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(54) Title: A SELF-FORMING CONTAINER

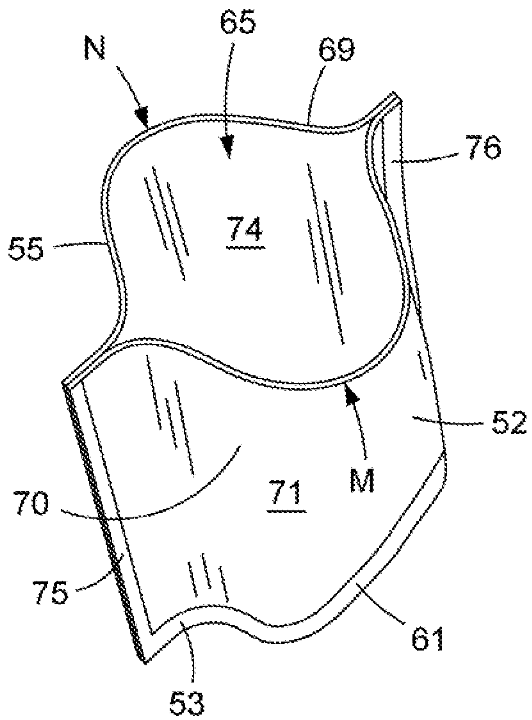

FIG. 15

(57) Abstract: A self-forming container having a continuous side wall with opposing top and bottom edges connected by an interior side wall surface, said side wall preferably having less than 10% shrink at 90°C, and more preferably being nonshrinkable; and a heat shrinkabie connecting wall connected to at least first and second opposing portions of the sidewall and forming therewith a adapted for heat activated self-forming into a stand up con figuration having a stable base connected to and supporting said side wall.

WO 2014/204465 A1

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A SELF-FORMING CONTAINER

BACKGROUND

1. Technical Field

[0001] The present application relates generally to packaging and more specifically to flexible synthetic polymeric packaging.

2. Background Information

[0002] Articles such as food, healthcare, personal care, office, home and garden supplies, etc. can be held within a container, e.g. a pouch, for ease of transport and use, and to protect the contents from microbial contamination or contact with air, moisture, dirt, etc. The container is typically sealed to provide a barrier to deleterious materials or energy.

[0003] Packaging having multilayer structures where one layer is a heat shrinkable film and another layer is a non-shrinkable film have been disclosed. However, there are few packages which combine heat shrinkable films with non-shrinkable films. One example is U. S. Patent No. 7,964,255 (Fink et al) assigned to Micro Shaping, Ltd. which discloses packaging using a combination of a first layer of heat shrinkable material and a second layer of non-heat shrinkable material with microwave susceptors arranged in a pattern in-between to create areas of increased stiffness after microwaving. Also, U.S. Patent 5,302,402 (Dudenhoffer et al) discloses packaging for bone-in cuts of meat where a biaxially, heat shrinkable, thermoplastic film bag has a non-heat shrinkable, relatively thick, patch adhered to the bag to provide resistance to puncture and abrasion.

[0004] In addition, one package uses a differential in shrink force to provide curl resistance when packaging foods such as ribs which are prone to shape distortions. This curl resistant packaging is made from a heat shrinkable laminate bag for bone-in meat products and has been disclosed in U.S. Patent Application Publication No.

2006/0177612 (Peterka). Peterka's package combines a heat shrinkable bag with opposing heat shrinkable laminates on either side of the bag where one laminate has a higher total free shrink value than the bag or the laminate of the opposing side of the bag.

[0005] In the art, known containers include pouches with contents held between two sheets that form the pouch. Also, one typical package is termed a "stand up" pouch (SUP) which has the ability to be upstanding on a stable base as long as the pouch is filled with contents. SUPs are available in a great variety of structures.

[0006] One example of the type of stand up pouch package is disclosed in U.S. Patent No. 3,935,993 (Doyen et al.) which describes a freestanding container having a pair of side walls with a pair of end panels where the end panels each have a central fold using gusset forming strips and curvilinear heat seal seams. Other stand up containers are disclosed e.g. in U.S. Patent Nos. 4,837,849; 6,722,106; 6,060,096; and EP No. 823,388. Disadvantageously, the aforementioned packages rely upon their package contents to provide support for a stand up configuration and, absent contents, may easily collapse.

[0007] Attempts been made to produce self-expanding containers and pouches. For example, mechanisms such as extensible stays (U.S. Patent Nos. 5,174,658; 5,184,896; expandable polymers (U.S. Patent Publication No. 2004/0005,100); and hand distortable, reinforcement elements (U.S. Patent Publication No. 2003/0002,755) have all been proposed to create stable stand up pouches or packages.

[0008] These previous attempts are expensive and complicated to manufacture. Also, there is a continuing need for provision of more useful, efficient, and economical packaging having a stable, stand up, voluminous configuration.

BRIEF SUMMARY

[0009] In one form of the present invention, a self-forming container is provided having (a) a side wall with opposing top and bottom edges connected by an interior side wall surface, and (b) a connecting wall connected to at least first and second opposing portions of the sidewall and forming therewith a container wherein the connecting wall is heat shrinkable in at least one direction and the side wall is less heat shrinkable, and preferably not heat shrinkable, in that same direction. Thus, the container is adapted for heat activated, self-forming into a stand up configuration having a stable base connected to and supporting the side wall.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] Figure 1 is a perspective view of a self-formed container in accordance with the present invention.

[0011] Figure 2 is a top view of the self-formed container of Figure 1.

[0012] Figure 3 is a perspective view depicting the bottom of the self-formed container of Fig. 1.

[0013] Figure 4 is a bottom view of a self-formed container in accordance with the present invention.

[0014] Figure 5 is a front view of a self-forming container in accordance with the present invention.

[0015] Figure 6 is a slightly expanded cross-sectional view taken along lines 6-6 of Fig. 5.

[0016] Figure 7 is a side view of the container of Fig. 5.

[0017] Figure 8 is a top view of the container of Fig 5.

[0018] Figure 9 is a bottom view of the container of Figure 5.

[0019] Figure 10 is a front view of an embodiment of the present invention which has a double gusset.

[0020] Figure 11 is a slightly expanded cross-section taken along lines 11-11 of Fig. 10 showing a double gusset insertion.

[0021] Figure 12 is a side view of the container Fig. 10.

[0022] Figure 13 is a bottom view of the container of Fig. 10.

[0023] Figure 14 is a top view of the container of Fig. 10.

[0024] Figure 15 is a perspective view of the container of Fig. 10 after heat forming.

[0025] Figure 16 is a top view of the inventive container of Fig. 15.

[0026] Figure 17 is a bottom view of the inventive container of Fig. 15.

[0027] Figure 18 is a partial view showing a portion of the heat activated inventive container of Fig. 17 enlarged for magnification purposes to show layer details.

[0028] Figure 19 is a schematic front view of another embodiment of a container in accordance with the invention.

[0029] Figure 20 is a schematic side view of Fig. 19.

[0030] Figure 21 is a schematic view of an alternative embodiment of the inventive self-forming container.

[0031] Figure 22 is a schematic plan view of an alternative embodiment of the inventive self-forming container having a lap sealed side panel.

[0032] Figure 23 is a schematic view of an alternative embodiment of the inventive self-forming container of Fig. 22 taken along lines 23-23.

[0033] Figure 24 is a schematic view of an alternative embodiment of the inventive self-forming container having resistance strips.

[0034] Figure 25 is a schematic sectional view taken along lines 25-25 of Fig. 24 and slightly expanded for illustration.

[0035] Figure 26 is a schematic front view of an inventive force strip which may activate a self-forming aspect of the present invention.

[0036] Figure 27 is a schematic end view of the force strip of Fig. 26.

[0037] Figure 28 is a schematic top view of the force strip of Fig. 26.

[0038] Figure 29 is a schematic plan view of the force strip of Fig. 28 after activation by heat shrinking.

[0039] Figure 30 is a schematic view of an alternative lap seal embodiment of the inventive force strip after activation by heat shrinking.

DETAILED DESCRIPTION

[0040] There are many prior art package designs which employ plastic, polymeric, metallic, cellulosic or noncellulosic sheets, films or foils having one or more layers made by well-known processes including extrusion or coextrusion, as sheets or tubes, wet laid or dry laid, forming, spunbonding, tubular blown or slot cast, and which made be laminated, coating laminated, adhesive laminated , etc. Such materials generally are formed with stable dimensions over a wide range of conditions and temperatures. Where shrinkage does occur it is viewed as a defect to be minimized and avoided. These nonshrink materials form the bulk of flexible packaging in commercial use today and are found in use for packaging a range of goods from bread bags to cereal boxes, bacon pouches, candy bags and stand up pouches for beverages, candy, and prepared food mixes, etc.

[0041] There is also a line of specialty packaging that has been in long use which intentionally builds heat shrinkability into polymeric film structures whereby a package may be heat activated at elevated temperatures to cause the entire packaging to shrink its dimensions typically to conform to and/or compress the contents of the package to provide a neat appearance, tamper resistance or evidence, retain product integrity against water purge, fat out, etc. These heat shrinkable films are often used to package meat e.g. beef, lamb, and pork for shipping from slaughter houses to supermarket butcher departments, and also for skin tight turkey or poultry packaging, cheese packaging, frozen foods such as pizza, as well as for packaging reams of paper, books, DVDs, boxes, and irregularly shaped articles, multi-packs, etc.

[0042] In the present invention, novel use is made of these two ideas by coupling a nonshrink packaging structure with a heat shrinkable packaging structure in a specific manner to cause a container to change shape and form a stable stand up container which at normal ambient room temperatures resists return to its pre-shrunk configuration which is typically a lay flat configuration. Many uses and advantages are possible with the inventive packaging. It may e.g. replace a less stable traditional stand up flexible pouch which has no resistance to collapsing into a lay flat configuration unless filled with contents. Thus, an empty stand up pouch is inherently unstable which limits its utility. Embodiments of the present invention may also be advantageously used in place of rigid or semi-rigid containers e.g. thermoformed tubs, bottles, metal and rigid plastic cans, and the like. These containers are bulky to ship and store prior to filling with contents. In contrast, the present invention may conveniently be shipped and stored flat and expanded to a stable almost semi-rigid or non-collapsible state when desired for either product filling, display or use with easy access to the container contents after opening. These and other advantages, and desirable properties and combinations thereof will be readily apparent from the description below.

[0043] As used herein the term "semi-rigid" means a material having a modulus of elasticity in either flexure or tension of between 70 and 700 MPa at 23° C and 50% relative humidity according to ASTM D747, D790, D638, or D882 (ASTM D883).

[0044] Rigid plastics have a modulus of elasticity in either flexure or tension greater than 700 MPa at 23° C and 50% relative humidity according to ASTM D747, D790, D638, or D882 (ASTM D883). Preferred rigid plastics for certain embodiments will have a modulus of elasticity greater than 1000 MPa, or advantageously in certain embodiments, greater than 1.4 GPA. Especially preferred for certain embodiments are side walls made from rigid plastics sheets having a modulus greater than 1.4 GPa and having a sheet thickness between 10 to 20 mils, and plastic sheets having this combination of thickness (10-20 mil) and modulus of elasticity (>1.4 GPa) are defined herein as "tensiff".

[0045] In one embodiment of the present invention, a self-forming container is provided by making novel use of several thermoplastic film properties including the ability of one type of film to heat shrink and the ability of another type of film to resist heat shrinkage. These two properties are arranged in the present invention so as to cause a container to self-form at elevated temperature into a stable formed configuration which resists return to its former configuration while providing a stable roomy compartment for product contents that resists collapsing upon itself. Preferably, a shrink film is coupled with a nonshrink film, but it will become apparent that two shrink films having a differential in same direction shrink may also be used.

[0046] Thus, a self-forming container may be provided having a continuous side wall with opposing top and bottom edges connected by an interior side wall surface, with this side wall having less than 10% shrink at 90° C; and a connecting wall connected to at least first and second opposing portions of said sidewall and forming therewith a container, the connecting wall having at least 10 % shrink at 90° C in at least one direction; and whereby the container is adapted for heat activated self-forming into a stand up configuration having a stable base connected to and supporting the side wall.

[0047] By the phrase a "continuous side wall" is meant a side wall which forms a circuit, loop or continuous path from a starting point to a point distal therefrom and back again. For example, a continuous side wall may be provided by: (i) a seamless tube; (ii) a single sheet connected to itself e.g. by a lap seal or fin seal or other connecting means; (iii) a plurality of side wall segments attached to one another to form a circuit or loop; or (iv) an enclosed wall; and the side wall may be either foraminous or nonforaminous, permeable or impermeable to various materials, substances, solids, liquids, energies, etc.

[0048] In another embodiment a self-forming container is provided comprising: a continuous side wall having opposing top and bottom edges connected by an interior side wall surface, with the side wall having a percentage shrink at a temperature "T" (e.g. between 80-150° C, and preferably 90° C) of from 0 to "A" in at least one axial direction; and further having a connecting wall connected to at least first and second opposing portions of the sidewall and forming therewith a container. The connecting wall has a minimum percentage shrink at a specified temperature e.g. between 80-150° C, (such as at 90° C in certain embodiments) of 10 + "B" in at least one direction; where "A" is from 0 to 30, and "B" ≥ "A". The container is adapted for heat activated change or self-forming into a stand up configuration having a stable base connected to and supporting the side wall.

[0049] Preferably, the sidewall will have less than 5% shrink in both MD & TD, more preferably, less than 3%, most preferably 0%. The connecting wall will have at least 10% shrink in one direction and suitably at least 15, 20, 25, 30, 35, 40, 45, 50% or higher shrink in one direction, preferably the machine direction. Preferably, the connecting wall will also have less than 15%, 10%, 5%, or most preferably less than 3% shrink in the other direction, preferably transverse direction.

[0050] The temperature selected for the parameter in the above paragraph may be selected with consideration of the materials chosen for the package container materials and/or contents. For example, polyolefins such as polyethylene in its various forms, and polypropylene, as homopolymers and copolymers, melt (and also have softening points and glass transition temperatures) over a range of temperatures. These temperature ranges may differ from polymer to polymer and from polymer family to polymer family e.g. the melting points and/or melting point ranges of polyolefins may differ from other polymers such as nylons or polyesters. Containers according to the present invention may be made of materials for which retort temperatures and pressures are required, or from materials more suitable for other applications where lower temperature processing is appropriate. In view of the present teaching and depending upon the desired packaging application, suitable materials may be chosen and orientation built into a heat shrinkable film for activation under desired conditions including e.g. heat activation and heat stability at appropriate respective temperatures or temperature ranges. The temperature at which the free or unrestrained shrink values or shrink forces may be determined may be 80, 85, 90, 95, 100, 105, 110, 115, 120, 125, 130, 135, 140, 145, or 150 ° C or even higher (or lower than 80) as dictated by the choice of materials used and intended use of the container. For many applications, it is contemplated that a temperature of 90, 120, or 130 ° C will be useful. Generally, with respect to the choice of material for the heat shrinkable film component of the container, a temperature will be selected which is near the orientation temperature of the shrink imparting material, or blends thereof, e.g. such temperatures are between (a) either the glass transition temperature T_g or the Vicat Softening Point (V_{sp}), and (b) the melting point (m.p.) of the predominant polymer or polymer blend which controls the shrink values. Where polymer blends are used in a shrink layer or layers which control the shrink of the film and melting point is an important physical characteristic of the layer, it may be determined and defined in terms of "average melting point". For a given polymer blend this may be calculated by adding the product of the individual polymer's melting point and its blend fraction, i.e. polymer 1 melting point times its blend fraction plus polymer 2 melting point times its blend fraction plus the corresponding factor for any other components in the blend. This is a guide, but may in any case be determined empirically without undue experimentation.

[0051] In another embodiment, a self-forming container is provided which has a first, preferably semi-rigid, rigid or tensiff, side wall having a perimeter with opposing top and bottom edges connected by opposing first and second side edges; and a second, preferably semi-rigid, rigid, or tensiff, side wall opposite the first side wall, the second side-wall having a perimeter with opposing top and bottom edges connected by opposing first and second side edges; and a bottom wall comprising a heat shrinkable film. The first side edges of the first and second sidewalls are connected to each other and the second side edges of the first and second sidewalls are connected to each other to form a continuous inner side wall surface of the container and the bottom wall is connected to the first and second walls proximate their respective side wall bottom edges. This container is also preferably adapted for heat activated self-forming into a stand up configuration having a stable base connected to and supporting said first and second side walls.

[0052] In another embodiment of the invention, a self-forming container has (a) a side wall having top and bottom edge portions, and opposing first and second side portions; and (b) a bottom wall comprising a heat shrinkable film. The side walls are flexible, resiliently deformable, and/or semi-rigid, preferably a combination thereof. The bottom wall is connected to the side wall about the side wall bottom edge portion. The container may be subjected to elevated temperature i.e. above ambient room temperature or 23° C, and this temperature supplies heat which activates the heat shrinkage properties changing the container from a lay flat or flexible collapsible configuration into a stand up configuration which resists collapsing at room temperature under ambient conditions, which process is termed "self-forming" and which container after heat activation and change is termed "self-formed". This self-formed stand up configuration has a relatively stable base connected to and supporting the side wall which may comprise first and second side wall portions or panels.

[0053] Suitable materials which may be selected and used for the side wall include many of the same materials that may be used to construct a typical container wall and may be monolayer or multilayer in construction. Multilayer films may also include micro-layer technology. These micro-layers including panel layers may be utilized in either the non-shrink films or sheets, or the heat shrinkable films and sheets utilized in constructing containers, whether sidewall, or connecting wall, or shrink bands, in accordance with the present invention. Examples of suitable materials for containers of the present invention include polyolefins, polyethylene terephthalates, polyamides, nylons, polystyrenes, polyacrylates, and generally any polymer that is known for use in flexible polymer packaging including foamed polymers e.g. closed celled foamed sheets which may have heat (i.e. hot or cold) or moisture insulation properties, or varying appearance attributes. Such materials may be homopolymers, copolymers, and their derivatives and blends thereof. Metal foils and metalized films are also contemplated as are paper, paperboard, nonwoven sheets of resilient deformation and metallized versions thereof. One or more functional properties may be contributed by one or more layers including desired levels of heat sealability, optical properties e.g. transparency, gloss, haze, abrasion resistance, coefficient of friction, tensile strength, modulus of flexure or tension, Young's modulus, flex crack resistance, puncture resistance, rigidity, stiffness, abrasion resistance, printability, colorfastness, flexibility, stretch or shrinkability, dimensional stability, barrier properties to gases such as oxygen, or to moisture, light of broad or narrow spectrum including e.g. UV resistance, etc.

[0054] Many of the same thermoplastic polymeric materials identified for side wall construction may be used for constructing the heat shrinkable connecting wall panels of the present invention as long as the resins are selected for their ability to be stretch orientated by tenter frame or double bubble or trapped bubble or machine direction cast orientation (MDO) processes as further described below. Typically employed resins for use in making the heat shrinkable films of the prior art may also be used in the present invention. Especially preferred are polyolefins, e.g. ethylene polymers and copolymers, cyclic polyolefins, and styrenic copolymers.

[0055] A particularly preferred blend may be made with a cyclic olefin copolymer that is commercially available from Topas Advanced Polymers GmbH under the trade name Topas 8007F-400 blended with 30 wt. % of a conventional ethylene octene-1 copolymer commercially available from The Dow Chemical Company under the trade name Attane NG 4701G (hereinafter COC:EAO blend). Another suitable material is styrene butadiene block copolymer having a radial or star block configuration with polybutadiene at the core and polystyrene at the tips of the arms. Such polymers are commercially available from Chevron Phillips Chemical Co. under the trade designation K-Resin. These polymers reportedly contain about 27% butadiene or more in a star-block form and often feature a bimodal molecular weight distribution of polystyrene.

[0056] Heat shrinkable films of the present invention are axially oriented with preferential orientation in the direction receiving the most stretch during film formation. The resulting film shrinks preferentially in that same direction that was stretched more during film manufacture. Machine direction (MD) is along the direction of film transport during or after extrusion. Transverse direction (TD) is perpendicular to the direction of film transport. Shrinkage is preferentially machine direction orientation (MD) if more stretch is applied to the MD than to the TD, and TD if more stretch is applied transverse than machine direction.

[0057] Films of the present invention have an MD or TD ratio (ratio of oriented stretch length to the unstretched length in the MD or TD direction, respectively). Advantageously, this ratio will be at least 2:1, preferably at least 3:1, more preferably between about 3:1 to 5:1. Advantageously, uniaxially stretched films may be employed, especially e.g. those films stretched in the machine direction. There is no clear upper limit for the orientation ratio, although films typically have a ratio of 10:1 or less.

[0058] The shrink films used in the present invention may have a heat shrinkability (e.g. at 90° C) of at least 10%, 20%, 30%, 40%, 50%, 60%, 70% or higher in at least one direction. In some preferred embodiments, the shrinkability is disproportionate in one direction and advantageously a uniaxial shrink of 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75 percent or higher may be used and may be couple with a cross-directional shrink value that is less than 10% or preferably less than 5% or more preferably less than 3% or even 0 %, or may even slightly expand in the cross-directional dimension e.g. up to 5% or preferably from 0 to 3%.

[0059] Preferred materials for use as container walls, panels , pouch films, lidstock, force strips, side wall and connecting wall layers, include nylons, polyesters, polystyrenic polymers, cyclic olefin polymers, and polyolefin e.g. ethylene or propylene homopolymers or copolymers, or mixtures thereof in any number of layers, particularly, but not limited to, 1 to 9 to 14 layers or more layers. Preferred polyolefins include ethylene homopolymers or copolymers and may include low, medium , high and ultra-low or ultra-high density polymers. Examples are high density polyethylene (HDPE), ethylene alpha-olefin copolymers (EAO) preferably utilizing butene-1, hexene-1, or octene-1 comonomer with a predominate ethylene comonomer portion) and including e.g. linear low density polyethylene (LLDPE), very low density polyethylene (VLDPE), plastomers, elastomers, low density polyethylene (LDPE) copolymers of ethylene and polar groups such as vinyl acetate or ethyl acrylate e.g. ethylene vinyl acetate (EVA) or ethylene methyl acrylate (EMA) or ethylene acrylic acid copolymer(EAA), functional group modified polymers including e.g. anhydride modified EAOs. Propylene homopolymers and copolymers including polypropylene and propylene ethylene copolymer are useful. Container side wall structures may also include a metal foil and may be a metal foil laminate with metal foil and a polymeric layer such as nylon. It may also be a metal foil laminate with an outer layer of polyethylene terephthalate, a core layer of metal foil and an inner layer of polyethylene. In this arrangement, the polyethylene terephthalate layer serves as a protective layer to the foil, and the polyethylene layer facilitates sealing. The foil is an excellent barrier to foreign materials, organisms, oxygen , moisture and light.

[0060] The present invention may utilize a gas barrier layer such as aluminum foil, polyvinylidene chloride copolymers such as saran, or ethylene vinyl alcohol copolymers (EVOH) which provide high barriers to gas permeability or materials such as nylon which impede gas permeation to a lesser extent than saran or EVOH.

[0061] Adhesives useful in the present invention include permanent adhesives and pressure sensitive adhesives (PSA) commonly available from many commercial sources. It is contemplated that acrylic and anhydride modified polymers may be employed as well as many adhesives which may be selected depending upon other material selections for the side wall panels, connecting wall panels or force strips.

[0062] Additives and processing aides; natural and synthetic colorants, pigments and dyes; fillers such as calcium carbonate or carbon black, antimicrobial agents may be incorporated into the container walls, panels, and strips structures.

[0063] Suitable side wall structures may include stiff yet flexible materials or semi-rigid or rigid, or tensiff panels having a sealant layer up to 5 mils thick or greater. Multilayer composites of e.g. a paper/ polyolefin/ metal foil/ polyolefin structure may be used.

[0064] The heat shrinkable connecting wall panels or force strips may also be made of various materials. MD shrink is preferred. If a force band is used, it may be sealed either inside or outside of the container compartment(s).

[0065] Contemplated combinations of materials include:

(a) side wall - flexible, semi-rigid, rigid, or tensiff material (preferably nonshrinkable) and connecting panel/strip - softer material with an MD force strip or shrink band

(b) side wall - flexible, semi-rigid, rigid, or tensiff material (preferably nonshrinkable) and connecting panel/strip - MD gusseted shrink film

[0066] Minimum individual side wall and connecting wall panel thicknesses of 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19 mils are contemplated. Both minimum and maximum thicknesses may be whatever is practical depending upon the nature of the materials used which may be determined without undue experimentation. It is expected that advantageously the sidewall or connecting wall panel thicknesses may be less than 20, 19, 18, 17, 16, 15, 14, 13, 12, 11, 10, 9, 8, 7, 6, 5, or 4 mils. Also, in some embodiments it is expected that a side wall of 3-7, 8-9 or 10-20 mils may be advantageously used. Generally stiff side walls are preferred, especially tensiff materials. The side wall should facilitate a bowing outward effect in cooperation with the forces imparted by heat shrinking of the connecting wall panel or force strip or band. The side wall may also advantageously include an insulating material from heat, cold or moisture condensation such as polymeric foam or cellulosic materials.

[0067] It should be apparent that other known package features may be incorporated with the present package/container including temperature indicators, easy opening features such as tear notches, easy peeling structures, recloseable features such as peel-reseal adhesives, zippers, slider-zippers, snaps, etc.

[0068] Referring now to the Drawings, Figures 1, 2, 3 and 4 represent an embodiment of the invention and illustrate an open package container which has been formed by heat activation into a stand up configuration having a stable base. It will be appreciated that the opening may be closed in certain embodiments, by various closures or closure means such as mechanical or chemical fasteners, hook and loop fasteners, heat seals, zippers, adhesives (either permanent or temporary, peelable and/or resealable), etc.. In Fig. 1, a perspective view of a container 10 has a first panel 11 with an first panel exterior surface 12 and an opposing first panel interior surface 13 (See also Fig. 2). The first panel 11 is sealed to a second panel 14 having a second panel exterior surface 15 and second panel interior surface 16 by a perimeter seal 17 defining a perimeter of a compartment 18 which is bounded by first panel 11, second panel 14, and a heat shrunken connecting wall panel e.g. a connecting base or bottom 19 (See Figs. 2 - 4) of the container 10.

[0069] The first panel 11 has a top edge 20 and opposing bottom edge 21 and a first side edge 22 and second side edge 23 and these edges form a continuous perimeter 24 of the exterior and interior surfaces of the first panel 11. The second panel 14, has a top edge 25 and opposing bottom edge 26 (See Figs. 3 and 4), and a first side edge 27 and second side edge 28 and these edges form a continuous perimeter 29 of the exterior and interior surfaces of the second panel 14.

[0070] The perimeter seal 17, is depicted as a continuous seal having a first side seal segment 30 and second side seal segment 31which are joined by front connecting seal segment 32 and a parallel rear connecting segment 33 (See Figs. 3 and 4), but it will be appreciated that perimeter seal 17, or segments thereof, may also be discontinuous, as for example, where a series of spot welds are made to form the perimeter. Of course, a continuous seal is generally preferred, but where the nature of the contents to be held by the container admit, it may be desirable to have discontinuities in sealing to allow ingress or egress of e.g. moisture, air, etc. In the embodiment illustrated in Fig. 1, this perimeter seal has a "U" shape, but it is further contemplated and well within the scope of the invention to provide containers where the side wall edges may be curved or at an angle, etc., and the bottom edge may likewise be varied. A precept is for the inventive container in its formed condition to have a stable base or connecting wall that supports the container in an expanded condition regardless of the presence or absence of contents within the container. This expanded condition is typically non-collapsible at room temperature. The illustrated embodiment in Figs. 1-4 show a container having a continuous side wall 34 about the interior and exterior surfaces of the panels 11 and 14 due to perimeter first and second seal segments 30, 31. However, a seamless tube may also be provided to comprise this continuous side wall 34. Also as previously noted, in the continuous side wall 34 there may be discontinuities in the seal segments or alternatively the seal itself may be continuous and hermetic. The aforementioned base or connecting wall panel 19 extends across or generally transverse to the side wall 34 to provide a support for maintaining the container 10 in an expanded condition as a consequence of heat activation of the base/connecting wall 19.

[0071] The perimeter seal 17 may be either peelable or non-peelable. In one embodiment, perimeter seal 17 is a peelable seal which is peelable along at least a portion of the seal or along the entire seal to provide access to the pouch contents.

[0072] Some embodiments of the present invention may be manually opened without use of scissors or other tools, preferably using easy to peel open systems such as peelable seals. "Peelable seal" and like terminology is used herein to refer to a seal, and especially heat seals, which are engineered to be readily peelable without uncontrolled or random tearing or rupturing the packaging materials which may result in premature destruction of the package and/or inadvertent contamination or spillage of the contents of the package. A peelable seal is one that can be manually peeled apart to open the package at the seal without resort to a knife or other implement to tear or rupture the package. Many varieties of peelable seals are known in the art, such as those disclosed in U.S. Pat. No. 4,944,409 (Busche et al.); U.S. Pat. No. 4,875,587 (Lulham et al.); U.S. Pat. No. 3,655,503 (Stanley et al.); U.S. Pat. No. 4,058,632 (Evans et al.); U.S. Pat. No. 4,252,846 (Romesberg et al.); U.S. Pat. No. 4,615,926 (Hsu et al.) U.S. Pat. No. 4,666,778 (Hwo); U.S. Pat. No. 4,784,885 (Carespodi); U.S. Pat. No. 4,882,229 (Hwo); U.S. Pat. No. 6,476,137 (Longo); U.S. Pat. No. 5,997,968 (Dries, et al.); U.S. Pat. No. 4,189,519 (Ticknor); U.S. Pat. No. 5,547,752 (Yanidis); U.S. Pat. No. 5,128,414 (Hwo); U.S. Pat. No. 5,023,121 (Pockat, et al.); U.S. Pat. No. 4,937,139 (Genske, et al.); U.S. Pat. No. 4,916,190 (Hwo); and U.S. Pat. No. 4,550,141 (Hoh), the disclosures of which are incorporated herein in their entirety by reference thereto.

[0073] A non-peelable seal may also be employed e.g. a strong integral heat seal along either a portion or along the entire perimeter. Permanent adhesives may also be used to form a non-peelable seal. Non-peelable seals may be easily opened by incorporating tear open features such as notches, and surface weakened areas, or through the use of tools such as scissors, etc.

[0074] The seals between (a) the a first side wall panel and a second side wall panel, or (b) between any side wall panel and the connecting wall can be formed by a variety of ways, but is preferably a permanent seal. For example, the seal may be formed as a weld heat seal by application of heat and pressure to the first panel surface and the second panel surface (or a connecting wall surface) with their respective surfaces in contact with each other for a sufficient time to cause bonding, with cooling of the bonded perimeter to form an integral permanent seal. Alternatively, an adhesive can be sandwiched between the surfaces. Similarly, the perimeter seal, may be a permanent seal made by use of a heat seal or permanent adhesive. The perimeter seal, whether permanent or peelable, in combination with the side wall and connecting panels and in conjunction with an opening closure or extension of the perimeter to act as a closure, can seal contents within the compartment to keep out unwanted materials such as particles and microbes.

[0075] Referring to Fig. 2, a top view of the self-formed container 10 of Figure 1 is depicted having a first panel 11 having respective exterior and interior surfaces 12, 13 and which is connected to a second panel 14 having respective exterior and interior surfaces 15, 16 by perimeter seal 17. The perimeter seal 17 has first and second side seal segments 30, 31 respectively, joined by front connecting seal segment 32 (See Fig. 1) and a rear connecting seal segment 33 (See Figs. 3 and 4), and with panels 11 and 14 forms a compartment 18. This compartment is defined by a continuous side wall 34 formed by panels 11 and 14 which are joined by first side seal segment 30 and opposing side seal segment 31. The side wall 34 has a continuous top edge 35 formed by top edges 20, 25 of the first and second panels respectively, which are joined to each other by the aforementioned heat seals 30, 31. First side heat seal segment 30 is proximate to first and second panel first side edges 22, 23, respectively. Second side heat seal segment 31 is proximate to first and second panel second side edges 23, and 28, respectively. As previously noted, it is contemplated a seamless tube could also be employed. Opposing top side wall edge 35 is a bottom side wall edge 36 adjacent which a bottom connecting wall panel 19 is attached to front connecting seal segment 33 and rear connecting seal segment 33 to connect together the first and second panels 11, 14 respectively, proximate bottom side wall edge 36, which corresponds to their respective bottom edges 21, 26 (See Figs. 3 and 4). Compartment 18 has an opening 37 defined by the side wall top edge 34, and also has an opposing closed base or bottom connecting panel 19. This bottom connecting wall panel 19 has an interior surface 38, with a center fold line 39, separating front and rear portions 40, 41 respectively of connecting panel 19. This panel 19 is formed from a heat shrinkable film 42 which is attached e.g. adhesively or preferably by heat sealing its perimeter edge portions to the first and second panels 11, 14 by the perimeter seal 17, as further described below. In contrast, the side wall 34 is formed from materials having less heat shrink properties than the bottom film 42 and is preferably not heat shrinkable.

[0076] Referring now to Fig. 3, a perspective view depicting the container bottom 43 of the self-formed container 10 of Fig. 1 with attached side wall 34. The side wall 34 is formed from a first panel 11 having exterior and opposing interior surfaces 12, 13, and second panel 14 having exterior and opposing interior surfaces 15, 16, respectively. The first and second panels are preferably made of nonshrinkable materials connected by an interposed connecting wall panel such as bottom base panel 19 made of a heat shrinkable film 42 which forms the container bottom or base 43. Connecting panel 19 is preferably a heat shrinkable film 42 which prior to heat activation of the container is folded about fold line 39 and inserted between the first and second panels 11, 14 and sealed thereto to form a integrally connected bottom 43. Panel 19 has a first edge 44 (See Fig. 4) sealed to first panel 11 proximate first panel bottom edge 21 at front connecting seal segment 32. Panel 19 has a second edge 45 (See Fig. 4) sealed to second panel 14 proximate second panel bottom edge 26 at rear connecting seal segment 33.

[0077] Referring now to Fig. 4, a bottom view of a self-formed container 10 of Figs. 1- 3 is depicted in accordance with the present invention. In this view the thin wall thicknesses are expanded for clarity of illustration. First panel 11 and second panel 14 have interposed therebetween a connecting panel 19 having a center fold line 39 separating a first bottom connecting panel front portion 40 and a second rear portion 41. Panel 19 has a first edge 44 sealed to first panel 11 proximate first panel bottom edge 21 at front connecting seal segment 32. Panel 19 has a second edge 45 sealed to second panel 14 proximate second panel bottom edge 26 at rear connecting seal segment 33. A first side edge 46 of panel 19 is folded back upon itself and this folded edge 46 is heated sealed between the first and second panels 11, 14 at a lower portion of the first side seal segment 30 of the perimeter seal 17 (See Figs. 5-7). A second side edge 47 of panel 19 is likewise folded back upon itself and this folded edge 47 is heated sealed between the first and second panels 11, 14 at a lower portion of the second side seal segment 31 of the perimeter seal 17 (See Figs. 5-7).

[0078] Prior to heat activation the first, second and connecting panels 11, 14, and 19 are all sealed together with the connecting panel folded inwardly disposed sandwiched and sealed at the periphery between the first and second panels, as best seen in Figs. 5-7. Upon heat activation, the heat shrinkable connecting panel 19 shrinks, especially in the longitudinal direction along the fold line 39 thereby pulling the first and second perimeter seal segments towards one another. Since the first and second panels are designed to have less shrink, and preferably no shrink, in this longitudinal direction the first and second panel walls are constrained to bow outward as the connecting panel 19 shrinks along the longitudinal axis which corresponds to the fold line 39. This contraction of the connecting base 19 and bowing of the first and second panels creates an interior compartment 18 and self-forms the structure into a container having a stand up configuration having a stable base connected to and supporting the side wall i.e. the first and second side wall portions. Since the connecting film 19 was folded inward and sealed to form a gusset, a relatively flat bottom 43 is formed. The shrunken film 42 thickens as it shrinks adding strength and rigidity and the forces and tensions between the contracting bottom and noncontracting side wall creates an "I" beam effect adding structural support that forms a stable container regardless of the presence or absence of contents within the container compartment.

[0079] Referring now to Fig. 5, a front view of a self-forming container 10, of the type shown in Figs. 1-4, prior to heat activation is shown. A first panel 11 having an exterior surface 12, a top edge 20, opposing bottom edge 21, a first side edge 22 and opposing second side edge 23, overlays a similar second panel (See Figs 6-7) and is sealed thereto by a perimeter seal 17 having a first side seal segment and opposing second side seal segment joined by a front connecting seal segment 32 and a rear connecting seal segment (See Figs. 3, 6 and 7). A bottom panel 19 (See Fig. 6) is folded at fold line 39 and sealed between the first and second panels 11, 14 at respective front and rear connecting seal segments 32 and 33(See Figs. 3 and 6) and at a lower portion 48 of the first side seal segment 30 as well as at a lower portion 49 of the second side seal segment 31. Preferably, the bottom panel is a connecting wall which is heat sealable on one side and not heat sealable on the other side under the chosen heat sealing conditions such as temperature, pressure and dwell time. These conditions will vary depending upon the choice of materials used. The bottom panel may be a multilayer construction where the surface layer in contact with the side wall is selected for enhanced sealing and the surface layer of the bottom panel that is folded upon itself is selected to resist bonding during a sealing operation.

[0080] The inventive self-forming container 10 may be shipped flat without taking up much space, yet upon heat activation quickly self-forms into a stand up configuration having a stable base which may be set on a flat surface for filling and after filling may be sealed and easily shipped and displayed on shelving without tipping making an efficient use of space. Advantageously, product may be sealed within the container prior to heat activation. Prior to or after shipping, transport, purchase and at the point of use, a stand up container may be formed by heat activation for convenience of access to the container contents as the self-formed container maintains a stable shape which may be designed to be for example like a cup or bowl.

[0081] Typical contents for various embodiments of the inventive container may include, for example, food including dry or liquid foodstuffs such as soups, powdered drinks, cocoa, nuts, snack foods, cereals, candy, dips, foodstuffs typically held in semi-rigid or rigid containers and cans, pet food or supplies, home and garden products, medical devices and products, as well as large bag items for which prior art SUPs offer inadequate support e.g. for flour, feed, cement, sand, fertilizer, etc.

[0082] Referring now to Fig. 6, an expanded cross-section taken along lines 6-6 of Fig. 5 is depicted. In this view the interior compartment 18 is slightly opened from its normal lay flat configuration for purposes of illustrating the construction of the container 10. First panel 11 having an exterior surface 12 and interior surface 13, top edge 20 and bottom edge 21 is positioned parallel to a second panel 14 having an exterior surface 15 and interior surface 16, top edge 25 and bottom edge 26. Disposed within these two panels 11, 14 is a heat shrinkable connecting wall 19 folded at 39 and having a first edge 44 and second edge 45 with adjacent heat seal segments 32, 33 respectively.

Referring now to Fig. 7, a side view of the container 10 of Fig. 5 is shown with first and second panels 11, 14 sealed together at perimeter seal 17. First side seal segment 30 is shown having a lower portion 48 which seals together folded connecting panel edge 46 sealed within and to panels 11 and 14. The first and second edges 44, 45 of the connecting panel are adjacent to and sealed proximate with first and second panel bottom edges 21, 26. Thus a gusseted heat shrinkable bottom connecting wall is provided which is adapted for heat activated self-forming into a stand up configuration having a stable base connected to and supporting said side wall.

[0083] Referring now to Fig. 8 a top view of the container of Figs. 5-7 is shown with the top edge 20 of the first panel 11 and the top edge 25 of the second panel 14. Panels 11, 14 are sealed together proximate the first side edges 22, 27 of the first and second panels 11, 14, respectively to form a first side seal segment 30. Panels 11, 14 are also sealed together at the opposing end of the container proximate the second side edges 23, 28 of the first and second panels 11, 14, respectively to form a second side seal segment 31. Between points "A" and "B" panels 11, 14 are unsealed from panel top edges 20, 25 to the bottom connecting panel 19 (See Fig. 6) to permit access to an interior compartment 18 (See also Fig. 6).

[0084] Referring to Fig. 9, a bottom view of the container 10 of Figs. 5-8 is shown. First and second panels 11, 14 are sealed to the connecting panel 19 along parallel front and rear connecting seal segments 32, 33. First and second panels 11, 14 also sealed at first and second side seal segments 30, 31 where these seals extend through both the folds of the connecting panel 19 as well as both panels 11, 14. Between points "A" and "B" the first and second edges of connecting panel 19 are not heat sealed, but merely folded along center fold line 39.

[0085] Referring now to Figs. 9-17, an alternative embodiment of the present invention is shown which depicts a container 50 which is identical to the embodiment of container 10 shown in Figs 1-9 except that a double gusseted connecting wall panel 50 replaces the single gusseted panel 19. Thus, Fig. 10 is a front view of container 50 having a front panel 52 with perimeter seal 53 with a dashed line showing a fold line limit 54 of a double gusseted connecting wall 51. Fig. 11 shows an expanded cross-section taken along lines 11-11 of Fig. 10 showing a double gusseted connecting wall panel 51 inserted between front panel 52 and a rear panel 55. Connecting wall panel 51 has first gusset fold 56 and a second gusset fold 57 connected at mating fold 58. Panel 51 has a first edge 59 sealed to front panel bottom edge portion 60 at front bottom seal segment 61 and a second edge 62 of connecting panel 51 sealed to rear panel edge portion 63 at rear bottom seal segment 64. The panels 51, 52, 53, and perimeter seal 53 cooperate to form an interior container compartment 65.

[0086] Referring now to Fig. 12, a side view of the container 50 is shown having front panel 52 and rear panel 55 connected by a first side seal segment 66 which secures an first side edge of folded double gusseted connecting wall panel 51 between the panels 52 and 55.

[0087] Referring to Fig. 13, a bottom view of the container 50 is depicted with front panel 52 and rear panel 55 sealed together through a double fold of the connecting panel 51 at a first side seal segment 66 proximate to edge 67 of panel 51 (See Fig. 11) and at an opposing second side seal segment 68. The first and second side seal segments are connected by front and rear bottom connecting wall panel seal segments 61, 64 where a bottom edge portion 60 of the front panel 52 is heat sealed to a first edge 59 of the connecting panel 51, and a bottom edge portion of 63 of the rear panel 55 is heat sealed to a second edge 62 of the connecting panel 51. A dashed line 58 depicts a mating fold axis which connects first and second gussets56, 57 of the connecting panel 51 (See Fig. 11). As previously described the bottom connecting wall panel may be designed to be heat sealable on the sidewall contact side while being resistant to heat sealing on the opposite side so that the gusset folds do not seal together in a manner which prevents their unfolding. This may be easily done by providing a multilayer bottom panel selecting seal side and opposing materials in these respective layers which are suitable to achieve the desired effect at the contemplated sealing temperatures and conditions.

[0088] Referring now to Fig. 14 a top view is depicted of the container 50 and shows front panel 52 and rear panel 55.

[0089] To activate self-forming, heat is applied to the inventive container 50 by e.g. application of elevated temperatures above room temperatures e.g. at 90° C by contacting the heat shrinkable connecting panel with hot air or hot water thereby causing it to shrink contract which results in self-forming into a stand up configuration having a stable base connected to and supporting said side wall.

[0090] Referring now to Figs. 15-18 a heat activated container of the type shown in Figs. 10-14 having a double gusseted connecting panel in an expanded configuration is depicted. In Fig. 15 a perspective view of the expanded heat activated container illustrates a wide mouth opening defined by a continuous side wall top edge 69 where the upstanding side wall 70 is formed from a front panel 52 which has an exterior surface 71 and opposing interior surface 72 (See Fig. 16), and a rear panel 55 which has an exterior surface 73 (See Fig. 16) and opposing interior surface 74, where the front and rear panels 52, 55 are connected together to form continuous side wall 70 e.g. by a first side seal segment 75 and opposing second side seal segment 76. These first and second side seal segments 75, 76 are connected to each other by a front bottom seal segment 61 and rear bottom seal segment 64 (See Fig. 17). Although the side wall 70 is shown being formed from two panels 52, 55, it may be formed of a single panel sealed to itself or from a seamless tube or from a plurality of side wall elements.

[0091] Referring to Fig. 16, a top view of the expanded container of Fig. 15 is shown and a number of the features and elements described above are denoted. The compartment 65 is rendered especially large by use of a double gusseted construction which produces a flatter, more rectangular, compact and stable base in the form of shrunken connecting wall panel 51 which has a first front portion 78 and second rear portion 79 separated by a mating fold axis 58. The heat activated shrunken connecting panel 51 (See Figs. 16 and 17) forces the side wall 70 to bow out at portions M and N as a consequence of forcing the side wall portions in the area of the first and second side seal segments 75, 76 respectively to move towards each other being pulled by the shrink forces applied through the heat activation of the heat shrinkable film which forms the connecting wall panel 51. As the side wall portions M, N bow out the area of the opening defined by side wall top edge 69 increases and a spacious interior compartment 65 is created which is held open by the a stable base formed form the connecting wall panel contraction which is now stable at room temperature and at the ambient conditions of normal use by consumers or other end users. It is further noted that it is contemplated that a lap sealed side wall or seamless tubular side wall may be used with a biaxial shrinkable connecting panel to produce an expanded cylindrically shaped container and a generally circular connecting wall panel. Also, the inventive container may be filled and sealed through the open top or may be equipped with a second connecting wall panel for a top closure which may be made of either a shrinkable or nonshrinkable film to produce a regular box or can type appearance. It may be advantageous in certain embodiments to fill the internal compartment through the side wall or through a seam or port in the side wall as well as through the top or bottom or a special fitment applied to the container.

[0092] Referring now to Fig. 17 a bottom view of the container of Figs. 15-17 is shown having a double gusseted connecting panel 51 in an expanded configuration. As previously noted, use of a double fold insertion of the connecting wall panel 51 is particularly advantageous to produce a flatter base and maximize the volume of the interior compartment 65 (See Fig. 16). As seen in Fig. 17 the bottom wall panel 51 has in this particular embodiment an almost square shape, but a variety of shapes are possible. In a preferred embodiment an bottom panel 51 is made from a heat shrinkable film having the property of shrinking greatly in (and having shrink forces applied in) a uniaxial or longitudinal or machine direction , but it is contemplated that such shrink properties may also be employed in a transverse direction or in multi-axial e.g. biaxial directions. Such shrink films are well known in the art of making heat shrinkable, axially oriented films and may be made by a variety of methods including MDO, tenter frames, double bubble or trapped bubble stretch orientation processes such as those described in U.S. Patent Nos. 3,022,543; 3,456,044; 4,277,594; 5,076,977; and as described in "Films, Orientation", Encyclopedia of Polymer Science and Technology, 3rd Ed., pp. 559-577, (2003, John Wiley & Sons, Hoboken, NJ, USA) which is hereby incorporated by reference in its entirety. Commercially available heat shrinkable films are manufactured by many companies including Curwood, Inc. of Oshkosh, Wisconsin, USA and Bemis Flexible Europe of Valkeakoski, Finland. Referring again to Fig. 17, bottom connecting wall panel 51 is sealed e.g. by heat seals, to the side wall 70 forming a front bottom seal segment 61 and rear bottom seal segment 64 and a first side seal segment75 and opposing second side seal segment 76. Seals 61, 64, 75, 76 form perimeter seal 53 which constrains the connecting panel 51. Before sealing, a double fold is made in the bottom connecting wall panel during insertion of the heat shrinkable panel into the side wall interior (this is also prior to heat activation which does not occur until after the container is fully constructed). A first fold inward was made at point E which continued to point F in the front portion of the connecting panel 51 and a second fold inward was made at point G which continued to point H in the rear portion of the connecting panel 51. Mating fold axis line 58 represents a center line where the centrally located portions of panel 51 return outwardly from respective folds EF and GH meeting at the mating fold axis 58. It should be noted that the perimeter seal 53 greatly constrains movement in the direction along fold lines EF and GH, but that the constraint transversely from the mating fold axis line 58 towards portions M and N is much less forceful due to the presence of the folds. After heat activation and shrinking of panel 51, Points E and F are forceably drawn towards each other, as are points G and H, and simultaneously, the film along the fold lines EF and GH is pulled transversely outward towards M and N respectively as panels 52 and 55 bow outward.

[0093] Referring now to Figure 18 a partial view showing a portion of the heat activated inventive container of Fig. 17 is enlarged for magnification purposes to show layer details where the folds of panel 51 are sealed at the side seal. The following explanation applied to both side seal areas where the panel 51 folds are sealed into the sides. A second side seal segment 76 is shown with the various layers that come into the seal area. The outer layers are front panel 52 and opposing rear panel 55 and disposed therebetween is the connecting panel 51 which has a first edge 59 and opposing second edge 62 with a first inward fold 56 and opposing second inward fold 57 connected by mating fold axis line 58. At the second seal segment sufficient heat, pressure and dwell time are applied to fuse, weld or otherwise chemically and/or physically bond together the layers and folds to provide a strong anchor which is preferably hermetic in nature at segment 76. As one follows the layers toward the interior of the package structure the front panel 52 and first edge 59 of the connecting panel 51 are bonded along their interface and this seal extends from the second side seal segment 76 into the front bottom seal segment 61. Similarly, the rear panel 55 and second edge 62 of the connecting panel 51are bonded along their interface and this seal extends from the second side seal segment 76 into the rear bottom seal segment 64. However, as one leaves the second side seal segment 76 along folds 56, 57 and mating fold axis line 58, these folds are not sealed or otherwise bonded together and upon heat activation of the shrink properties of the heat shrinkable film they easily unfold to facilitate movement of the panel film toward s bowed portions M and N (See Figs. 16 and 17). While these folds facilitate movement transversely, in the longitudinal or machine direction movement is not subject to an unfolding effect and shrinkage in the longitudinal/machine direction produces a direct force which results in the bowing out of the side walls which are not shrinking at the same rate or to the same extent (the side walls preferably have no shrink in the longitudinal/machine direction).

[0094] Referring now to Figs. 19 and 20, another embodiment of the invention is shown where a self-formed container 80 having front and rear nonshrink panels 81, 82 are sealed together by perimeter seal 83 which also connects a heat shrinkable film that is shrunken to produce a stable stand up container 80 attached to front panel 80 is a fitment 84 which has been attached e.g. by ultrasonic welding a fitment flange 85 to an interior surface of the front panel 81. The fitment 80 provides a pour spout and/or filling port and may be equipped with a closure cap. It is contemplated that this and various styles of fitments may be added to the top, side or any surface or combination of surfaces of the container to add utility of access to the container contents or interior compartment.

[0095] Another embodiment of the present invention provides handle means e.g. as shown in Fig. 21. It is contemplated that a pouch may be made as described above with respect the single or multi-gusseted pouches but having an extension forming a gripping aid and/or peg board slot. For example, a pouch 86 may be provided having a handle 87 formed therein whereby a pouch may be sold containing cocoa or other powdered drink mixes or soups which may be reconstituted by addition of water e.g. hot water which also activates the self-forming aspect of the invention whereby the connecting wall shrinks producing a stable stand up configuration so that a stand up cup is formed which may be placed upon a flat surface and the hot drink held by the handle for sipping and consumption through a wide cup mouth 88. Such a self-forming container could have a tear off top using scoring or other means known in the art and be shipped relatively flat for efficient use of space and lower shipping costs yet be self-formed into a useful container for consumption of its contents by merely tearing off the top, adding hot water and waiting a few seconds while the transformation into a stable cup takes place. The shrinkage process takes only a matter of seconds to complete, yet may be controlled so that it is not so rapid as to cause unwanted ejection of the contents. Conveniently, the handle may also be employed to hang multiple units of the package for sale or display e.g. on a hook in a peg board display.

[0096] Another embodiment of the invention is shown in Figs. 22-23 where a self-forming container 89 is made from a nonshrinkable side wall 90 having a front panel 91 with a first exterior surface 92 and a second interior surface 93(See Fig. 23), and a back panel 94 having a first exterior surface 95 and opposing second interior surface 96 with first and second wrap around side portions 97, 98, respectively, lap sealed to the front panel. The lap seals weld together the front panel to the second wrap around side portions 91, 94 of the back panel 94 at an interface between the front panel's first exterior surface 92 and the back panel's second interior surface 96. The interface between the second interior surface of the front panel and the second interior surface of the back panel 94 is unsealed thereby allowing expansion on the interior compartment 99 into a circular shape. This may employ a multilayer front panel having an easily sealed surface layer for contact with the wrapped portions 91, 94 and a seal resistance opposing surface to prevent sealing to the back panel's interior surface 96. A heat shrinkable bottom connecting wall panel is provided as described above for the preceding embodiments. By use of lap seals a rounder more cylindrical container shape is possible.

[0097] Another embodiment of the invention is shown in Figs. 24-25 where a self-forming container 101 is made from a combination of a side wall 102, a plurality of force strips 103, 104, 105, 106, and first and second connecting panels 107, 108. This embodiment illustrates a principle of the invention which is to couple a shrink force with an opposing resistance to bring about a deformation or bowing of a container side wall. Thus in the illustrated container 101 the shrink force may be supplied by either or both connecting walls 107, 108 and the resisting force may be supplied by paired force strips 104, 106 and 103, 105 where the force strips are nonshrink and are constrained to bow outward under the influence of a shrink forces which are applied longitudinally in the direction of the strips length. Alternatively, the force strips may be shrinkable in their longitudinal direction and the side wall 102 nonshrinkable and may be semi-rigid, rigid or tensiff which can also cause the side wall to bow outward forming a stable container.

Yet another embodiment of the invention is illustrated in Figs. 26-30 where a container forming band 109 is illustrated having a central shrinkable film strip 110 sealed between two nonshrinkable strips111, 112. The three strips 110, 111, 112 are sealed together at first end seal area 113 and opposing second end seal area 114 and the strips are not sealed to one another therebetween. Fig. 26 shows a front view of the band 109 having a first nonshrinkable strip 111. Fig. 27 is an end view of the band 109 with heat shrinkable strip 110 disposed between nonshrinkable strips 111 and 112. Fig. 28 is a top view of band 109 with heat shrinkable strip 110 disposed between nonshrinkable strips 111 and 112 prior to heat activation shrinking. In Fig. 29 the band 109 has been subjected to heat e.g. 90° C for about 60 seconds thereby causing the shrink strip 110 of band 109 to contract along its length. Since the nonshrink bands 111 and 112 cannot contract, internal forces cause them to bow outwards away from the contracting force of the shrink strip 110. This shrink band 109 may be attached to a nonshrink sidewall to produce a container which is self-formable upon heat activation into a self-formed container having a stable base with a stand up configuration. Also, the band may be located on the exterior or interior of a container. For example, it could be utilized in the interior with a central wall structure between side wall structures to form a multi-compartment package. Also, in another alternative embodiment, the nonshrink strips may be replaced by nonshrink panels or a single nonshrink panel which is seamless or sealed to itself to produce a container. These embodiments will lay flat prior to heat shrinking yet self-form into a stand up configuration having a stable base connected to and supporting a continuous side wall when heat activation causes the heat shrinkable strip to contract. Once formed, the self-formed container resists collapsing into a lay flat state at room temperature and typical ambient conditions e.g. of pressure, radiation, etc.

[0098] Another variation on the shrink band embodiment described above is shown in Fig. 30 which is similar to Figs. 26-29 except that the second nonshrink strip is longer and wraps around to the first nonshrink strip where it is sealed with a lap seal. This embodiment permits the shrink force strip to be sealed to either the first and not the second nonshrink strip or vice versa to prove a container surface which is rounder in appearance which may be desirable for presentation. Thus, a container forming band 115 is provided having a shrink force strip 116 disposed between a first nonshrink strip 117 and a second nonshrink strip 118 and strips 117, 118 are sealed together at first and second end lap seals119, 120, respectively and the heat shrink force strip 115 is likewise sealed to in this instance e.g. the first nonshrink panel 117 thereby producing a more pleasing surface 121 for advertising or conveyance of information. The amount of shrink and/or shrink force and opposing sidewall modulus may be adjusted to modify the extent of warping or curvature of the sidewall e.g. from the slight bends depicted in Fig. 20 to a can-like regular cylindrical shape.

[0099] Furthermore, the inventive container in various embodiments described throughout this disclosure including e.g. a pouch, may have inner surfaces of the sidewall e.g. respective first and second panels as shown in various Figs., and/or the connecting or bottom panel wall may each comprise a layer that has a low interaction with the pouch's intended contents, e.g. citrus flavored drinks or medicines, or aromatic or flavanoid containing products,, and may be substantially chemically inert and/or resist scalping of contents.

[00100] The side wall may have one or more layers e.g. a first panel and a second panel, and can be made from the same materials or different materials. Furthermore, the side wall and its panels can be a multilayered or laminated structure. The structure may be a single layer or a plurality of layers which may be polymeric, metallic, sheets, films or foils or combinations thereof. For example, the first and second panels can have a metal foil layer that forms an intermediate or core layer inside of either or both of the first and second panels and one or more polymer layers that form the inside and/or outside surface of the pouch 30. The metal foil layer can be aluminum. The one or more polymer layers can include cellulosic or preferably noncellulosic polymers, homopolymers or copolymers, blends of polymers. The panels may be constructed of one or more materials which contribute specific functionality to the package. Examples of suitable materials for one or more of these layers include polymers or copolymers such as polyethylene terephthalate, polyolefins e.g. polyethylene, polyester, nylon, styrenic polymers, cyclic polyolefins, metal foils, metalized films, oxygen or moisture barrier polymers such as ethylene vinyl alcohol copolymers, polyacrylonitriles, and vinylidene chloride copolymers such as saran. For example, a polyethylene layer can be sandwiched between a polyethylene terephthalate layer and the foil layer. The pouch can further have a sealant layer that forms the inside surface of the container's compartment such that an oxygen and/or moisture and/or UV light barrier layer such as the metal foil layer can be sandwiched between the sealant layer and the one or more polymer layers. The sealant layer can include polyethylene, ionomer, polyacrylonitrile, polyester, Barex®, or Surlyn®. The laminate may include more layers than those described above such as an adhesive layer between the sealant layer and the foil layer to adhere the sealant layer to the foil layer. Advantageously, sealants such as adhesives may be pattern applied. The thickness of the multilayer structure laminate may be any suitable thickness that provides structural integrity, and desired combinations of properties which may vary depending upon the nature of the contents, usage requirements and which may include e.g. consideration of barrier properties, abuse resistance, heat resistance, heat sealability, scalping resistance, puncture resistance, abrasion resistance, optical properties, haze, gloss, printability, transparency, as may be determined by those skilled in the art in view of the present disclosure. It is expected that typical preferred thicknesses, for example, may be advantageously employed between about 50 μm and about 500 μm.

[00101] In one contemplated method of manufacture, three rolls of pouch film web are placed on a machine and brought together to form heat sealed pouches. A second nonshrinkable pouch film is applied and heat sealed to a first nonshrinkable pouch film with a third heat shrinkable connecting panel film plowed in between the first and second pouch films and sealed thereto. The sealed films are severed from the three webs to provide an individual pouch with the heat shrinkable connecting film gusseted and located between the two side wall panel films and with the pouch having one open end available for product insertion. The three side sealed pouch is used to package an article by a manufacturer or packager who places a product in the pouch either before or after self-forming , and completes the final seal. The sealed package is then shipped for distribution or resell in either an un-self-formed, non-expanded state or in a self-formed, expanded container configuration.

[00102] Unless otherwise noted, the following physical properties are used to describe the present invention, films and polymers have reported values in accordance with, or properties which are measured by, either the test procedures described below or tests similar to the following methods unless otherwise noted.

[00103] Density: ASTM D-792

[00104] Average Gauge: ASTM D-2103

[00105] Tensile Strength: ASTM D-882, method A

[00106] Percent Elongation: ASTM D-882, method A

[00107] Melt Index: ASTM D-1238, Condition E(190° C.)

[00108] Melting Point: ASTM D-3418, DSC with 5° C./min. heating rate.

[00109] Vicat Softening Point: ASTM D-1525-82

[00110] Oxygen Gas Transmission Rate (O_2GTR): ASTM D-3985-81

[00111] Water Vapor Transmission Rate (WVTR): ASTM F 1249-90

[00112] All ASTM test methods noted herein are incorporated by reference into this disclosure.

[00113] Shrinkage Values: Shrinkage values are defined to be values obtained by measuring unrestrained (or "free")shrink of a 10 cm square sample immersed in water at 90°C (or the indicated temperature if different) for five seconds. Four test specimens are cut from a given sample of the film to be tested. The specimens are cut into squares of 10 cm length in the machine direction by 10 cm length in the transverse direction. Each specimen is completely immersed for 5 seconds in a

90°C (or the indicated temperature if different) water bath. The specimen is then removed from the bath and the distance between the ends of the shrunken specimen is measured for both the machine (MD) and transverse (TD) directions. The difference in the measured distance for the shrunken specimen and the original 10 cm side is multiplied by ten to obtain the percent of shrinkage for the specimen in each direction. The shrinkage of four specimens is averaged for the MD shrinkage value of the given film sample, and the shrinkage for the four specimens is averaged for the TD shrinkage value. As used herein the term "heat shrinkable film at 90°C" means a film having an unrestrained shrinkage value of at least 10% in at least one direction.

[00114] As used herein, the term "shrink force" may refer to the force or stress exerted by the film on the package as the film contracts under heat. A value representative of the shrink force may be obtained using an Instron Tensile tester with a heated chamber.

[00115] Shrink Force: The shrink force of a film is equal to that force or stress required to prevent shrinkage of the film under specified conditions. Shrink force values are measured using the Instron heated chamber. The position was held constant and the temperature was ramped up. The Instron software was used to collect force vs time data. The temperature/time was manually recorded throughout each run and time data converted to temperature. Six replicates using the following Run Conditions:

1" wide strips; 4" jaw span held constant throughout test

caliper measured and entered into program

sample loaded with minimal force at 25° C

Temperature controller was set to 400° C to ramp the temperature up quickly.

Test time/speed was set to 5 minutes at 0 mm/min.

Instron software recorded Force vs Time

Manually recorded Force, Time and Temp in 5° C increments

Test was started and temperature ramped up as soon as door was closed.
Data collection speed was 100ms per data point.
The shrink force for the film sample is reported in Newtons. The shrink force may be determined by cutting out rectangular specimens from sample films with the long axis parallel to either the machine or the transverse direction. The specimens are clamped at the short ends so that the force to be measured is applied along the long axis. One clamp is stationary, while the other clamps are housed in a small oven whose heating rate can be accurately controlled. The specimen is heated and the force needed to hold the moveable clamp at a fixed distance from the stationary clamp is measured. This force is equal to and opposite the shrink force.

[00116] Plastic films and layers employed in the present invention may be manufactured by various processes e.g. cast films using e.g. a slot die, or conventional blown films where a tubular film is produced directly from the die melt. Also, molded, thermoformed, blow molded sheets, semi-rigid solid, hollow or foamed bodies may also be produced. In a preferred embodiment, extrusion is by cast extrusion. In a preferred process for making an oriented, heat shrinkable film, a polymeric resin is melt extruded through a slot die onto a chilled roller where a cooled sheet having a temperature below the melting point of the polymer(s) is produced, and then preferably oriented by reheating to the polymer's orientation (draw) temperature range while stretching in the machine direction (e.g. by using known processes such as take off rollers travelling at a higher rate of speed than the film transport rate earlier prior to stretching) with cooling to lock in the stretch orientation. This locked in MD orientation produces a film having heat shrinkability which may remain through a fabrication process of the self-forming container of the present invention until it is released by heat activation at an elevated temperature which for polyolefin films is generally at about 80-90 ° C.

[00117] Heat shrinkable film may also be made by a trapped bubble or double bubble process of the type described in U.S. Pat. No.3,456,044. In an alternative process for making an oriented or heat shrinkable film, a primary tube comprising the inventive plastic blend is extruded, and after leaving the die is inflated by admission of air, cooled, collapsed, and then preferably oriented by re-inflating to form a secondary bubble with reheating to the film's orientation (draw) temperature range. Machine direction (M.D.) orientation is produced by pulling or drawing the film tube e.g. by utilizing a pair of rollers traveling at different speeds and transverse direction (T.D.) orientation is obtained by radial bubble expansion. The oriented film is set by rapid cooling. Suitable machine direction and transverse direction stretch ratios are from about 3:1 to about 5:1.

[00118] Films of the present invention may be monolayer or multilayer films or sheets generally of 1 to 20 mils. Multilayer films may have a variety of thicknesses which may be determined according to the desired film or container properties and without undue experimentation.

[00119] The side wall and connecting wall panels, where desired, may employ one or more oxygen or moisture barrier layers. These barrier layers may be of any desired thickness, but typically thicknesses are between about 0.1 and about 0.5 mils. Thinner barrier layers may not perform the intended functions and thicker layers do not appreciably improve performance.

[00120] In the barrier layer embodiment of this invention the outer thermoplastic layer of the enclosing multilayer film is on the opposite side of the core layer from the inner layer, and in direct contact with the environment. In a preferred three layer embodiment of the invention this outer layer is directly adhered to the core layer. Since it is seen by the user/consumer, it must enhance optical properties of the film. Also, it must withstand contact with sharp objects so is termed the abuse layer and provides abrasion resistance.

[00121] Following are examples and comparative examples given to illustrate the invention. In all the following examples, unless otherwise indicated, the heat shrinkable films were produced generally utilizing the slot cast apparatus and method described above. In the following examples, all layers were extruded (coextruded in the multilayer examples) as a cast sheet which was cooled upon exiting the die e.g. by contact with a chilled drum. This cooled sheet was then reheated by contact with further roller drums which were internally heated by oil (heated water could also be used as well electric induction heating) to the draw temperature (also called the orientation temperature) for axial orientation accomplished by pulling the sheet with thinning in the machine direction using differential speed with cooling accomplished by contact with another chilled roller to produce a heat shrinkable film. All percentages are by weight unless indicated otherwise.

[00122] Example 1

[00123] In Example 1, a uniaxially stretched, heat shrinkable, monolayer film was made and its physical properties tested. A film comprising 70 wt. % of a cyclic olefin copolymer commercially available from Topas Advanced Polymers GmbH under the trade name Topas 8007F-400 was blended with 30 wt. % of a conventional ethylene octene-1 copolymer commercially available from The Dow Chemical Company under the trade name Attane NG 4701G (hereinafter COC:EAO blend). This blend was melt plastified in an extruder and extruded through a slot cast die at a temperature of from 180-250 ° C onto a chill roll (temperature ~55° C) and subsequently uniaxially oriented in the machine direction by a slot cast MD stretch orientation process similar to that described above at a stretch orientation temperature of ~85° C. The orientation ratio in the machine direction was 3:1. There was no transverse orientation stretching applied apart from passage of the film through the machine direction rollers. A sample of this film was tested for physical properties. At 90° C the MD/TD heat shrink was about 50%/2%, and the shrink force was 324/13.5 grams (measured using a heated Instron Tensile property tester). This film was also used to form a heat shrinkable connecting wall panel by making a single fold and inserting and heat sealing between two nonshrink panels each of which having a multilayer structure of PET/tie/Al foil/tie/sealant where a cast, tentered, biaxially stretch oriented and annealed polyester terephthalate film is adhesive laminated to an aluminum foil layer with is adhesively tied to a polyolefin sealant layer. These panels are believed to have essentially no free shrink at 90 °C (and no shrink force either). Each panel is about 3.5 mils thick.

[00124] A pouch container is formed from two panels, each of which are about 160 millimeters (mm) wide and 130 mm high made from the multilayer structure described above, and a connecting wall heat shrinkable film, as described above, is cut to be about 160 mm wide and 76 mm high. This connecting wall film is folded in half and positioned between the two nonshrink panels as depicted in Fig. 6 and then all three films are heat sealed together along the side edges with the bottom edges of the heat shrinkable connecting wall heated sealed to opposing panel bottom edges to create a three sided pouch container with a single gusseted bottom. The heat shrinkable connecting wall is positioned so that its uniaxial, machine direction, stretch/shrink is along an axis that extended from one side wall edge where the two panels meet to the opposing side wall edge where the opposing panel side walls meet similar to the embodiment shown in Figs. 5-9.

[00125] This three sided pouch container of the invention may be laid flat which is ideal for shipping and storage taking up very little space. A pouch similar to that described above had its heat activated, self-forming properties tested by adding hot water (175° F/79° C) inside its compartment. The container immediately self-formed by contraction of the connecting panel thereby drawing the opposing pairs of side wall edges toward each other creating a stand up configuration having a stable base connected to and supporting the side wall with an expanded compartment volume. This transformation into a stable stand up self-formed container was completed within a few seconds (less than about five seconds). Upon emptying the pouch of water, the pouch maintained its stand up configuration having a stable base and resisted any return to a folded condition. Thus, at ambient temperature a permanent, non-reversible, change in the shape configuration from a flexible, lay flat condition to a more rigid, stable, stand up configuration occurred.

[00126] Example 2

[00127] Another container of the present invention was fabricated, as for Example 1, except with the following changes. The pair of nonshrink side wall panels was replaced with a different multilayer panel material which utilized unoriented PET. These panels were 5 inches high and 7 inches wide and also used a single gusset but having a fold 2 ¼ inches from the bottom edge. After heat activation, the bottom connecting wall shrank, however the container base was slightly distorted due to the low softening point of the material used in the sidewall relative to the heat activation temperature and coupled with the deep gusset fold and shrink forces attendant to the shrink film utilized.

[00128] Example 3

[00129] Another container was made, as described for Example 2, except this container used nonshrink side wall panels which were approximately 5 inches high by 6 inches wide and a single gusseted, connecting panel with a 1 ½ inch fold. The side wall panels and connecting wall utilized the same materials as for Example 2. The container of example 3 was heat activated as for Example 2. There was much less distortion of the base of the example 3 container which result is believed due to use of a shorter fold depth in combination with a shorter panel width. The self - forming container of Example 3was also equipped with a plastic, double track, reclosable zipper of the type which are commercially available from several manufacturers.

[00130] Example 4

[00131] In Example 4, another uniaxially stretched, heat shrinkable film was made using the equipment and conditions similar to those for Example 1, except that the COC:EAO blend used in the connecting wall heat shrinkable film was replaced with 98 wt. % of a styrene - butadiene-styrene copolymer that is commercially available from Chevron Phillips under the trade designation "K-resin KR52" blended with 2 wt. % of a styrene-butadiene-styrene copolymer containing slip and antiblock additives (hereinafter SBS blend), and the extrusion temperatures were 180-200° C, the chill roll quench temperature was 30° C. This properties of the film made from this blend were measured. At 90° C the MD/TD heat shrink was about 68%/-3% and the shrink force was 84.6/2.9 grams (measured using a heated Instron Tensile property tester).

[00132] This heat shrinkable SBS film was cut into a rectangular panel of dimensions 63.5 mm high x 180 mm wide with the machine direction shrink being in the lengthwise width (i.e. the longer dimension). This heat shrink connecting wall panel was folded lengthwise upon itself and place between two nonshrink side wall panels of 130 mm height x180 mm width which is configured generally as shown in Figures 5-9 of the drawings. The side wall panels had a 6.75 mil thick white pigmented, multilayer film construction which included a polystyrene film layer, an oxygen barrier layer, and a polyolefin sealant layer. The sidewall sheets were measured to have 0% shrink at 90° C; an average thickness of about 10.3 mil; and an average MD/TD Young's modulus of about 1553/1638 MPa. The three pouch container components (i.e. two nonshrink side wall panels and a connecting wall heat shrinkable film) were heal sealed together to form a self-forming container as a pouch having a bottom single gusseted heat shrinkable connecting panel. This pouch was then subjected to elevated temperatures to heat activate the self-forming properties whereupon the pouch self-formed by shrinking of the connecting panel into a stand up configuration having a stable base similar to that depicted in Figures 1-4. In this particular embodiment a stable base was formed having a higher machine direction (M.D.) shrink with a slight growth in the transverse direction (T.D.) which is attributable to them SBS material used in the connecting wall which tends to dimensionally expand in the cross direction to the uniaxial shrink direction. At the high test temperature the connecting wall could be manually stretched, but upon cooling to ambient room temperature the configuration stabilized and resisted further stretching.

[00133] Example 5

[00134] In Example 5, an inventive, self-forming container was made, as described for example 1 above, except that the nonshrink panel walls utilized a blue pigmented high-impact polystyrene multilayer film similar to that described in Example 4. These side wall panels had dimensions of 4 inches in height and 6 inches in width. These sidewall sheets were measured to have 0% shrink at 90° C; an average thickness of about 12.5 mil; and an average MD/TD Young's modulus of about 1633/1634 MPa. The same COC:EAO blend connecting wall heat shrinkable film was used, although a double gusseted connecting wall structure was made using a 6 inch wide and 3 ½ inch high film, folded into an inverted "W" shape having fold lines which are 7/8 inch above the bottom panel edges and similar to the configuration depicted in Figures 10-14 of the Drawings.

[00135] The inventive container of example 5 had an interior compartment into which instant oatmeal was added with water. The oatmeal and water containing pouch was set up into a microwave oven. The container was subjected to microwave heating on its high setting (full power) for 60 seconds causing heat activation and self-forming of the container along with cooking of the instant oatmeal. Upon removal from the microwave, the oatmeal was stirred with a spoon. The container was intact with a stable bottom and a compartment containing an expanded volume. Upon removal of the contents of the self-formed container, the stable expanded configuration was maintained and the container was not collapsible at ambient temperature. Advantageously, the double gusset created a more voluminous shape which may be characterized as a bowl, cup, or box- like as shown in Figs. 15-17.

[00136] Example 6

[00137] Another container was made, similar to that described above with respect to Example 5, except with the following changes. The side wall panels were formed from a multilayer structure having a polyolefin sealant, biaxially oriented and annealed polyester layer, and other polyolefin layers. The sidewall material was very flexible and typical of that used in many commercially available standup pouches. The side wall panels had a thickness of about 5 ½ mils and each panel was about 4 inches in height and 6 ½ inches in width. The same connecting wall material was used as for Example 5 with a similarly sized double gusset having the same fold line located 7/8 of an inch above the bottom edge of the panels and the connecting wall material matched the width of the panels (6 ½ inches).

[00138] The container of example 6 was self-formed by heat activation using hot water as described in Example 1. Following heat activation, the container connecting wall shrank, pulling the opposing sets of paired side wall edges towards one another creating an expanded internal compartment and forming the container into a stand up configuration having a stable base connected to and supporting a continuous side wall made from the two panels. This configuration was not collapsible to the preform state although the side wall panels remained flexible. The appearance of this expanded formed stable container with similar to that depicted in Figures 15-17.

[00139] <u>Example 7</u>

[00140] Another self-forming container was made similar to that as described above for Example 5, utilizing a similar nonshrink side wall made from similar panels. A polyolefin multilayer blown film was substituted for the connecting wall material. It is believed that this blown film had little shrink force and a relatively low free shrink value at 90° C. It was made by a simple blown bubble process. A 4 inch high and 6 inch wide, double gusseted base construction was used. The container was heat activated by heating water in its internal compartment for about

60-70 seconds in a microwave oven on the full power (high) setting. A stable base supporting the side wall in a stand up container configuration was formed and maintained after removing the heated water return of the container to room temperature. The formed container was not collapsible to the pre-forming flat state. The increase in volume of the internal compartment after forming was not as expanded as for the container of Example 4. It is believed that the use of blown film which has little shrink force resulted in only a small expansion of the volume relative to other embodiments of the invention which utilize shrink films for the connecting wall which have been made by cold drawn or high shrink force inducing stretch orientation methods.

[00141] Example 8

[00142] Another example of the invention may be made as described for Example 1 with the following changes. The sidewall may have a 5 ½ inch height with a lay flat width of the container being 6 ¼ inches and utilizing a single gusseted nonshrink material having a height of 3 ½ inches which may be folded once so that a fold line of 1.75 inch from the bottom edge of the container is maintained. The material used for the gusset in Example 8 is the same material as that used for the side wall. In addition, a machine direction oriented, heat shrinkable shrink band may be inserted adjacent to the bottom edge of the container between the gusset folds and sealed at either end to the perimeter side at the opposing side wall edges. This shrink band is similar to that is depicted in Figs 26-29, except that side wall panels here are integral with the outer layers of the band depicted in the figures. Alternatively, the shrink band of those figures could be inserted and sealed along the container bottom or within the interior of the sidewall or at any point between the bottom and the top, or at the top. Upon heat activation, the shrink band contracts causing a deformation of the sidewalls creating an expansion of volume forming an internal compartment. Upon cooling this change is permanent and irreversible at room temperature.

[00143] Those skilled in the art of manufacturing paperboard, and polymeric film packaging including stretch oriented films know of different and various processes of such manufacture and the present inventive films include uniaxially and biaxially oriented or stretched films regardless of the method used for their production as well as unoriented or unstretched films including slot cast and hot blown films and other sheet materials such as paperboard.

[00144] Films useful with the present invention may also be optionally crosslinked by irradiation e.g. at a level of 2-6 megarads (Mrad) after biaxial stretching (which irradiative process may be referred to as post-irradiation), in the manner generally described in Lustig et al, U.S. Pat. No.4,737,391 which is hereby incorporated by reference. Films may also be corona treated or plasma treated or treated by other known radiative processes to enhance or alter or add desired properties as is known in the packaging arts.

[00145] These examples are not exhaustive and other features and properties of the other pouches illustrated herein in the Figures can be applied.

[00146] The features of these embodiments illustrate that a variety of shapes, sizes and configurations may be employed in the present invention and may be made using non-peelable or peelable polymeric films with or without metal foil layers or tear initiators.

[00147] In another embodiment of the invention, a heat shrinkable connecting wall itself has heat shrinkable side wall panels which are in turn adhered to nonshrink exterior side walls to produce the same opening effect with added bowing along the side wall from the heat shrink forces applied through the shrinkable side wall panel. The shrink and not shrink side walls may be adhered to one another through use of adhesive lamination. or corona treatment and irradiative attachment for example by use of an electron beam curing unit.

[00148] The inventive container in another embodiment is used as a retort container which forms a "can-like" shape in a retort chamber during heating.

[00149] In yet another embodiment, both top and bottom of the side walls are connected by heat shrinkable films which are preferably attached by single or multiple folds or gussets to produce a symmetrically shaped container or can/box like appearance. This embodiment may also be display on its side if desired with the connecting walls located on the sides.

[00150] Advantageously, the present invention may be used to package a variety of products including e.g. dry ramen noodles, dry rice, dry soup mix, macaroni and cheese mixes, gelatin powder, cocoa, instant coffee, backpacker meals, oatmeal, grits, etc. and these types of foods may be shipped in a closed, sealed compact state which conserves space and then expanded by heat shrinking the connecting panel e.g. by addition of hot water to the contents thereby creating a stable bowl or cup container which has sufficient rigidity to enable serving and access. Thus, the inventive package takes on multiple shapes, such as flat and rounded bowl, and has means to transform from one shape or configuration to another shape or configuration. Thus, the present invention provides a self-forming container without any necessity for microwave susceptors, stays, expandable polymers or microencapsulated materials. In one embodiment, a consumer may just add hot water to simultaneously reconstitute the food product and create a stable bowl-like shape for serving and/or eating. In another embodiment, an expanded container is used by a processor for economical shipping and storage followed by self-forming for ease of filling. In yet another embodiment, the processor enjoys the benefits of small volume storage of the unfilled containers while permitting the processor to self-form the container and provide a stable filled container with a variety of articles from soup to nuts, to retorted foods and packages to containers for perishable or nonperishable food or non-food articles.

Embodiments of the Inventions

[00151] Various embodiments have been described above. Although the invention has been described with reference to these specific embodiments, the descriptions are intended to be illustrative and are not intended to be limiting. Various modifications and applications may occur to those skilled in the art without departing from the true spirit and scope of the invention as defined in the appended claims.

[00152] What is claimed is:

CLAIMS

1. A self-forming container comprising:

a side wall having an interior side wall surface; and

a connecting base wall comprising a heat shrinkable film; said connecting base wall connected to first and second opposing portions of said interior side wall surface thereby closing said side wall; whereby said container is adapted for heat activated self-forming into a stand up configuration having a stable base connected to and supporting said first and second side walls.

2. A self-forming container, as defined in claim 1, wherein said heat shrinkable film has a machine direction shrink of at least 10% at 90°C.

3. A self-forming container, as defined in claim 1, wherein said heat shrinkable film has a machine direction shrink force of at least 50 g/mil at 90°C.

4. A self-forming container, as defined in claim 1, wherein each of said side walls has a machine direction modulus of elasticity of at least 1000 MPa at 23°C and 50% relative humidity

4. A self-forming container, as defined in claim 1, wherein said heat shrinkable film has at least 40% shrink and less than 10% shrink at 90° C in at least one direction .

6. A self-forming container, as defined in claim 1, wherein:

said side wall has top and bottom edge portions; and

said connecting base wall is connected to said side wall proximate said side wall bottom edge portion.

7. A self-forming container, as defined in claim 1, wherein said connecting wall is attached to said side wall with a single gusset.

8. A self-forming container, as defined in claim 1, wherein said connecting wall is attached to said side wall with a plurality of gussets.

9. A self-forming container, as defined in claim 1, wherein said connecting wall has at least 10% greater shrink at 90° C than said side wall in the same direction.

10. A self-forming container, as defined in claim 1, wherein said heat shrinkable film has a machine direction shrink value of at least 30% at 90°C.

11. A self-forming container, as defined in claim 6, wherein said side wall is rigid.

12. A self-forming container, as defined in claim 1, wherein:

said side wall has less than 10% shrink at 90° C; and

said connecting wall having at least 10% greater shrink at 90° C in at least one direction than the side wall in that same direction.

13. A self-forming container, as defined in claim 1, wherein:

said side wall is continuous having opposing top and bottom edges connected by said interior side wall surface, said side wall having less than 10% shrink at 90° C; and

said connecting wall having at least 10% shrink at 90° C in at least one direction.

14. A self-forming container, as defined in claim 1, wherein:

said side wall has a percentage shrink, at temperature T° C, of from 0 to "A" in at least one axial direction; and

said connecting wall has a percentage shrink, at said temperature T° C, of 10 + "B" in at least one direction;

where "T" is from 80 to 150 °C, "A" is from 0 to 30, and "B" ≥ "A".

15. A self-forming container, as defined in claim 14, wherein:

"T" is 90 °C.

16. A self-forming container, as defined in claim 14, wherein:

"T" is 120 °C.

17. A self-forming container comprising:

a first side wall having a perimeter with opposing top and bottom edges connected by opposing first and second side edges;

a second side wall opposite said first side wall, said second side-wall having a perimeter with opposing top and bottom edges connected by opposing first and second side edges; and

a bottom wall comprising a heat shrinkable film;

wherein said first side edges of said first and second sidewalls are connected and said second side edges of said first and second sidewalls are connected to form a continuous inner side wall surface of said container and said bottom wall is connected to said first and second walls proximate their respective side wall bottom edges; and whereby said container is adapted for heat activated self-forming into a stand up configuration having a stable base connected to and supporting said first and second side walls.

18. A self-forming container, as defined in claim 17, wherein said first and second side walls have less than 5% shrink at 90° C in both machine and transverse directions.

19. A self-forming container, as defined in claim 17, wherein said first and second side walls are semi-rigid, rigid, or tensiff.

20. A container forming band comprising:

a shrink force strip disposed between a first nonshrink strip and a second nonshrink strip said first and second nonshrink strips and said shrink force strip sealed together at first and second opposing ends.

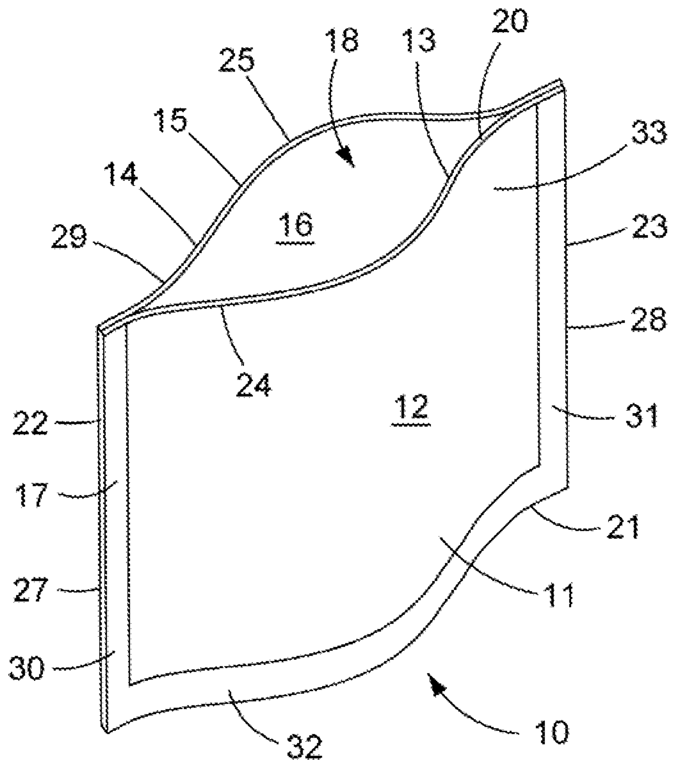

FIG. 1

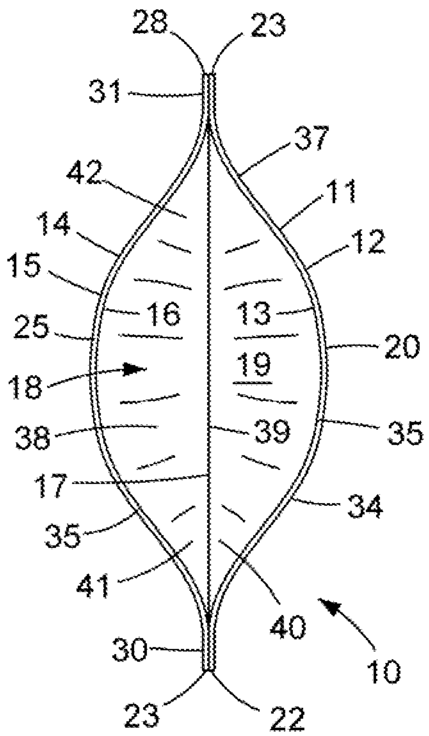

FIG. 2

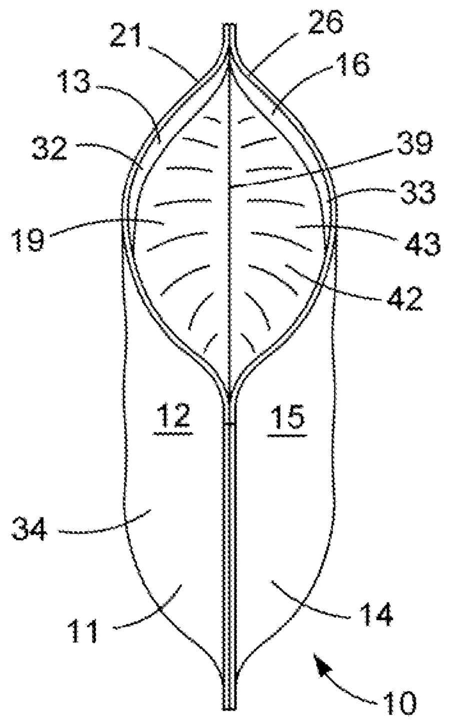

FIG. 3

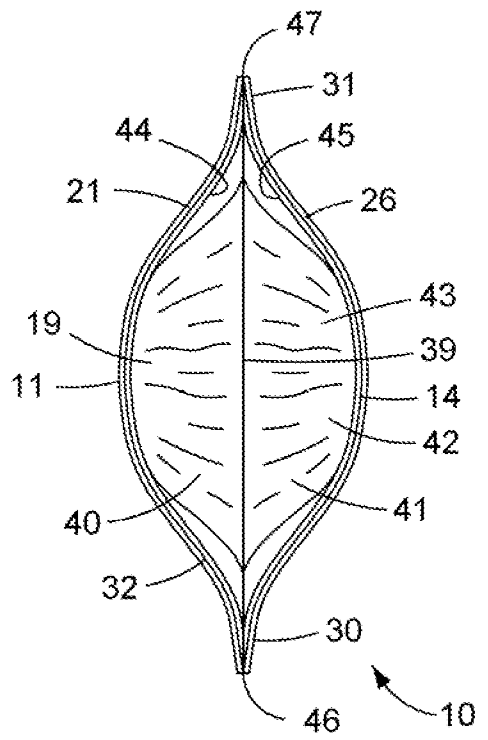

FIG. 4

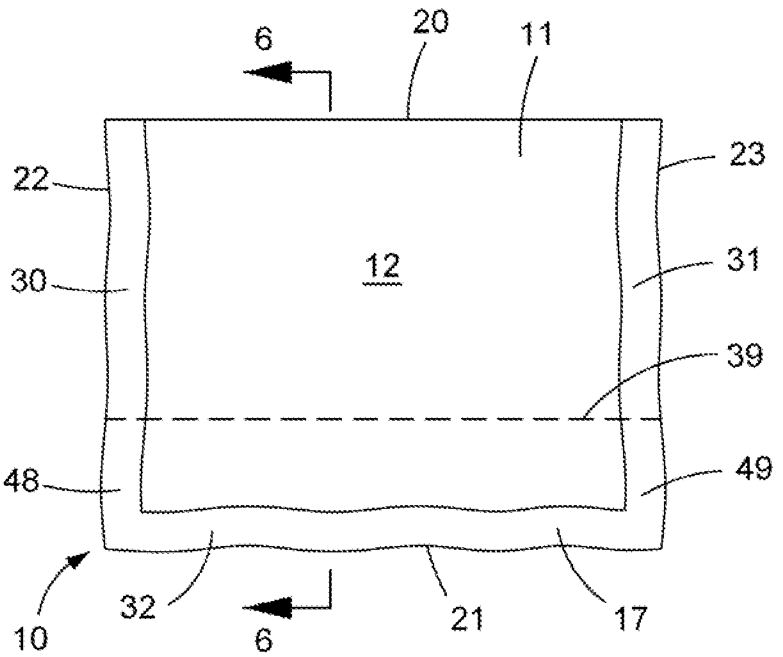

FIG. 5

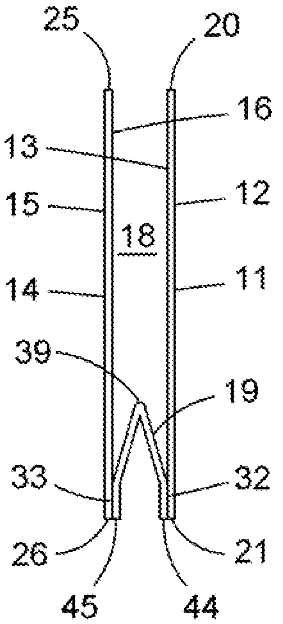

FIG. 6

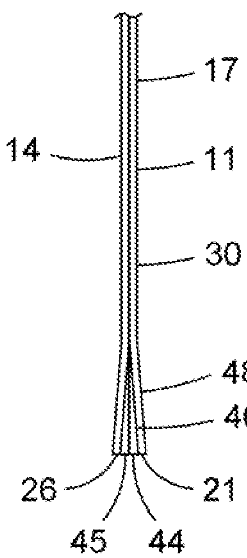

FIG. 7

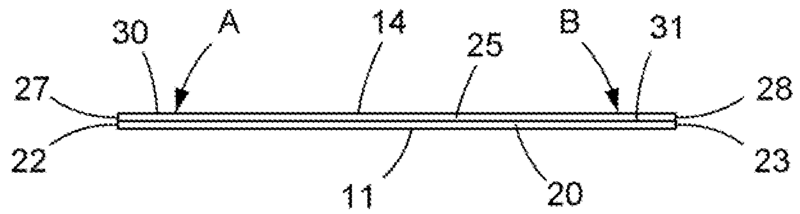

FIG. 8

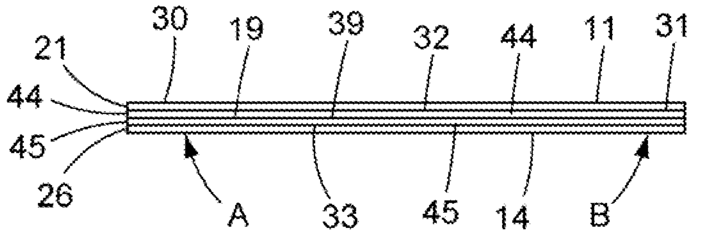

FIG. 9

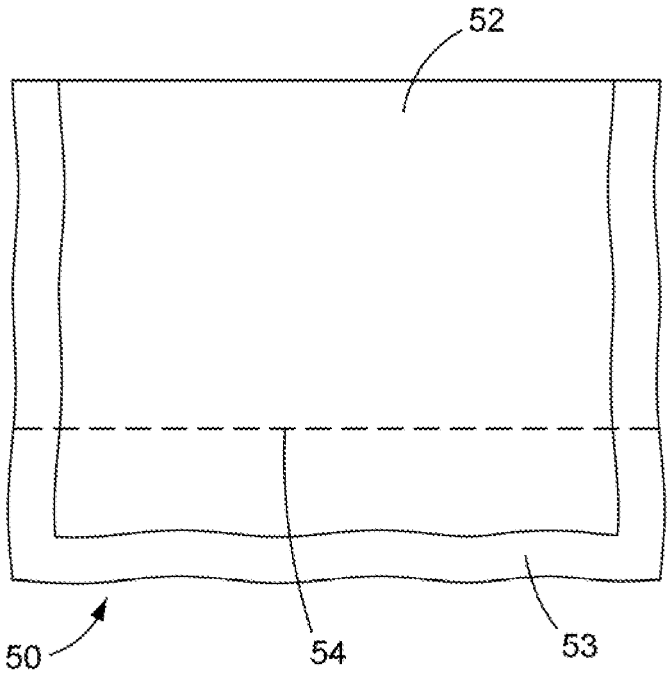

FIG. 10

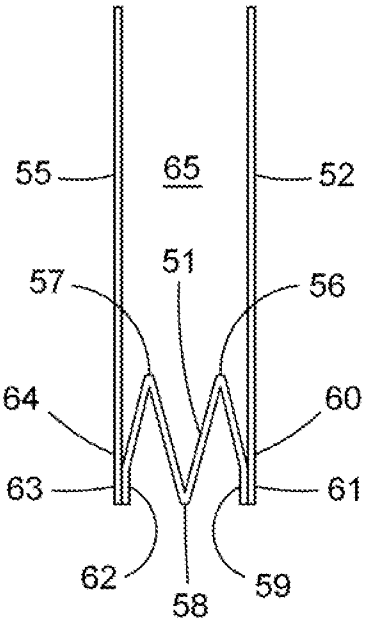

FIG. 11

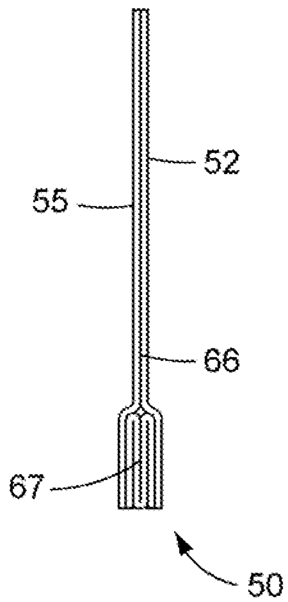

FIG. 12

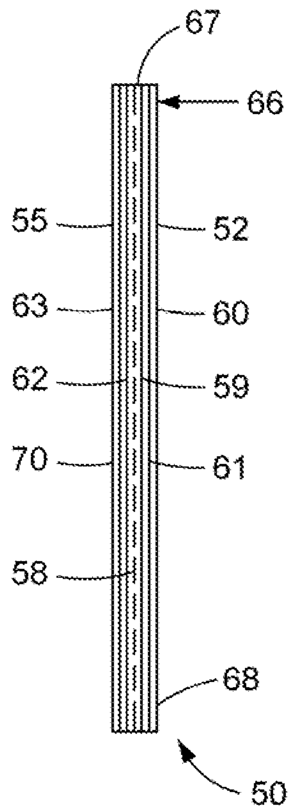

FIG. 13

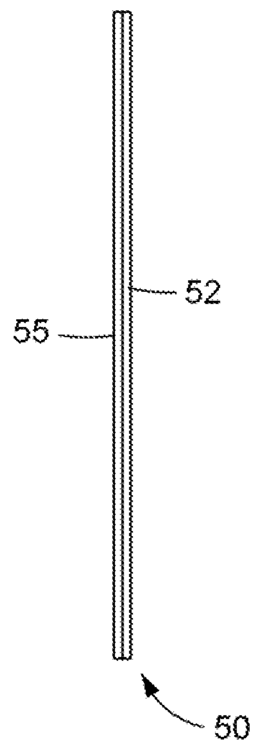

FIG. 14

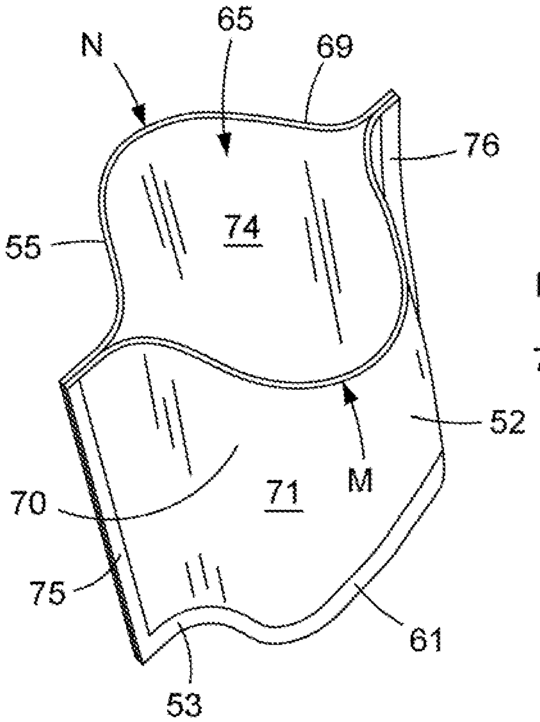

FIG. 15

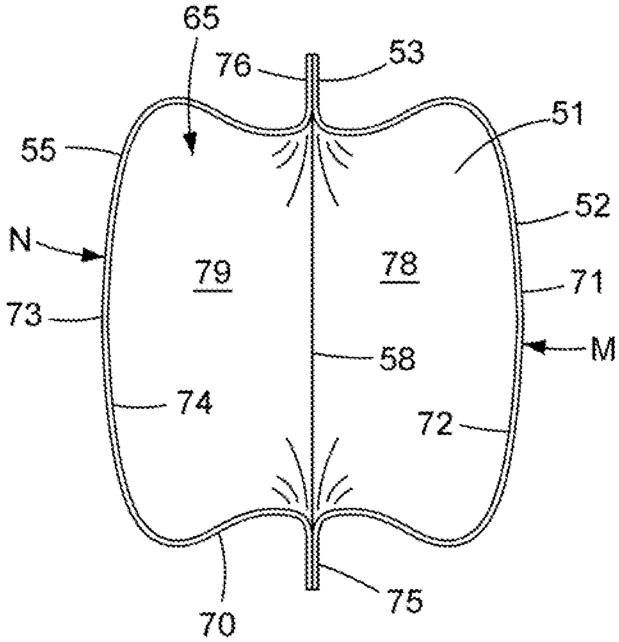

FIG. 16

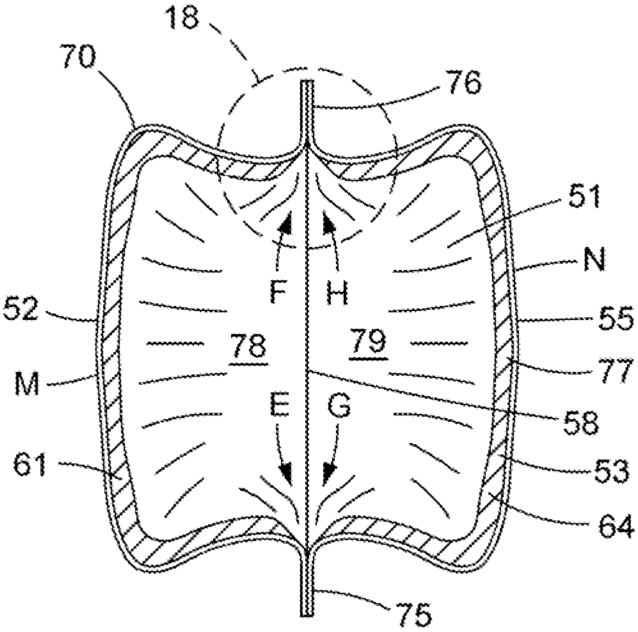

FIG. 17

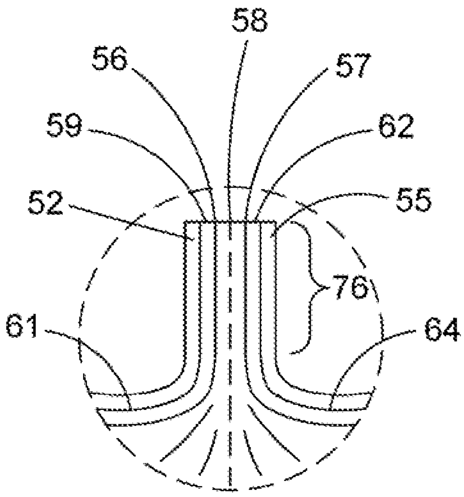

FIG. 18

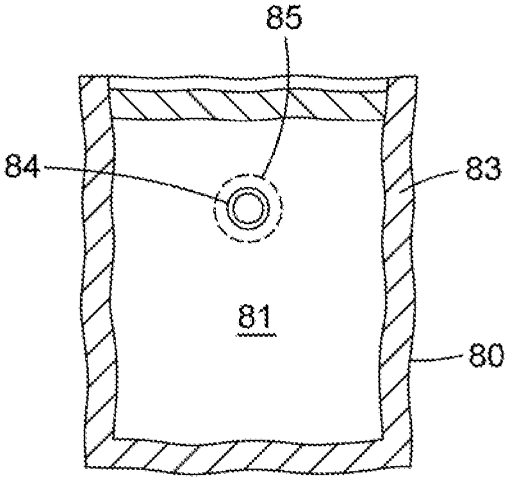

FIG. 19

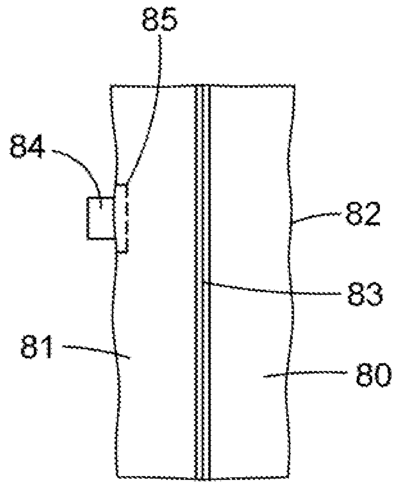

FIG. 20

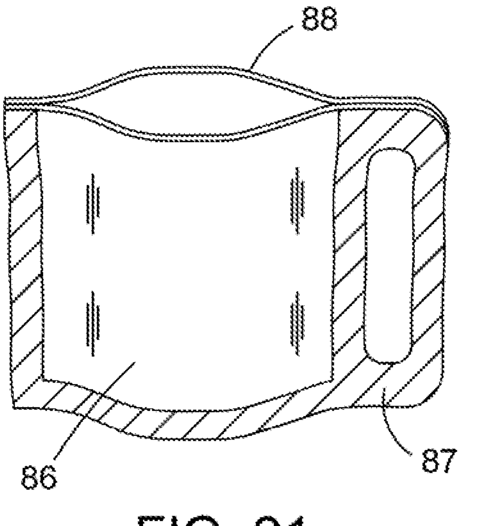

FIG. 21

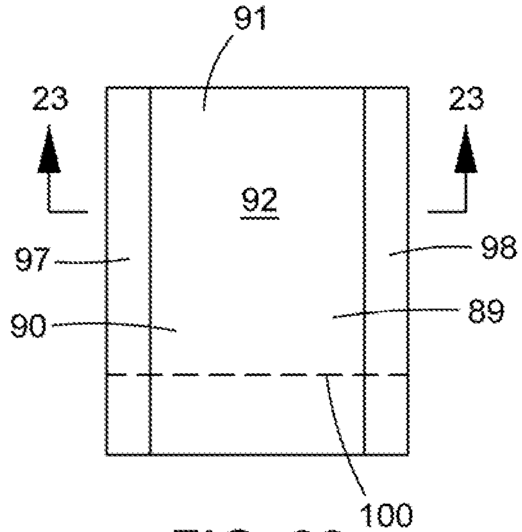

FIG. 22

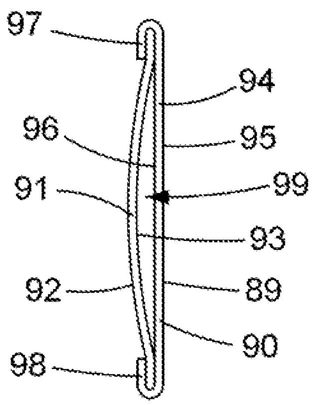

FIG. 23

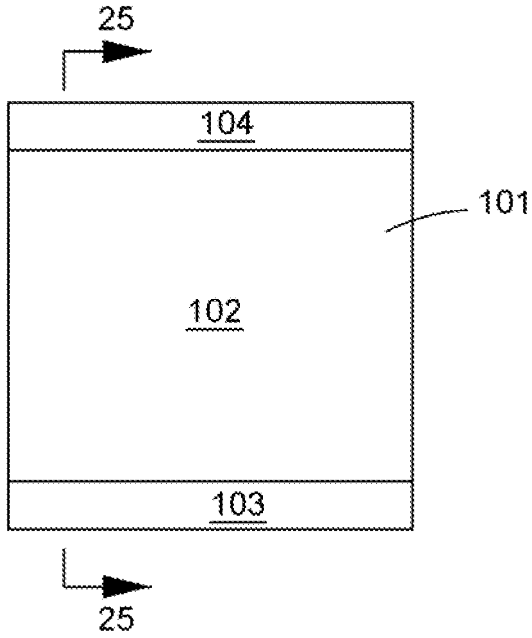

FIG. 24

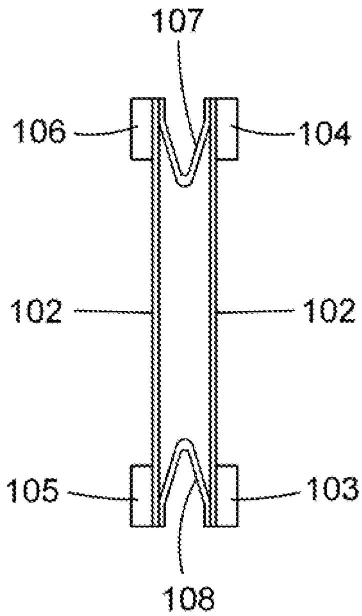

FIG. 25

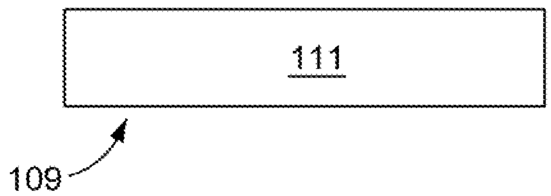

FIG. 26

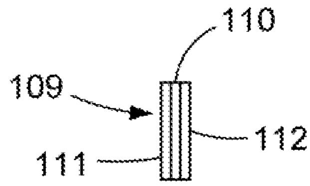

FIG. 27

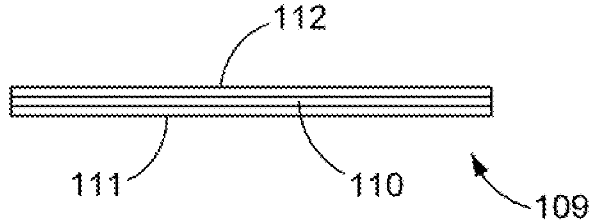

FIG. 28

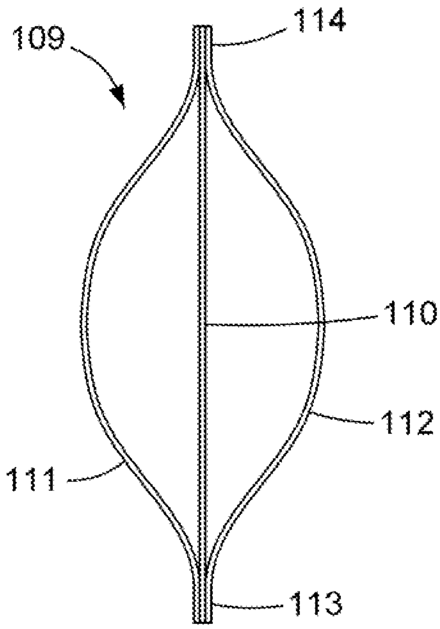

FIG. 29

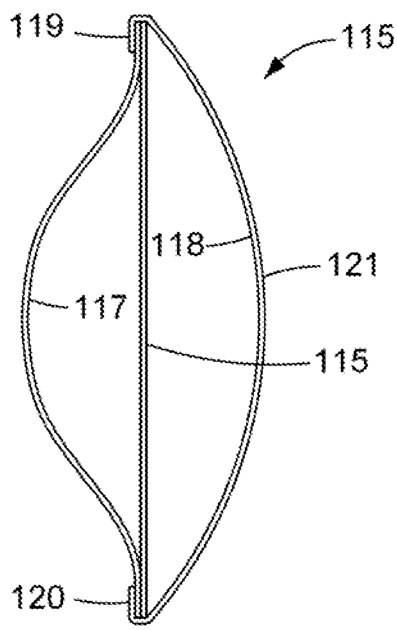

FIG. 30

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/046805

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - B65D 33/00 (2013.01)
USPC - 383/104
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(8) - B29C 65/00, 65/04; B31B 37/00; B32B 27/32; B65D 33/00, 75/00 (2013.01)
USPC -156/308.4; 383/104, 107, 116, 119, 120, 121, 122; 426/410; 428/34.9; 493/189

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
CPC - B65D 5/242, 75/002 (2013.01)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Orbit, Google Patents, Google

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2003/0172624 A1 (BARTEL et al) 18 September 2003 (18.09.2003) entire document	1-20
Y	US 3,896,991 A (KOZLOWSKI et al) 29 July 1975 (29.07.1975) entire document	1-20
Y	JP 2011-25944 A (KUGE) 10 February 2011 (10.02.2011) see machine translation	7, 8
A	JP 2011-98544 A (KOYAMA) 19 May 2011 (19.05.2011) entire document	1-20

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

* 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 application or patent 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
18 November 2013

Date of mailing of the international search report
02 DEC 2013

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