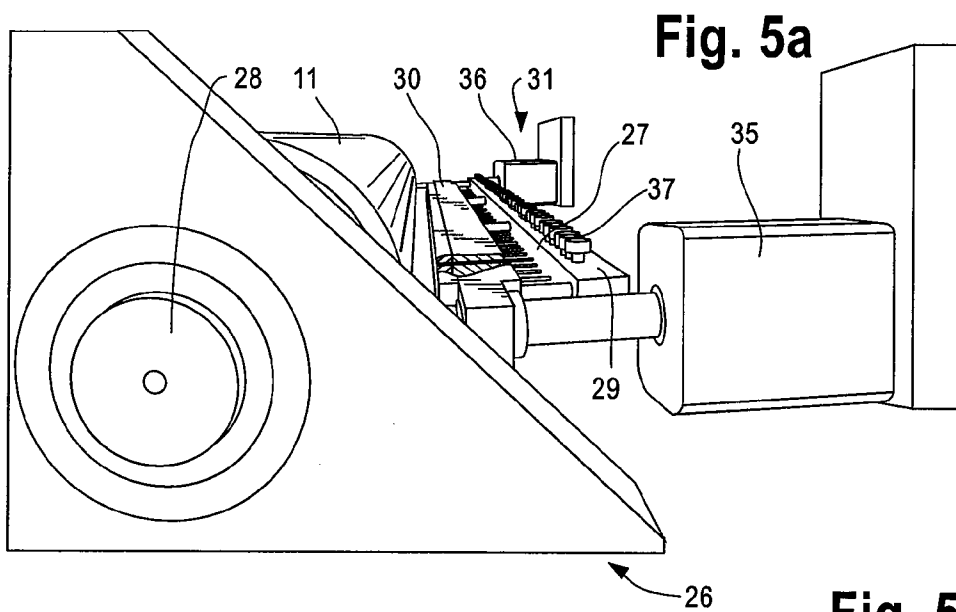
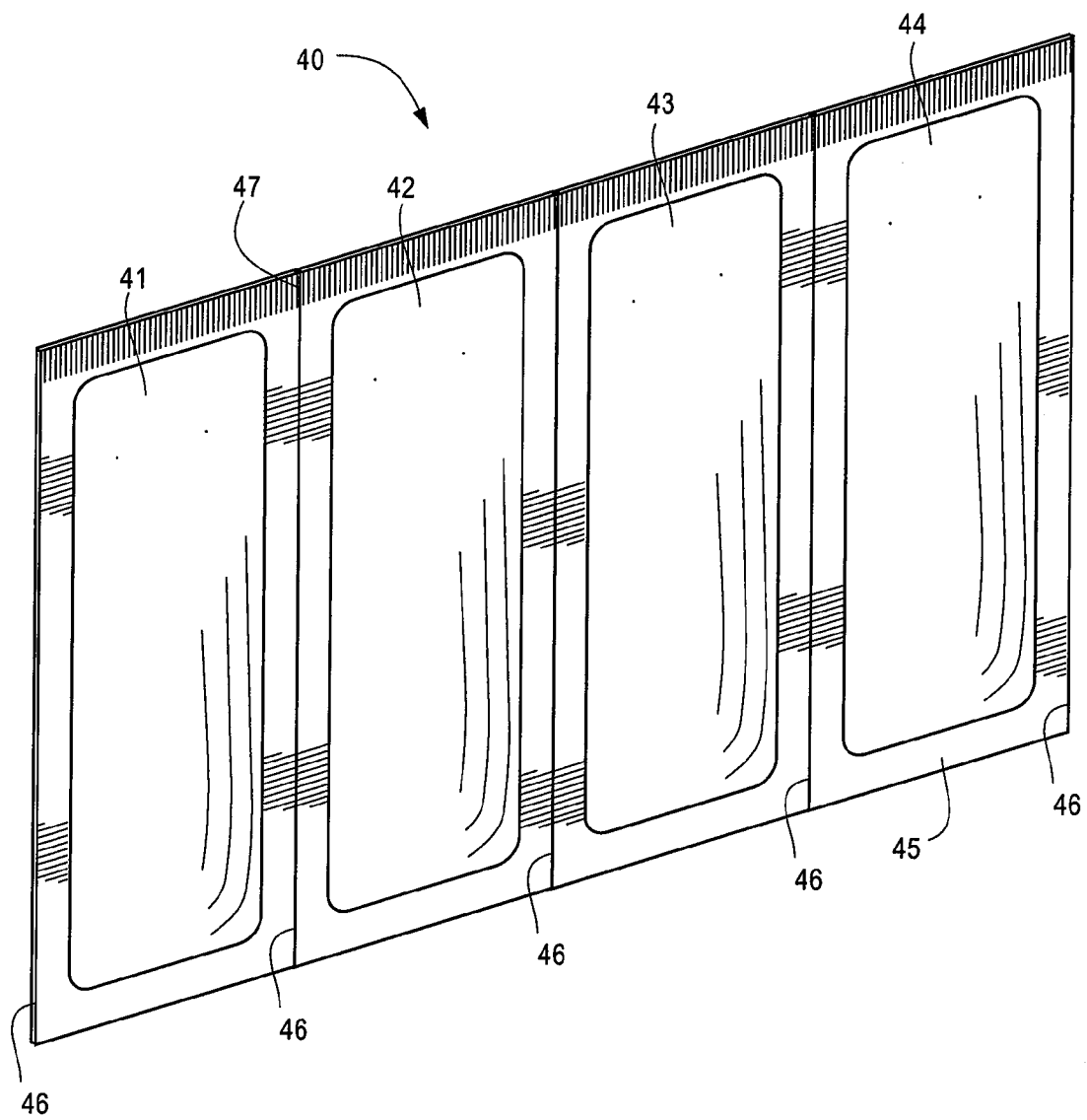
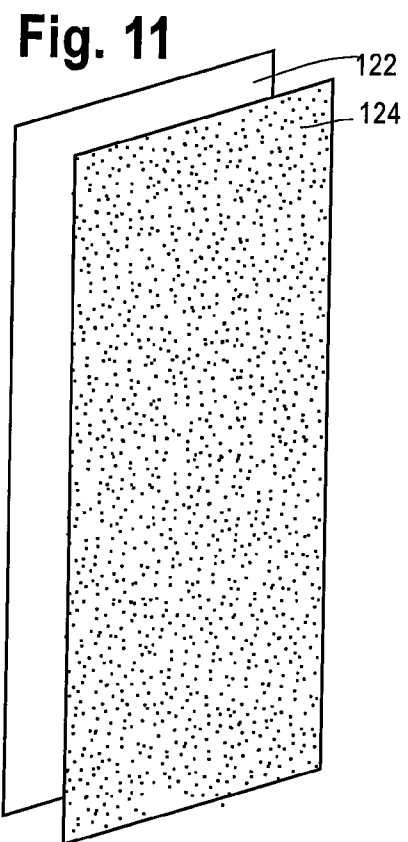
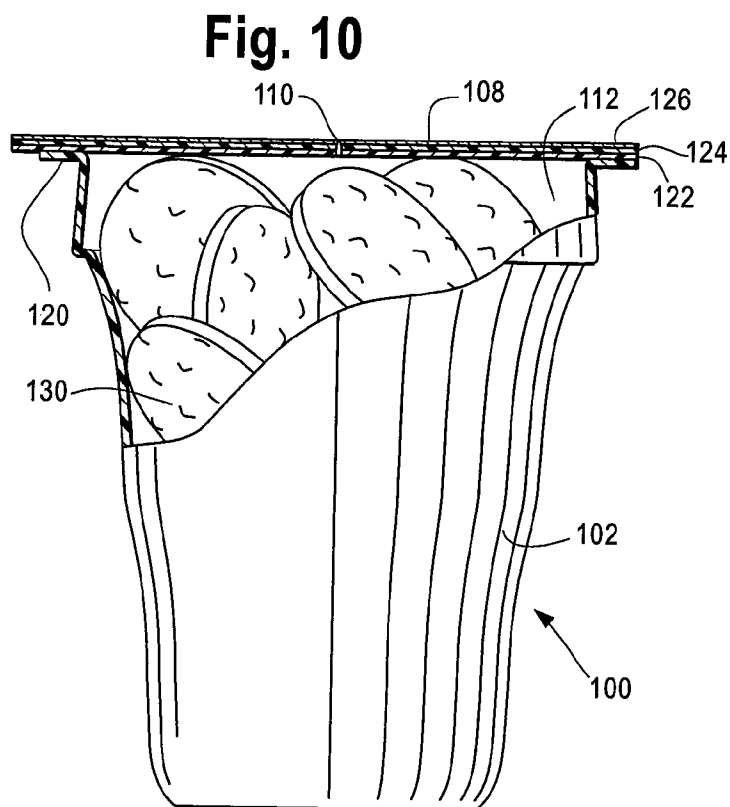
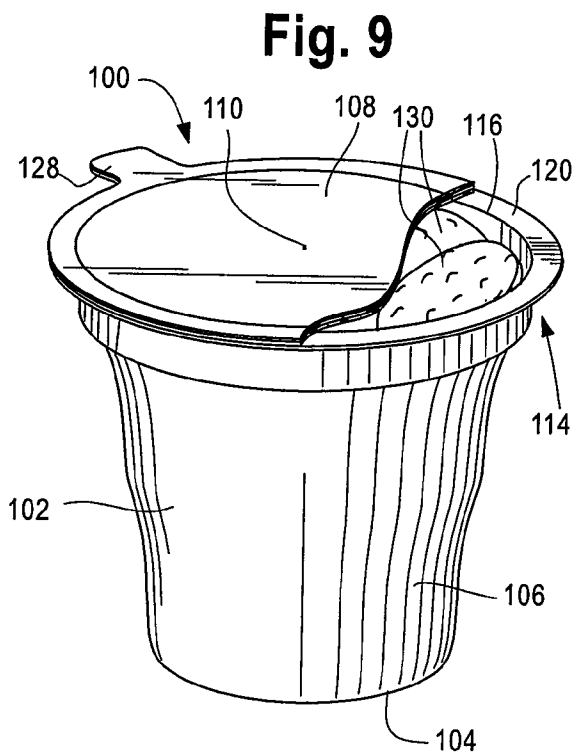
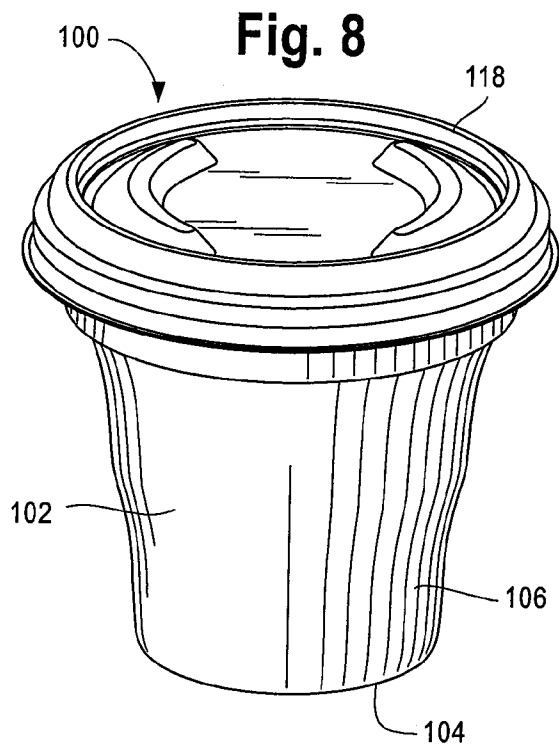


Fig. 7



INTERNATIONAL SEARCH REPORT

International application No
PCT/US2010/036901

A. CLASSIFICATION OF SUBJECT MATTER

INV. B65D33/01 B65D75/26 B65D75/42 B65D77/20 B65D77/22

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)

B65D

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)

EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 707 348 A1 (SUEDPACK VERPACKUNGEN GMBH & C [DE]) 4 October 2006 (2006-10-04) abstract; claims 1,6; figures 1-4,6 paragraph [0013] - paragraph [0018] -----	1-15
A	US 2007/087096 A1 (MIR NAZIR [US]) 19 April 2007 (2007-04-19) paragraph [0050] - paragraph [0055]; figures 1,2 paragraph [0062] - paragraph [0063]; figures 3,4 paragraph [0098] - paragraph [0109]; figures 10,13,15 -----	1-15
A	EP 1 627 825 A1 (REMLIA C V [NL]) 22 February 2006 (2006-02-22) abstract; figures 1-3 paragraph [0040] - paragraph [0042] -----	1-15
-/--		

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"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.

"&" document member of the same patent family

Date of the actual completion of the international search

17 August 2010

Date of mailing of the international search report

22/11/2010

Name and mailing address of the ISA/

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Authorized officer

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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2010/036901

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2009/045189 A1 (CORMIER DWAYNE [CA] ET AL) 19 February 2009 (2009-02-19) abstract; figures 1,3 paragraph [0035] - paragraph [0036] -----	1-15

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2010/036901

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-15

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-15

Vented container being sealed via a laminar sheet material

2. claims: 16-35

Vented bag containing baking powder

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2010/036901

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1707348	A1	04-10-2006	NONE
US 2007087096	A1	19-04-2007	AU 2005250421 A1 15-12-2005
EP 1627825	A1	22-02-2006	NONE
US 2009045189	A1	19-02-2009	CA 2597828 A1 17-02-2009 CA 2639084 A1 17-02-2009