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(54) Microwave popcorn product with serving bowl feature.

(57) Corn kernels packaged within an elongate bag can be popped with microwaves and served in the bag. During popping, part of the bag's longitudinally-extending back seal opens and permits vapors to vent from the bag. After the kernels are popped, the back seal is fully opened to transform the bag into a serving bowl having an opening defined by the edges of bag material previously forming the back seal. The bag is made from a laminate of two paper layers with a susceptor between the two paper layers at a location where the bag will contact the floor of the microwave oven. Alternatively, instead of using two layers of paper, a single layer of paper surrounding a layer of polymeric barrier material can be employed. The back seal is formed from side edges of a web of the laminate either by bonding the inner layers of the web edges together or by bonding the inner layer of one web edge to the outer layer of the other web edge. If the innermost layer of the bag is made of a polymeric barrier material, the back seal can be formed by pressing the web edges together under heat and pressure. If the innermost layer is paper, an adhesive must be applied to the web edges before they are pressed together, usually at elevated temperatures. A method of preparing the package of corn kernels is also disclosed.

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MICROWAVE POPCORN PRODUCT WITH SERVING BOWL FEATURE

BACKGROUND OF THE INVENTION

For many years, people have enjoyed popped kernels of corn as a snack food. Such snacks are traditionally prepared either by pouring kernels of corn into a screen-like container suspended over an open fire, by placing kernels in a covered pan positioned on an operating kitchen stove burner, or by placing kernels in an enclosure having electrical resistance heating elements and passing current through the electrical resistance heating elements. With any of these techniques, the kernels are heated until they pop. Although these ways of popping corn have been widely used, a more convenient and faster method of preparing popcorn has long been sought. In addition, it has been desired to pop corn in a container which need not be cleaned but can instead be thrown away after use.

The demand for fast and convenient preparation of foods has not, however, been limited to popcorn; consumers have also sought to cook a wide variety of foods quickly and conveniently. As a result of this need, the popularity of microwave ovens for food preparation has increased dramatically.

As those skilled in microwave technology have known for some time, microwaves heat materials selectively. Those materials that absorb microwaves (i.e. lossy materials) are heated by microwaves, while materials which reflect microwaves or are transparent to them are not greatly heated. Many foods are very effectively heated by microwaves, because they contain moisture which is very lossy. Consequently, microwaves are absorbed by moisture within the foods which causes the foods to be rapidly heated. This understanding of the technical basis for microwave heating has found application in preparing popcorn. Specifically, it has been discovered that moisture within the kernels of corn can be heated as they absorb microwaves. As the moisture within the kernels is heated, it vaporizes and eventually causes the kernels to pop.

The manufacturers of microwave ovens or microwave ovenware have sought to capitalize upon the ability of microwave ovens to pop corn by producing plastic, glass, or ceramic appliances for popping corn. Such appliances are disclosed in U.S. Patent No. 4,156,806 to Teich et al, U.S. Patent No. 4,158,760 to Bowen et al, U.S. Patent No. 4,299,160 to Wokeck, U.S. Patent No. 4,335,291 to Ishino et al, U.S. Patent No. 4,435,628 to Bowen et al, U.S. Patent No. 4,477,705 to Danley et al, U.S. Patent No. 4,496,816 to MacNamara, U.S. Patent No. 4,532,397 to McClelland, U.S. Patent No. 4,542,271 to Tanonis et al, U.S. Patent No. 4,563,561 to Vaeth et al, and Japanese Patent Nos. 56-12928 and 56-56534. In addition, U.S. Design Patent Nos. 255,535 and 255,536 disclose an ornamentally-designed appliance for preparing popcorn with microwaves. Although such durable appliances have found utility in preparing popcorn with microwaves, they are relatively expensive and, therefore, cannot be thrown away after use. Instead, such appliances must be cleaned for reuse.

An alternative to durable appliances are cardboard containers such as those disclosed in U.S. Patent No. 4,036,423 to Gordon, U.S. Patent No. 4,038,425 to Brandenberg et al, U.S. Patent No. 4,248,901 to Austin, U.S. Patent No. 4,260,101 to Webinger, U.S. Patent No. 4,277,506 to Austin, U.S. Patent No. 4,279,933 to Austin et al, U.S. Patent No. 4,448,309 to Roccaforte et al, U.S. Patent No. 4,453,665 to Roccaforte ("Roccaforte '665"), U.S. Patent No. 4,553,010 to Bohrer et al, U.S. Patent No. 4,584,202 to Roccaforte, and U.S. Patent No. 4,586,649 to Webinger. Similar containers can also be manufactured from plastic, as disclosed in Japanese Patent No. 60-234562. Although such containers are disposable, their cost of materials and manufacturing are still relatively expensive. In addition, such containers tend to be bulky and, therefore, difficult to store compactly.

Bags are another way to package microwaveable popcorn. U.S. Patent No. 3,582,363 to Jones discloses the use of a cellophane bag for packaging microwaveable popcorn, while the more routinely-used paper bags are disclosed in U.S. Patent No. 3,851,574 to Katz et al, U.S. Patent No. 3,973,045 to Brandenberg et al, U.S. Patent Nos. 4,461,031 and 4,493,685 both to Blamer, and U.S. Patent No. 4,596,713 to Burdette.

Such bags conventionally include a pair of closed ends between which a front panel, a back panel, and side panels connecting the front and back panels extend. On the front or back panel, the bags have a seal extending between the ends which is formed by bonding together side edge surfaces of a web of material from which the bags are made. In making this bond, the web is transformed into an elongate tube which is transversely cut into shorter tubes and then closed at one end to form bags. The bags are then filled with the requisite ingredients through the open end of the bag. This open end of the bag is then sealed usually

through the application of heat and pressure which cause a layer of adhesive material on the inside of the bag to adhere to itself. Such bags can be either of the stand-up or lay-down type.

During microwave popping, the bags used to package the corn kernels will expand, and, when a predetermined internal bag pressure is reached, one end of the bag will open to permit venting. After popping has terminated, the end of the bag where venting took place can be fully opened to enable the consumer either to eat popcorn right out of the bag or to pour it from the bag into a serving bowl.

Although packaging microwaveable popcorn in such paper bags has achieved some success, even this technology is not without problems. Specifically, kernels packaged in such bags can either fail to pop, scorch, or become chewy when subjected to microwaves. Paper bags also tend to be stained by oil or shortening injected into the bag. It is also difficult to serve popcorn from such bags, and, as a result, it has been necessary to use a serving bowl which must be subsequently cleaned. Serving problems arise with lay-down bags, because popcorn tends to fall out of the open end, while stand-up bags suffer from being easily knocked over and from being difficult to see inside. In addition, when reaching into such bags, the consumer may get oil on his hands, arms, and sleeves when they contact oil on the inside surfaces of the bag. Consumers also risk being burned when they grasp the venting end of the bag and pull that end completely open.

A number of solutions to these problems have been developed.

U.S. Patent No. 4,219,573 to Borek places a layer of insulation between the floor of the microwave oven and the bag to increase the percentage of kernels popped.

U.S. Patent Nos. 4,450,180 and 4,548,826 to Watkins and Japanese Patent No. 60234562 to Golden Valley Foods (all collectively referred to hereafter as the "Golden Valley Foods patents") reduce the percentage of unpopped kernels by utilizing a bag having gussets of different sizes which form 2 tubes of different size. The popcorn and oil or shortening are added only to the smaller tube which rests on the oven floor.

U.S. Patent No. 4,283,427 to Winters et al incorporates in food cartons (rather than bags) a chemical susceptor pouch containing a combination of a solute of inorganic salts of Group IA and IIA metals and a polar solvent for the solute. Initially, the susceptor pouch absorbs microwaves, but, when the food being heated reaches a certain maximum temperature, the susceptor pouch becomes transparent to microwaves to avoid scorching.

U.S. Patent No. 4,571,337 to Cage et al ("Cage") prevents popped kernels from becoming chewy by utilizing a stand-up bag having a top which is heat-sealed so that a central portion of the top remains closed until opened by a predetermined pressure within the bag. Cage takes advantage of the existence of only two layers (i.e. the front panel and the back panel) along the center strip at the top of the bag to create a relatively weak seal at the center strip compared to the seal at the rest of the top of the bag where front and bottom panels are aligned with the gussetted side panels to form four layers (i.e. the front panel, the back panel, and the two portions of the gussetted side panel).

U.S. Patent No. 4,292,332 to McHam ("McHam") prevents the staining of paper bags by providing a synthetic resin layer on the interior of the bag. The interior of Cage's bag is also provided with an inner layer of a polyester film to prevent staining.

McHam also discloses a bagged, microwave popcorn product with a serving feature which is achieved by subjecting the bags to an additional manufacturing step of perforating the bag. After popping has terminated, the bag can be torn open along the perforations to transform the bag into a serving container. The perforations also serve a pressure relief function. Such packages are, however, more expensive due to the additional manufacturing step. In addition, it is difficult to perforate precisely and uniformly so that bags will consistently vent at the desired bag pressure. Moreover, the perforations are susceptible to weakening or breaking during shipment which will change venting characteristics or risk spoilage of the bag contents due to exposure to the atmosphere. In transforming McHam's package into a serving bowl, the consumer must place his finger against the perforations and push downwardly, subjecting his fingers to the risk of being burned by hot vapors escaping from the bag Furthermore, after the bag is finally opened, it does not fully confine the popcorn, and, as a result, some of it will spill out and over the bag's ends.

There thus continues to be a need for further improvements in microwave popcorn products packaged in bags.

SUMMARY OF THE INVENTION

There will now be described features of the various preferred packages of corn kernels hereinafter described with reference to the drawings.

It has been discovered that corn kernels can be popped with microwaves in a bag which can function as a serving bowl after popping to avoid the problems of serving popcorn from end-venting bags. Further, it has been found that such a serving bowl feature can be incorporated in bags without modification or additions to the structure of existing bags, without risking spillage of the popcorn ingredients, without subjecting the consumer to the risk of burns, and yet achieving precise and uniform venting. In addition, flavorants or other additives can be more easily distributed over popped corn through the open back seal.

All these benefits are obtained by utilizing the seal on the front or back panel of the bag which extends longitudinally between the ends of the bag for venting. The panel seal venting pressure is selected and adjusted during manufacturing of the bag by varying the amount and composition of adhesive used to form the seal and the pressure and temperature applied to the seal during its formation. As a result, when this packaged microwave popcorn product is subjected to microwaves, the bag will expand, but the panel seal is strong enough to open only when a predetermined pressure is reached. The bag will then vent through the seal until microwave corn popping is completed. Meanwhile, the ends of the bag will remain closed.

After the package of popcorn is removed from the source of microwaves, any unopened portion of the venting panel seal is weak enough to be pulled fully open by a consumer with his hands and without tearing the bag elsewhere. As the panel seal is fully opened, hot vapor will escape through this widening opening without risk of burning the consumers' hands which are placed away from the panel when it is being opened. In opening the bag, a portion of it previously forming the panel seal and now defining the opening rises upwardly to confine the popcorn. Although the panel seal permits venting during kernel popping and opening during transformation to a serving bowl, the seal has sufficient strength to remain closed during shipment, handling, and preliminary stages of corn popping.

As an alternative to venting through the back seal, the microwave popcorn product according to the present invention can be constructed to vent through one of the ends of the bag. After popping is complete, the bag's back seal can be pulled open to transform the bag into a serving bowl.

The benefits achieved with the package of the present invention are further enhanced by preparing the bag from a laminate having an outer layer of paper, an inner layer of greaseproof paper, and a susceptor such as a layer of metallized and selectively demetallized polyester film between the inner and outer layers only at the portion of the bag which will rest on the floor of the microwave oven. Other similar laminations such as, an outer paper layer with an inner layer of a thermoplastic polymeric barrier material could also be utilized. In this alternative embodiment, a susceptor will preferably still be employed inside the paper layer and the layer of polymeric barrier material will be polyester or the like.

Yet further improvement can be obtained by utilizing corn kernels selected so that 60-75 kernels will have a total mass of 10 grams.

Except for the relative strengths of the bag seals, the microwave popcorn product of the present invention is prepared generally in accordance with conventional procedures.

First, separate webs of material such as paper for the outer layer of the bag, greaseproof paper for the inner layer of the bag, and a susceptor such as a polyester film (e.g. polyethylene teraphthalate) which was initially completely metallized and then selectively demetallized are produced. Such metallized films are disclosed by U.S. Patent No. 4,258,086 to Beall, U.S. Patent No. 4,267,420 to Brastad, U.S. Patent No. 4,553,010 to Bohrer et al, and U.S. Patent No. 4,592,914 to Kuchenbecker. Demetallizing polyester films is also well known. Typically, the polyester film is metallized and then selectively demetallized so that the percentage of light transmission of the metallized film is 35-75%, preferably 50-65%. The three webs of material are then joined together by conventional techniques to produce a laminate having two layers (i.e. paper and greaseproof paper) in some locations and three layers (i.e. paper, metallized and selectively demetallized polyester film, and greaseproof paper) in other locations.

Instead of using greaseproof paper as an inner layer of the bag, a layer of a thermoplastic polymeric material can be utilized. In such cases, a similar lamination procedure would be utilized.

The laminate is then folded and sealed along its length by conventional techniques to produce a tubular web which can then be cut into tubular segments of smaller length. Such methods can be carried out by utilizing conventional bag making machines, such as those made by Holweg S.A. and Windmoeller & Hoelscher GmbH. With such equipment, the strength of the longitudinally-extending panel seal can be adjusted by varying the sealing pressure or temperature and/or the amount or composition of adhesive used.

One end of each of the tubular segments is then sealed in a conventional manner. For example, heat and pressure can be applied to the end of the bag so that an adhesive material coated on the interior of the tube at this end will bond the tube walls together at this location. The sealed end of the tube can then be folded across the bag and against either the front or back panel with an adhesive material being applied to maintain this fold.

After sealing one end of the bag, kernels of corn and then hot, liquified oil or shortening mixed with salt and optionally coloring and/or flavoring can be injected into the bag. Coloring, flavoring (e.g. butter flavoring, brown sugar flavoring, caramel flavoring, maple flavoring, cheese flavoring alone or with jalapeno, nacho, or pizza spices, barbeque flavoring, meat flavoring, and mixtures thereof), or salt can also be added to the bag. If a lay-down bag is utilized, it is preferred to maintain these injected materials at a location substantially equidistant from the ends of the bag. This is achieved by again folding the sealed end of the bag across the front or back panel of the bag. The bag can be folded anywhere between 25% to 40% of the distance between the ends of the bag. Instead of folding prior to filling, the bag can be clamped at a location during filling and folded later. After these ingredients are injected into the bag, the hot liquified oil or shortening will cool and solidify with the corn kernels and other ingredients.

After filling, the open end of the bag is closed like the other end of the bag. For example, heat and pressure may be applied to the open end of the bag to cause an adhesive material coated on the interior walls of the tube to bond the walls together. This end can then be folded across the bag and against the front or back panel with an adhesive material being applied to maintain this fold. By sealing the ends in this manner, the panel seal will open to effect venting, while the ends will remain closed.

After sealing, the top of the bag is folded over the front or back panel so that a compact package is produced. Again, the top end of the bag can be folded between 25% to 40% of the distance between the ends of the bag depending on how the bottom end is folded. To increase the shelf life of the product, it is desirable to enclose the filled and sealed bag in a plastic pouch made from a material conventionally utilized for such purposes (e.g. polypropylene film with a heat seal layer coated on or coextruded on one or two surfaces). Alternatively, the product's shelf life can be enhanced by freezing the packaged product.

Particularly preferred formulations of the ingredients injected into the bag of the present invention are set forth in Table 1 (natural flavor formulation) and Table 2 (butter flavored formulation).

TABLE 1

Popcorn kernels (yellow, shelled medium-kernels of high quality and sized so that 60 to 75 kernels will have a total mass of 10 grams)	60-70 wt % (preferably 66.99 wt %)
Oil (partially hydrogenated mixture of 90 wt % soybean oil and 10 wt % cottonseed oil)	25-30 wt % (preferably 28.71 wt %)
Salt (average size 30-65 microns)	3.5-4.5 wt % (preferably 4.30 wt %)

TABLE 2

Popcorn kernels (yellow, shelled medium kernels of high quality and sized so that 60 to 75 kernels will have a total mass of 10 grams)	60-70 wt % (preferably 65.74 wt %)
Oil (partially hydrogenated mixture of 90 wt % soybean oil and 10 wt % cottonseed oil)	25-30 wt % (preferably 28.28 wt %)
Salt (average size 30-65 microns)	3.5-4.5 wt % (preferably 3.65 wt %)
Flavoring (natural butter flavoring with other natural flavors)	1.5-2.5 wt % (preferably 2.36 wt %)
Coloring (artificial or natural coloring --e.g. extracts of annatto or turmeric)	.01-.10 wt % (preferably 0.05 wt %)

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is perspective view of the back panel of an unfilled bag in accordance with a preferred embodiment of the present invention having the panel seal opened.

Figure 2 is a top view taken along line 2-2 of Figure 1.

Figure 3 is a partial top view of an alternative embodiment of an unfilled bag in accordance with the present invention having the panel seal open.

Figure 4 is a partial top view of another embodiment of an unfilled bag in accordance with the present invention having an open panel seal and showing an inner layer of a polymeric material.

Figure 5 is perspective view of the front panel of an unfilled bag in accordance with the present invention.

Figure 6 is a cross-sectional view of a bag in accordance with the present invention having one end sealed and being filled with corn kernels and shortening or oil.

Figure 7 is a cross-sectional view of a bag taken along line 7-7 of Figure 6.

Figure 8 is a perspective view of a bag filled with corn kernels and shortening or oil and having both ends sealed.

Figure 9 is a perspective view of a bag in accordance with the present invention containing corn kernels and oil or shortening, having both ends sealed, and being positioned within a microwave oven.

Figure 10 is a perspective view of a bag made in accordance with the present invention and containing kernels popped with microwaves.

Figure 11 is a cross-sectional view of a bag taken along line 11-11 of Figure 10.

Figure 12 is a perspective view of a bag in accordance with the present invention having popped corn kernels and being opened by a consumer.

DETAILED DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of the back panel 18 of an unfilled bag 10 in accordance with the present invention and having panel seal 28 opened. In addition to back panel 18, bag 10 is provided with a front panel 16 and a pair of inwardly-folded gussetted side panels 20 all of which extend between an open top end 12 and sealed bottom end 14. Bottom end 14 is folded over and bonded with an adhesive to back panel 18 at bottom seal 22. The gussetted side panels 20 extend inwardly towards each other between front

panel 16 and back panel 18; however, a center strip 24 of front panel 16 and back panel 18 lies between the inner-most points of the gussetted side panels 20.

In forming bottom seal 22 (and top seal 46 which is discussed below), an adhesive is applied to both surfaces of the bag so that when top end 12 and bottom end 14 are folded over and sealed, a seal is formed at both the interior and exterior of the bag to insure that these ends of the bag remain sealed. Preferably, the adhesive is dried, so that it is not activated until contacted with heat for sealing.

Figure 2 is a top view taken along line 2-2 of Figure 1. At back panel 18 and gussetted side panels 20, bag 10 is formed from two layers--an outer paper layer 38 and an inner layer of greaseproof paper 40. Front panel 16 is additionally provided with a susceptor 36 between outer and inner paper layers 38 and 40, respectively. Susceptor 36 may be formed from a metallized and selectively demetallized polyester film. Although a wide variety of metals and polyester films can be used to produce susceptor 36, the preferred polyester film is polyethylene terephthalate, while the metal is preferably aluminum. Alternatively, if a bag formed from paper with an inner layer of polyester film is utilized, the metallic portion of the susceptor can be stainless steel or blends of metals. The susceptor can also be applied in the form of a metallized polyester film bonded to paper or paperboard which is cut to a desired size and placed between layers of paper or other laminating materials. Alternatively, a susceptor material can be printed on one of the paper layers or on another laminating material.

In the preferred embodiment of the present invention, back seal 28 is formed by bonding first back seal surface 30 and second back seal surface 32 with an adhesive 34. As Figure 2 illustrates, back seal 28 is formed by bonding together the inner layers of grease proof paper 40 of the first and second back seal surfaces 30 and 32. The strength of back seal 28 can be adjusted by varying the composition or the amount of adhesive. The adhesive is preferably a thermoplastic, polymeric material such as a vinyl acetate emulsion. The amount of glue is adjusted to modify the width of the band of adhesive 34 such that a narrower band of adhesive permits venting at a lower pressure than a wider band of adhesive.

Figure 3 is a partial top view of a less preferred embodiment of an unfilled bag in accordance with the present invention having an open panel seal 328. Back seal 328 is formed by bonding first back seal surface 330 and second back seal surface 332 with an adhesive 334. In this embodiment, outer paper layer 338 of the first back seal surface 330 is bonded to the inner greaseproof paper layer 340 of second back seal surface 332.

Figure 4 is a partial top view of another embodiment of an unfilled bag in accordance with the present invention having the panel seal opened and showing an inner layer of polymeric material 442. Back seal 428, like the preferred embodiment of Figure 2, is formed by bonding the inner surfaces of first back seal surface 430 and second back seal surface 432 together. However, instead of using an adhesive to bond these layers together, the bag which is formed from a laminate comprising a layer of paper 438 and an inner layer of a thermoplastic polymeric barrier material 442 is provided with a back seal 428 by bonding the layers of barrier material 442 for the first back seal surface 430 and the second back seal surface 432 together with heat and pressure. In this embodiment, paper layer 438 need not be greaseproof, and the layer of polymeric barrier material 442 is a polyester film laminated on the paper so that the paper and polyester bond together. Alternatively, the laminate of Figure 4 can be sealed generally in the manner shown in Figure 3 with either the layer of polymeric barrier material 442 of first back seal surface 430 being bonded to the paper layer 438 of second back seal surface 432 or with the layer of polymeric barrier material 442 of second back seal surface 432 being bonded to the paper layer 438 of first back seal surface 430.

Figure 5 is a perspective view of the front panel of an unfilled bag in accordance with the present invention having an open back panel seal. As this drawing illustrates, susceptor 36 is positioned within a portion of front panel 16. The ratio of the width of susceptor 36 across bag 10 to its length extending partially between top end 12 and bottom end 14 is generally about 1:1.0 to 1:1.4, preferably about 1.0 to 1.15. Front panel 16 and back panel 18 have a width across top end 12 which is generally about 1.3 to 1.5 and preferably about 1.4 times as large as the width of each of the gussetted side panels 20 folded into bag 10.

Although Figures 1-5 show a bag with an open back panel seal, this is merely for purposes of illustration; by the time the bag is produced, back seal 28 has long since been closed.

Figure 6 is a cross-sectional view of a bag in accordance with the present invention having one sealed end and being filled with corn kernels and oil or shortening, while Figure 7 shows a top cross-sectional view of the bag shown in Figure 6 taken along line 7-7. Prior to filling with corn kernels 42 and oil or shortening 44, the bottom of bag 10 is folded across the bag against either front panel 16 or back panel 18 so that these ingredients do not fall to the bottom of the bag. As illustrated in Figure 7, back seal 28 is formed in accordance with the preferred embodiment where the inner paper layers 40 of first back seal surface 30

and second back seal surface 32 are bonded with an adhesive 34.

As also shown in Figure 7, side panels 20 are inwardly folded and gussetted such that front panel 16 and the inwardly-folded portion of each gussetted side panel adjacent front panel 16 define a longitudinal extending tube equal to that defined by back panel 18 and the inwardly-folded portion of each gussetted side panel adjacent back panel 18. The concept of how a bag forms these tubes is discussed more fully in the Golden Valley Foods patents. As Figure 7 also shows, bag 10 is substantially filled cross-sectionally with corn kernels 42 and oil or shortening 44.

Figure 8 is a perspective view of a lay-dcwn bag 10 filled with corn kernels and oil or shortening having both ends sealed. Top end seal 46 is formed in a manner similar to that of bottom seal 22 by folding top end 12 across panel 18 and adhesively bonding them together with top seal 46. Alternatively, top end 12 (as well as bottom end 14) can be closed by heating and pressing front and back panels 16 and 18 together to bond together the interior surfaces at top end 12. Top end 12 can then be folded across panel 18 and then bonded together. The top end inner surfaces can be caused to adhere to one another by application of an adhesive to the surfaces or by providing the bag with an inner layer of polymeric material which adheres to itself upon application of heat and pressure, as shown in Figure 4. Yet another alternative would be simply to heat seal the end without folding or further bonding. However, where venting is to be effected through back seal 22, the end seals must be stronger than back seal 28 so that during microwave corn popping, back seal 28 will open, while the seals at top end 12 and bottom end 14 remain closed. Such a result could be achieved by applying a stronger bonding adhesive to the end seals than is applied to the back seal.

The filled bag 10 shown in Figure 8 not only has a lower folded end 47 but also an upper folded end 49 folded toward back panel 18. Lower folded end 47 and an upper folded end 49 can, for compact packaging and shipping, be folded over the portion of bag 10 containing unpopped corn kernels 42 and oil or shortening 44 which are generally equidistant from ends 12 and 14. In this folded position, the bag can be frozen and/or sealed within a pouch (not shown) of plastic (e.g. polypropylene film) to increase the shelf life of the product.

As shown in Figure 9, the sealed bag filled with corn kernels, solidified shortening or oil, etc. is placed on floor 50 of microwave oven 48. The bag is positioned with front panel 16 which contains susceptor 36 closest to the oven floor 50. In addition, lower folded end 47 and upper folded end 49 are spread apart from the portion of the bag containing the corn kernels 42 and solidified shortening or oil 44. After placing the bag on oven floor 50 in this manner, the door (not shown) of microwave oven 48 is closed, and the microwave oven is turned on for approximately 5 minutes. The kernels then begin to pop as a result of moisture within each kernel vaporizing. This evaporation of moisture causes the bag to expand such that back panel 18 moves upwardly away from front panel 16. In addition, inwardly-folded gussetted side panels 20 move outwardly so that each of the folded parts comprising each gusset move apart.

Instead of placing the bag on the actual floor of oven 48, the bag can rest on an elevated support provided as an accessory to the oven or as an element of the packaging.

Figure 10 is a perspective view of a bag in accordance with the present invention containing popped corn 56, while Figure 11 is a cross-sectional view of the bag of Figure 10 taken along line 11-11. As microwave corn popping continues, the evaporation of moisture causes the corn kernels to pop, and the evaporated moisture expands bag 10. Such expansion causes the pressure within bag 10 to increase until it forces panel seal 28 to open. The bag will open at a pressure of 2.5 to 4.5 inches of water, preferably 3.4 inches of water. The rupture of panel seal 28 where first and second back seal surfaces 30 and 32 are bonded together creates back seal opening 52 through which vapors V from within the bag escape. As Figure 10 illustrates, bottom seal 22 and top seal 46 have remained closed, because they are stronger than was back seal 28. Back panel 18 is provided with a pair of bag opening tabs 54 which are displaced from bag seal opening 52. When a squeezing force S is applied at these tabs as well as the corresponding portions of side panels 20 and a tensile force P of 2.75 to 8.00 pounds, preferably 4.50 pounds, is then exerted, any unopened portion of back seal 28 is opened so that back seal opening 52 is widened. Such full opening of seal 28 by exertion of force P will take place without tearing the bag elsewhere.

Figure 12 is a perspective view of bag 10 in accordance with the present invention having popped corn kernels and being opened up by a consumer. As this drawing illustrates, when a consumer places his thumbs T on these tabs and his index fingers I against side panels 20 beneath these tabs, squeezes bag 10 between his thumbs and index fingers, and pulls them apart with tensile force P, opening 52 widens as a result of first and second back seal surfaces 30 and 32 being pulled apart. As pulling continues, the upper edges of these back sealing surfaces rise from position 30′ to 30 and from position 32′ to 32, respectively, to confine popcorn 56 and to prevent spillage. Although vapors V continue to escape from opening 52, the consumer has little or no risk of burning his hands due to their distance from opening 52.

Instead of venting through back seal 28, top end 12 can be allowed to open during popping, as is done conventionally, to permit bag 10 to vent. After popping is completed, back seal 28 which remained closed during popping, is pulled opened as shown in Figure 12, to transform the bag into a serving bowl. Such venting of top end 12 would be effected by heat sealing the ends with adhesive material inside the bag and without folding or further sealing that end. Again, the longitudinal back seal would be formed to open with a tearing force of 2.75 to 8.00 pounds, preferably 4.50 pounds.

Claims

1. A package of corn kernels suitable for popping with microwaves comprising:

a bag with a pair of closed ends between which a front panel, a back panel, and side panels connecting the front and back panels extend and

a plurality of corn kernels and oil or shortening within said bag,

characterised by:

a seal on the back panel extending between the ends of said bag, wherein said seal is formed by bonding together side edge surfaces of a material from which said bag is made and has sufficient strength to open and permit said bag to vent during popping of said corn kernels only after a predetermined pressure within said bag is reached.

2. A package according to claim 1, wherein both the side edge surfaces bonded together to form said seal are the surfaces of said bag which are adjacent to said corn kernels.

3. A package according to claim 2, wherein the side edge surfaces are bonded together with a thermoplastic, polymeric material.

4. A package according to claim 1, wherein said seal is formed by bonding one side edge surface which is the surface of said bag adjacent to said corn kernels to another side edge surface which is the surface of said bag distal from said corn kernels.

5. A package according to claim 1, wherein the side edge surfaces are bonded together with an adhesive.

6. A package according to claim 1, wherein the side edge surfaces are bonded together with a thermoplastic, polymeric material.

7. A package according to any preceding claim, wherein said bag is made from a laminate having an outer layer of paper, an inner layer of paper, and a susceptor layer between the inner and outer paper layers.

8. A package according to claim 7, wherein said susceptor layer is located only on the front panel.

9. A package according to claim 8, wherein the susceptor layer is a metallized and selectively demetallized polymeric film.

10. A package according to claim 7, 8 or 9, wherein the inner layer of paper is greaseproof paper.

11. A package according to any one of claims 1-8, wherein said bag is a laminate having an outer layer of paper and an inner layer of polymeric material.

12. A package according to any preceding claim, wherein the side panels are inwardly folded and gussetted such that the front panel and the inwardly-folded portion of each gussetted side panel adjacent the front panel define a longitudinally-extending tube, and the back panel and the adjacent inwardly-folded portion of each of the gussetted side panels define another tube.

13. A package according to claim 12, wherein the tubes are substantially equal.

14. A package according to claim 13, wherein said plurality of corn kernels and said oil or shortening substantially fill said bag cross-sectionally.

15. A package according to any preceding claim wherein said bag is a lay-down bag.

16. A package according to any preceding claim, wherein the ends of said bag are folded over themselves and glued closed.

17. A package according to any preceding claim, wherein said plurality of corn kernels and oil or shortening are equidistant from the ends of said bag.

18. A package according to any preceding claim wherein said oil or shortening is solidified.

19. A package according to any preceding claim, wherein the closed ends of said bag are sealed with sufficient strength so they remain closed during microwave popping.

20. A package according to any preceding claim, wherein the predetermined pressure is 2.5 to 4.5 inches of water.

21. A package according to any preceding claim, wherein, after said bag vents, said seal can be pulled fully open with a force of 2.75 to 8.00 pounds.

22. A package of corn kernels suitable for popping with microwaves comprising:

a bag with a pair of closed ends between which a front panel, a back panel, and side panels connecting the front panel and the back panels extend and

a plurality of corn kernels and oil or shortening within said bag,

characterised by:

a seal on the back panel extending between the ends of said bag, wherein said seal is formed by bonding together side edge surfaces of a material from which said bag is made, and wherein, after popping, said seal is weak enough to enable consumers to pull it apart by hand without tearing said bag elsewhere, whereby said bag is provided with a single opening defined by the side edge surfaces and is transformed into a serving bowl from which popped corn can be removed through the opening.

23. A package according to claim 22, having the features sat forth in any one of claims 1-19.

24. A package according to claim 22 or 23, further comprising:

tabs on the back panel of said bag, wherein said tabs are positioned so that they are grasped and pulled away from each other by consumers with their fingers to open fully said seal after said corn kernels are popped to form the single opening.

25. A package according to any one of claims 22-24, wherein consumers can pull said seal apart after popping with a tearing force of 2.75 to 8.00 pounds.

20. A package of corn kernels suitable for popping with microwaves comprising:

a lay down bag with a pair of ends, folded over themselves and glued closed, between which a front panel, a back panel, and side panels connecting the front and back panels extend, wherein the side panels are inwardly folded and gussetted, wherein said bag is a laminate having an outer layer of paper, an inner layer of greaseproof paper, a susceptor between the inner and outer layers only on said front panel, and wherein the inwardly-folded portion of each gussetted side panel adjacent the front panel defines with the front panel a longitudinally-extending tube equal to that defined by the back panel and the adjacent inwardly-folded portion of each of the gussetted side panels and

a plurality of corn kernels and solidified oil or shortening filling said bag cross-sectionally and located substantially equidistant from the ends of said bag, characterized by:

a seal on the back panel extending between the ends of said bag, wherein said seal is formed by bonding together with an adhesive at side edge surfaces of a material from which said bag is made, wherein both the side edge surfaces bonded together are the surfaces of said bag adjacent said corn kernels, wherein said seal has sufficient strength to open and permit said bag to vent during popping of said corn kernels at a pressure within said bag of 2.5 to 4.5 inches of water, while the ends remain closed and

tabs on the back panel of said bag, wherein, after popping, any unopened portion of said seal is weak enough and said tabs are positioned so that said tabs can be grasped by consumers and pulled away from each other with a force of 2.75 to 8.00 pounds to open fully said seal after said corn kernels are popped, whereby said bag is provided with a single opening defined by the edge surfaces and is transformed into a serving bowl from which popped corn can be removed through the opening.

27. A method of preparing a package of corn kernels suitable for popping with microwaves, said method comprising:

providing a longitudinal web of material suitable for forming a bag;

sealing side edges of the web to form a longitudinally-extending tube and a longitudinal seal;

cutting transversely said longitudinally-extending tube to form a plurality of shorter, individual tubes having open first and second ends;

closing the first end of each of said shorter, individual tubes to form a plurality of open-ended bags each having a front panel, a back panel, and side panels extending between the first and second ends;

charging a plurality of corn kernels and oil or shortening into each of said bags; and

closing the second end of each of said bags, characterized in that:

said longitudinal seal on each of said bags has strength sufficient to open and permit said bags to vent during popping of said corn kernels only after a predetermined pressure within said bags is reached, and wherein, after popping, any unopened portion of said seal is weak enough to enable consumers to pull it apart by hand after said corn kernels have popped without tearing said bag elsewhere, whereby said bag is provided with a single opening defined by the edges and is transformed into a serving bowl from which popped corn can be removed through the opening.

28. A method according to claim 27, wherein said closing of the ends of said bag is achieved by folding each of the ends across said bag against the front or back panel and applying an adhesive where the ends contact the panel.

29. A method according to claim 27 or 28, further comprising:

folding the closed first end across said bag and against the front or back panel prior to said charging a plurality of corn kernels and oil or shortening.

30. A method according to claim 29, wherein said charging a plurality of corn kernels and oil or shortening comprises:

injecting the plurality of corn kernels into said bag through the second end, while the first end is sealed and folded across said bag and

injecting the oil or shortening in a hot, liquified form into said bag containing the plurality of corn kernels through the first end.

31. A method according to claim 30, further comprising:

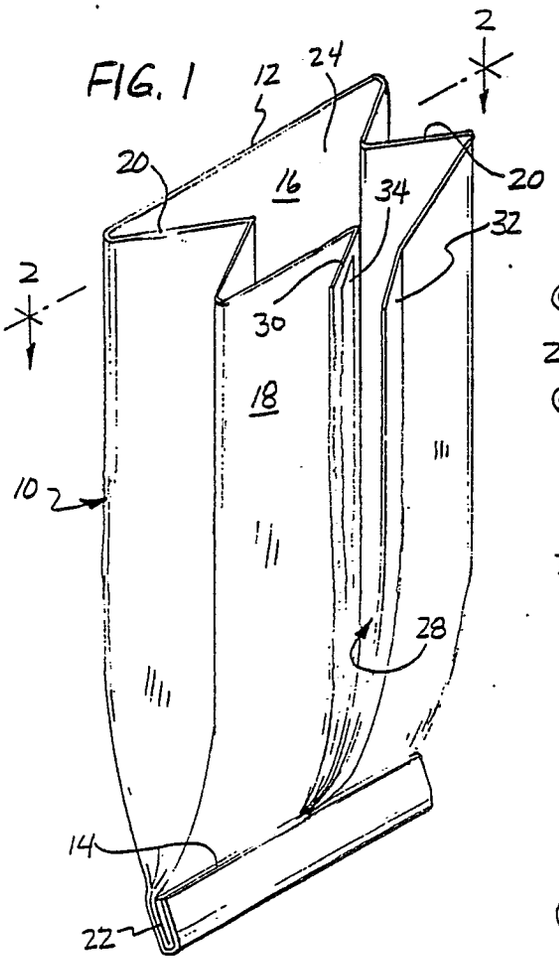
permitting the oil or shortening within said bag to cool and solidify.

32. A method according to claim 31, further comprising:

folding the second closed end across said bag, after said closing of the second end to form a compact package for shipment and storage.

33. A method according to any one of claims 27-32, wherein the package has the features set forth in any one of claims 1-21.

FIG. 1



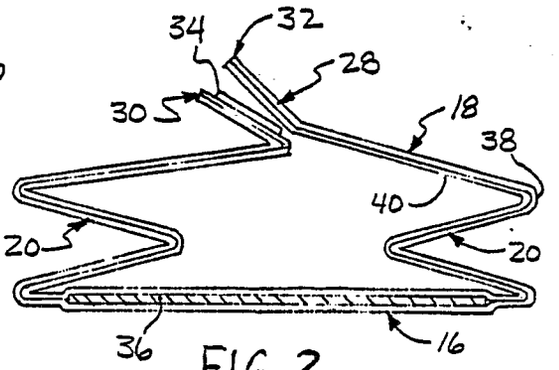


FIG. 2

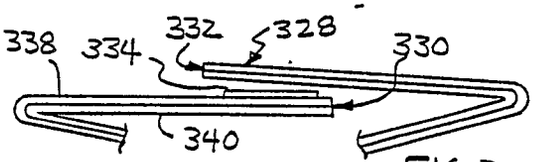


FIG. 3

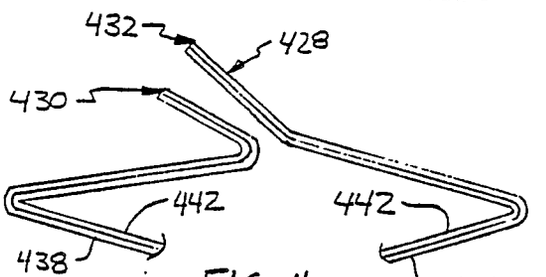


FIG. 4

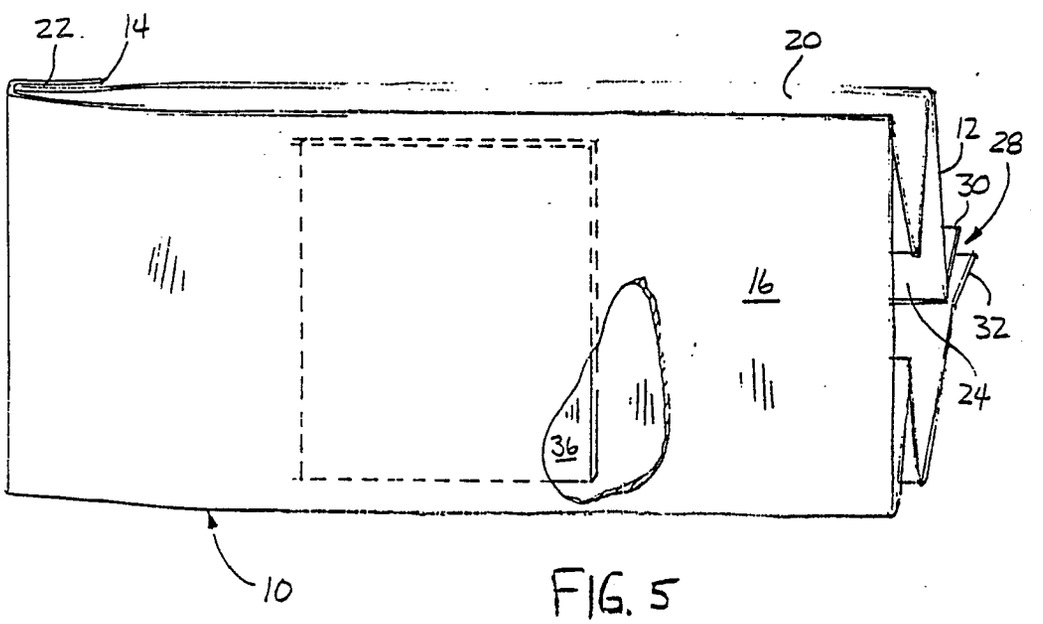


FIG. 5

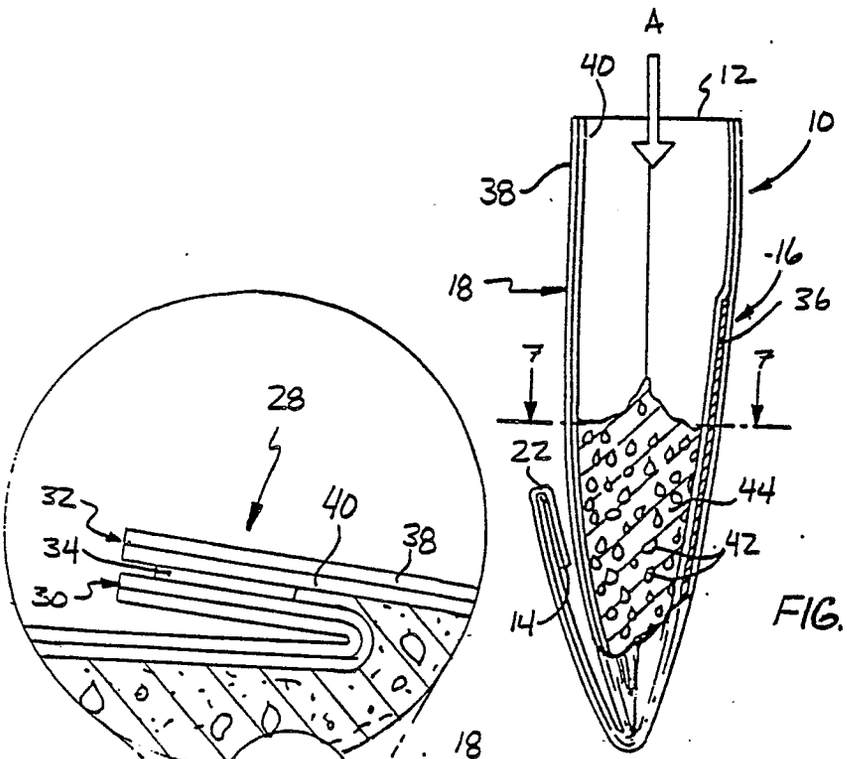


FIG. 6

FIG. 7

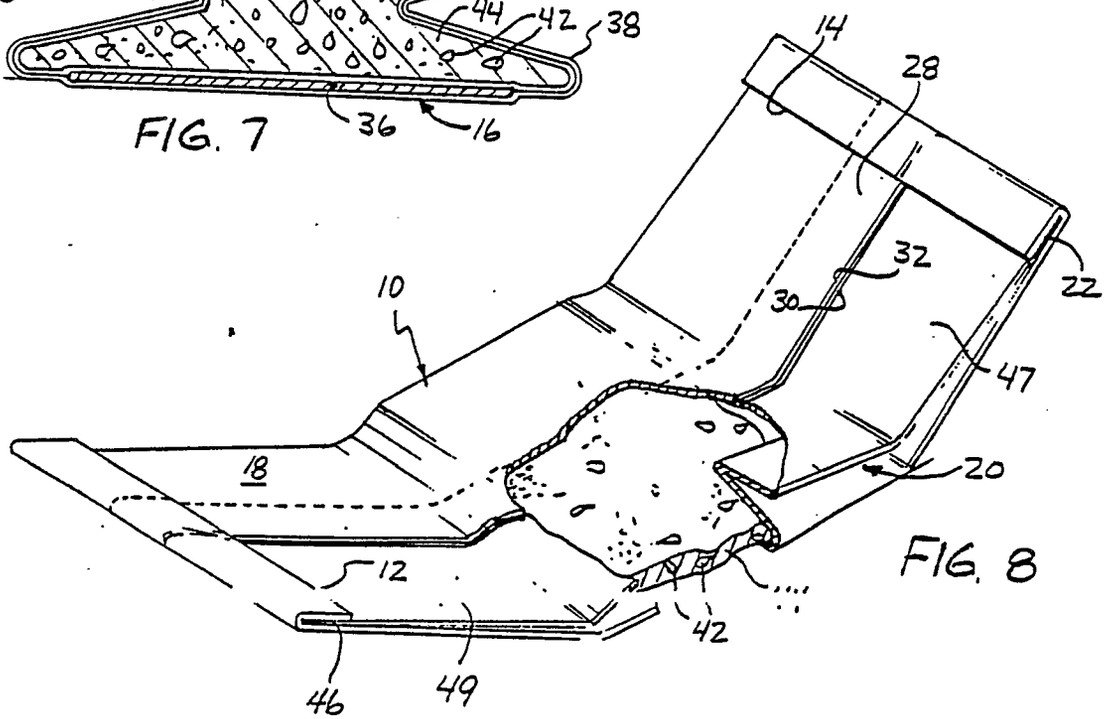


FIG. 8

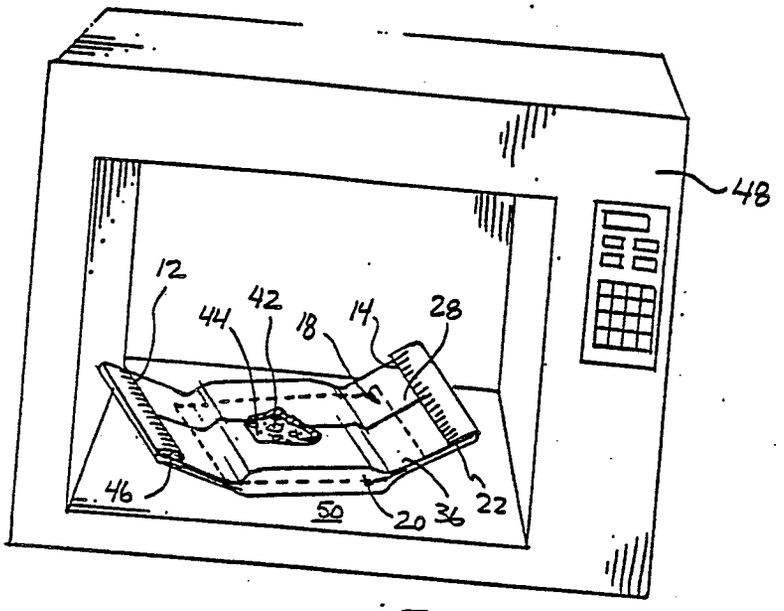

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FIG. 9

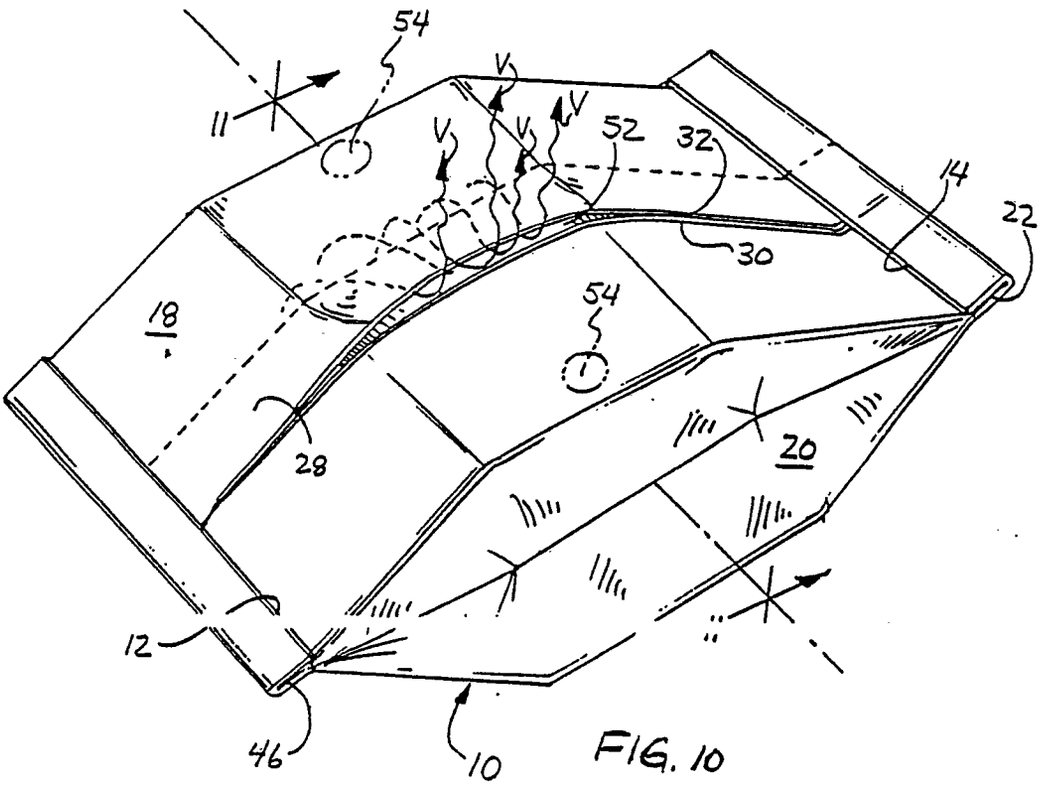
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FIG. 10

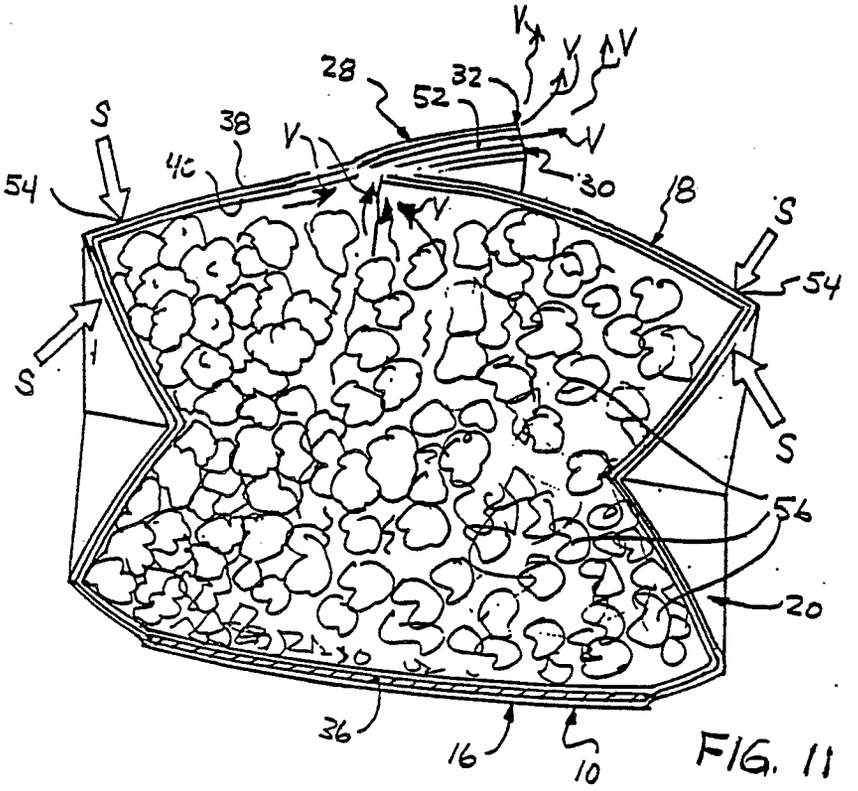
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FIG. 11

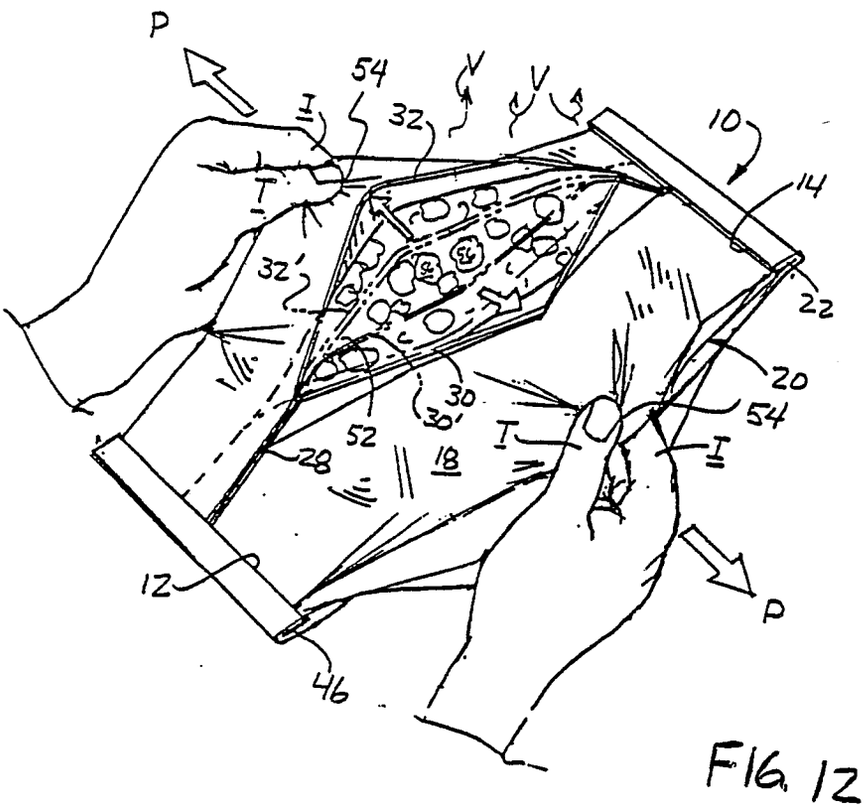
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FIG. 12