US 20050037164A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2005/0037164 A1**

**Wu et al.** (43) **Pub. Date: Feb. 17, 2005**

(54) **LIQUID-TRAPPING BAG FOR USE IN VACUUM PACKAGING**

(75) Inventors: **Hongyu Wu**, San Jose, CA (US); **Charles Wade Albritton**, Hercules, CA (US); **David Brakes**, Kowloon (CN)

Correspondence Address:
**FLIESLER MEYER, LLP**
**FOUR EMBARCADERO CENTER**
**SUITE 400**
**SAN FRANCISCO, CA 94111 (US)**

(73) Assignee: **Tilia International, Inc.**, San Francisco, CA

(21) Appl. No.: **10/795,149**

(22) Filed: **Mar. 4, 2004**

**Related U.S. Application Data**

(60) Provisional application No. 60/452,168, filed on Mar. 5, 2003. Provisional application No. 60/452,172, filed on Mar. 5, 2003. Provisional application No. 60/452,171, filed on Mar. 5, 2003. Provisional application No. 60/451,954, filed on Mar. 5, 2003. Provisional application No. 60/451,948, filed on Mar. 5, 2003. Provisional application No. 60/452,142, filed on Mar. 5, 2003. Provisional application No. 60/452,021, filed on Mar. 5, 2003. Provisional application No. 60/451,955, filed on Mar. 5, 2003. Provisional application No. 60/451,956, filed on Mar. 5, 2003. Provisional application No. 60/452,157, filed on Mar. 5, 2003. Provisional application No. 60/452,139, filed on Mar. 5, 2003.

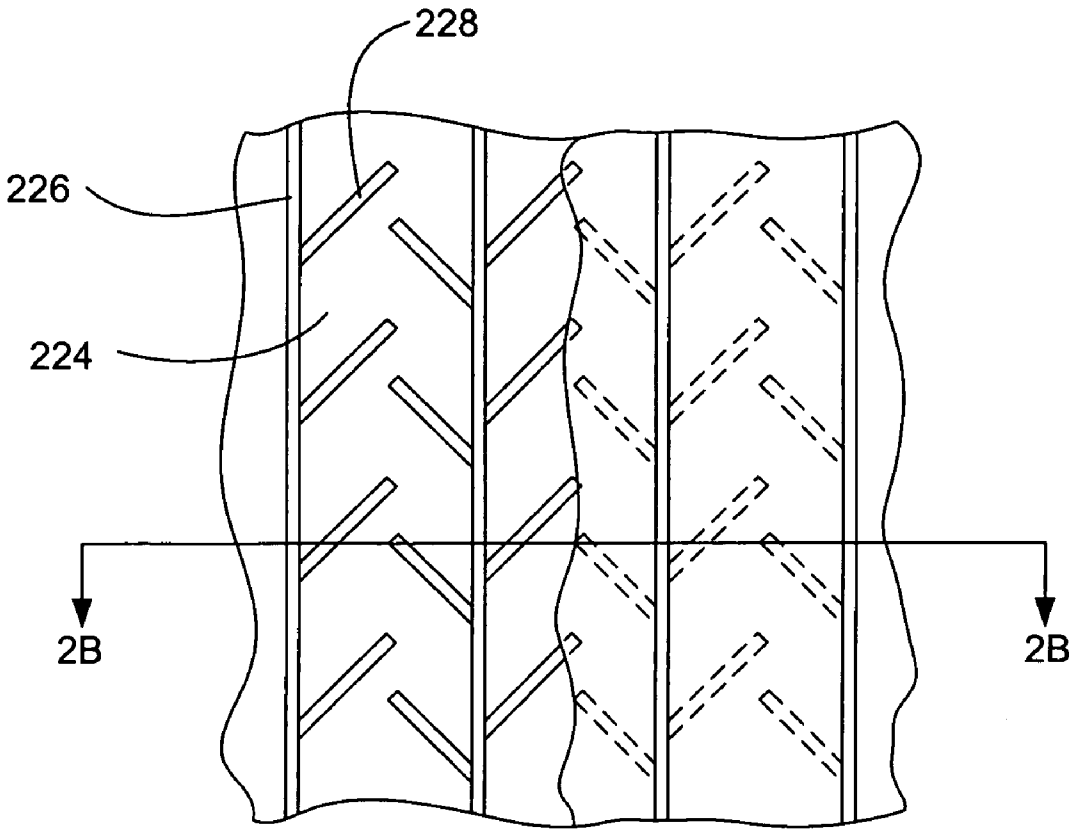
**Publication Classification**

(51) **Int. Cl.**[7] ..... **B65D 1/00**

(52) **U.S. Cl.** ..... **428/34.2**

(57) **ABSTRACT**

A bag for use in vacuum packaging comprises a first panel and a second panel overlapping each other. A plurality of channels having a plurality of baffles is formed on one or more of the panels for evacuating air and/or other gases from inside the bag using a suction source, while preventing liquids from being drawn into the suction source. This description is not intended to be a complete description of, or limit the scope of, the invention. Other features, aspects, and objects of the invention can be obtained from a review of the specification, the figures, and the claims.



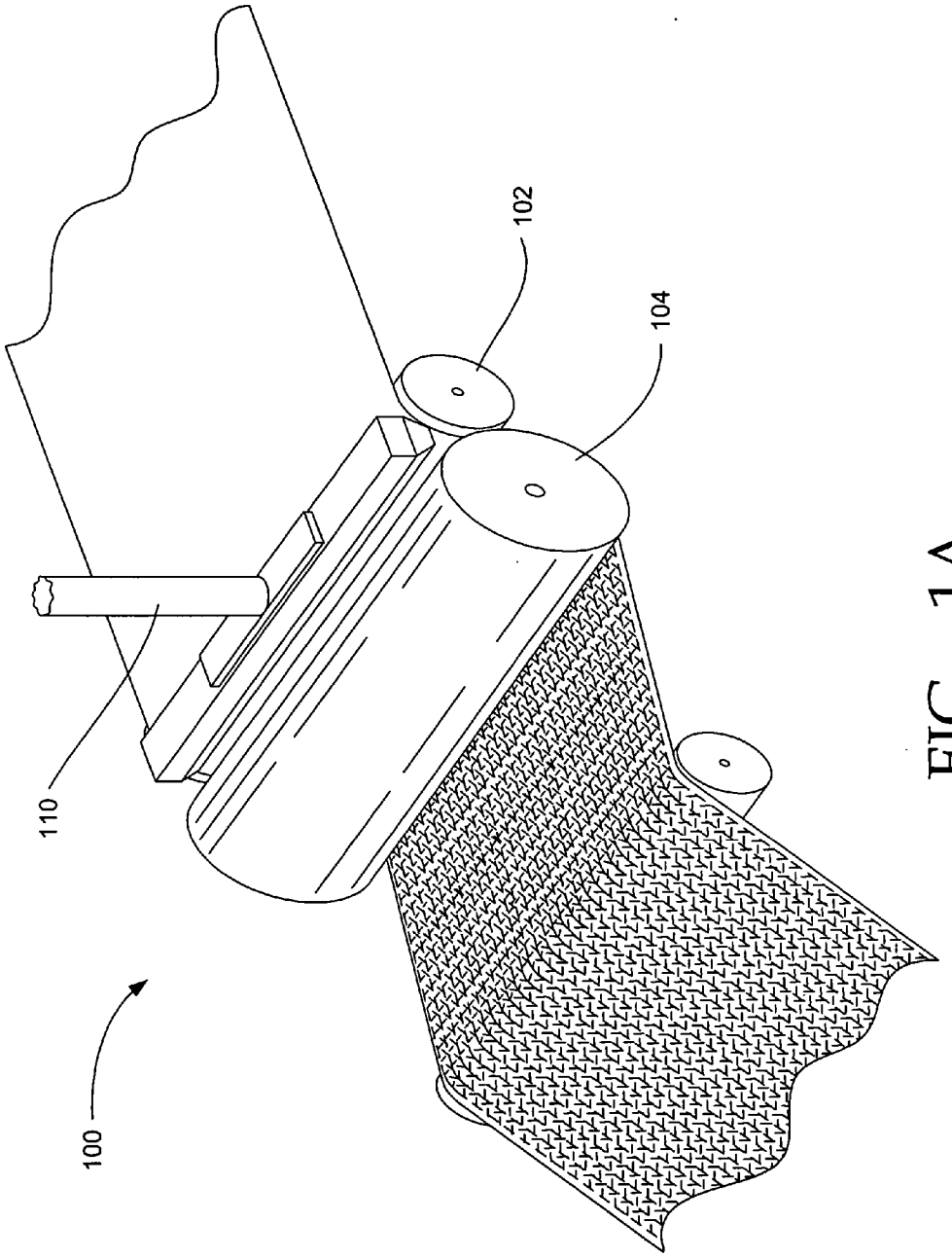



FIG. - 1A

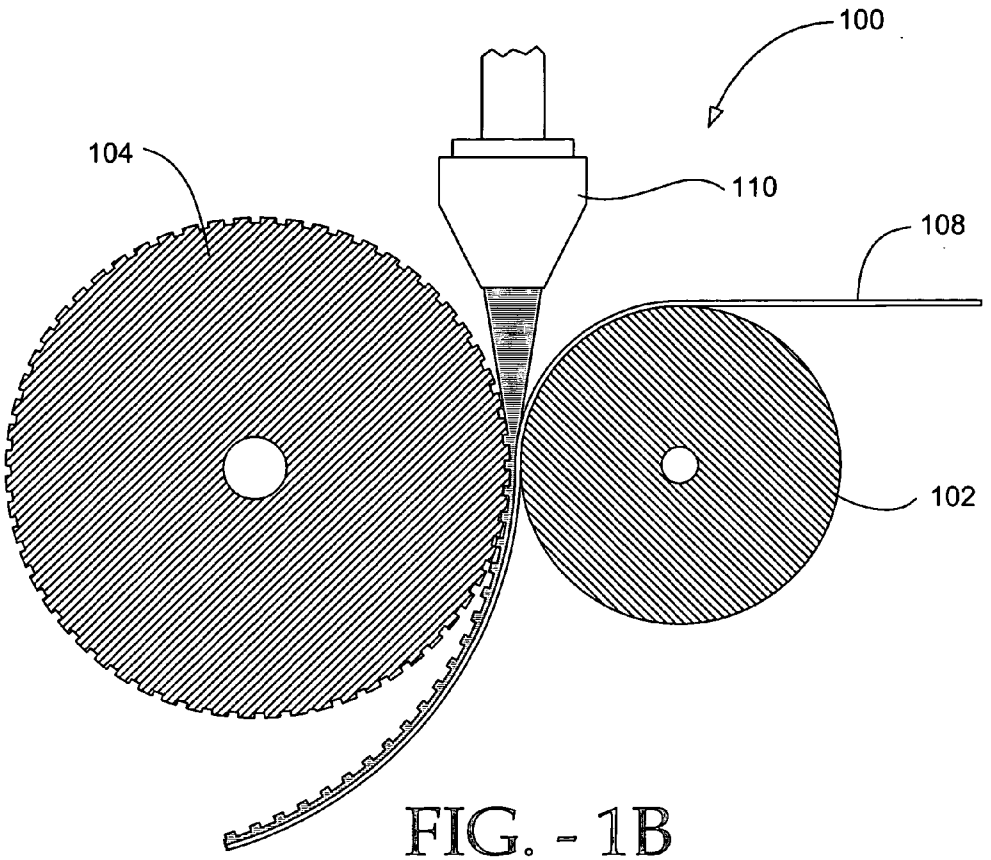



FIG. - 1B

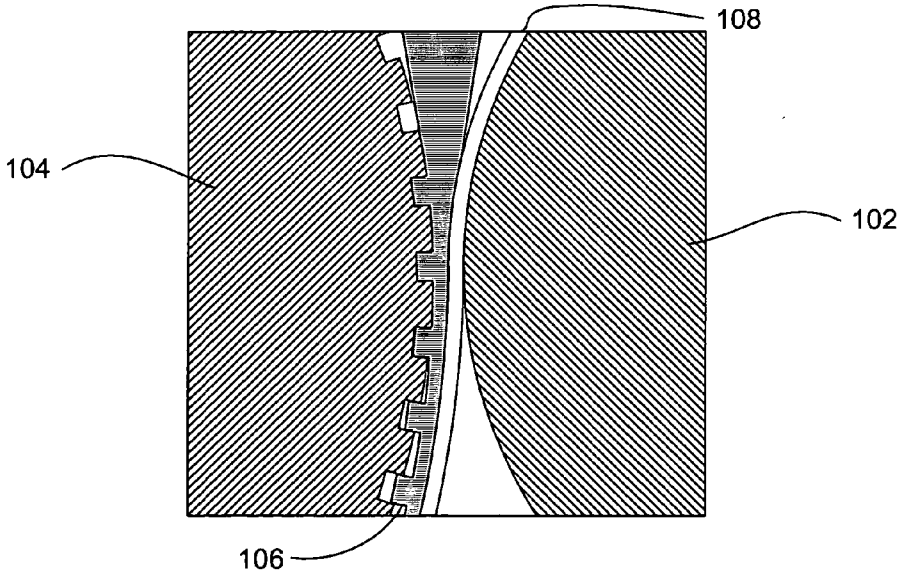



FIG. - 1C

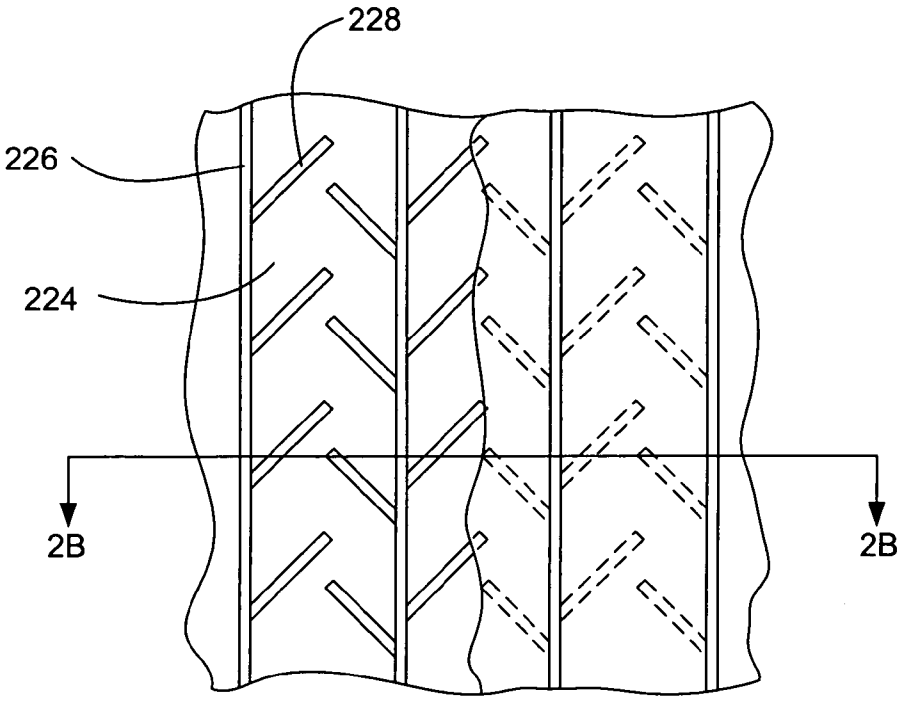



FIG. - 2A

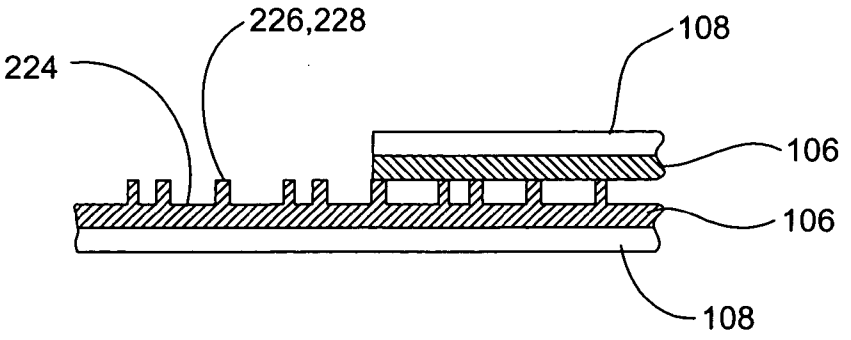



FIG. - 2B

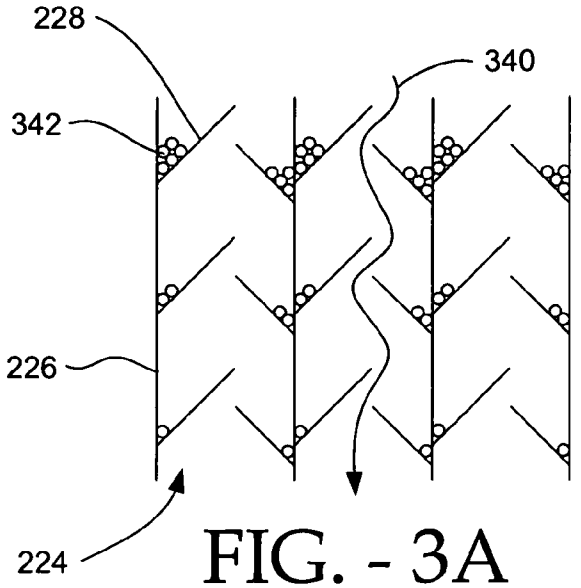



FIG. - 3A

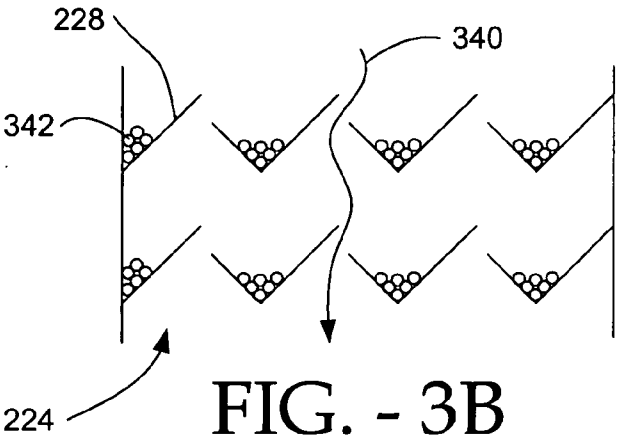



FIG. - 3B

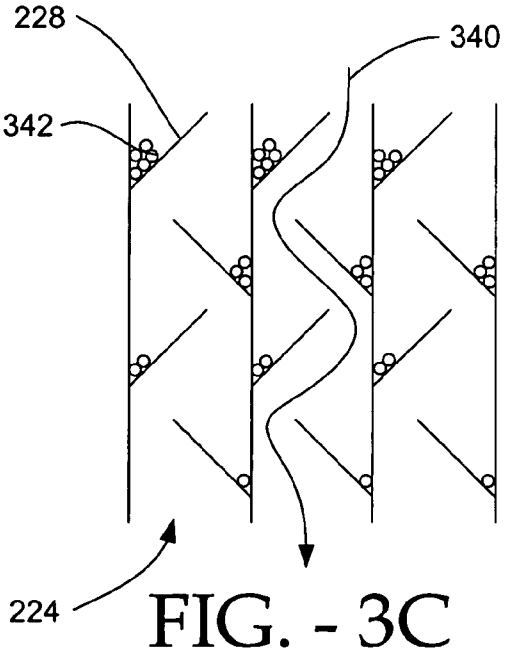



FIG. - 3C

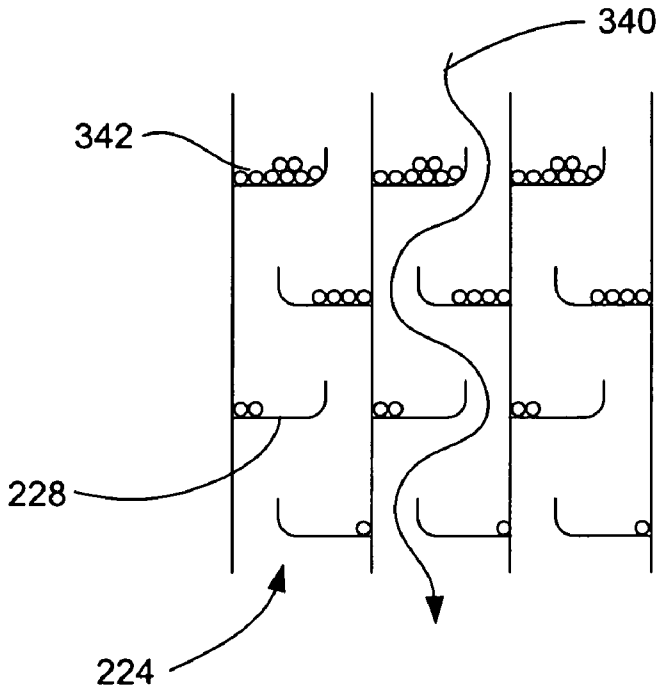



FIG. - 3D

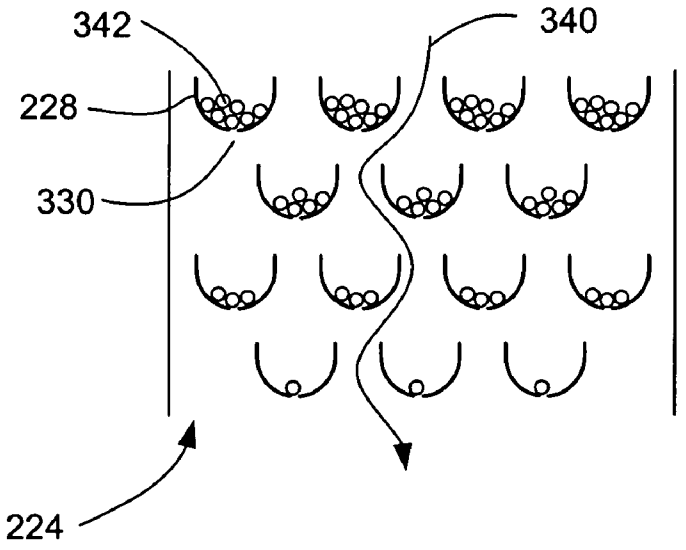



FIG. - 3E

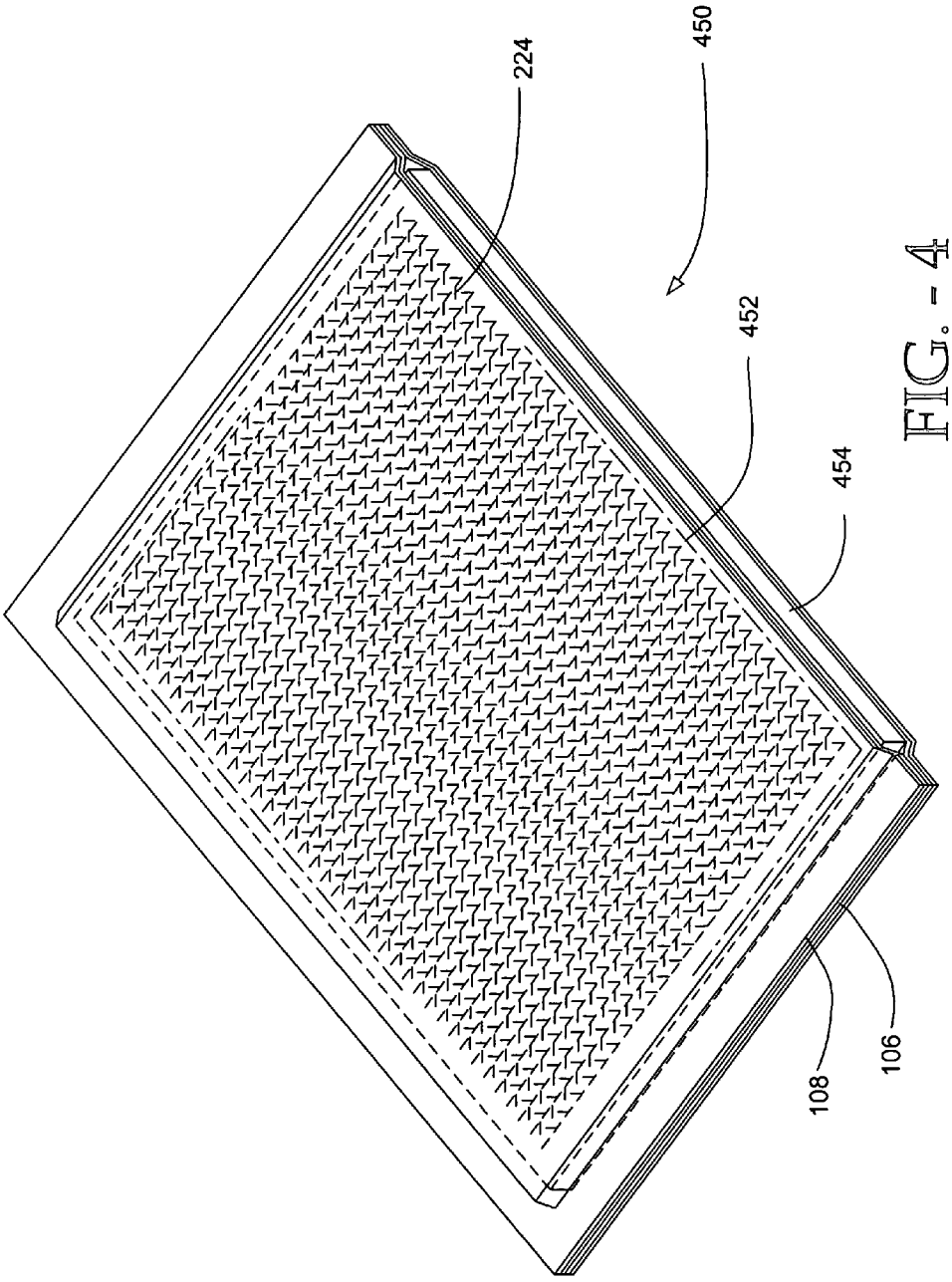



FIG. - 4

# LIQUID-TRAPPING BAG FOR USE IN VACUUM PACKAGING

## PRIORITY CLAIM

[0001] This application claims priority to the following U.S. Provisional Patent Application:

[0002] U.S. Provisional Patent Application No. 60/452,168, entitled "LIQUID-TRAPPING BAG FOR USE IN VACUUM PACKAGING," by Henry Wu, et al., filed Mar. 5, 2003 (Attorney Docket No. TILA-01177US0).

## CROSS-REFERENCE TO RELATED PATENT APPLICATIONS

[0003] This U.S. patent application incorporates by reference all of the following co-pending applications:

[0004] U.S. Provisional Patent Application No. 60/452,138, entitled "METHOD FOR MANUFACTURING LIQUID-TRAPPING BAG FOR USE IN VACUUM PACKAGING," by Henry Wu, et al., filed Mar. 5, 2003 (Attorney Docket No. TILA-01177US1);

[0005] U.S. Provisional Patent Application No. 60/452,172, entitled "SEALABLE BAG HAVING AN INTEGRATED TRAY FOR USE IN VACUUM PACKAGING," by Henry Wu, et al., filed Mar. 5, 2003 (Attorney Docket No. TILA-01178US0);

[0006] U.S. Provisional Patent Application No. 60/452,171, entitled "METHOD FOR MANUFACTURING A SEALABLE BAG HAVING AN INTEGRATED TRAY FOR USE IN VACUUM PACKAGING," by Henry Wu, et al., filed Mar. 5, 2003 (Attorney Docket No. TILA-01178US1);

[0007] U.S. Provisional Patent Application No. 60/451,954, entitled "SEALABLE BAG HAVING AN INDICIA FOR USE IN VACUUM PACKAGING," by Henry Wu, et al., filed Mar. 5, 2003 (Attorney Docket No. TILA-01179US0);

[0008] U.S. Provisional Patent Application No. 60/451,948, entitled "METHOD FOR MANUFACTURING A SEALABLE BAG HAVING AN INDICIA FOR USE IN VACUUM PACKAGING," by Henry Wu, et al., filed Mar. 5, 2003 (Attorney Docket No. TILA-01179US1);

[0009] U.S. Provisional Patent Application No. 60/452,142, entitled "SEALABLE BAG HAVING AN INTEGRATED ZIPPER FOR USE IN VACUUM PACKAGING," by Henry Wu, et al., filed Mar. 5, 2003 (Attorney Docket No. TILA-01180US0);

[0010] U.S. Provisional Patent Application No. 60/452,021, entitled "METHOD FOR MANUFACTURING A SEALABLE BAG HAVING AN INTEGRATED ZIPPER FOR USE IN VACUUM PACKAGING," by Henry Wu, et al., filed Mar. 5, 2003 (Attorney Docket No. TILA-01180US1);

[0011] U.S. Provisional Patent Application No. 60/451,955, entitled "SEALABLE BAG HAVING AN INTEGRATED VALVE STRUCTURE FOR USE IN VACUUM PACKAGING," by Henry Wu, et al., filed Mar. 5, 2003 (Attorney Docket No. TILA-01181US0);

[0012] U.S. Provisional Patent Application No. 60/451,956, entitled "METHOD FOR MANUFACTURING A SEALABLE BAG HAVING AN INTEGRATED VALVE STRUCTURE FOR USE IN VACUUM PACKAGING," by Henry Wu, et al., filed Mar. 5, 2003 (Attorney Docket No. TILA-01181US1);

[0013] U.S. Provisional Patent Application No. 60/452,157, entitled "SEALABLE BAG HAVING AN INTEGRATED TIMER/SENSOR FOR USE IN VACUUM PACKAGING," by Henry Wu, et al., filed Mar. 5, 2003 (Attorney Docket No. TILA-01182US0);

[0014] U.S. Provisional Patent Application No. 60/452,139, entitled "METHOD FOR MANUFACTURING A SEALABLE BAG HAVING AN INTEGRATED TIMER/SENSOR FOR USE IN VACUUM PACKAGING," by Henry Wu, et al., filed Mar. 5, 2003 (Attorney Docket No. TILA-01182US1);

[0015] U.S. patent application Ser. No. 10/169,485, entitled "METHOD FOR PREPARING AIR CHANNEL EQUIPPED FILM FOR USE IN VACUUM PACKAGE," filed Jun. 26, 2002;

[0016] U.S. patent application Ser. No. _____, entitled "METHOD FOR MANUFACTURING LIQUID-TRAPPING BAG FOR USE IN VACUUM PACKAGING," Attorney Docket No. TILA-01177US3, filed concurrently;

[0017] U.S. patent application Ser. No. _____, entitled "SEALABLE BAG HAVING AN INTEGRATED TRAY FOR USE IN VACUUM PACKAGING," Attorney Docket No. TILA-01178US2, filed concurrently;

[0018] U.S. patent application Ser. No. _____, entitled "METHOD FOR MANUFACTURING A SEALABLE BAG HAVING AN INTEGRATED TRAY FOR USE IN VACUUM PACKAGING," Attorney Docket No. TILA-01178US3, filed concurrently;

[0019] U.S. patent application Ser. No. _____, entitled "SEALABLE BAG HAVING AN INDICIA FOR USE IN VACUUM PACKAGING," Attorney Docket No. TILA-01179US2, filed concurrently;

[0020] U.S. patent application Ser. No. _____, entitled "METHOD FOR MANUFACTURING A SEALABLE BAG HAVING AN INDICIA FOR USE IN VACUUM PACKAGING," Attorney Docket No. TILA-01179US3, filed concurrently;

[0021] U.S. patent application Ser. No. _____, entitled "SEALABLE BAG HAVING AN INTEGRATED ZIPPER FOR USE IN VACUUM PACKAGING," Attorney Docket No. TILA-01180US2, filed concurrently;

[0022] U.S. patent application Ser. No. _____, entitled "METHOD FOR MANUFACTURING A

SEALABLE BAG HAVING AN INTEGRATED ZIPPER FOR USE IN VACUUM PACKAGING," Attorney Docket No. TILA-01180US3, filed concurrently;

[0023] U.S. patent application Ser. No. _____, entitled "SEALABLE BAG HAVING AN INTEGRATED VALVE STRUCTURE FOR USE IN VACUUM PACKAGING," Attorney Docket No. TILA-01181US2, filed concurrently;

[0024] U.S. patent application Ser. No. _____, entitled "METHOD FOR MANUFACTURING A SEALABLE BAG HAVING AN INTEGRATED VALVE STRUCTURE FOR USE IN VACUUM PACKAGING," Attorney Docket No. TILA-01181US3, filed concurrently;

[0025] U.S. patent application Ser. No. _____, entitled "SEALABLE BAG HAVING AN INTEGRATED TIMER/SENSOR FOR USE IN VACUUM PACKAGING," Attorney Docket No. TILA-01182US2, filed concurrently; and

[0026] U.S. patent application Ser. No. _____, entitled-"METHOD FOR MANUFACTURING A SEALABLE BAG HAVING AN INTEGRATED TIMER/SENSOR FOR USE IN VACUUM PACKAGING," Attorney Docket No. TILA-01182US3, filed concurrently.

## FIELD OF THE INVENTION

[0027] The present invention relates to bags for use in vacuum packaging and methods and devices for manufacturing bags for use in vacuum packaging.

## BACKGROUND

[0028] Methods and devices for preserving perishable foods such as fish and meats, processed foods, prepared meals, and left-overs, and non-perishable items are widely known, and widely varied. Foods are perishable because organisms such as bacteria, fungus and mold grow over time after a food container is opened and the food is left exposed to the atmosphere. Most methods and devices preserve food by protecting food from organism-filled air. A common method and device includes placing food into a gas-impermeable plastic bag, evacuating the air from the bag using suction from a vacuum pump or other suction source, and tightly sealing the bag.

[0029] A bag for use in vacuum packaging can consist of a first panel and second panel, each panel consisting of a single layer of heat-sealable, plastic-based film (for example, polyethylene). The panels are sealed together along a substantial portion of the periphery of the panels by heat-sealing techniques so as to form an envelope. Perishable products, such as spoilable food, or other products are packed into the envelope via the unsealed portion through which air is subsequently evacuated. After perishable products are packed into the bag and air is evacuated from the inside of the bag, the unsealed portion is heated and pressed such that the panels adhere to each other, sealing the bag.

[0030] U.S. Pat. No. 2,778,173, incorporated herein by reference, discloses a method for improving the evacuation of air from the bag by forming channels in at least one of the panels with the aid of embossing techniques. Air escapes from the bag along the channels during evacuation. The embossing forms a pattern of protuberances on at least one of the panels. The protuberances can be discrete pyramids, hemispheres, etc., and are formed by pressing a panel using heated female and male dies. The first panel is overlaid on the second panel such that the protuberances from one panel face the opposite panel. The contacting peripheral edges of the panels are sealed to each other to form an envelope having an inlet at an unsealed portion of the periphery. The perishable or other products are packed into the envelope through the inlet, and the inlet is sealed. Thereafter, an opening is pierced in a part of the panel material that communicates with the charnels, air is removed from the interior of the envelope through the channels and opening, and the opening is sealed. This type of bag requires two additional sealing steps after the perishable or other product is packed into the envelope. One further problem is that embossing creates impressions on the plastic such that indentations are formed on the opposite side of the panel

[0031] To avoid additional sealing steps, a vacuum bag is formed having a first panel and a second panel consisting of laminated films. Each panel comprises a heat-sealable inner layer, a gas-impermeable outer layer, and optionally, one or more intermediate layers. Such a bag is described in U.S. Pat. No. Re. 34,929, incorporated herein by reference. At least one film from at least one panel is embossed using an embossing mold to form protuberances and channels defined by the space between protuberances, so that air is readily evacuated from the vacuum bag.

[0032] U.S. Pat. No. 5,554,423, incorporated herein by reference, discloses still another bag usable in vacuum packaging. The bag consists of a first and second panel, each panel consisting of a gas-impermeable outer layer and a heat-sealable inner layer. A plurality of heat-sealable strand elements are heat bonded at regular intervals to the inner layer of either the first panel or the second panel. The spaces between strand elements act as channels for the evacuation of air. The strand elements are extruded from an extrusion head and heat bonded to the heat-sealable layer by use of pressure rolls. Separate equipment is required for producing strand elements, and a procedure of heat bonding a plurality of strand elements at regular intervals to the heat-sealable inner layer is complicated. Also, various shapes of pattern are hard to form using this process.

## BRIEF DESCRIPTION OF THE FIGURES

[0033] Further details of embodiments of the present invention are explained with the help of the attached drawings in which:

[0034] **FIG. 1A** is a perspective view of a method for manufacturing a vacuum bag in accordance with one embodiment of the present invention;

[0035] **FIG. 1B** is a side view of the method shown in **FIG. 1A** illustrating the embossing method used in an embodiment of the present invention;

[0036] **FIG. 1C** is a close-up view of a portion of **FIG. 1B**;

[0037] **FIG. 2A** is a top view of a partial portion of a first panel overlapping a partial portion of a second panel in accordance with one embodiment of the present invention;

[0038] **FIG. 2B** is a cross-section view through line 2B-2B of **FIG. 2A**;

[0039] **FIG. 3A-3E** are plan views of exemplary patterns on a panel in accordance with embodiments of the present invention, manufactured by the process shown in **FIG. 1**; and

[0040] **FIG. 4** is a perspective view of a vacuum bag in accordance with one embodiment of the present invention.

## DETAILED DESCRIPTION

[0041] The detailed embodiments of the present invention are disclosed herein. It should be understood, however, that the disclosed embodiments are merely exemplary of the invention, which may be embodied in various forms. Therefore, the details disclosed herein are not to be interpreted as limiting, but merely as the basis for the claims and as a basis for teaching one skilled in the art how to make and/or use the invention.

[0042] **FIGS. 1A-1C** illustrate one embodiment of a method for manufacturing a vacuum bag in accordance with the present invention. The vacuum bag comprises a first panel and a second panel, wherein each panel comprises a gas-impermeable base layer **108** and a heat-sealable inner layer **106** with at least one panel having liquid flow obstructing protuberances and/or channels. A laminating roll **102** and a cooling roll **104** are arranged so that melt-extruded resin can be introduced between the rolls and cooled to form the heat-sealable inner layer **106** and to laminate the formed inner layer **106** to the gas-impermeable base layer **108**. As illustrated in **FIG. 1C**, a gap between the laminating roll **102** and the cooling roll **104** can be controlled according to specifications (for example, thickness) of a panel for use in vacuum packaging. The temperature of the cooling roll **104** is maintained in a range such that the melt-extruded resin can be sufficiently cooled to form a desired pattern. For example, a temperature range of about −15° C. to about −10° C. can be sufficient to properly form the desired pattern. The temperature range of the cooling roll **104** can vary according to the composition of the resin, the composition of the gas-impermeable base layer **108**, environmental conditions, etc. and can require calibration. Also, the cooling roll **104** can be sized to have a larger diameter than the laminating roll **102**, thereby bringing the melt-extruded resin into contact with more cooled surface area. For example, the diameter of the cooling roll **104** can be about one-and-a-half to about three times as large (or more) as that of the laminating roll **102**.

[0043] The heat-sealable inner layer **106** typically comprises a thermoplastic resin. For example, the resin can be comprised of polyethylene (PE) suitable for preserving foods and harmless to a human body. A vacuum bag can be manufactured by overlapping two panels such that the heat-sealable inner layers **106** of the two panels are brought into contact and heat is applied to a portion of the periphery of the panels to form an envelope. The thermoplastic resin can be chosen so that the two panels strongly bond to each other when sufficient heat is applied.

[0044] The gas-impermeable base layer **108** is fed to the gap between the cooling roll **104** and the laminating roll **102** by a feeding means (not shown). The gas-impermeable base layer can be comprised of polyester, polyamide, ethylene vinyl alcohol (EVOH), nylon, or other material having similar properties, that is capable of being heated and capable of being used in this manufacturing process. The gas-impermeable base layer **108** can consist of one layer, or two or more layers. When employing a multilayer-structured base layer, it should be understood that a total thickness thereof is also adjusted within the allowable range for the total gas-impermeable base layer **108**.

[0045] An extruder **110** is positioned in such a way that the melt-extruded resin is layered on the gas-impermeable base layer **108** by feeding the melt-extruded resin to a nip between the cooling roll **104** and the gas-impermeable base layer **108**. The resin is fed through a nozzle **112** of the extruder **110**. The temperature of the melt-extruded resin is dependent on the type of resin used, and can typically range from about 200° C. to about 250° C. The amount of resin extruded into the laminating unit **100** is dependent on the desired thickness of the heat-sealable inner layer **106**.

[0046] A pattern fabricated on the circumferential surface of the cooling roll **104** in accordance with one embodiment of the present invention can include cavities (and/or protuberances) defining a plurality of discrete channels having a baffled structure. The resin extruded from the nozzle **112** is pressed between the cooling roll **104** and the gas-impermeable base layer **108** and flows into the cavities of the cooling roll **104**. The resin quickly cools and solidifies in the desired pattern while adhering to the gas-impermeable base layer **108**, thereby forming the heat-sealable inner layer **106** of the panel. The heat-sealable inner layer **106** can be formed while the resin is sufficiently heated to allow the resin to flow, thereby molding the resin, unlike other methods adopting a post-embossing treatment where the heat-sealable inner layer is drawn by a die or embossed between male and female components.

[0047] The thickness of each protuberance formed on the heat-sealable inner layer **106** of a panel can be determined by the depth of the cavities of the cooling roll **104**, and the width of the channel can be determined by the interval between the cavities. Thus, the shape, width, and thickness of the channels for the evacuation of air and/or other gases can be controlled by changing the specifications for the cavities of the cooling roll **104**. **FIGS. 2A and 2B** illustrate a cross-section (along line 2B-2B) of two panels in accordance with one embodiment of the present invention (the thickness of the panels are exaggerated relative to the width of the channel walls and baffles). The heat-sealable inner layer **106** can range from preferably 0.5-6.0 mils in thickness at the channels **224**, and preferably 1.0-12.0 mils in thickness at the protuberances **226**,**228**, while the gas-impermeable base layer **108** can range from about preferably 0.5-8.0 mils in thickness. The dimensions of the inner layer and the base layer are set forth to illustrate, but are not to be construed to limit the dimensions of the inner layer and the base layer.

[0048] **FIG. 3A** is a plan view of a pattern **320** formed on a panel by the cooling roll **104** for use in a vacuum bag, in which the heat-sealable inner layer **106** is molded in such a way that protuberances form the plurality of channels **224** having channels walls **226** and baffles **228**. The baffles **228** can be arranged in a herringbone pattern at angles such that air and/or other gases **340** (shown schematically) can be drawn around the baffles **228** by suction and evacuated from

the vacuum bag, while heavier liquid particles **342** can be trapped between the channel walls **226** and the baffles **228**. Angles formed by the intersection of baffles **228** and channel walls **226**, and gaps between adjacent baffles **228** can be defined when producing the cooling roll **104** to suit the liquid intended to be trapped. Different arrangements of the baffles **228** relative to the chamber walls **226**, and relative to other baffles **228** can be multi-fold (shaped to define liquid-trapping vessels), and can be optimized to improve evacuation of the air and/or other gases **340**, while effectively preventing liquids **342** from being drawn out of the vacuum bag. For example, as shown in **FIG. 3A** the baffles **228** can be arranged such that an approach angle for passing through the channel opening between the baffles **228** is severe and that vessels formed by the baffles **228** are relatively deep, thereby retarding liquid flow by deflecting liquid **342** into the vessels and trapping a significant amount of liquid **342**.

**[0049]** As indicated above, one of ordinary skill in the art can appreciate the multitude of different baffle arrangements for retarding the evacuation of liquid **342** relative to the evacuation of air and/or other gases **340**. As shown in **FIG. 3B**, in other embodiments a pattern **320** fabricated on the circumferential surface of the cooling roll **104**, and thereafter the panel, can mold protuberances forming a plurality of channels **224** defined by "V"-shaped baffles **228**, eliminating the need for molding channel walls. In still other embodiments, the channel walls **226** can extend substantially the length of the panel with only a portion of the length of the channels near an evacuation opening having baffles **228**.

**[0050]** As shown in **FIG. 3C**, in other embodiments a pattern **320** fabricated on the circumferential surface of the cooling roll **104**, and thereafter the panel, can mold protuberances forming a plurality of channels **224** having channels walls **226** and baffles **228**, wherein each baffle **228** extends across a substantial portion of the width of the channel **224**, thereby defining a path between the baffle **228** and the channel wall **226** for the air and/or other gases **340** to be drawn. The baffles **228** can alternatively be parabolic or rounded, as shown in **FIG. 3D**, to form pockets for collecting liquid particles **342**.

**[0051]** **FIG. 3E** illustrates still another embodiment of a pattern **320** fabricated on the circumferential surface of the cooling roll **104**, and thereafter the panel, that can include parabolically-shaped or "U"-shaped baffles **228** arranged like fish-scales either along the length of the panel, or a portion of the panel to capture liquid particles **342**. The U-shaped baffles **228** can also include slits **330** in the troughs of the U-shaped baffles **228** small enough to improve the flow of air and/or other gases **340** while retarding an amount of liquid particles **342**. In other embodiments, the baffles **228** can be more or less parabolic. One of ordinary skill in the art can appreciate the multitude of different baffle shapes for retarding the evacuation of liquid relative to the evacuation of air or other gases.

**[0052]** It is understood that the trapping of liquid in baffles or vessels formed in the bag is advantageous as this structure retards and prevents liquids from being drawn into the vacuum pump or suction device of a vacuum sealing tool such as disclosed in U.S. Pat. No. 4,941,310, which is incorporated herein by reference.

**[0053]** **FIG. 4** illustrates a bag for use in vacuum packaging in accordance with one embodiment of the present invention. The vacuum bag **450** comprises a first panel **452** and a second panel **454** overlapping each other. Channels **224** are formed on at least one of the panels **452,454** in accordance with an embodiment described above. The heat-sealable inner layer **106** and the gas-impermeable base layer **108** of the first and second panels **452,454** are typically made of the same material respectively, but can alternatively be made of different materials that exhibit heat-sealability and gas-impermeability respectively. As described above, the resin-formed layer **106** is used as an inner layer and the gas-impermeable base layer **108** is used as an outer layer. The lower, left, and right edges of the first and the second panel **452,454** are bonded to each other by heating, so as to form an envelope for receiving a perishable or other product to be vacuum packaged. Once a perishable or other product is placed in the vacuum bag **450**, air and/or other gases can be evacuated from the bag **450**, for example by a vacuum sealing machine as described in the above referenced U.S. Pat. No. 4,941,310, which is incorporated herein by reference. Once the air and/or other gases are evacuated to the satisfaction of the user, the inlet can be sealed by applying heat, thereby activating the heat-sealable inner layers **106** and bonding them together where contacted by the heat.

**[0054]** The foregoing description of preferred embodiments of the present invention has been provided for the purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise forms disclosed. It is to be understood that many modifications and variations will be apparent to the practitioner skilled in the art. The embodiments were chosen and described in order to best explain the principles of the invention and its practical application, thereby enabling others skilled in the art to understand the invention for various embodiments and with various modifications that are suited to the particular use contemplated. It is intended that the scope of the invention be defined by the following claims and their equivalence.

**1**. A bag adapted to receive an article, comprising:

a first panel including a plurality of protuberances;

a second panel; and

the first panel and the second panel secured together to form the bag.

**2**. A bag adapted to receive an article, comprising:

a first panel having:

a first outer layer; and

a first inner layer connected with the first outer layer, the first inner layer including a plurality of protuberances; and

a second panel connected with the first panel such that the first panel and the second panel form an envelope having an inlet, the second panel having:

a second outer layer; and

a second inner layer connected with the second outer layer;

wherein when the first inner layer contacts the second inner layer the plurality of protuberances obstruct liquid flow through the inlet.

**3**. The bag of claim 2, wherein the first outer layer and the second outer layer comprise a gas-impermeable material.

**4**. The bag of claim 3, wherein the gas-impermeable material is one of polyester, polyamide, ethylene vinyl alcohol, and nylon.

**5**. The bag of claim 2, wherein the first inner layer and the second inner layer comprise a thermoplastic resin.

**6**. The bag of claim 5, wherein the thermoplastic resin is polyethylene.

**7**. The bag of claim 2, wherein the plurality of protuberances define a plurality of channels.

**8**. The bag of claim 7, wherein the plurality of channels includes a plurality of baffles.

**9**. The bag of claim 8, wherein the plurality of baffles are arranged in a herringbone pattern.

**10**. The bag of claim 8, wherein the plurality of baffles form a plurality of pockets for trapping liquid particles.

**11**. The bag of claim 2, wherein the plurality of protuberances define a plurality of baffles.

**12**. The bag of claim 11, wherein the plurality of baffles form a plurality of pockets for trapping liquid particles.

**13**. The bag of claim 8, wherein the plurality of baffles comprise a U-shape.

**14**. The bag of claim 13, wherein the plurality of baffles include a slit in a trough of the U-shape, the slit being sized such that gas can pass through the slit.

**15**. A bag adapted to receive an article, comprising:

a first panel including:

a first gas-impermeable layer; and

a first inner layer laminated to the first gas-impermeable layer, the first inner layer having a textured exposed surface;

wherein the textured exposed surface obstructs liquid flow when gas is evacuated through the heat-sealable opening; and

a second panel including:

a second gas-impermeable layer; and

a second inner layer laminated to the second gas-impermeable layer;

wherein the first panel is connected with the second panel to form an envelope such that the first inner layer opposes the second inner layer, the envelope including a heat-sealable opening for evacuating gas.

**16**. A heat-sealable bag adapted to receive an article, comprising:

a first panel including:

a first gas-impermeable layer;

at least one first intermediate layer connected with the first gas-impermeable layer; and

a first inner layer laminated to the at least one first intermediate layer, the first inner layer having a textured exposed surface;

wherein the textured exposed surface obstructs liquid flow when gas is evacuated through the heat-sealable opening; and

a second panel including:

a second gas-impermeable layer;

at least one second intermediate layer connected with the second gas-impermeable layer; and

a second inner layer laminated to the at least one second intermediate layer;

wherein the first panel is connected with the second panel to form an envelope such that the first inner layer opposes the second inner layer, the envelope including a heat-sealable opening for evacuating gas.

**17**. The bag of claim 16, wherein the first gas-impermeable layer and the second gas-impermeable layer comprise one of polyester, polyamide, ethylene vinyl alcohol, and nylon.

**18**. The bag of claim 16, wherein the first inner layer and the second inner layer comprise a thermoplastic resin.

**19**. The bag of claim 18, wherein the thermoplastic resin is polyethylene.

**20**. The bag of claim 16, wherein the textured exposed surface comprises a plurality of channels.

**21**. The bag of claim 20, wherein the textured exposed surface further comprises a plurality of baffles.

**22**. The bag of claim 21, wherein the plurality of baffles are arranged in a herringbone pattern.

**23**. The bag of claim 21, wherein the plurality of baffles form a plurality of pockets for trapping liquid particles.

**24**. The bag of claim 16, wherein the textured exposed surface comprises a plurality of baffles.

**25**. The bag of claim 24, wherein the plurality of baffles form a plurality of pockets for trapping liquid particles.

**26**. The bag of claim 24, wherein the plurality of baffles comprise a U-shape.

**27**. The bag of claim 26, wherein the plurality of baffles includes a slit in a trough of the U-shape, the slit being sized such that air can pass through the slit.

**28**. A bag adapted to receive an article, comprising:

a first panel defining a plurality of receptacles adapted to trap a liquid and a plurality of channels that pass by said receptacles, which channels are adapted to allow the passage of a gas;

a second panel; and

the first panel and the second panel secured together to form the bag.

**29**. A bag adapted to receive an article, comprising:

a first panel defining a plurality of receptacles adapted to trap a liquid, which receptacles are formed with a first wall that runs about along a length of the bag and a plurality of second walls that run in a direction that is across the length of the bag;

a second panel; and

the first panel and the second panel secured together to form the bag.

**30**. A system for forming a bag including a three-dimensional structure formed on at least one panel, comprising:

a cooling roll having a plurality of cavities for forming one or more structures;

wherein the one or more structures include a plurality of receptacles adapted to trap a liquid;

a laminating roll;

a backing material; and

a flowable material that can be flowed into the one or more cavities to form the one or more structures, the flowable material adhering to the backing material.

* * * * *