

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
20 July 2006 (20.07.2006)

PCT

(10) International Publication Number
WO 2006/076331 A2

(51) International Patent Classification:
B65B 9/00 (2006.01)

(21) International Application Number:
PCT/US2006/000765

(22) International Filing Date: 11 January 2006 (11.01.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
11/036,802 14 January 2005 (14.01.2005) US

(71) Applicant (for all designated States except US):
FRITO-LAY NORTH AMERICA, INC. [US/US];
7701 Legacy Drive, Plano, Texas 75024-4099 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): BEZEK, Edward,
Anthony [US/US]; 2266 Christal Falls Drive, Frisco,
Texas 75034 (US). EDWARDS, Eduard [US/US]; 2705

Petersburg Drive, Arlington, Texas 76014 (US). SAGEL,
Joseph, Paul [US/US]; 455 Craig Circle, Highland Vil-
lage, Texas 75077 (US). TUCKER, Steven, Kenneth
[US/US]; 412 Ellen Avenue, Hurst, Texas 76053 (US).

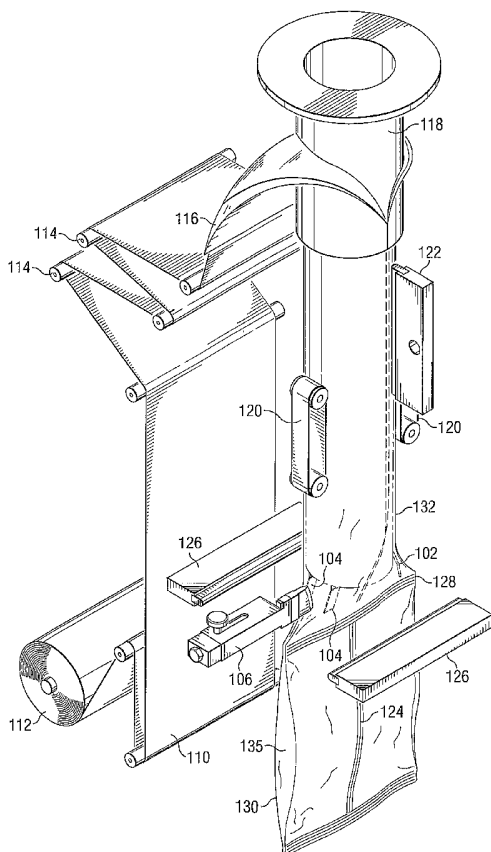
(74) Agent: CAHOON, Colin, P.; Carstens & Cahoon, LLP,
P.O.Box 802334, Dallas, Texas 75380 (US).

(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,
GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,
KG, KM, KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV,
LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI,
NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG,
SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US,
UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,
ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),

[Continued on next page]

(54) Title: METHOD AND APPARATUS FOR MAKING A VERTICAL STAND UP PACKAGE HAVING ONE OR MORE COMPARTMENTS



(57) Abstract: A method for making a vertical stand up package hav-
ing one or more open or closed compartments within the package, and
method and apparatus for manufacturing the same, constructed by mod-
ification to existing vertical form, fill and seal packaging machines. The
invention involves producing a flat bottom bag that can stand upright
having an internal compartment from a single sheet of flexible packaging
film. A different product can be placed into the compartment. The com-
partment can also be used as a dipping well. In one aspect a multi-com-
partment package can be made.

WO 2006/076331 A2



European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

— of inventorship (Rule 4.17(iv))

Published:

- without international search report and to be republished upon receipt of that report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

METHOD AND APPARATUS FOR MAKING A VERTICAL
STAND UP PACKAGE HAVING ONE OR MORE COMPARTMENTS

5 BACKGROUND OF THE INVENTION

1. Technical Field

The present invention relates to a method for making a vertical stand-up package having a compartment constructed using a modified vertical form, fill, and seal packaging machine, and the apparatus and method for making same, that provides for a single piece
10 construction of a vertical stand-up package. The invention allows for use of existing converter and packaging technology to produce a stand up package having one or more open or closed compartments with minimal increased cost and minimal modification.

15 2. Description of Related Art

Vertical form, fill, and seal packaging machines are commonly used in the snack food industry for forming, filling, and sealing bags of chips and other like products. One such packaging machine is seen diagrammatically in Figure 1. This drawing is simplified and does not show the cabinet and support structures that typically surround a machine, but it
20 demonstrates the working of the machine well. Packaging film 110 is taken from a roll 112 of film and passed through tensioners 114 that keep it taut. The film then passes over a former 116, which directs the film into a vertical tube around a product delivery cylinder 118. As the tube is pulled downward by drive belts 120 the vertical tube of film is sealed along its length by a vertical sealer 122, forming a back seal 124. The machine then applies a pair of
25 heat sealing jaws 126 against the tube to form a transverse seal 128. This transverse seal 128 acts as the top seal on the bag 130 below the sealing jaws 126 and the bottom end seal on the bag 132 being filled and formed above the jaws 126. After the transverse seal has been formed, a cut is made across the sealed area to separate the finished bag 130 below the seal

128 from the partially completed bag 132 above the seal. The tube is then pushed downward to draw out another package length. Before the sealing jaws form each transverse seal, the product to be packaged is sent through the product delivery cylinder 118 and is held within the tube above the transverse seal 128. The material that is fed into the form, fill and seal
5 machine is typically a packaging film such as polypropylene, polyester, paper, polyolefin extrusions, adhesive laminates, and other such materials, or from layered combinations of the above. For many food products, where flavor retention is important, a metalized layer will form the inner most layer.

One modification to a vertical form, fill, and seal packaging machine is disclosed in
10 U.S. Patent No. 6,722,106 ("the '106 Patent"), which is assigned to the same assignee as the present invention. The '106 Patent discloses a method for making a free standing package called a vertical stand up pouch. The modification uses two forming plates 104 and a tension bar 102 to hold the packaging film tube in tension from inside the tube. Tension is applied on the outside of the film and in the opposite direction of the tension provided by the forming
15 plates 104 by a fixed or stationary tucker mechanism 106 positioned between the forming plates 104. When the tucker bar 106 is properly positioned, it provides a crease or fold in the tube of the packaging film between the two forming plates 104. This creates a gusset 135 that permits the package to stand upright on the gusset 135. The crease is formed prior to formation of the transverse seal by the seal jaws 126. Consequently, once the transverse seal
20 is formed, the crease becomes an integral feature of one side of the package.

The vertical form and fill machine thereafter operates basically as previously described in the prior art, with the sealing jaws 126 forming a lower transverse seal (and upper transverse seal for the bag below), and product being introduced through the forming tube 101 into the sealed tube of packaging film which now has a crease on one side. The film
25 is then pulled downward by moving belts 120 and the upper transverse seal is formed,

thereby completing the package. An example of the vertical stand up package formed is shown in Figures 2a and 2b. The outside layer of packaging film show the graphics 179 oriented 90 degrees clockwise from graphics orientation normally present on a pillow pouch formed by a standard prior art vertical form, fill and seal machine. As shown in Figure 2b the transverse seals 128 of the vertical stand up package are oriented vertically once the bag stands up on one end as shown in Figure 2b. Figure 2a shows the crease 176 that was formed by the tucker bar 106 and forming plates 104 shown in Figure 1 to create a gusset 135 that permits the package to stand upright. Various modifications of the vertical stand up pouch, methods for making the pouch, and apparatuses for making the pouch are disclosed in U.S. Patents 6,729,109 and 6,679,034.

Another self standing flexible pouch is disclosed in U.S. Patent No. 6,679,630 also assigned to the same assignee as the present invention. Figure 3a is cross-sectional view of the self standing flexible package disclosed in the '630 Patent. Referring to Figure 3a, the '630 Patent teaches a package 70 having a flap 78 formed by creating a bend 84 in the film to form an inner portion of flap 78. An opening 90 is formed between the inner and outer portions of the flap 78. Figure 3b shows a completed package 70 in a standing or display position. Referring to Figures 3a and 3b, as package 70 is shown standing, flap 78 extends outward and away from back forming pocket 80. To enclose and retain any product within the package a back seal 124 seals the film tube and transverse end seals 128 seal the terminal ends of package 70. The transverse seals 128 also serve to retain the flap 78 to the terminal ends of package 70. Unfortunately, the '630 Patent requires the flap 78 to be manually drawn away from the back for the package 70 to stand erect with the use of a flap 78. Thus, the package requires manual manipulation to stand up. In addition, because packages are typically opened at the transverse seals, product can spill out of the package after the package is opened, when the package is in the stand up position. Thus, there is a need to provide a

package having a compartment or pocket that permits the compartment to hold different contents than are held in the main portion of a package when the package stands erect. Consequently, a need exists for a vertical stand-up package having one or more open compartments that are accessible while the package is standing erect that minimizes the use
5 of film.

The prior art discloses other containers often associated with TV dinners having multi-compartment food containers where the compartments are adjacent and integrated into the container. Unfortunately, many of these food containers are made from more expensive thermoforming techniques. Consequently, a need exists for a multi-compartment food
10 container that can be made from an economical modification of a vertical form, fill, and seal machine.

SUMMARY OF THE INVENTION

The proposed invention involves producing a vertical stand up package having one or more open or closed compartments constructed from a single sheet of material using a vertical form, fill, and seal machine modified with a spiral former, a first and second filling structure, and a gusseting mechanism. The former receives flexible packaging film and forms a tube having an overlap end and an inner end. The overlap is sealed to the tube thereby causing the inner end to form an internal compartment wall. The gusseting mechanism creates a vertical tuck along the length of the bag while it is being formed permitting the package to stand up once the transverse end seals are made.

The method disclosed and the package formed as a consequence is a substantial improvement over prior art packages having a compartment. The method works on existing vertical form, fill, and seal machines requiring little modification. There are no jaw carriage modifications involved. The bag makers can be easily converted back to a pillow pouch configuration with a relatively few simple changes. The same metalized or clear laminations used as materials in pillow pouches can also be used with the invention. The above as well as additional features and advantages of the present invention will become apparent in the following written detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself, however, as well as a preferred mode of use, further objectives and advantages thereof, will be best understood by reference to the following
5 detailed description of illustrative embodiments when read in conjunction with the accompanying drawings, wherein:

Figure 1 is a perspective view of a prior art form, fill, and seal machine.

Figure 2a and 2b are perspective views of prior art vertical stand-up packages.

Figure 3a is a cross-sectional view of a prior art package capable of self support
10 having a pouch.

Figure 3b is a perspective view of a prior art package.

Figure 4 is a perspective view of one embodiment of the present invention depicting a modified form, fill, and seal machine.

Figure 5a is a simplified top view of the dual delivery tube assembly of one
15 embodiment of the present invention.

Figure 5b is a cut away perspective view of the package in accordance with one embodiment of the present invention.

Figure 5c is a cut-away side view of the package in accordance with one embodiment of the present invention.

Figure 5d depicts a cut away top view of one embodiment of the present invention
20 having salsa poured into the compartment.

Figure 6a is a front view of one embodiment of the vertical stand-up package having a compartment.

Figure 6b is a perspective bottom view of the package depicted in Figure 6a.

Figure 7a is a perspective view of a folding device adjacent the vertical form fill and
25

seal machine along line 7A--7A of Figure 4 in accordance with one embodiment of the present invention.

Figure 7b is a perspective view of the folding device depicted in Figure 7a along line 7B-7B of Figure 4

5 Figure 7c is a perspective view of a folding device depicted in Figure 7a along line 7C-7C of Figure 4.

Figure 8a is a simplified top view of the multi-delivery tube assembly in accordance with one embodiment of the present invention.

10 Figure 8b is a cut-away perspective view of the package made from the assembly depicted in Figure 8a.

DETAILED DESCRIPTION

Figure 4 is a perspective view of one embodiment of the present invention depicting a modified form, fill, and seal machine. A spiral former 426 receives the packaging film 110 and directs the compartment terminal end 410 around a fill tube or first filling structure 418 to receive a first item 718. The former 426 simultaneously directs the tube terminal end 622 (film overlap end) to overlap the compartment terminal end 410 (film inner end). Thus, in the embodiment shown, the spiral former 426 creates a tube having an enclosed channel in communication with a first filling structure 418 and an open channel in communication with a second filling structure 420. The second filling structure 420 is adjacent the first filling structure 418 and situated so as to permit a second item 720 to be placed in the open channel. The open channel becomes the compartment when the package is sealed.

Figure 5a is a simplified top view depicting the former and dual delivery tube assembly of one embodiment of the present invention. In the embodiment shown, an indentation in the first filling structure 418 creates a channel for placement of the second filling structure 420. This indentation, however, is not required and is shown to be illustrative of one embodiment. The film tube comprises an inner compartment wall 640 bounded by a compartment terminal end 410 and a compartment seal end 422.

Referring to Figures 4 and 5a, as the film tube is pulled downward by drive belts 120, the vertical tube terminal end 622 of film is sealed to the compartment seal end 422 by a vertical sealer 122. The vertical sealer 122 can use heat seal or cold seal technology. The tube then passes over two forming plates 104 and a tension bar 102. A tucker bar 106, positioned between the forming plates 104, provides a crease or fold in the tube of packaging film between the two forming plates 104. The sealing jaws 126 then form a first end seal.

Figure 5b is a cut away perspective view of the package in accordance with one embodiment of the present invention. Referring to Figures 5a and 5b, the lap seal 522,

created by the vertical sealer 122, has sealed the seal end 422 of the compartment wall 640 and the tube terminal end 622. The compartment terminal end 410 of the compartment wall 640 is secured within the package by the first end seal 631 at the location generally depicted by numeral 412. A compartment 620 is thereby formed that is bounded by an overlapped segment of film 520, or overlap wall 520 of the tube, the lap seal 522 and the compartment wall 640. The main portion 618 is bounded by the compartment wall 640 and the gusset 680.

Figure 5c is a cut-away side view of the package in accordance with one embodiment of the present invention. In the embodiment shown, the package 600 comprises two compartments 618 620 open to one another. A first item 718 rests in the main portion 618 of the package 600 while a second item 720 is disposed within the compartment portion 620 of the package 600. The first and second items are separated by a compartment wall 640. As shown by Figure 5c, the package is formed by a single sheet of film formed into a tube having an overlap wall 520. The terminal end 622 of the overlap wall 520 is sealed with a lap seal 522 to the compartment seal end 422 of the compartment wall 640. It should be noted that the height of the compartment wall 640 can be adjusted as desired. Additionally, as will be discussed in greater detail below, the top of the compartment wall 640 can be sealed to the overlap wall 520 to form a closed compartment. Such embodiment could prove advantageous, for example, to permit placement of a liquid in either compartment or to prevent the compartments from sharing headspace.

Referring to Figures 4, 5a, and 5b, upon completion of the first end seal 631, a first item 718 can be dropped through a first filling structure 418 in communication with the main portion 618 of the tube. Similarly, a second item 720 can be dropped through a second filling structure 420 in communication with the compartment portion 620 of the tube. The items can be dropped simultaneously. Once the first item 718 and second item 720 have been placed in the package, a second end seal can be provided by the sealing jaws 126.

Figure 6a is a front view of one embodiment of the vertical stand up package having a compartment. Figure 6b is a bottom perspective view of the package depicted in Figure 6a.

The flexible vertical stand up package 600 rests on the gusset 680 having a crease 676 and, unlike a standard pillow pouch package, the end seals 631 are oriented in a vertical direction.

5 A score line 615 can facilitate opening the package by removing the top. In a preferred embodiment, the lap seal 522 is located adjacent the gusset 680 to provide additional stability for the stand up package 600.

One advantage of the package formed by the present invention is that complementary items can be stored in the package. For example, in one embodiment the first item can

10 comprise tortilla chips and the second item can comprise pre-packaged salsa. The salsa can be pre-packaged in a traditional pillow package by a prior art vertical form, fill, and seal machine similar to that depicted in Figure 1. The vertical stand up package can then be opened, the pre-packaged salsa can be retrieved from the open compartment, opened, and poured into the pouch from which it was retrieved. In an alternative embodiment, salsa or
15 other liquid can be directly placed into a closed compartment.

Figure 5d depicts a cut away top view of one embodiment of the present invention having salsa poured into the compartment 620. Salsa, when poured into the compartment 620, applies pressure at the compartment wall 640 and can press the compartment wall 640 in the direction of the arrows 623 shown in Figure 5c and Figure 5d to form a dipping well.

20 Surprisingly, when the compartment terminal end 410 is folded over a portion of the compartment wall 640, the integrity of the compartment 620 is enhanced and salsa, or other product, is less likely to spill from the compartment 620 over the compartment wall 640 into the main portion 618 of the package. Thus, the present invention permits a consumer to purchase a package having chips and salsa, and to then use the package to consume the chips
25 and salsa directly from the stand up package without the chips spilling out of the package or

using (and potentially dirtying) a salsa dish. Such package can be ideal for picnics or anytime a ready-to-eat product is desired.

Figure 7a is a perspective view of a folding device adjacent the vertical form fill and seal machine along line 7A--7A of Figure 4 in accordance with one embodiment of the present invention. Figure 7b is a perspective view of the folding device depicted in Figure 7a along line 7B-7B of Figure 4. Figure 7c is a perspective view of a folding device depicted in Figure 7a along line 7C-7C of Figure 4. Referring to Figures 4, 5c, 7a-7c, the rolled edge can be formed with a folding device 700 near the former 426 to permit a portion of the film which eventually becomes the compartment wall 640 terminal end 410 to fold over a portion of itself so as to provide a j-shaped rolled edge or fold having a trough 411 and a terminal end 410. In the embodiment shown, the folding device 700 comprises a tucker bar 702 and a pair of rollers 704 705. The angle that the tucker bar 702 engages the film 110 can be adjusted to obtain the desired fold. In the embodiment shown, the v-shaped bottom roller 704 comprises a channel 706. The top disc-shaped roller 705 is disposed within the channel 706. The tucker bar 702, positioned between the tensioner 114 and the pair of rollers 704 705 provides a j-shaped fold having a terminal end 410 and a trough end 411.

While the folding device 700 as shown comprises a tucker bar 702 and a pair of rollers 704 705, in one embodiment, the folding device 700 comprises the tucker bar 702. In one embodiment, the trough end 411 of the fold passes through the channel 706 of the bottom v-shaped roller 704. The outer edge of the disc-shaped top roller 705 is bounded on two sides by the packaging film 110 as the packaging film 110 passes through the channel 706 of the bottom v-shaped roller 704. In one embodiment, the former 426 comprises a gutter 710 mounted adjacent the edge of the former. The gutter 710 can be substantially perpendicular to the former edge.

Figure 8a is a simplified top view of the multi-delivery tube assembly in accordance

with one embodiment of the present invention. In the embodiment shown, extensions 160 are attached to the first filling structure 418. As shown in Figure 8a, the multi-delivery tube assembly comprises a first filling structure 418, a second filling structure 420 and a third filling structure 421. In addition, the multi-delivery tube assembly depicted in Figure 8a
5 comprises a first vertical sealer 122, a second vertical sealer 124 and a third vertical sealer 126 for sealing portions of the overlap segment 520 of film to a portion of the inner compartment wall 640.

Figure 8b is a cut-away perspective view of the package made from the assembly depicted in Figure 8a. As shown in the Figure, the overlap segment 520 comprises a first
10 longitudinal seal 522, a second longitudinal seal 524, and a third longitudinal seal 526. In the embodiment shown, the package comprises three compartments 618 620 621 closed from one another. In one embodiment, one or more of the longitudinal seals 522 524 526 comprises a cold seal. Cold seal technology is well known in the art and is widely used to close food packages having heat-sensitive foods such as chocolate bars where heat sealing of the
15 package is not desirable. Cold seal adhesives are typically coated or printed onto a flexible packaging film to permit sealing of the package with pressure.

It should be noted that there are several potential embodiments of the present invention. For example, referring to Figure 8b, in one embodiment if the third longitudinal seal 526 is omitted, the package can have a first compartment 618, a sealed second
20 compartment 620 and a third open compartment 621. Thus, a package having two compartments 618 621 open to one another and a closed compartment 620 can be produced.

Examples of package applications, such as complementary products that can be packaged together in the main portion and compartment include crackers and cheese, cake mix and pre-packaged icing, or ready to eat cereal, milk, and/or a utensil such as a spoon. A
25 pre-packaged seasoning can be placed in the compartment portion and a dehydrated food,

such as noodles, can be placed in the main portion. The seasoning can be removed, water added to the main portion 618, the entire package can then be heated in a microwave, the seasoning can be added, and the consumer can consume the food product directly from the main portion 618 of the package.

5 Promotional items can be also placed in the compartment with product placed in the main portion of the package. Thus, a consumer desiring to immediately access the promotional item can easily do so without immersing one's hand and fingers in product. For example, a promotional coupon can be placed into compartment portion of the package while potato chips are placed into the main portion. A consumer may only want a portion of potato
10 chips, but may want to also access the promotional coupon. The promotional coupon, in prior art packages having no compartment often falls to the bottom of the package. Thus, a consumer may be forced, in a prior art package, to dig with his or her hand through the potato chips in order to access the promotional coupon. The present invention, on the other hand, permits a consumer to simply reach directly into the compartment to retrieve the promotional
15 coupon without contacting product. The food package need not be limited to shelf-stable food products. For example, the package of the present invention can be used to store cereal and pre-packaged milk in the refrigerated section of a grocery store.

The present invention can be achieved with relatively inexpensive modification of existing form, fill, and seal machinery to produce a vertical stand up package having one or
20 more open or closed compartments. Further, the multi-compartment package of the present invention is one-half to one-third the cost of a multi-compartment thermoformed package.

While the invention has been particularly shown and described with reference to a preferred embodiment, it will be understood by those skilled in the art that various changes in form and detail may be made therein without departing from the spirit and scope of the
25 invention.

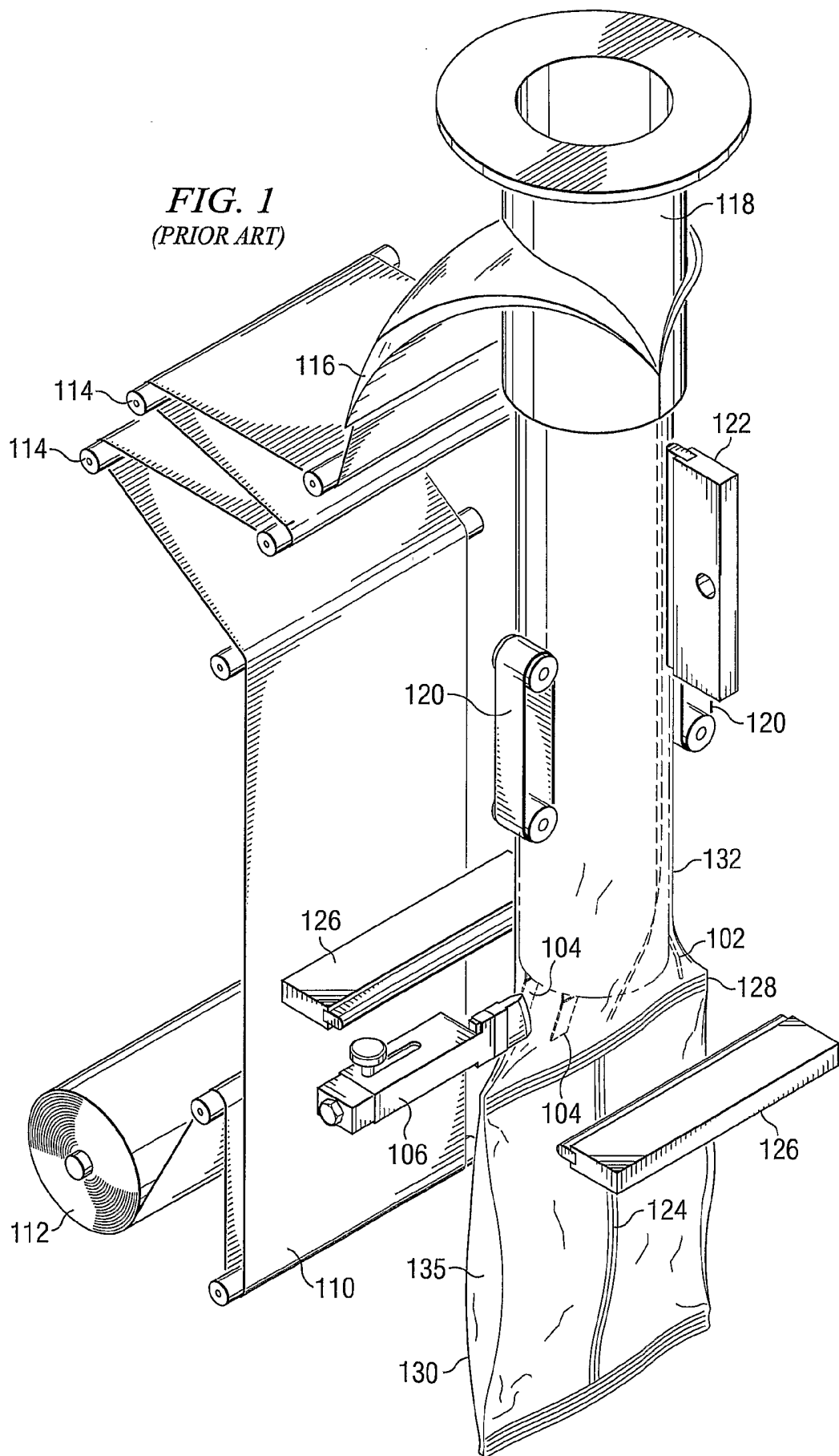
CLAIMS:

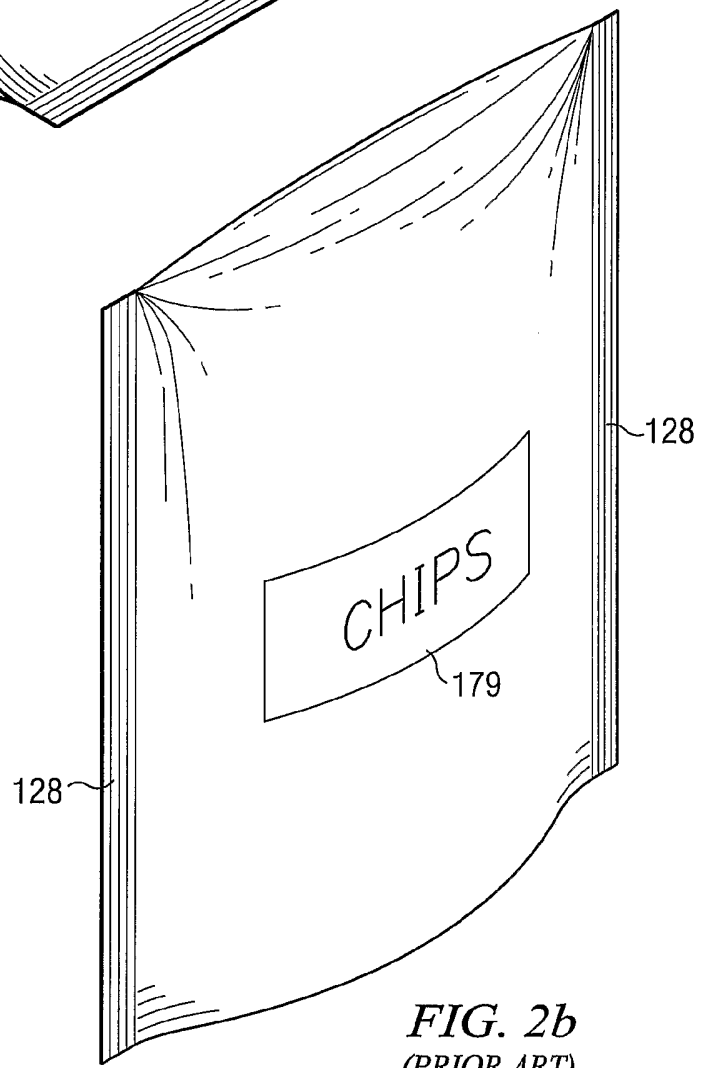
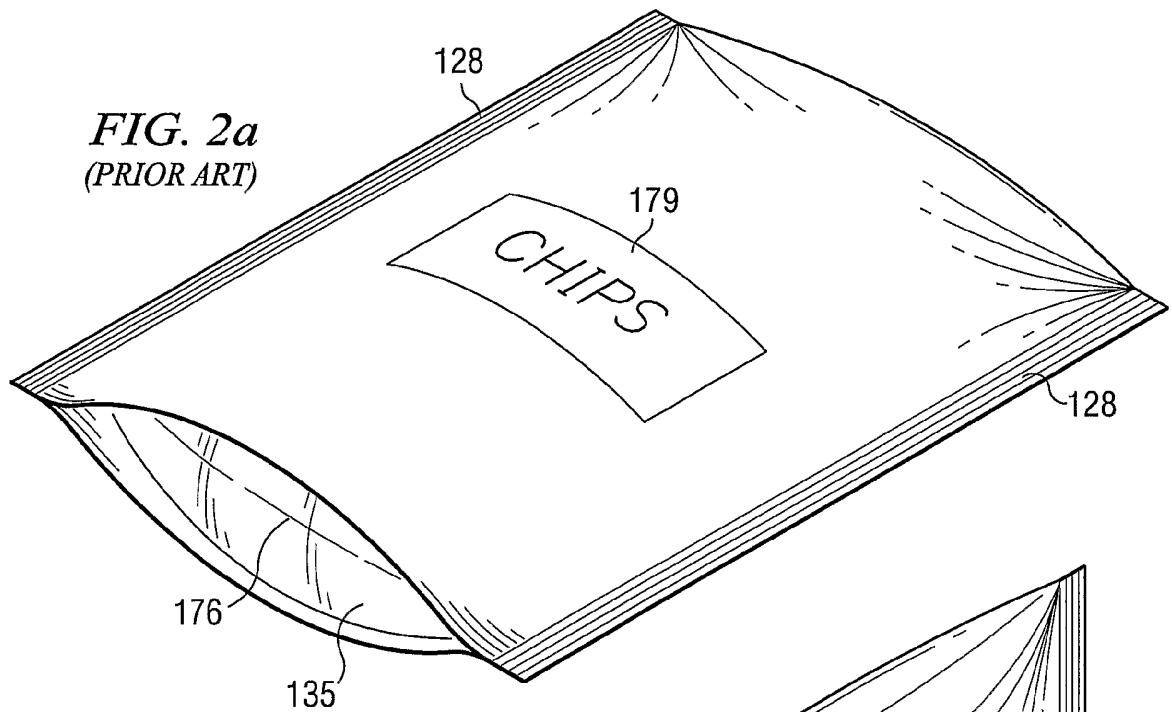
What is claimed is:

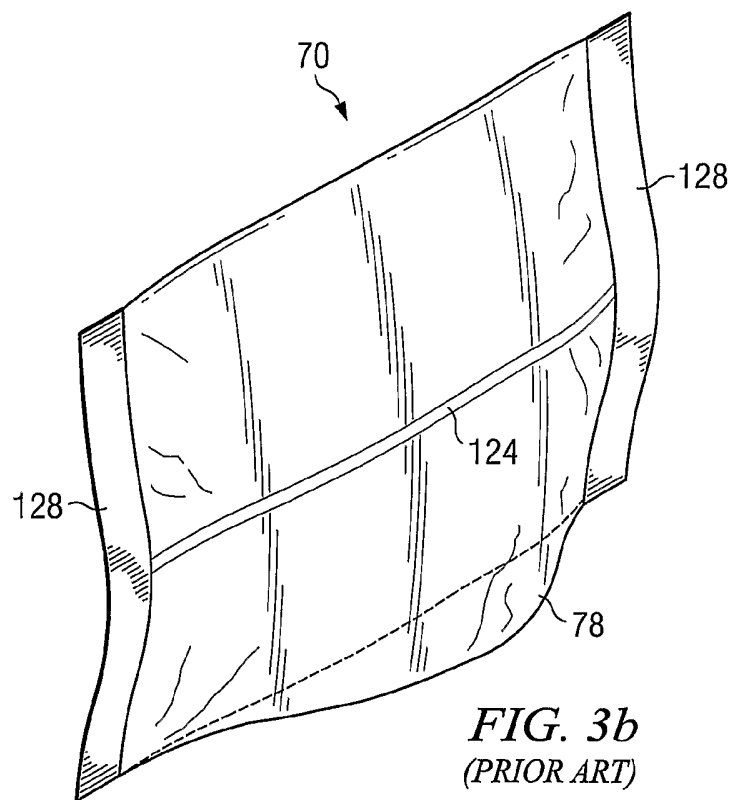
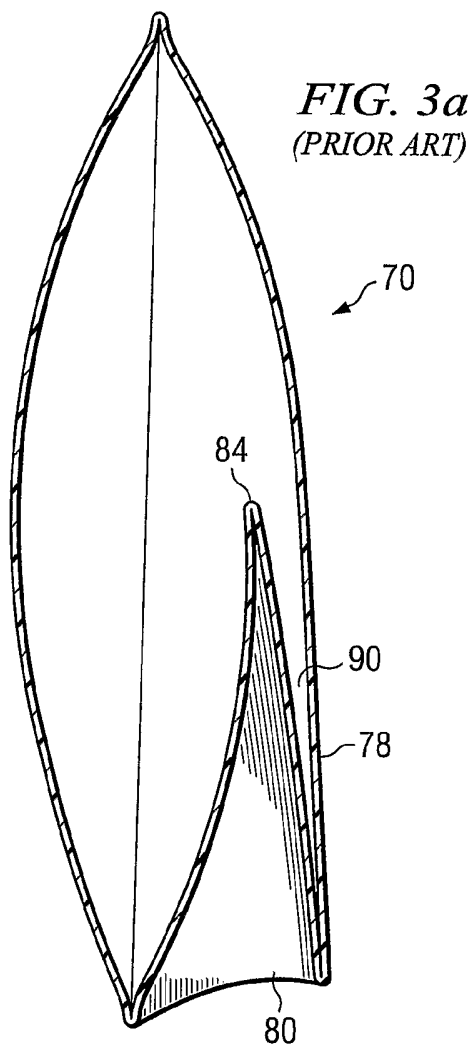
1. A method for making a vertical stand up package having a compartment, said method comprising the steps of:
 - a) forming a sheet of film into a tube having an overlapped segment of film extending adjacent said tube to form a compartment having a compartment wall with a compartment wall terminal end inside said tube;
 - b) providing at least one vertical seal to seal said overlapped segment to said tube;
 - c) forming at least one gusset in said tube; and
 - d) providing transverse end seals.
2. The method of claim 1 wherein step a) further comprises folding a portion of said compartment wall to form a j-shaped fold having a terminal end and a trough end.
3. The method of claim 1 wherein said seal provided at step b) is adjacent said gusset formed by step c).
4. A vertical stand up package having at least one open or closed compartment made from the method of claim 1.

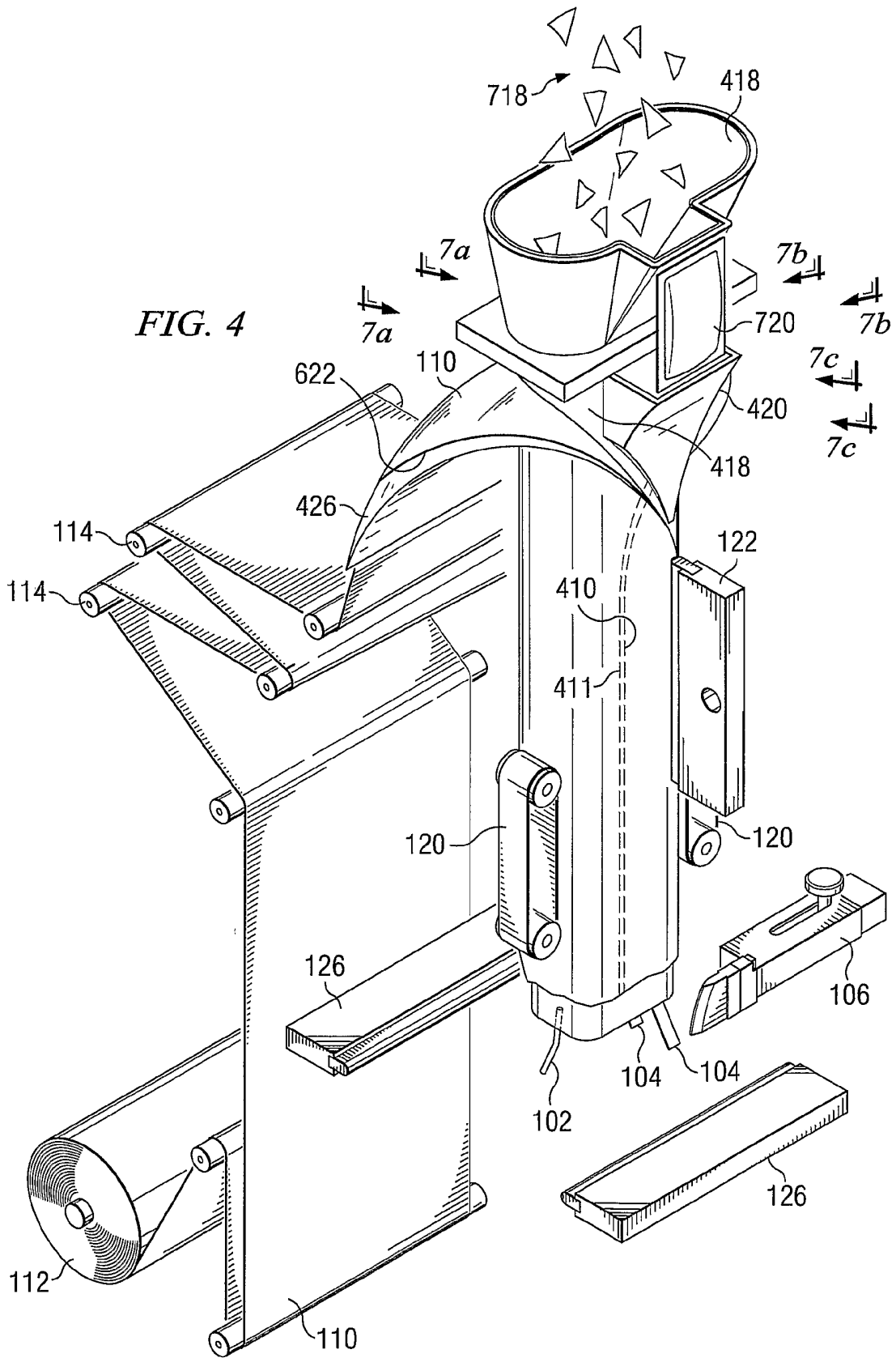
5. A method for making a package having at least two items, said method comprising the steps of:
- a) overlapping a sheet of film to form a tube having an inner compartment wall bounded by a compartment terminal end and a compartment seal end;
 - 5 b) sealing said seal end of said inner compartment wall to said tube terminal end to form a main portion and a compartment portion wherein said main portion and said compartment portion share the same headspace;
 - c) providing a first end seal;
 - d) providing a first item through a first filling structure in communication with said
 - 10 main portion;
 - e) providing a second item through a second filling structure in communication with said compartment portion; and
 - f) providing a second end seal.
6. The method of claim 5 further comprising a front panel length and a back panel length wherein said front panel length and said back panel length are substantially equal.
7. The method of claim 5 wherein first item is a food product.
8. The method of claim 5 wherein said second item is a pre-packaged food product.
9. The method of claim 8 wherein said pre-packaged food product is selected from the group consisting of salsa, cheese, condiment, milk, and icing.
10. The method in claim 5 wherein said second item is a promotional item.
11. The method in claim 5 wherein said second item is a utensil.
12. The method in claim 5 wherein said compartment portion can be used as a dipping well.

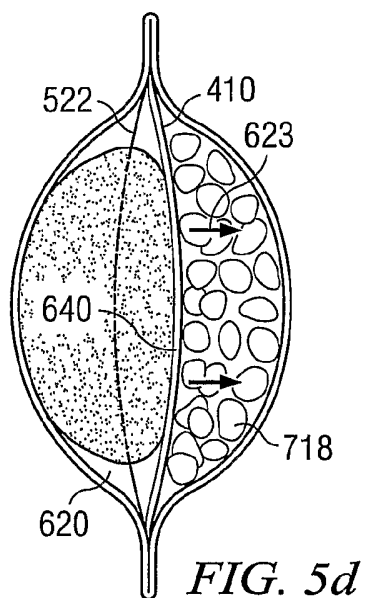
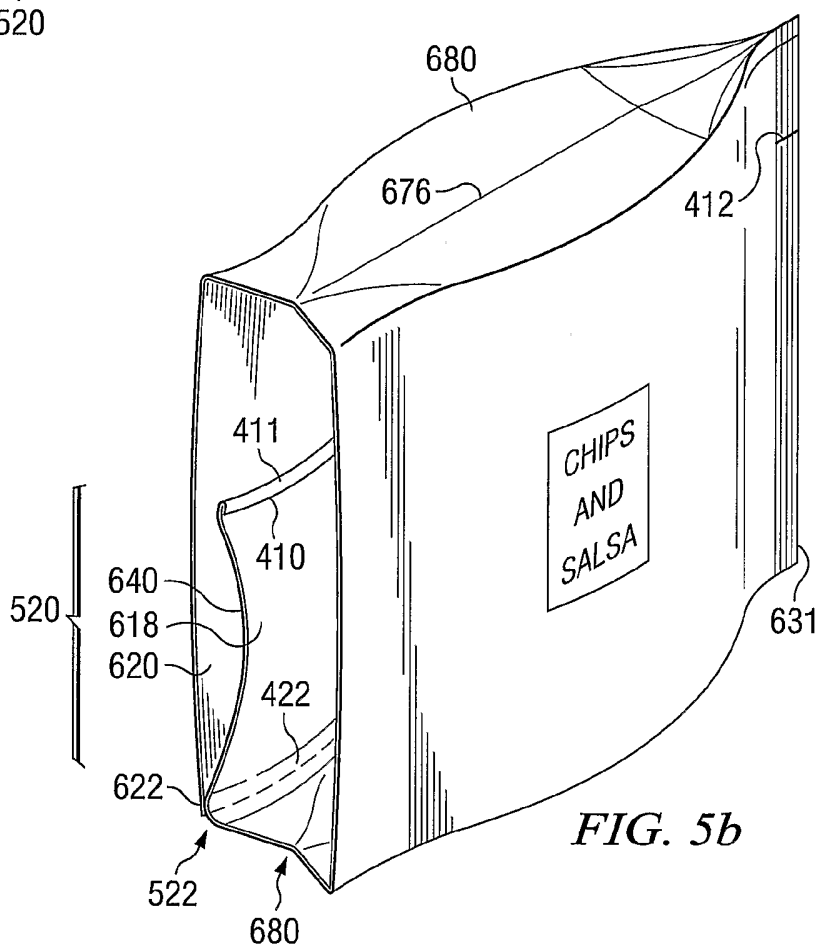
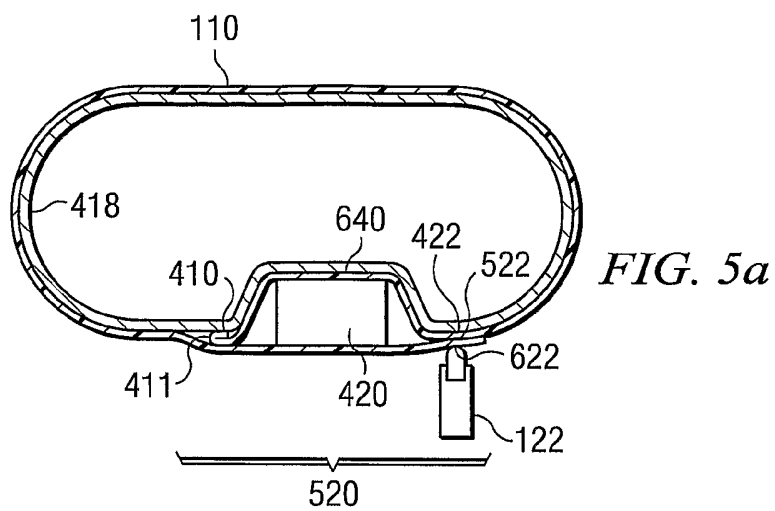
13. The method in claim 5 wherein step a) further comprises folding a portion of said inner compartment wall near said terminal end to form a j-shaped fold having a trough end.











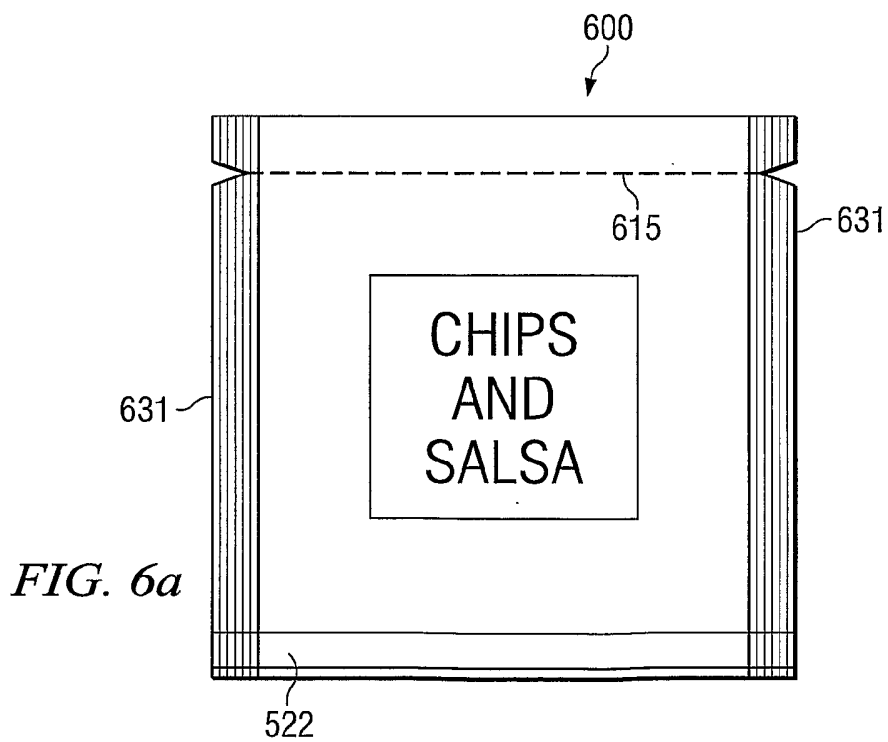
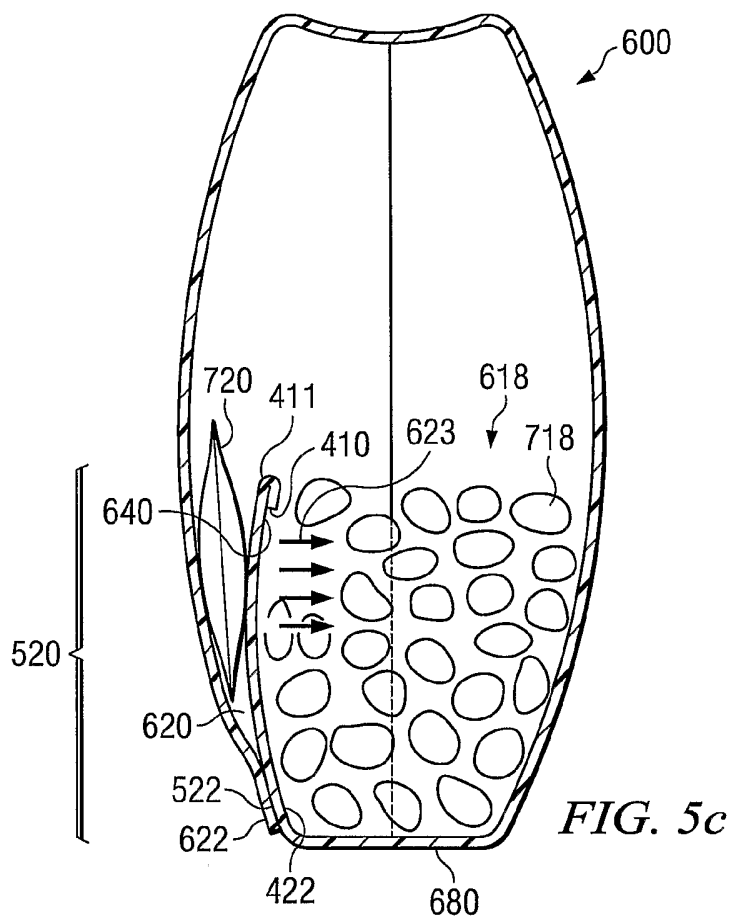


FIG. 6b

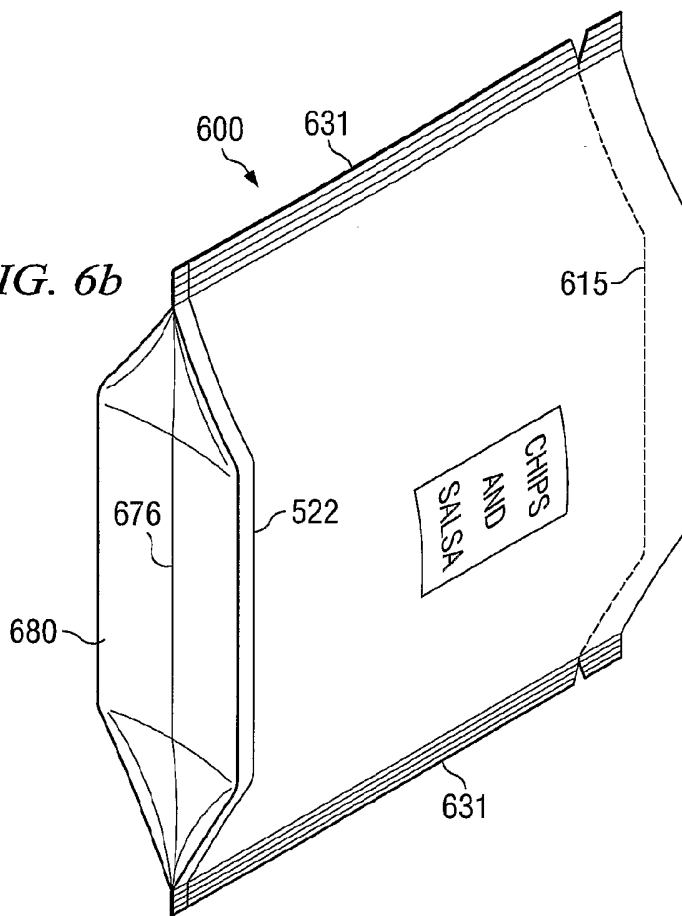
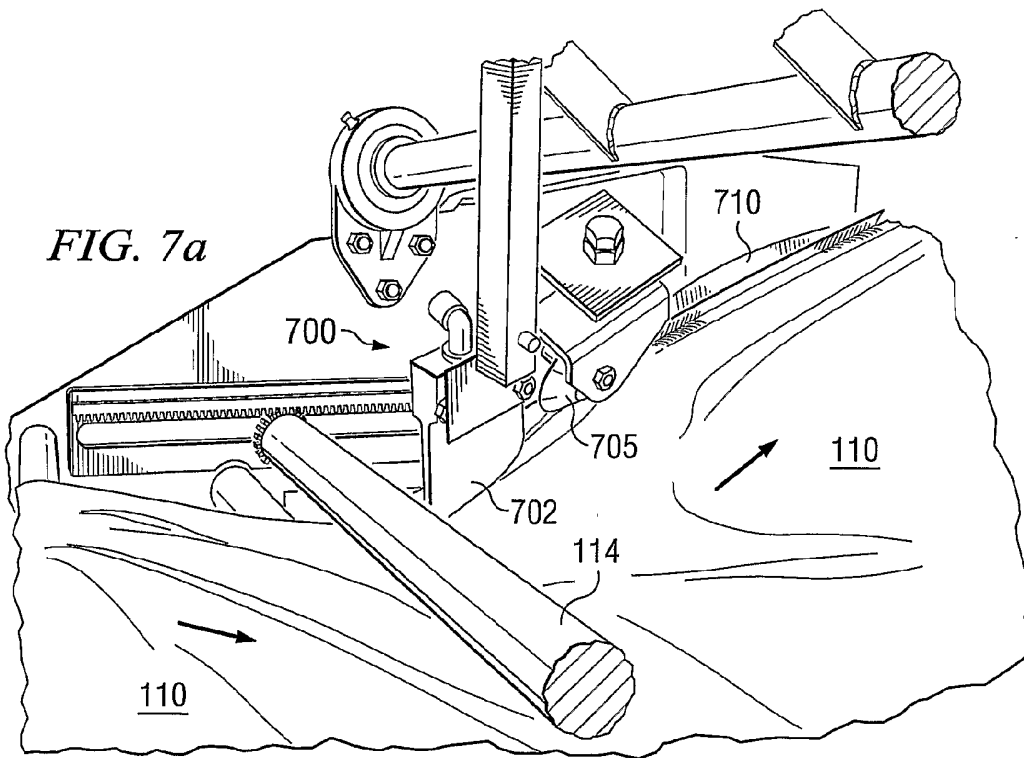
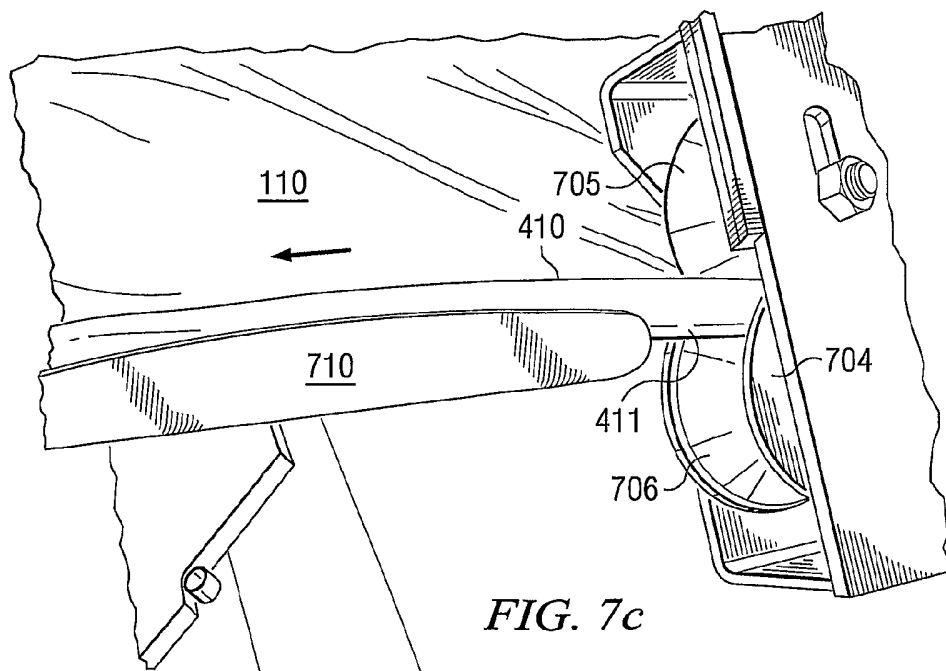
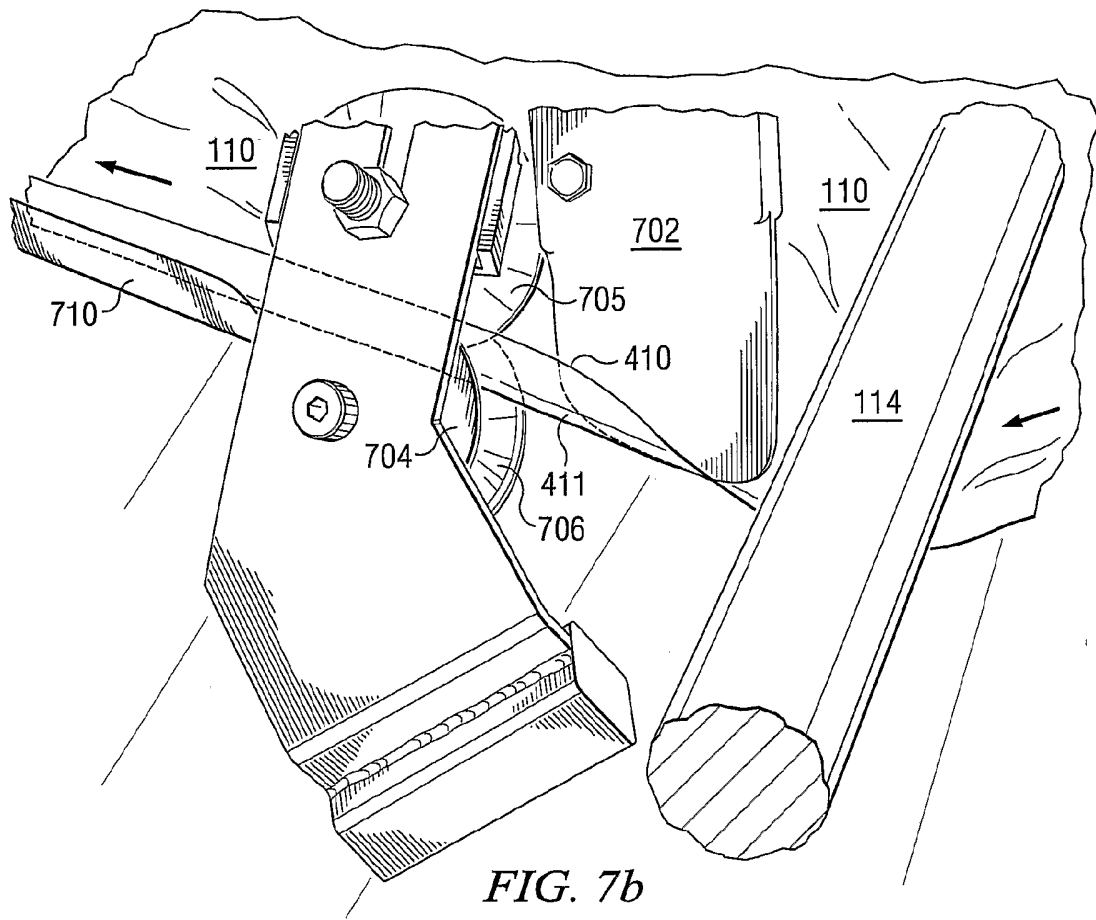


FIG. 7a





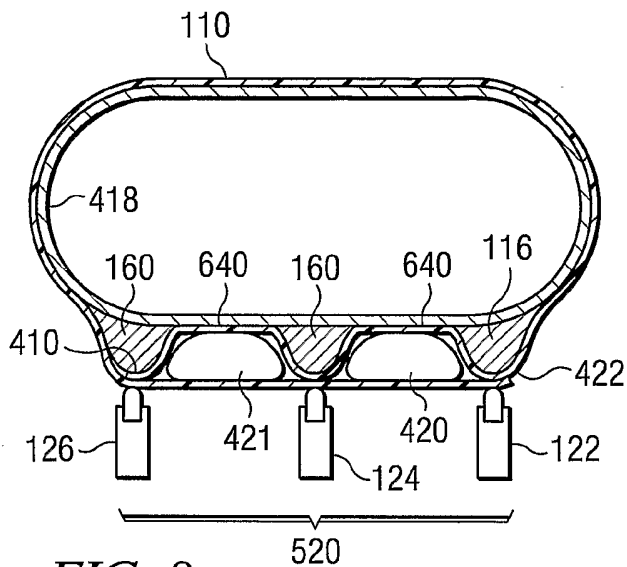


FIG. 8a

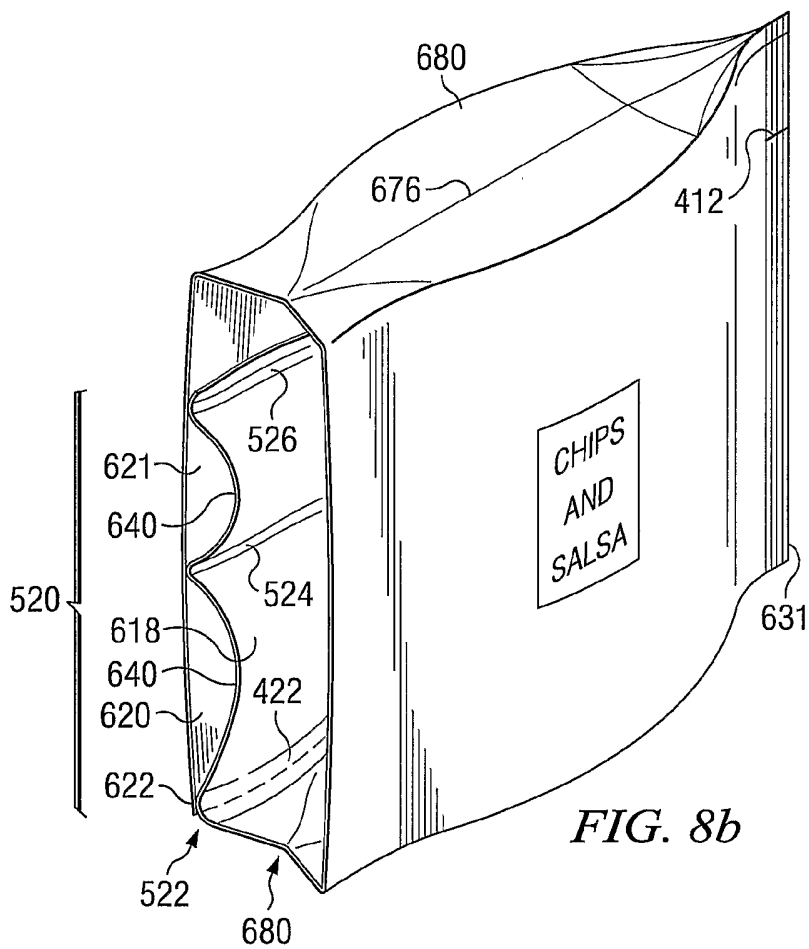


FIG. 8b