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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : B65D 81/34	A2	(11) International Publication Number: WO 00/61456
		(43) International Publication Date: 19 October 2000 (19.10.00)

(21) International Application Number: PCT/US99/07801

(22) International Filing Date: 9 April 1999 (09.04.99)

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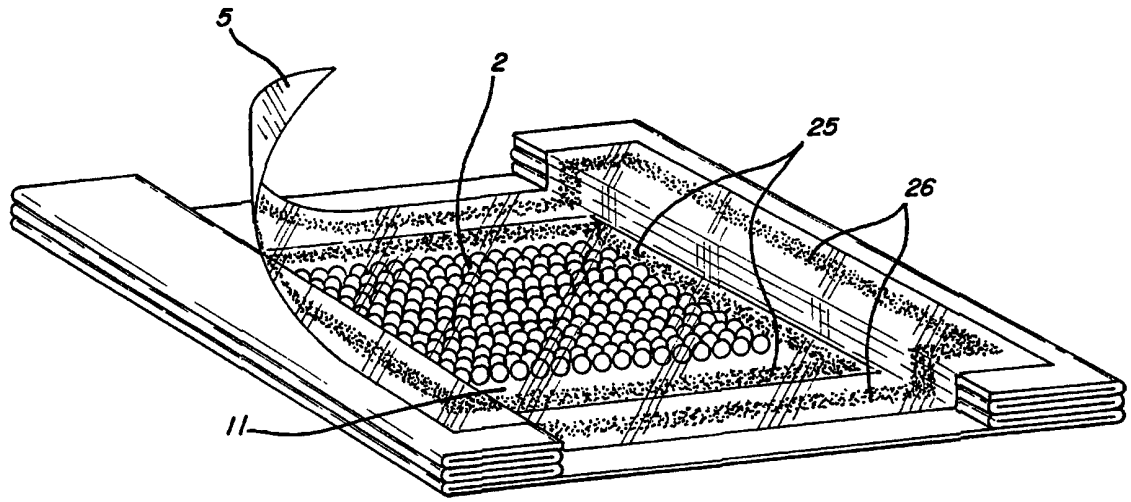
(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published

Without international search report and to be republished upon receipt of that report.

(54) Title: MICROWAVE POPCORN BAG WITH EFFICIENT CHARGE ARRANGEMENT AND INTERNAL PRODUCT BARRIER



(57) Abstract

An improved microwave popcorn package which contains a charge of popcorn kernels for preparation in a microwave oven. The package is formed of multiple microwave transmissive panels joined together to create a cavity in which the kernels are stored and popped. Preferably one of the panels includes a susceptor for heating the kernels, and the kernels are evenly displaced adjacent substantially the entire surface area of the susceptor. An envelope for containing the unpopped kernels is created from additional microwave transmissive material, or from the panels themselves. The strenght of the envelope is sufficent to contain and protect the kernels during shipping and storage, but the envelope will burst when subjected to the internal pressure created by the kernels during the popping process. One of the package panels is also preferably joined to the package with a releasable adhesive that permits the panel to be removed after the popping process to permit access to the kernels. Preferably the envelope is created with the same material that provides the removable panel, and preferably the envelope isolates any oily ingredients from the remainder of the package during the storage period prior to popping.

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MICROWAVE POPCORN BAG WITH EFFICIENT CHARGE ARRANGEMENT AND INTERNAL PRODUCT BARRIER

Field of the Invention

The present invention relates to an enhanced microwave popcorn package which achieves greater popping efficiency at less expense than predecessor packages. In particular, this invention relates to a highly efficient arrangement of kernels and associated oils and seasonings across a susceptor embedded in such a package. More particularly, this invention relates to the creation of a moisture and grease resistant barrier which isolates the greasy kernels and oils from the package and surrounding environment until the popping cycle is initiated.

Background of The Invention

Popcorn has long been a favorite snack item, the popularity of which supports a large and profitable sector of the food industry. However, as consumers have become increasingly health and time conscious, traditional cooking methods involving pans of hot, messy cooking oil that take relatively long to heat, have steadily become less popular. Though these concerns have been somewhat addressed with healthier oils and hot air poppers, far and away the most dramatic innovation in this area was the creation of containers that enable popcorn to be prepared in a conventional microwave oven.

Popcorn is commonly sold and stored in ready-to-use, shelf-stable, leak-proof packages which also serve as microwaveable cooking containers. These packages are designed to store a charge of popcorn kernels along with other edible ingredients such as shortening, cooking oils and seasonings/flavorings, (collectively the "slurry") in a collapsed configuration that reduces storage requirements and shipping costs. The material forming these packages is transparent to microwave energy so that the entire package can be placed in a microwave oven for the heating process. When microwave energy is applied to the product, the popcorn kernels rupture and assume the familiar shape of popped popcorn while the flexible package expands to accommodate the increased volume of the popped kernels.

A popular microwave popcorn package is described in U.S. Patent No. 4,571,337 to Cage. This is a traditional "grocery-bag" style with a flat bottom end and a crimp-sealed top end. Inwardly folded gussets provided on the sides permit the package to assume a relatively flat shape for shipping and storage. During the cooking process, steam generated by the slurry and kernels is held in the bag causing the gussets to unfold and the bag to inflate. To the extent that excess steam is generated, the corresponding pressure creates vent holes in the corners of the top seal. When the popcorn kernels have popped and are ready to be served, the top end of the inflated bag can be opened by pulling on diagonally opposite corners of the package.

Another common package style is the wedge-bottom, or pinch-bottom, bag illustrated in U.S. Patent No. 4,596,713 to Burdette. Both the top and bottom ends of this package are sealed by crimping and/or high temperature adhesive (there is no bottom panel), and the edges of the front and back panels are joined by side panels with gussets extending into the package. The charge of popcorn is placed in the center portion of this package between the top and bottom ends, and the top and bottom ends are folded over the center portion to maintain this placement during shipping and storage. Unlike the package described in the Cage patent *supra*, the Burdette package cannot sit upright on the bottom end. Thus it must be placed in the microwave oven on either the front or back panel. As the kernels are popped, the steam and increased popcorn volume cause the ends and gussets to unfold and the package to inflate. This package is likewise opened at one of the ends after cooking to provide access to the popped kernels within.

Fundamental differences in the heating mechanisms of microwave ovens and traditional stoves initially hindered the success of microwaveable popcorn products. In a common skillet or pan, a flat, very hot surface quickly heats the unpopped kernels causing vapor pressure inside the kernels to rupture the tough exterior causing the kernels to assume the familiar "popped" configuration. When a kernel pops, it quickly assumes a much larger and lighter consistency that causes it to jump from the pan's surface to be replaced with the denser unpopped kernels. This natural process is effective because the kernels that still require heat gravitate toward the pan while the kernels that are prone to burn rise to relatively cool areas above the pan. Microwave ovens, on the other hand, do not typically create such a temperature gradient. Rather, microwave ovens disperse microwave energy relatively evenly throughout the popcorn package. Moreover, while most microwave ovens generate enough energy to eventually pop the kernels, it is typically too low to pop them very fast. Since some variance in kernel structure is inevitable, some of the kernels will pop quite faster than others. Thus while the slower kernels absorb microwave energy toward popping, the faster kernels dry out and eventually scorch or burn.

Most currently available microwaveable popcorn containers use a susceptor to address the heating problems associated with microwaves. A susceptor is a very thin sheet of material, usually vacuum metalized polyester, that rapidly increases in temperature and radiates heat energy when subjected to microwave energy. When affixed to the package panel below the popcorn, a susceptor emulates the heated surface of a pan. The susceptor rapidly increases the temperature of the panel and adjacent kernels which in turn hastens the popping process. Since the cooking time is thereby shortened, the early popped kernels are subjected to less unnecessary energy. Moreover, since the susceptor concentrates most of the heat on the bottom surface, the lighter popped kernels can ascend to the higher, relatively cool areas in the package.

Experimentation has also shown that packages employing susceptors cause kernels to pop with greater volume than packages without susceptors.

In wedge-bottom packages such as that illustrated in the Burdette patent, *supra*, the susceptor and kernels are placed near the middle of the package so that the popped kernels have sufficient space to escape the susceptor's heat. Thus the manufacturing processes used to make these packages must position the kernels adjacent the susceptor rather than permitting gravity to pull them to either end of the package. This is currently accomplished through a vertical filling process in which the bottom portion of the package length is folded over the middle section and the kernels and slurry are poured in the open top. The top section of the package is then sealed and folded over the middle section to hold the kernels in place. This keeps the unpopped kernels from lodging in the ends, and reduces the required susceptor size. This process is illustrated and described in more detail in European Patent Application Number 88304722.7.

Though the vertical filling process positions the kernels and slurry generally in the middle of the package adjacent the susceptor, it does not do so very well. Instead of distributing evenly across the susceptor, the kernels tend to collect along the fold between the bottom and middle sections. Generally, the kernels and slurry in such vertically filled packages cover approximately 25% of the available susceptor. This uneven build-up reduces popping efficiency because the kernels positioned immediately adjacent the susceptor heat much faster than the kernels that start farther from the susceptor. Thus the overall cooking time is lengthened, as is the lag time between the early and late pops. This effect is mitigated to the extent that the slurry liquefies and disperses across the susceptor during heating, but this takes time and energy that could more efficiently be spent heating the kernels. Moreover, until the slurry is spread across the susceptor the "dry" areas of the susceptor will generate significant amounts of unused heat. If there are no adjacent kernels or oil to absorb this heat, the susceptor may become hot enough to scorch or even burn the package material. Unevenly dispersed kernels and slurry also create irregularly shaped packages that requires increased space for shipping and storage.

U.S. Patent No. 4,038,425 to Brandberg et al. teaches a popcorn package which is not filled vertically, but is in communication with a smaller exterior compartment that holds the popcorn and slurry prior to popping. The idea is that by holding the kernels in a small compartment until they pop, heat will be more easily contained and higher temperatures reached. This design keeps the kernels and slurry from the package folds, but at the costs of preventing the unpopped kernels from evenly dispersing across the susceptor and inhibiting the escape of the popped kernels to the cooler areas of the package. Another problem with the Brandberg package is that since the storage compartment communicates freely with the inside of the bag, it does not

protect the popcorn slurry during shipping and storage and the kernels can spill in the package if the proper orientation is not maintained. Moreover, the external compartment creates an irregular shape that is difficult (and expensive) to manufacture and bulky to transport and store.

Current microwave popcorn packages include a mechanism by which the oily ingredients in the slurry are contained. Since the kernels and slurry are typically loose in current packages, the package panels themselves are designed to be sufficiently impervious to the oily ingredients to prevent them from soaking through (a phenomenon commonly called "strike-through"). To this end, high quality "grease-proof" paper is currently used.

Grease-proof paper is typically made with very long, tightly interwoven fibers. The longer the fibers, and the tighter they are woven, the more grease resistant the paper will be. Grease resistance can also be attained by treating the paper with a fluorocarbon compound (e.g. 3M® brand FC-807) during the papermaking process. The degree of grease resistance is also a function of the amount of fluorocarbon compound that has been applied.

High quality grease-proof paper can resist strike-through for six months or more, but this protection comes at a significant material and manufacturing cost. Printing on grease-proof paper can also be difficult since the paper is resistant to ink. Thus, dual-layered packages having grease-proof paper on the inner surfaces, and ink receptive paper on the outer surface are popular. For example, the inner layer could be formed of bleached greaseproof Kraft paper of approximately 25 lbs./ream and the outer layer could be formed of plain bleached Kraft paper of approximately 30 lbs./ream. These layers, along with adhesive therebetween, typically provide sufficient grease resistance, but disadvantages include the relative heaviness which increases shipping costs, and stiffness which hinders the expansion of the package. Single ply packages with combined grease-proof paper and fluorocarbon treated surfaces have also been used, but typically these have had limited success containing the oils for commercially acceptable periods.

U.S. Patent No. 5,461,216 to McDonald addresses grease-proofing in single ply packages by increasing protection at the more vulnerable areas. McDonald observed that prior single ply packages failed to prevent strike-through, but typically these failures were limited to the seams, folds and corners where the fibers and/or fluorocarbon treating was broken. Thus the McDonald device teaches the use of highly refined fibers that tend to stretch or bend rather then break when the paper is folded. This limits the exposure of fiber ends which wick grease through the panel. In addition, McDonald teaches the application of "grease protectors" that block the flow of grease along the more vulnerable folded or creased areas. Grease protectors are described as strips of heat seal adhesive affixed to the inner and/or outer surfaces of the package along folds or creases.

Another problem associated with storing the slurry loose in the package is that the slurry must be relatively solid at room temperature to prevent it from flowing away from the desired position adjacent the susceptor. Moreover, liquid slurries are shunned because the package would require very high grease-resistance to prevent strike-through, and the ends would have to be sealed particularly well to prevent leakage. Nonetheless, liquid slurries require less energy to heat and are generally understood to impart a better taste to the finished popcorn.

To maintain the popcorn's freshness, most commercially available popcorn packages are overwrapped with polypropylene film for shipping and storage. This overwrap provides a needed moisture and volatile flavor barrier over the shelf life of the product. This can be important since the mechanics of popping popcorn require a certain degree of moisture in the kernels. Unfortunately, since current overwraps encase the entire package, much of the moisture in the popcorn and slurry is lost to the package material and air within the overwrap during storage. Moreover, since the material used to create the overwrap is relatively expensive, covering the entire package to protect the relatively small volume of kernels and slurry unnecessarily increases the package's cost.

Multi-purpose packages have also been introduced which provide means for converting the package into a convenient serving container after the kernels have been popped. One early such package is described in U.S. Patent No. 4,292,332 to McHam. One of the panels of the McHam package includes an "H" pattern of weaknesses that release excess vapor during popping. After the popping process is complete, the weaknesses assist the consumer in opening the package as the panel can be torn along the weaknesses to create two "flaps" (i.e. the upper and lower halves of the "H"). These flaps are then folded over to provide access to the interior of the container.

In practice, a McHam style package risks early ruptures along the pattern of weaknesses as the expanding kernels exert pressure inside the package. If the weaknesses can withstand this pressure during popping, they will likely be too strong to permit easy tearing after the kernels are popped. Moreover, since there is no handle on the package with which to remove the panel, the consumer must initially push the flaps into the package before reaching in to pull an edge away. The McHam package also lacks means by which the panels and flaps can be pulled entirely off the package to create a large aperture through which the consumer can obtain the popcorn.

An improvement to the basic concept of a convertible package was recently introduced by Hunt-Wesson, Inc. This Hunt-Wesson package includes two parallel separation lines extending longitudinally down the length of the package. These separation lines are formed

by reinforcing the adjacent areas with contact tape, whereby any tears initiated along the separation lines will tend not to deviate to other areas of the package. Thus after the kernels have been popped, the entire section of the panel between the separation lines can be removed. This leaves a relatively large aperture through which the consumer can access the popcorn without having his hand soiled by the greasy flaps. In addition, the intended tear lines can be weakened to provide added control. This product works well for its intended purpose, but the panel reinforcement, and/or weakening, to create the separation lines represent additional material and manufacturing costs that would preferably be avoided.

In view of the foregoing, it should be appreciated that there is a need for an improved microwaveable popcorn product that pops a higher percentage of kernels in a reduced popping cycle, and does so without scorching the kernels. There is also a need for a printable, flexible and inexpensive package that contains the kernels adjacent the susceptor, maintains the moisture content in the pre-popped slurry, resists charring, permits the use of liquid slurry, and provides access to the popped kernels through a large opening in the panels, while keeping material and manufacturing costs to a minimum.

Summary of the Invention

The present invention pertains to a microwaveable popcorn product that addresses many of the above-described deficiencies in currently available packages. Moreover, these objectives are accomplished with a package design that is inexpensive to manufacture.

The primary structural components of the inventive product include a package comprising multiple panels of flexible, microwave transmissive material joined together to form an inner cavity. A susceptor is mounted on one of the panels such that it is adjacent an inner surface of the package, and a charge of microwaveable popcorn kernels and slurry is placed on the inner surface of the cavity adjacent the susceptor. The susceptor is capable of converting microwave energy to heat, and the popcorn kernels are prone to pop and expand when heated.

An important feature of this invention is that the slurry and popcorn kernels are dispersed in an even, uniform thickness relative the susceptor. Thus the heat generated by the susceptor will be evenly distributed to the kernels so that they will pop at a substantially equal rate. This aspect can be refined by dispersing the kernels in a single layer adjacent the susceptor such that all the kernels are as close to the susceptor as possible. This feature can be further refined by dispersing the charge of popcorn kernels and slurry across the entire susceptor. Thus the heat generated by the susceptor will be efficiently transferred to the kernels and slurry with limited heat transfer to the surrounding package material that could cause charring.

In another embodiment of this invention, the charge is securely contained in an

envelope located within the cavity of the package. The envelope is strong enough to contain the charge of unpopped kernels until the popping process begins. However, when subjected to the steam, high temperatures and expansion pressure created by the kernels during the popping process, the envelope will burst and release its contents. Thus the unpopped kernels will be protected and held in place through shipping and storage, but when the popping process is initiated the popped kernels will escape into the larger cavity of the package.

In a refined embodiment of the invention, the envelope is created from two sheets of material that are entirely independent of the package material, yet reside within the package. This embodiment is advantageous in that it permits the envelope to be manufactured separate from the package, and subsequently inserted into the package.

In another embodiment of the invention, an envelope is created with a cover that overlies the charge of kernels and is adhered to the inner surface of the package around the perimeter of the charge. Thus the envelope is an integral part of the package which ensures that the charge will be located in the proper position and saves the cost of an additional sheet of envelope material.

In another embodiment of the invention, the envelope is created with only the panels that form the package. This is accomplished by compressing the inner surfaces of top and bottom package panels together against the charge, and releasably sealing the inner surfaces around the perimeter of the charge. Thus, with the exception of the adhesive layer, there are no additional materials required over that which are already part of the package.

According to another aspect of the invention, the package is divided into three sections: a top section, a bottom section and a middle section that resides between the top and bottom sections. The susceptor and charge of kernels and slurry are positioned in the middle section of the package; and, the top and bottom ends are folded over the middle section. Thus the charge is retained in the middle section between the folds. This ensures that the evenly dispersed charge remains adjacent the susceptor, and in the best position for popping.

According to another aspect of the invention, side panels forming the package include multiple gussets and the charge is placed along the channel at the longitudinal center of the package between the innermost folds of the gussets. This arrangement enhances the freedom of the kernels to move about the package during the popping process and reduces the thickness of the package. This also serves to hold the kernels in the center portion of the package adjacent the susceptor.

According to another aspect of the invention, a susceptor is mounted directly onto one of the surfaces of the envelope adjacent the charge. Thus the charge will remain immediately

adjacent the susceptor no matter where the envelope is located in the package ensuring that susceptor's heat is efficiently transferred to the charge. This also permits the use of a smaller susceptor than if the susceptor was mounted on the package.

According to another aspect of the invention, the charge of popcorn kernels is displaced in an even, uniform thickness inside the envelope and adjacent the susceptor. Thus heat generated by the susceptor when microwave energy is applied to the product will be evenly distributed to the kernels so that the kernels heat and pop at a substantially equal rate. In a further refinement of this aspect, the charge of popcorn kernels is dispersed in a single layer adjacent the susceptor.

According to another aspect of the invention, a panel of the package has a susceptor mounted thereon, and the envelope is placed adjacent the susceptor. Thus the envelope can be used with currently available package styles. Moreover, the envelope can be produced at less expense than if it included a susceptor.

According to another aspect of the invention, the envelope is secured to an inner surface of the cavity inside the package. Thus, after the package has burst and the kernels have popped, the consumer can empty the popped kernels from the package without removing the empty envelope in the process.

According to another aspect of the invention, the envelope is substantially impervious to water. Thus the moisture content of the charge and slurry will remain substantially constant from the time that the charge and slurry are sealed in the envelope until the envelope bursts. This aspect can be refined by lining the envelope with polyester to attain the moisture barrier. This aspect can be further refined by evacuating the envelope of air as this further maintains a predetermined level of moisture in the envelope.

According to another aspect of the invention, the envelope comprises two layers of material that are placed on either side of the charge of kernels and adhered to each other around the perimeter of the charge. The adhesive used to join the layers has a bonding strength that is strong enough to hold the layers together during shipping and storage, but too weak to contain the expansion pressure created within the envelope when the kernels are popped. Thus when the popping process is begun, the layers of the envelope will separate thereby releasing the kernels into the package cavity.

According to another aspect of the invention, the adhesive used to bond the layers of the envelope is heat sensitive such that the bonding strength diminishes as the temperature increases. Thus the adhesive will be strongest when it is required to hold the envelope together (i.e. during the relative cool periods of shipping and storage); but will be weakened by the very

process that requires its release. In a refinement of this aspect, a susceptor is mounted to one of the layers of the envelope adjacent the charge and the adhesive. Thus a significant temperature increase of the adhesive will be realized very early in the popping process.

According to another aspect of the invention, the package includes gusseted side panels that permit the front and back panels to converge onto the envelope prior to popping, and diverge during popping. Front and back layers forming the envelope are securely attached to the front and back panels such that as the front and panels diverge, the layers of the envelope will be pulled apart. This serves two functions: it opens the envelope to release the unpopped kernels, and it keeps the envelope layers from mixing with the popped kernels.

According to another refinement of the invention, the edges of the front panel are joined to the edges of the side panels along two lap seams, and the lap seams are bonded together with a releasable adhesive. The releasable adhesive is strong enough to hold the package together during shipping, storage and the popping process. However, the adhesive is weak enough that it will permit the front panel to be peeled from the remainder of the package without tearing the package material. This creates a large aperture in the package to provide access to the interior cavity. A similar arrangement can be created in which the back panel, as opposed to the front panel, is removably attached to the side panels.

Other features and advantages of the present invention will become apparent from the following description of the preferred embodiments, taken in conjunction with the accompanying drawings which illustrate, by way of example, the principles of the invention.

Brief Description of the Drawings

Figure 1 is a plane top view of the exterior of the package of the invention.

Figure 2 is a cross-sectional side view of the package, taken along the line 2-2 of Figure 1, illustrating a first embodiment of the invention in which the charge of kernels is arranged in a uniform thickness.

Figure 3 is a plane side view of the package of Figure 1 taken after the end sections have been folded over the middle section.

Figure 4 is a cross-sectional side view of an envelope utilized in a second embodiment of the invention to contain and protect the kernels and slurry.

Figure 5 is a cross-sectional side view, similar to that illustrated in Figure 2, of the package incorporating the envelope illustrated in Figure 4.

Figure 6 is a cross-sectional side view, similar to that of Figure 5, in which the popping process is partially complete and the package is partially inflated.

Figure 7 is a perspective view of the package of Figures 5 and 6 after the package has been expanded by the popped popcorn kernels.

Figure 8 is a perspective view, similar to that of Figure 7, of the package after a panel has been partially removed along with a portion of the envelope.

Figure 9 is a cross-sectional side view, similar to that illustrated in Figure 2, of another embodiment of the package in which a cover is draped over the kernels and attached to the inner surface of the package to envelope the kernels.

Figure 10 is a cross-sectional side view of similar to that of Figure 9 in which the popping process is partially complete and the package is partially inflated.

Figure 11 is a cross-sectional side view, similar to that illustrated in Figure 2, of another embodiment of the package in which the front and back panels of the package are sealed around the charge to envelope the charge.

Figure 12 is a cross-sectional side view, similar to that of Figure 11, in which the popping process is partially complete and the package has partially inflated.

Figure 13 is a top elevational view of the embodiment of Figures 11 and 12. A corner of the back panel has been partially removed from the remainder of the package for illustrative purposes.

Figure 14 is a perspective view of the package of Figures 11, 12 and 13 after the package has been expanded by the popped popcorn kernels.

Figure 15 is a perspective view, similar to that of Figure 14, of the package after a panel has been partially removed to allow access to the popped kernels within.

Figure 16 is an illustration of the preferred manufacturing process for creating the package of this invention.

These figures are provided to illustrate the concepts of the present invention only. The relative dimensions of the features will likely be modified in an actual commercial embodiment, but the need to make any such modifications will be well within the understanding of one skilled in the art. Numerals used in multiple drawings represent alternate views of the same or similar parts.

Description of the Preferred Embodiment

Consumer satisfaction with microwaveable popcorn has been overwhelmingly evidenced by the large number of these products sold every day. Nonetheless, several characteristics of the currently available packages are still less than ideal. For example, material costs are still relatively high (especially in comparison to the cost of the ingredients), and the cooking process still requires a trade-off between popping a high percentage of the kernels and

scorching the kernels that popped early. Described below are several embodiments of Applicant's invention, each incorporating slight structural variations on the overall concepts. As will become readily apparent, selection of a "preferred" embodiment will depend on independent factors such as the allowable material expenses and manufacturing costs, and the overall level of complexity desired in the final product.

Embodiment 1

The present invention relates to a microwave popcorn product, generally indicated as 1 in the accompanying drawings. The package contains a charge of popcorn kernels 2 that expand into puffed edible popcorn 3 when heated in a microwave oven. As shown in the accompanying figures, the primary structural components of the package include a rectangular front panel 4, a rectangular back panel 5, and two rectangular side panels 6 and 7 which connect the sides of the front and back panels to form inner cavity 8. For the purposes of this description, the front panel 4 is the panel that is to be placed downward when the package is placed in a microwave oven.

Various sheet materials may be used to form the panels, so long as the basic requirements of the package are met. The package must be stiff enough to resist tearing under the expected loads, but at the same time it must be flexible enough that the internal steam and popcorn volume can expand the package from its compressed configuration. If the kernels are loosely stored in the package, the panels should resist leaking or staining for the expected periods of shipping and storage as well as during the popcorn process. A two-ply construction with an inner grease-proof paper layer of 20-25 lbs./ream adhered to an outer machine finished paper layer of 25-30 lbs/ream is suitable. A suitable material for a single ply package is a grease-proof paper approximately 0.5 to 1.0 mils thick with a weight of about 35-60 lbs./ream Machine glazed papers are also suitable, but can be too rigid if too thick. The surface of the paper can also be treated with a commercially available fluorocarbon stain inhibitor such as 3M® Inc. brand FC-807. However, as will be discussed in more detail below, if an envelope is used to contain the charge and slurry, lower grade grease-proof paper will be acceptable.

All four panels of the package 1 comprise a top end 9 and a bottom end 10. Both ends of front panel 4 and back panel 5 must be connected to close the package and fully contain the popcorn 2. The preferred design is the "tube" method in which the top and bottom ends 9,10 are secured directly to each other. Alternatively, a bottom panel (not illustrated) can be included to create the "grocery-bag" style described in the background section *supra*. The ends are closed by crimping the material or applying a heat sensitive adhesive to the inner surfaces and placing the ends in a heated press. Typical adhesives used to close the ends include polyvinyl acetate or

polyethylene vinyl acetate.

Referring to the cross-sectional view of Figure 2, a susceptor 11 is preferably adhered to the front panel 4 to enhance popping performance. As explained in more detail in the background section above, a susceptor consists of a thin layer of metal adhered or evaporated on to a structural base such as a sheet of polyester. When subjected to microwave energy the susceptor rapidly increases in temperature and radiates heat energy to its surroundings.

The contents of the package 1 principally include a charge of unpopped kernels 2 mixed with a slurry of shortenings, cooking oils and seasonings (not illustrated) to enhance the flavor and texture of the resulting popcorn 3. Room temperature stable ingredients are preferable so that refrigeration is not required, and if the slurry is to be loose in the package it should be solid at room temperature. If a leak-proof envelope, discussed *infra,* is used, the slurry can be a liquid.

All of the kernels within a particular package would ideally fall within a very narrow range of strength and moisture content so that they will all pop at approximately the same time. However, since these variables cannot realistically be so strictly controlled, the time and heat requirement will vary from kernel to kernel. Energy will necessarily be applied to the entire collection of kernels after some of the kernels have already popped. If this is continued for too long, the earlier pops will become very dry and eventually scorch or even burn. This invention optimizes a short cooking cycle to avoid these problems.

Preferably the charge of kernels and slurry 2 is dispersed across the susceptor 11 in a uniform thickness "x," and covers substantially the entire surface area of the susceptor. (See Figure 2) Thus, since the entire charge of kernels will be heated at approximately the same rate, the lag time between the early and late pops will be shortened which in turn keeps the popped popcorn 3 moist and reduces scorching. This arrangement has been experimentally shown to reduce standard cooking times to an average 2½ minutes from an average 3¾ minutes for packages in which the slurry is initially accumulated on only 25% of the susceptor. Another advantage of this arrangement is that the slurry will not have to melt and flow across the susceptor. This ensures that the heat from the susceptor 11 is efficiently transferred from the beginning of the process, and prevents any "dry" (i.e. uncovered) areas of the susceptor from becoming excessively hot and charring the package.

Popping performance can be further improved by using a susceptor 11 that is large enough to disperse all of the kernels 2 in a *single* layer. In other words, all of the kernels would preferably be laid side-by-side on the front panel 4 immediately adjacent the susceptor. Each kernel would thus receive the maximum amount of energy available from the susceptor from the beginning of the microwave cycle. Moreover, at least until the kernels start to pop, each would

receive an equal amount of energy, thus forwarding the goal of popping all the kernels at the same time. Depending on the number and size of kernels in the charge, the size of the susceptor, and front and back panels might have to be modified to accommodate this arrangement.

As illustrated in Figure 2, the side panels 6, 7 each include multiple gussets 12 which allow the package 1 to maintain a collapsed configuration prior to the preparation of the popcorn kernels 2. These multiple gussets are formed in each side panel by creating inwardly directed folds parallel to the longitudinal axis of the package thereby giving the side panel a pleated or accordion-like configuration. The stiffness of the side panel material causes the gussets to remain compressed so that the package will remain relatively flat during storage and shipping. However, the side panel material must be flexible enough that the gussets will expand when subjected to the internal pressure created during the popping process. Thus the package will inflate to accommodate increased interior volume of the popped popcorn 3.

Since multiple gussets 12 do not protrude significantly into the inner cavity 8, they do not hinder the free flowing movement of kernels 3 during popping. This freedom can be further improved by placing the entire charge and slurry between the inner folds of the gussets whereby the kernels will not get stuck under the gussets (See Figure 2). Moreover, since the inner gussett edges form a barrier of sorts, the kernels will be held in the center portion of the package adjacent the susceptor. Another advantage of placing the slurry between the gussets is that the overall thickness of the package will be kept to a minimum. Depending on the number and size of the kernels used, this feature might also require modification of the package dimensions and/or susceptor size, but one skilled in the art could readily make these modifications.

The susceptor 11 need not cover the entire front panel 4 to pop the kernels 2 efficiently, but if the susceptor covers only a portion of the panel, the kernels must be held adjacent that portion. As explained above, the gusset edges can be used to keep the kernels from spilling off the sides of the susceptor. It is also advisable to keep the unpopped kernels from the ends 9, 10 as the pinched corners will restrict the kernels from fully popping. Thus the package 1 is longitudinally divided into three approximately equal sections: a top section 13, a middle section 14 and a bottom section 15; and, the susceptor and charge are placed on the middle section. To ensure that the kernels cannot escape the middle section until popped, the package is folded between the sections such that the top and bottom sections overlie the middle section (as illustrated in Figure 3). The combination of the gusset edges and these folds hold the kernels in place until the steam and expansion pressure of the popping process cause package to unfold.

Embodiment 2

Figures 4-8 illustrate a microwaveable popcorn package 1 similar to Embodiment

1, with the exception that the charge 2 is not loose in the package. Rather the charge is securely contained in an envelope 16 which in turn is located in the cavity 8 of the package. The envelope must be made of a material that is transparent to microwave energy, preferably polyester, whereby microwave energy will heat the popcorn kernels and slurry within. Since the envelope is too small to contain the kernels after they have popped, the structural constitution of the envelope is designed to burst when subjected to the heat, steam and expansion pressure created by the kernels during the popping process. After the envelope has ruptured, the kernels will escape into the surrounding package which holds the popped kernels 3 until they are removed by a consumer.

A susceptor 11 is preferably included in Embodiment 2 to aid the popping process. The susceptor is preferably mounted to the lower surface of the envelope (as is illustrated in Figures 4-6). Thus no matter where the envelope is positioned in the package, the susceptor will be adjacent the kernels. An alternative design places the susceptor on the front panel of the package (as illustrated in Figure 2 of Embodiment 1), and a susceptor-free envelope is secured to the inner surface of the package adjacent the susceptor. In either event, it is important that the charge of kernels is positioned adjacent the susceptor.

As in Embodiment 1, the charge 2 is preferably dispersed in a uniform thickness inside the envelope. Thus no matter whether the susceptor is placed on the envelop, or on and adjacent panel, the kernels will be heated at a substantially even rate and there will be little to no dry area on the susceptor. Moreover, if the envelope is large enough that the charge can be leveled into a single layer, the heating efficiency will be further improved.

There are multiple ways to create an envelope that will burst to release the kernels. The difficulty comes in ensuring that the envelope is strong enough to withstand the stresses associated with manufacturing, shipping and storage, yet weak enough to burst very early in the popping process. One potential design utilizes a sheet of polyester of a precise thickness and strength that will burst at the opportune time. However, since microwave ovens exert different energy levels, and since the polyester manufacturing process will invariably include some margin of error, it would be difficult and expensive to produce envelopes with such precision. An alternative is to score the envelope along the desired rupture area. However, this is not preferred because the perforations increase the risks of premature rupture, moisture transmission to and from the charge, and leakage of the shortening and cooking oils.

The preferred envelope construction is illustrated in Figure 4. A front layer 17 has the charge 2 positioned on the upper surface thereof, and a back layer 18 is draped over the charge. The edges 19 of the front and back layers are adhered together around the charge with a releasable adhesive 20.

A releasable adhesive is used so that the envelope will split open when it is subjected to the internal expansion pressure created during the popping process. Preferably the bonding strength of the adhesive decreases when subjected to steam and increased temperatures. Thus the adhesive will be strongest during the relatively cool periods of shipping and storage, and weakest when it is intended to release. The releasing effect is further improved if the susceptor 11 is mounted directly to the front layer 17 of the envelope so that the adhesive will be quickly heated. The preferred adhesive for creating the envelope is DuPont Brand Selar PT 8307.

After the kernels 2 have popped, the consumer will need to gain access to them. This is traditionally accomplished by opening an end of the package 1 and pouring the contents into a bowl (See e.g. the Burdette patent discussed *supra*) . Since it would be undesirable for the spent envelope pieces to be mixed with the kernels 3, the envelope 16 is securely mounted to the inner surfaces of the package cavity 8 such that it will remain attached after the popping process. This can be accomplished with a heat resistant adhesive such as a modified acrylic emulsion sold by Basic Adhesives, Inc. product no. BR-3885. Note that the adhesive used to secure the envelope to the package should be considerably stronger than the releasable adhesive used to seal the edges of the envelope. As illustrated in Figure 5, strips of heat resistant adhesive 21 secure the front layer 7 of the envelope to the inner surface of the front panel 4; and, strips of heat resistant adhesive 22 secure the back layer 18 of the envelope to the inner surface of the back panel 5.

As illustrated in Figure 6, securing the envelope layers 17, 18 to the inner surfaces of the cavity 8 helps pull the envelope 16 apart at the proper time. As the kernels 2 expand and expel steam, the top and bottom sections 13, 15 of the package 1 unfold from the middle section 14, the gussets 12 expand, and the package inflates. This inflating process causes the front and back panels 4, 5 to diverge from each other, which in turn pulls the front and back layers of the envelope apart.

Embodiment 2 also includes an improved method for allowing the consumer to access the popped kernels 3. A pair of lap seams 23 extend the longitudinal length of the package 1 and secure back panel 5 to side panels 6, 7. The lap seams are bonded together with a releasable adhesive which has a bonding strength great enough to hold the panels together before and during the popping process, yet weak enough to permit the back panel to be peeled from the side panels without tearing the package material. Figure 7 illustrates a package of this embodiment after the popping process has been completed. Figure 8 illustrates the same package with the back panel partially removed. Note that if the back layer 18 of the envelope 16 is attached to the back panel 5, it too can be removed from the remainder of the package. Alternatively, if the front panel 4 was releasably attached to the side panels 6,7, the package could be turned over and the front panel and

front envelope layer could be removed.

The adhesive used along the lap seams 23 will not be subjected to as much heat, steam and internal pressure as the adhesive used to hold the envelope layers 17,18 together. Thus the same releasable adhesive used for the envelope can be used for the lap seams 23. Moreover, depending on the bonding strength of the adhesive, the width of the lap seams can be modified until the appropriate strength is reached. Applicant has found that Franklin Duracet 12 or Basic Adhesives, Inc. product no. BR-3885 works well for this application.

As with Embodiment 1, the kernels 2 (and envelope 16) are preferably located in the middle section 14 of the package 1 to aid the flow of popped kernels about the package. The best way to accomplish this is to place the envelope in the middle section, and fold the top and bottom sections over the middle section to hold it in place during shipping and storage. Similarly, if the envelope can be made small enough to fit between the gussets, as illustrated in Figure 5, the freedom of the kernels during the popping process will be improved.

The use of polyester for envelope 16 has also been shown to be very effective in preserving the freshness and popping performance of the kernels 2. The mechanics of popping popcorn rely on moisture within the kernels to expand and rupture the exterior shell of the kernel. Preferably sufficient moisture is present to reach a very high pressure and cause a violent rupture as this creates larger, puffier kernels. If the kernels are too dry due to losee of moisture during storage, insufficient internal vapor pressure will be generated leading to smaller popped kernals and increased number of kernels that do not pop at all. However, if the moisture content is too high, the pericarp will become pliable and rubbery and will split open with little intensity. Thus it is important to maintain the moisture content within set parameters. The invention addresses this goal by creating the envelope 16 out of polyester, which is substantially impervious to the transmission of water. This is advantageous over the prior art polypropylene packets that covered the entire package. The envelope 16 is much smaller and lighter, and does not include the package material or large volume of air which can absorb moisture from the kernels and slurry. The moisture content and slurry freshness can be further controlled by drawing a vacuum in the envelope.

The use of an envelope 16 is beneficial in that lighter, inexpensive materials can be used for the package panels 4, 5, 6, 7. Since the envelope contains the oily charge 2 for the vast majority of the product's life, the need for expensive grease-proof panel material is drastically reduced. Strike-through protection has traditionally focused on the affected elements of the package (i.e. the panels). Rather than trying to protect the panels from the oils, Applicant contained the source of the oils. Thus the only time that the oils and shortening come in contact

with the panels is during and after the popping process. By this time, the product's remaining usefulness is typically less than ½ hour (or much less if the consumer pours the contents into a separate bowl). To prevent strike-through for such a short time requires far less protection than the prior bags which were designed to be stored for as long as six months or more.

The use of an envelope 16 does not provide protection against strike-through during the popping process. Thus, depending on cost considerations, it might be preferable to use a moderately grease-proof material that can contain the oils for at least a few minutes at approximately 400° F. However, to the extent that strike-through during popping is acceptable, the panels can be made of inexpensive non-grease-proof paper. Regardless of which material is selected, the package will be considerably lighter and more flexible than the traditional multi-ply or heavily treated single-ply packages.

The envelope 16 also provides additional flexibility for the shortenings and oils used in the slurry. It was previously impractical to use liquid oils because they tended to soak through the panels and leak through any faults in the package. Solid shortenings and oils were also used because they helped to hold the charge in the intended position. Applicant's polyester envelope eliminates this reliance on solid shortening and oils. Since the envelope is constructed of polyester, it can hold the charge and associated ingredients regardless of the whether it is in liquid or solid form. Thus it is possible to use liquid shortenings and oils which is advantageous as the liquid oils are believed to impart better taste to the popcorn.

Embodiment 3

Figures 9 and 10 illustrate another embodiment of the invention. This package is similar to Embodiment 2 with the exception that front layer 17 of the envelope 16 is an integral part of the front panel 4 of the package 1. Referring to the cross-sectional view of Figure 9, attached to the inner surface of the front panel 4 is a layer of polyester 24 on which a susceptor 11 has been evaporated. A strong, heat-resistant adhesive (not illustrated) holds the front panel, susceptor and polyester a single stratified unit. The back layer 18 of the envelope, referred to more appropriately in this embodiment as the "cover," is draped over the charge 2 and is releasably bonded to the inner surface of the front panel to create a polyester-lined envelope. A releasable adhesive is used to bond the cover to the front panel as was described above for Embodiment 2.

During the popping process, the mechanics of Embodiment 3 will behave much as was described for Embodiment 2. When subjected to microwave energy, the susceptor 11 will heat the kernels 2 and the releasable adhesive 20. Through a combination of the increased temperature of the susceptor, and the steam and expansion pressure of the kernels, the releasable adhesive will permit to cover 18 to rise from the inner surface of the front panel 4 thereby spilling

the kernels into the cavity 8. As the process continues and the package inflates, the back panel 5 will diverge from the front panel 4 to allow the popped kernels to fill the inner cavity of the package.

The package 1 of Embodiment 3 also preferably includes a removable panel for permitting access to the popped kernels 3. If the back panel 5 is to be removable, the popped product will operate as described above (and illustrated in Figure 8). However, for Embodiment 3 is preferable to make the front panel 4 removable. When the popping process is complete, the package can be rotated so that the front panel is on top and the package can be opened by peeling the front panel from the side panels along lap seams 23. This in turn removes the susceptor 11 and the lower layer of the envelope 16 from the remainder of the package. Thus, even if the consumer does not carefully peel the front panel from the side panels 6,7, or if the releasable adhesive on the lap seams is too strong, the susceptor will resist any tendency that the front panel might otherwise have toward tearing. For this reason, it is also preferable to extend the susceptor all the way to the edges of the front panel.

Embodiment 4

Embodiment 4 completes the progression of the configurations described above. As illustrated Figures 11 and 12, the front and back panels 4, 5 also serve as the front and back layers of the envelope 16. Preferably a polyester sheet with a susceptor evaporated thereon is attached to the inner surface of the front panel, and a strong, heat-resistant adhesive holds these layers in a single stratified unit. The back panel 5 is constructed of a moldable material such as polyester. The inner surfaces of the front and back panels are converged together such that they envelope the charge of kernels 2 and are in contact around the perimeter of the charge of kernels. Inner strips of releasable adhesive 25 surround the charge and hold the inner surfaces of the front and back panels together around the perimeter (as can seen in Figure 11). Thus the envelope is created simply by bonding the inner surfaces of the package together around the charge. Note that in this embodiment the charge will have to be positioned between the gussets so that the inner surface of the front and back panels can meet all the way around the charge.

During the popping process, the apparatus Embodiment 3 will perform in the manner illustrated in Figure 12. The releasable adhesive strips that hold the front and back panels together to form the envelope will release, the kernels will spill into the cavity 8, and the gussets will expand to allow the package to inflate.

Embodiment 4 also preferably utilizes a removable panel. In this Embodiment the back panel 5 is the preferred choice since it will likely be of a different material than the remainder of the package 1, and will need to be attached to the side panels 6,7 anyway. To the extent that

a clear material such as polyester is used for the back panel, this package will be visually interesting in that it will be possible to watch the kernels 2 pop, and the popped kernels 3 will be visible through the panel after the popping process is complete. As illustrated in Figure 13, the back panel is attached to the side panels along lap seams 23 with a releasable adhesive 26. Note that the back panel in Figure 13 does not extend all the way to the package. Depending on the manufacturing process used to create this package, the back panel might actually extent completely to the top and bottom ends of the package. Figures 14 and 15 illustrate the package of Embodiment 4 after the kernels have been popped, and the back panel has been partially removed to expose the popped kernels 3.

Depending on the desired degree of complexity, and the available manufacturing tools, any one of the above embodiments could be "preferable." However, to the extent that an envelope is to be used to contain the charge and slurry, Embodiment 4 is arguably the best arrangement in that it does not require additional panels or layers to create the envelope.

Preferred Manufacturing Process

Figure 16 illustrates the basic elements of a preferred manufacturing method for creating the apparatus of Embodiment 4.

The package 1 is constructed with the back panel 5 below the front panel 4. Roll 30 deposits a continuous layer of polyester film onto conveyor belt 31. A vacuum is drawn below the surface of the conveyor such that the polyester film conforms to recesses 32. A charge of popcorn and slurry 2 is then deposited in the recesses from popcorn hopper 33. If a solid slurry is used, it is preferably formed into solid cakes of popcorn and slurry sized to fill the recess. However, it is important to note that this horizontal manufacturing technique is also well suited to the use of liquid slurry since the recesses will contain the liquid until it is sealed in the envelope 16. Moreover, since the ingredients will be depositied onto a horizontal surface, gravity will spread them evenly across the recess, and ultimately the susceptor, which contributes to efficient popping action.

The front panel 4 and side panels 6,7 are preferably constructed of a single layer of grease resistant paper, though non-grease-resistant paper could be used to reduce material costs. A continuous sheet of paper from roll stock 34 is used to create both the front and side panels of the package 1. A susceptor 4, preferably comprising a sheet of polyester with a metalized film evaporated on the surface thereof, is adhered to the centerline of the paper stock at station 36. Strips of high temperature adhesive (to seal the package ends) are then applied to what will be the top and bottom ends 9,10 of the package at station 37, and the paper stock is fed through folding device 38 which creates longitudinal gussets 12 in the sides panels.

Referring briefly to Figure 11, two separate patterns of releasable adhesive strips are required to attach the polyester film (i.e. the back panel 5) to the gusseted side panels in Embodiment 4. Inner pattern 25 holds the inner surface of the paper stock to the inner surface of the polyester to create the envelope 16; and, outer pattern 26 holds the polyester to both the ends of the package and the edges of the gussets 12. Both of these releasable adhesive patterns are applied to the paper stock at station 39.

After the gussets, susceptor and adhesive patterns have been applied to the paper stock, the paper is rolled onto the conveyor and attached to the polyester layer at position 40. Care must be taken to synchronize the paper stock with the polyester film such that the susceptor 11 and adhesive patterns 25,26 are properly registered. Each susceptor 11 must be positioned directly above the recesses 32 and popcorn charge 2, each inner adhesive pattern 25 must register with the circumference of a recess, and the outer adhesive pattern 26 must correspond with the outer edges of the polyester film. After the paper and polyester have been aligned, the adhesives (releasable and hi-temperature) are secured in heat press 41. Individual packages are then cut off at station 42.

As will be readily apparent to one of skill in the art, the above described manufacturing process has been provided for illustration purposes only. In practice, these steps will not necessarily be performed in this order, and they might not all be performed in the same process. For example the gussets and susceptor could be added to the paper stock in a separate process, and the releasable adhesive could be applied to the polyester as opposed to the paper. One of skill in the art will also readily recognize that this process can be adapted to create the package/envelope combinations of Embodiments 2 and 3. For example, if the steps of applying high temperature adhesive and gussets were removed, this process could be used to create the separate envelope that is to be inseted into a package (i.e., Embodiment 2. Similarly, if the polyester film was wide enough to seal around the charge without reaching the gusset edges, and an additional roll of paper stock was applied over to polyester film and joined to the panels on either side of the film, the package of Embodiment 3 would be created. Of course, since this process evenly distributes the charge relative to the susceptor, the concept of Embodiment 1 will also be realized.

Although the invention has been described in detail with reference only to certain embodiments, those skilled in the art will appreciate that various modifications can be made without departing from the spirit of the invention. With such possibilities in mind, the invention is defined with reference to the following claims.

Claims:

1. A microwaveable popcorn product comprising:

a popcorn package comprising multiple panels of flexible, microwave transmissive material joined together to form an inner cavity,

a susceptor mounted on a front panel of the package;

a charge of unpopped microwaveable popcorn kernels positioned in the cavity on an inner surface of the front panel adjacent the susceptor;

wherein the kernels are prone to pop and expand when heated by the susceptor; and,

wherein the charge of kernels is dispersed in a uniform thickness relative the susceptor;

whereby the susceptor will heat and pop the kernels at a substantially uniform rate when microwave energy is applied to the product.

2. The product of claim 1 wherein the charge is dispersed in a single layer of kernels such that all of the kernels are positioned immediately adjacent the susceptor.

3. The product of claim 1 wherein the charge of kernels is dispersed across substantially the entire susceptor.

4. The product of claim 1 wherein:

the panels forming the package include a front panel, a back panel and two side panels;

each side panel includes multiple gussets which permit the package to collapse for shipping and storage and to expand to accommodate the volume of the popped kernels; and,

the charge fits between the innermost edges of the gussets on each side panel;

whereby the gussets can be more completely compressed and whereby interference between the gussets and the kernels will be minimized.

5. A microwaveable popcorn product comprising:

a popcorn package comprising multiple panels of flexible, microwave transmissive material joined together to form an inner cavity; and,

a microwave transmissive envelope positioned in the cavity of the package; and,

a charge of unpopped microwaveable popcorn kernels securely contained within the envelope;

wherein the kernels are prone to pop and expand when heated by microwave energy;

wherein the structural constitution of the envelope is strong enough to contain the unpopped kernels yet is weak enough that the envelope will burst when subjected to the expansion pressure created within the envelope when the kernels are popped;

wherein the package is sufficiently large to accommodate the volume of the popped kernels.

6. The product of claim 5 further comprising a susceptor mounted on a surface of the envelope adjacent the charge, whereby the charge will be heated by the susceptor when microwave energy is applied to the product.

7. The product of claim 6 wherein the charge is dispersed in a uniform thickness relative the susceptor, whereby the susceptor will heat the kernels at a substantially equal rate when microwave energy is applied to the product.

8. The product of claim 7 wherein the charge is dispersed in a single layer of kernels such that substantially all of the kernels are in contact with the portion of the envelope on which the susceptor is mounted.

9. The product of claim 5 further comprising a susceptor mounted on a front panel of the package, and wherein the envelope is positioned adjacent the susceptor whereby the charge will be heated by the susceptor when microwave energy is applied to the product.

10. The product of claim 5 wherein the envelope is securely fixed to an inner surface of the cavity whereby the envelope will not be loose among the popped popcorn kernels after the envelope has burst and the kernels have popped.

11. The product of claim 5 wherein the envelope is substantially impervious to the transmission of moisture, whereby the moisture content of the charge will remain substantially constant from the time that the charge is sealed within the envelope until the envelope bursts.

12. The product of claim 11 wherein the envelope is lined with polyester and sealed with an adhesive that is also substantially impervious to the transmission of water.

13. The product of claim 11 wherein the envelope is evacuative of air.

14. The product of claim 5 wherein:

the envelope comprises a front layer and a back layer;

the charge rests between the front and back layers;

an adhesive joins the opposing edges of the front and back layers around the perimeter of the charge; and,

the adhesive has a bonding strength less than that required to contain the expansion pressure created within the envelope when the kernels are popped;

whereby when the kernels are popped, the front and back layers will separate and release the kernels from the envelope.

15. The product of claim 14 wherein the bonding strength of the adhesive diminishes as the temperature of the adhesive increases, whereby heat generated as the kernels are popped will accelerate the separation of the front and back layers.

16. The product of claim 15 further comprising a susceptor mounted on the envelope adjacent the charge such that both the charge and the adhesive will be heated by the susceptor when microwave energy is applied to the product.

17. The product of claim 14 wherein:

the panels forming the package include a front panel, a back panel and two side panels;

each side panel includes multiple gussets which permit the package to collapse for shipping and storage, and to inflate to accommodate the volume of the popped kernels;

the front and back panels converge when the package is collapsed, and diverge when the package is inflated; and,

the front and back layers of the envelope are connected to the front and back panels respectively;

whereby the front and back layers of the envelope will be pulled apart as the package is inflated.

18. The product of claim 17 wherein:

the edges of the front panel slightly overlap the edges of the side panels along two lap seams; and,

the lap seams are bonded together by a releasable adhesive having a bonding strength great enough to hold the panels together while the kernels are popped, yet weak enough to permit the front panel to be peeled from the side panels without tearing the package material;

whereby the front panel and the front layer can be peeled from the remainder of the package after the kernels are popped to provide access to the interior of the package.

19. The product of claim 17 wherein:

the edges of the back panel slightly overlap the edges of the side panels along two lap seams; and,

the lap seams are bonded together by a releasable adhesive having a bonding strength great enough to hold the panels together while the kernels are popped, yet weak enough to permit the back panel to be peeled from the side panels without tearing the package material;

whereby the back panel and the back layer can be peeled from the remainder of the package after the kernels are popped to provide access to the interior of the package.

20. The product of claim 5 wherein:

the envelope comprises a front layer and a back layer;

the charge rests between the front and back layers; and,

the front and back layers of the envelope are independent of the panels forming the

package.

21. The product of claim 5 wherein:

the panels forming the package include a front panel, a back panel and two side panels;

the charge is positioned on an inner surface of the front panel; and,

the envelope comprises a cover blanketed over the charge and sealed to the inner surface of the front panel around the perimeter of the charge such that the charge is securely enveloped between the cover and the inner surface of the front panel.

22. The product of claim 5 wherein:

the panels forming the package include a front panel, a back panel and two side panels;

the charge is positioned an inner surface of the front panel;

the back panel is positioned such the inner surface of the back panel rests adjacent the charge and contacts the inner surface of the front panel around the perimeter of charge; and,

the inner surfaces of the front and back panels are sealed around the charge such that the charge is securely enveloped between the inner surfaces of the front and back panels panel.

23. A microwaveable popcorn product comprising:

a popcorn package comprising multiple panels of flexible, microwave transmissive material joined together to form an inner cavity;

a charge of unpopped microwaveable popcorn kernels deposited on an inner surface of a front panel of the package;

a microwave transmissive cover blanketed over the charge and adhered to an inner surface of the front panel around the charge thereby creating an envelope that contains the between the cover and the front panel that securely contains the charge;

wherein a susceptor capable of converting microwave energy to heat is mounted on the front panel;

wherein the charge is deposited adjacent the susceptor;

wherein the kernels are prone to pop and expand when heated;

wherein the structural constitution of the envelope is strong enough to contain the unpopped kernels yet is weak enough to burst when subjected to the expansion pressure created within the envelope when the kernels pop; and,

wherein the package is sufficiently large and flexible to accommodate the volume of the popped kernels.

24. The product of claim 23 wherein:

the cover is adhered to the inner surface of the front panel with a releasable adhesive, said adhesive having a bonding strength less than that required to contain the expansion pressure

created within the envelope when the kernels are popped;

whereby the cover will separate from the front panel when the kernels are popped.

25. The product of claim 24 wherein the adhesive has a bonding strength which diminishes as the temperature of the adhesive increases, and wherein the adhesive is applied sufficiently close to the susceptor to receive heat from the susceptor, whereby heat generated by the susceptor will accelerate the separation of the cover from the front panel.

26. The product of claim 23 wherein:

the panels forming the package include a front panel, a back panel and two side panels;

the edges of the front panel slightly overlap the edges of the side panels along two lap seams; and,

the lap seams are bonded together by a releasable adhesive having a bonding strength great enough to hold the panels together while the kernels are popped, yet weak enough to permit the front panel to be peeled from the side panels without tearing the panel material;

whereby the front panel and susceptor can be peeled from the remainder of the package after the kernels are popped to provide access to the interior of the package.

27. The product of claim 26 wherein the cover is securely fixed to the back panel whereby the cover will remain attached to the back panel after the front panel has been removed.

28. The product of claim 23 wherein:

the panels forming the package include a front panel, a back panel and two side panels;

the edges of the back panel slightly overlap the edges of the side panels along two lap seams; and,

the lap seams are bonded together by a releasable adhesive having a bonding strength great enough to hold the panels together while the kernels are popped, yet weak enough to permit the front panel to be peeled from the side panels without tearing the panel material;

whereby the back panel can be peeled from the remainder of the package after the kernels are popped to provide access to the interior of the package.

29. The product of claim 28 wherein the cover is securely fixed to the back panel whereby the cover will remain attached to the back panel as the back panel is peeled from the remainder of the package.

30. A microwaveable popcorn product comprising:

a popcorn package comprising multiple panels of flexible, microwave transmissive material joined together to form an inner cavity; and,

a charge of unpopped microwaveable popcorn kernels deposited on an inner surface of a front panel of the package;

wherein an inner surface of the back panels rests adjacent the charge and contacts the inner surface of the front panel around the perimeter of charge;

wherein the inner surfaces of the front and back panels are adhered together around the charge such that an envelope is created between the front and back panels that contains the charge;

wherein a susceptor is mounted on the front panel, said susceptor being capable of converting microwave energy to heat;

wherein the charge is deposited adjacent the susceptor;

wherein the kernels are prone to pop and expand when heated;

wherein the adhesion between the portions of the front and back panels forming the envelope is strong enough to contain the unpopped kernels yet is weak enough to release when the envelope is subjected to internal expansion pressure created when the kernels are popped; and,

wherein the package is sufficiently large and flexible to accommodate the volume of the popped kernels.

31. The product of claim 30 wherein the adhesive that holds the front panel to the back panel around the charge has a bonding strength which diminishes as the temperature of the adhesive increases, and wherein the adhesive is applied sufficiently close to the susceptor to receive heat from the susceptor, whereby heat generated by the susceptor will accelerate the separation of the front and back layers.

32. The product of claim 30 wherein:

the panels forming the package include a front panel, a back panel and two side panels;

the inner surfaces of the front and back panels are lined with a moisture resistant material which forms front and back layers of the envelope respectively.

33. The product of claim 30 wherein:

the panels forming the package include a front panel, a back panel and two side panels;

the edges of the front panel slightly overlap the edges of the side panels along two lap seams; and,

the lap seams are bonded together by a releasable adhesive having a bonding strength great enough to hold the panels together while the kernels are popped, yet weak enough to permit the front panel to be peeled from the side panels without tearing the panel material;

whereby the front panel and susceptor can be peeled from the remainder of the package after the kernels are popped to provide access to the interior of the package.

34. The product of claim 30 wherein:

the panels forming the package include a front panel, a back panel and two side panels;

the edges of the back panel slightly overlap the edges of the side panels along two lap

seams; and,

the lap seams are bonded together by a releasable adhesive having a bonding strength great enough to hold the panels together while the kernels are popped, yet weak enough to permit the back panel to be peeled from the side panels without tearing the panel material;

whereby the back panel can be peeled from the remainder of the package after the kernels are popped to provide access to the interior of the package.

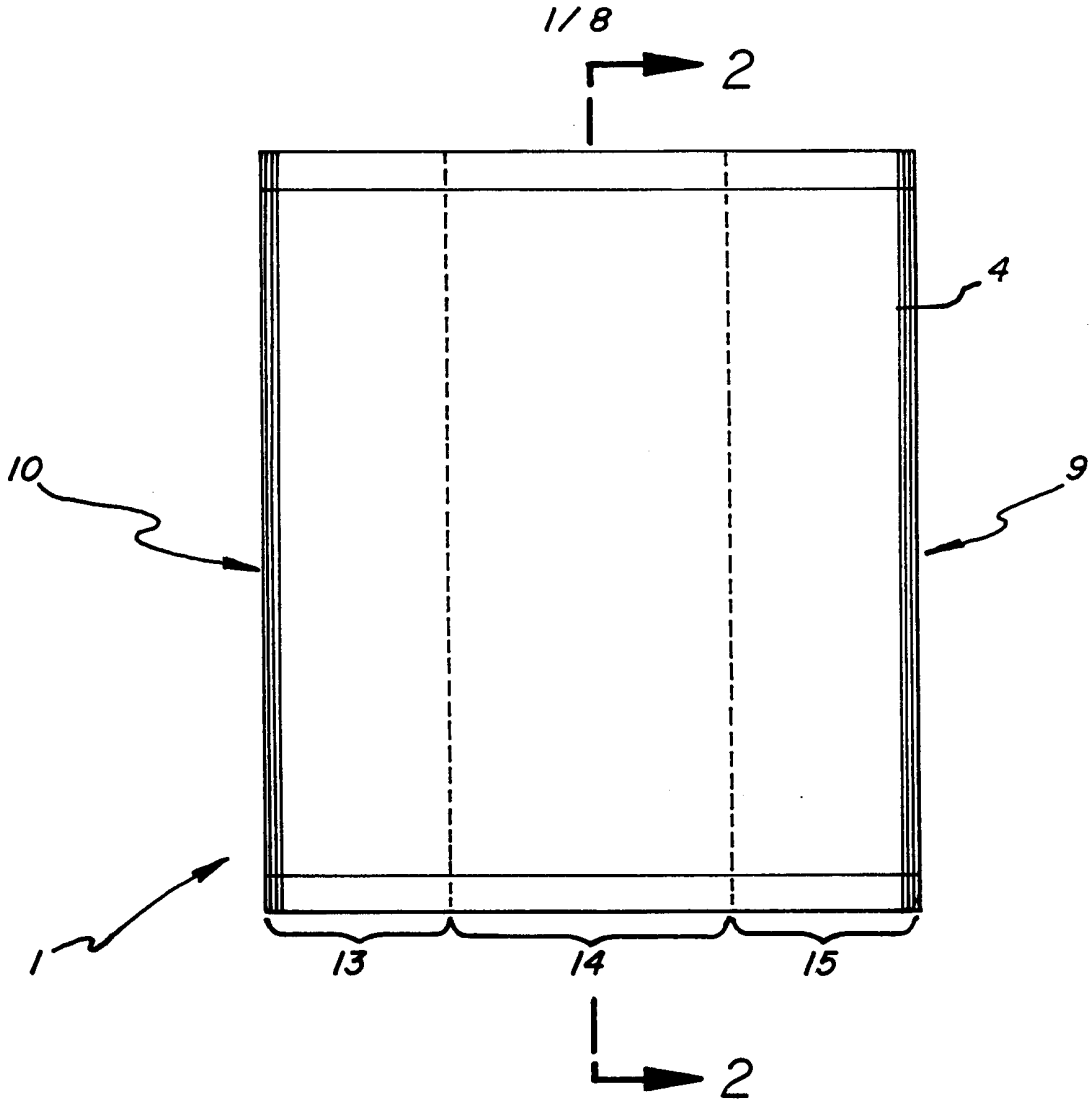

FIG. 1

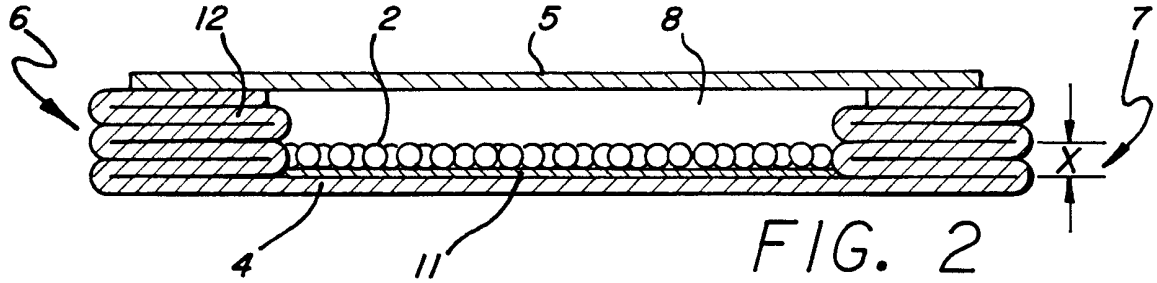

FIG. 2

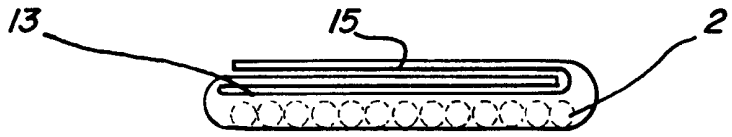

FIG. 3

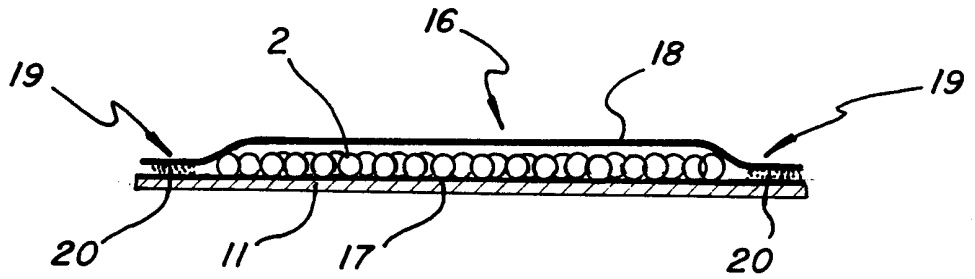

FIG. 4

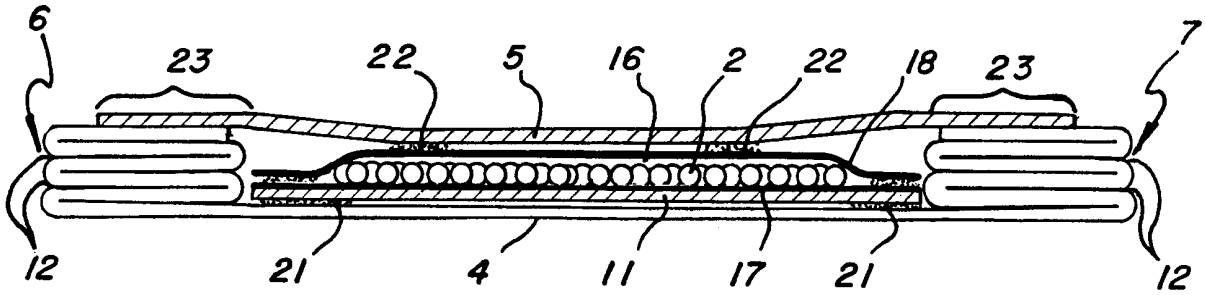

FIG. 5

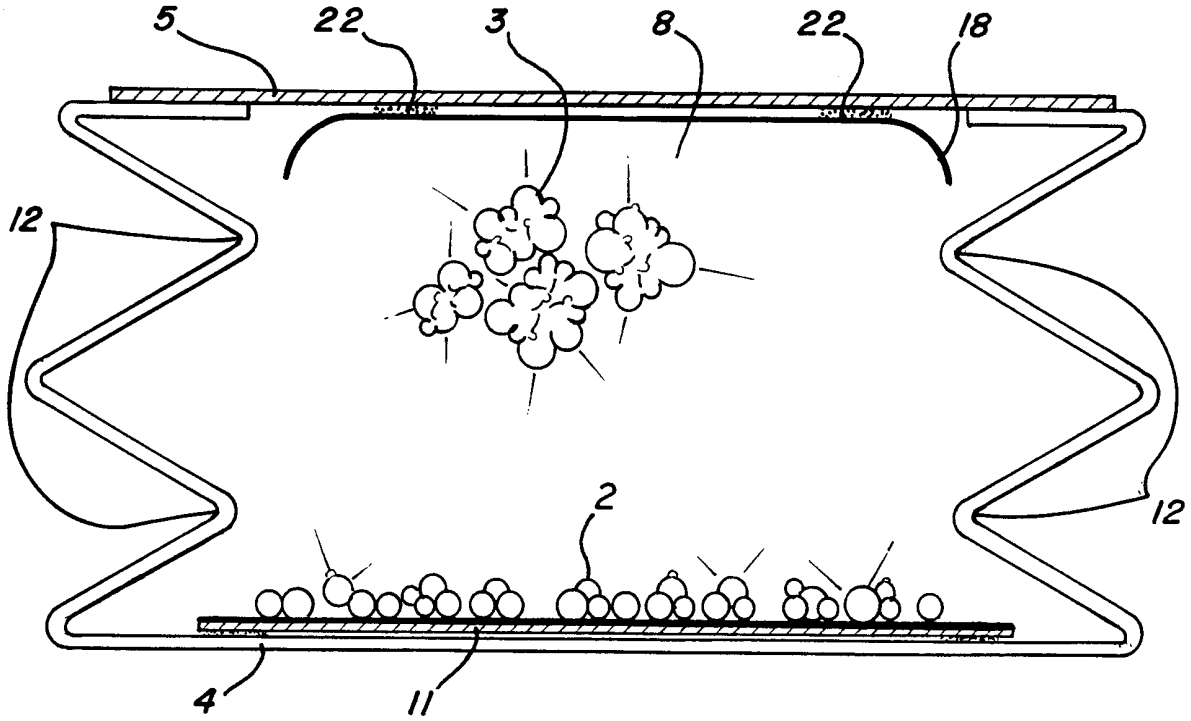

FIG. 6

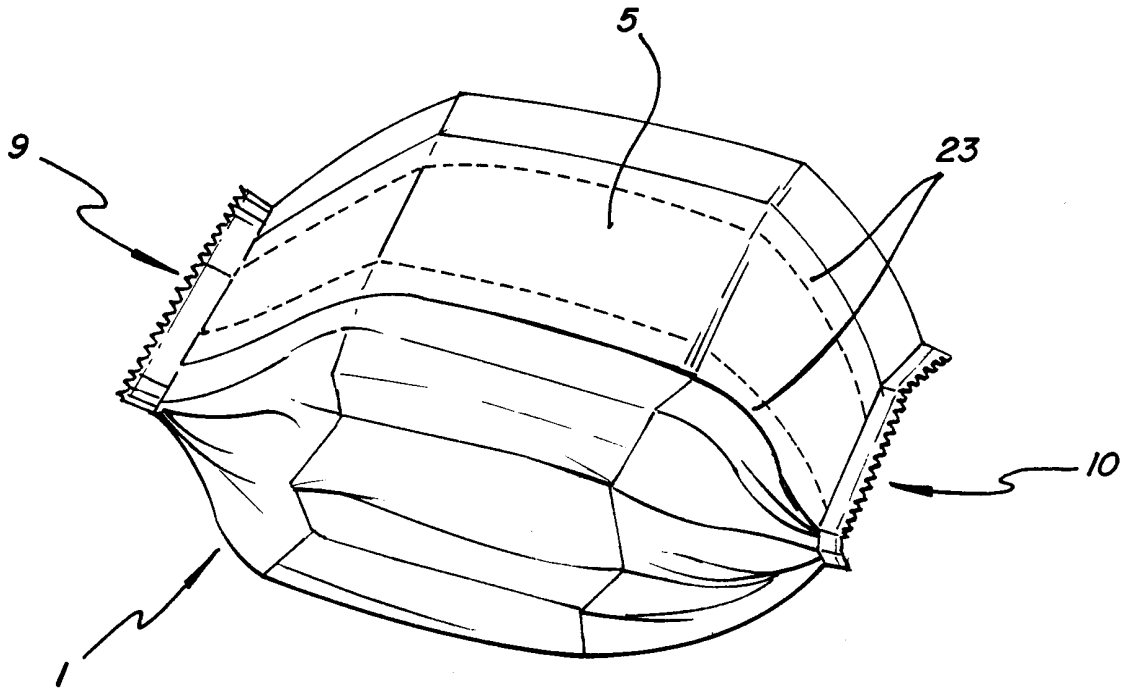

FIG. 7

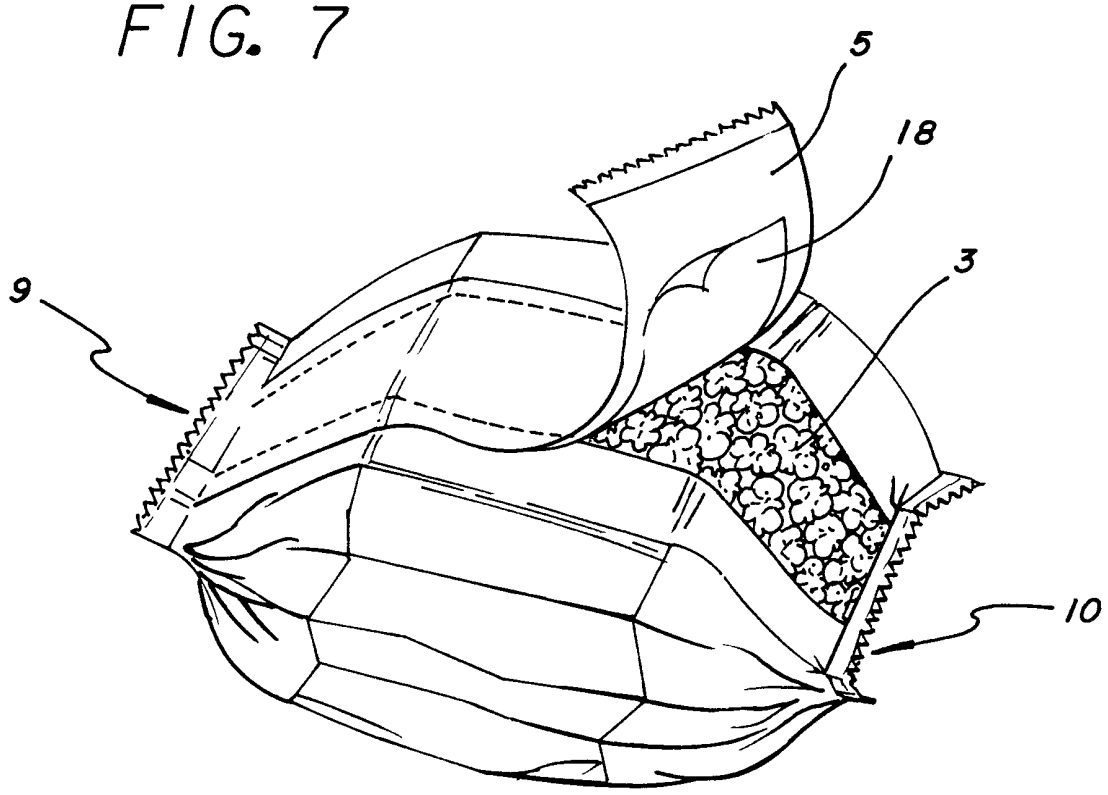

FIG. 8

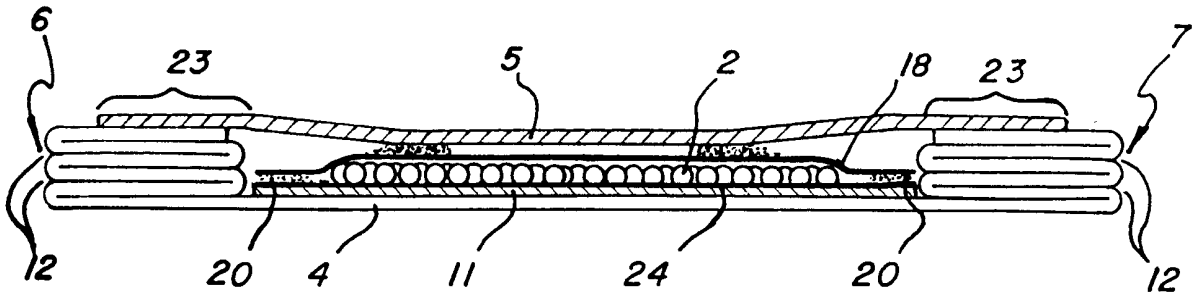

FIG. 9

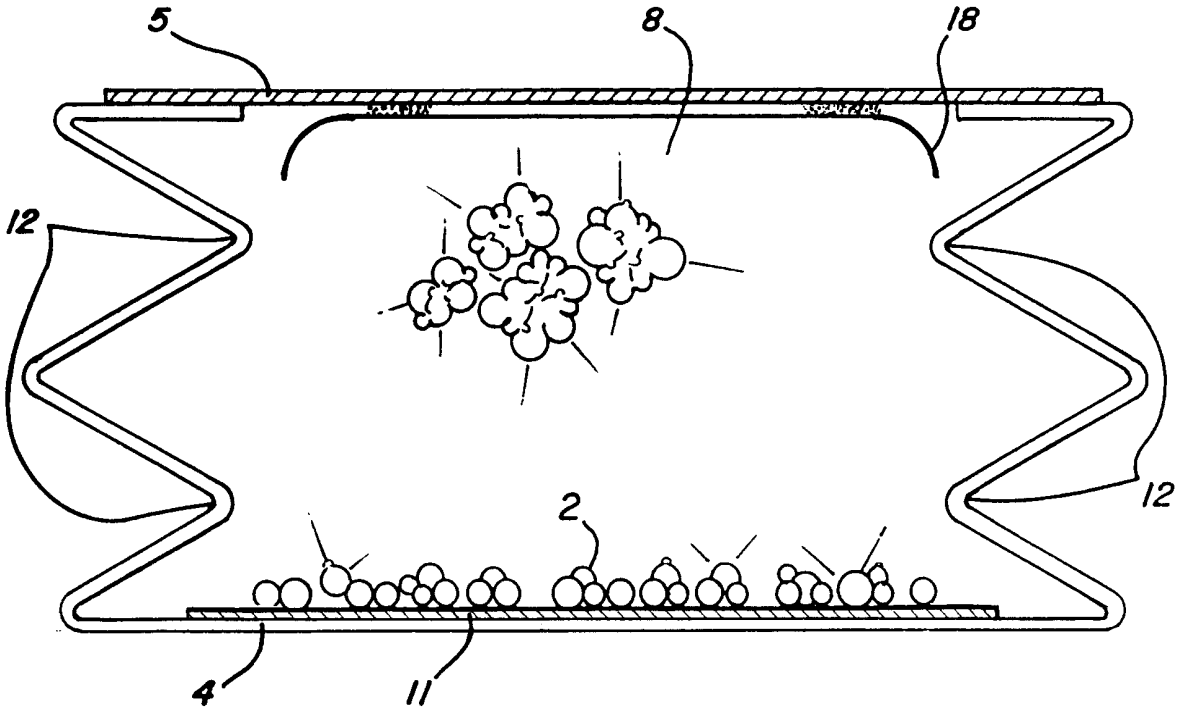

FIG. 10

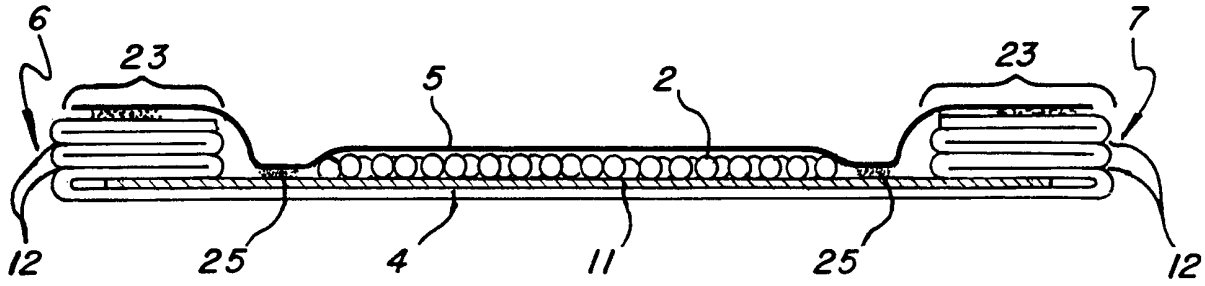

FIG. 11

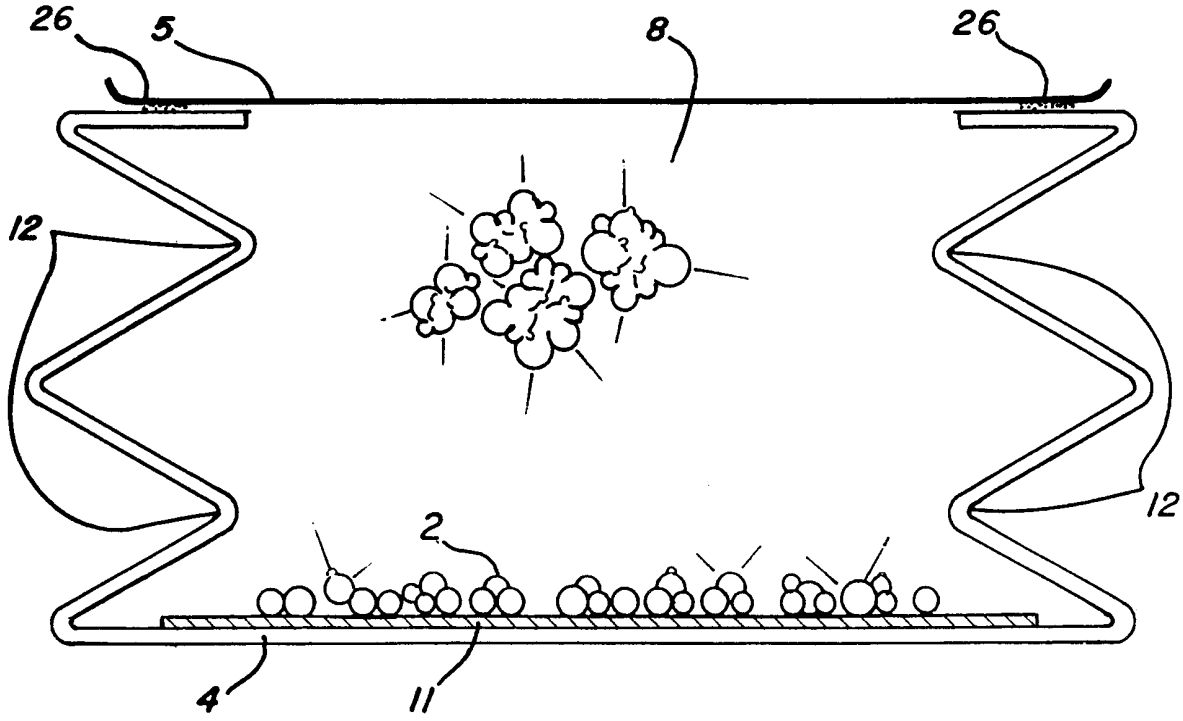

FIG. 12

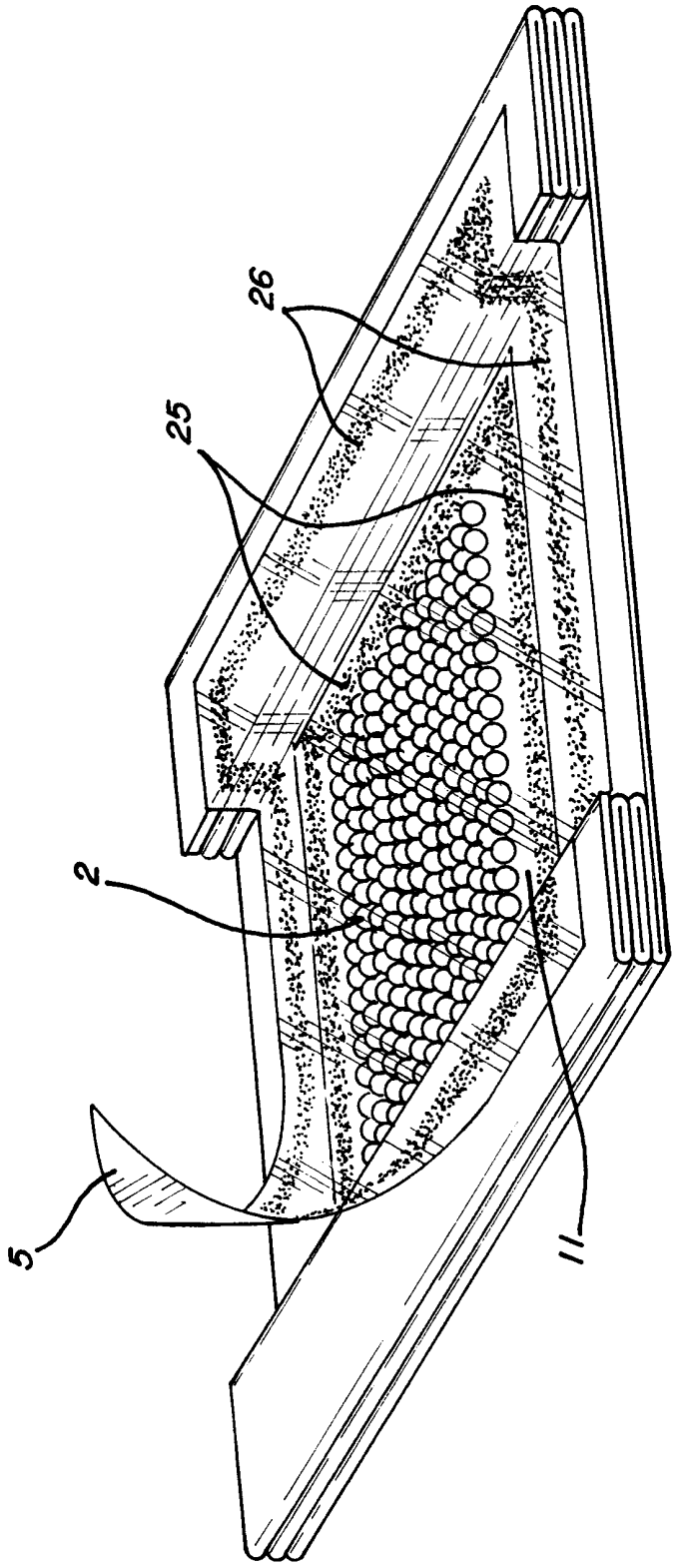

FIG. 13

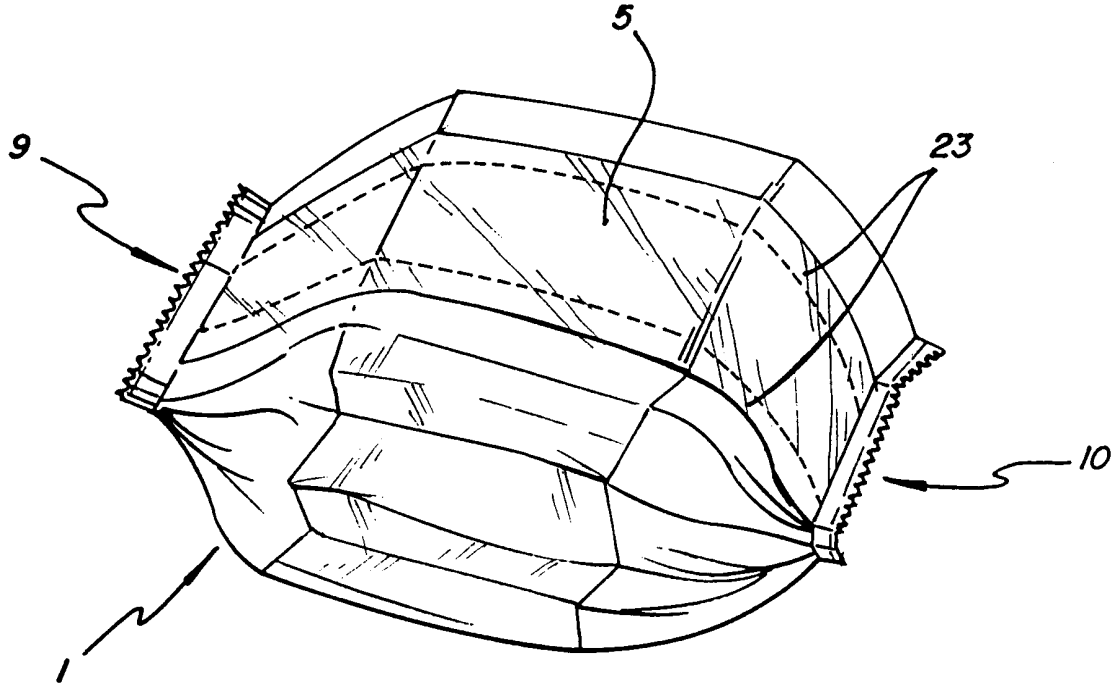

FIG. 14

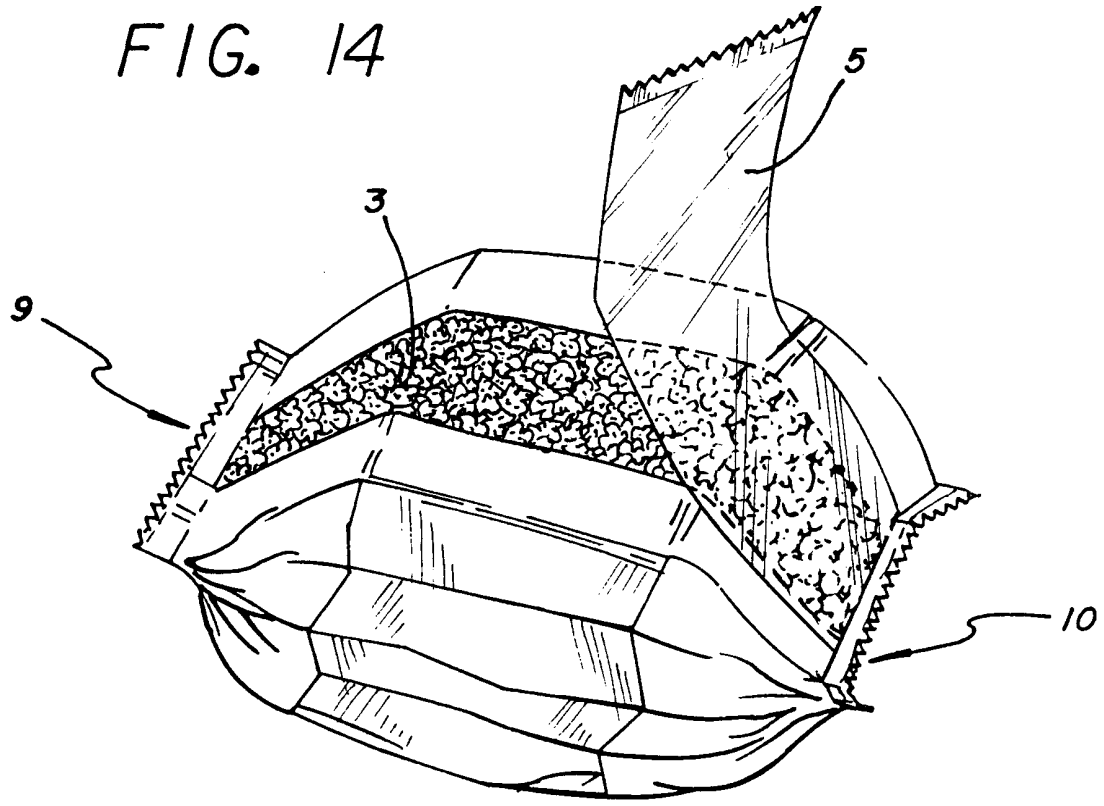

FIG. 15

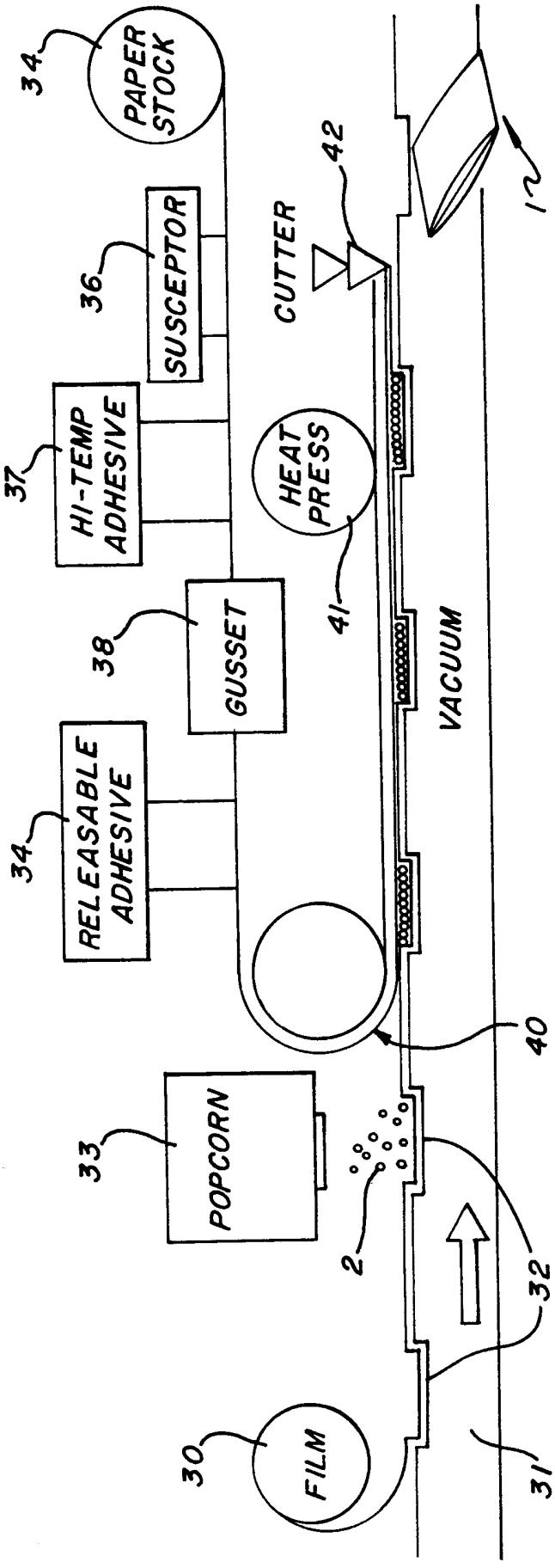
34
PAPER STOCK
36
SUSCEPTOR
37
HI-TEMP ADHESIVE
38
GUSSET
34
RELEASABLE ADHESIVE
33
POPCORN
30
FILM
2
CUTTER
42
HEAT PRESS
41
VACUUM
40
32
31
12

FIG. 16