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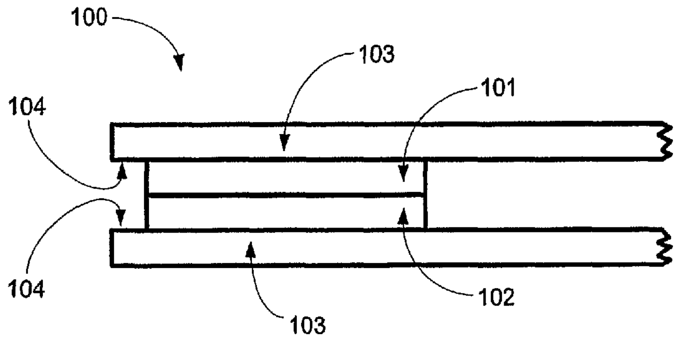
**(54) Title:** COHESIVE RECLOSURE SYSTEMS AND CONTAINERS USING SAME



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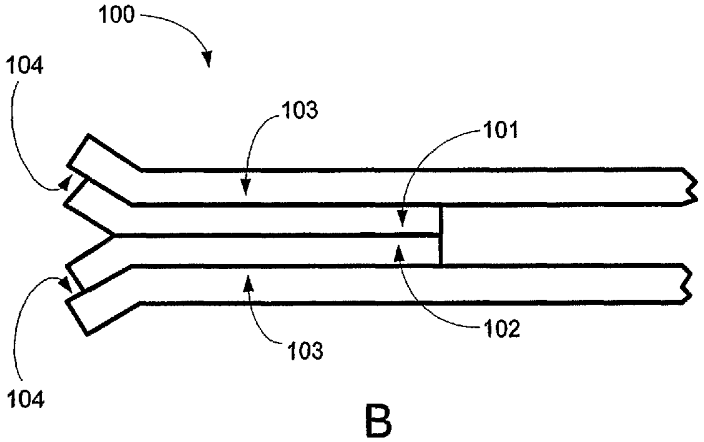

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**(57) Abstract:** This invention relates to resealable closure systems that are useful in containers, such as those used in packaging goods. The reclosure system features cohesive layers which are bonded to each other to provide a resealable closure. The cohesive bond layers are separable to provide opening of the container and access to the interior of the container and/or contents. The cohesive layers have low blocking characteristics. The reclosure systems are useful for flexible packaging, such as polymeric film and cloth packages, and rigid packaging, such as fiberboard, cardboard, paper, and polymeric foam. The reclosure systems may be opened and resealed multiple times. The closure system is resistance to contamination by oils, debris, solvents, and water. The reclosure is cold sealable with finger pressure.

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# Title: COHESIVE RECLOSURE SYSTEMS AND CONTAINERS USING SAME

This application claims the priority to provisional application Serial No. 60/493,090 filed on August 6, 2003, the content of which is hereby incorporated by reference in its entirety.

## Field of the Invention

This invention relates to reclosure systems for containers. The reclosure system comprises at least one cohesive reclosure that provides for the ability of the containers to be opened and closed multiple times.

## Background of the Invention

Product packaging having reclosure mechanisms are often employed for packaging products in applications where the consumer may wish to remove only a portion of the product and to reclose the package. Particularly with baked goods, which readily dry out if left exposed to the atmosphere, there is a significant interest on the part of the product manufacturers for easily and inexpensively produced packaging that can be repeatedly opened and reclosed. Flexible packaging produced from flexible sheet materials are generally favored for reasons of cost, functionality, and marketing appeal.

Various types of reclosure mechanisms have been developed for reclosing a flexible package to keep unused portions of a food product fresh. Many of these mechanisms are separately manufactured articles that are added to the package either in a subsequent manufacturing step or by the consumer, such as zippers, reclosure tapes or tabs, seal strips, clips, and the like. However, such mechanisms are disadvantageous because they necessitate additional manufacturing operations and materials, thus increasing manufacturing cost. Accordingly, efforts have been made toward developing adhesive-based reclosure mechanisms for flexible packages. Such packaging is readily produced on automated flexible web-handling machinery, and the only component required is the flexible web to which adhesive has already been applied during the manufacturing process for the web.

The challenge in making a reclosure mechanism that relies on adhesive for resealing is that an adhesive that is suitable for forming the original package seal, e.g., one having sufficient strength and integrity to prevent inadvertent opening of the package and to keep the product fresh during handling and shipment, is generally different from the type of adhesive that is desirable from a resealing point of view.

Pressure-sensitive adhesives have been used to make containers resealable. The pressure sensitive adhesive may be repeatedly removed and reattached to suitable substrates and thus provide reclosure capabilities. However, pressure-sensitive adhesives do not provide sufficient closure strength to form reliable original package seals in many applications. Furthermore, because pressure-sensitive adhesives are inherently tacky and will adhere to almost any surface to which they come in contact, automated handling of sheets or webs having pressure-sensitive adhesives applied thereto is difficult. For example, the pressure-sensitive adhesive may become adhered to the rollers of an apparatus, a problem known in the industry as "picking." Additionally, the web may stick to itself when it is wound into a roll and stored prior to being used, a problem known as "blocking."

A need exists for a reclosure system that will be able to provide sufficient resealable bond strength after container opening and provide sufficient antiblocking.

## Summary of the Invention

This invention relates to cohesive reclosure systems that are useful in containers, such as those used in packaging goods. The reclosure system features cohesive layers that are bonded to each other to provide a resealable closure. The cohesive bond layers are separable to provide opening of the container and access to the interior of the container and/or contents. The cohesive layers have low blocking characteristics. The reclosure systems are useful for flexible packaging, such as polymeric film and cloth packages, and rigid packaging, such as fiberboard, cardboard, paper, and polymeric foam. The reclosure systems may be opened and resealed multiple times. The closure system may be resistant to contamination by oils, debris, solvents, and water. The reclosure may be cold sealable with finger pressure.

In one aspect of the invention, the cohesive reclosure comprises at least one cohesive layer comprising styrene-isobutylene-styrene copolymer and at least one cohesive target, wherein the cohesive layer is repeatedly removable and adherable to the cohesive target. The cohesive target ay be a second cohesive layer. In one embodiment, the cohesive target is the package itself.

In another aspect, the invention is directed to a method of making a resealable package comprising: applying a cohesive layer comprising a styrene-isobutylene-styrene copolymer to a first sealing surface of the package; providing a cohesive target on a second sealing surface of the package; wherein the cohesive layer is repeatedly removable and adherable to the cohesive target. In one embodiment, the cohesive layer is extruded onto the first sealing surface of the package.

## Brief Description of the Drawings

Figs. 1A and 1B are cross sectional views of one embodiment of the reclosure system.

Figs. 2A and 2B are cross sectional views of one embodiment of the reclosure system.

Figs. 3A and 3B are cross sectional views of one embodiment of the reclosure system.

Figs. 4, 5 and 6 are illustrations of a packing envelope with the cohesive reclosure of the present invention.

Fig. 7 is an illustration of a bag, such as a sandwich bag or other lay flat bag, having the cohesive reclosure of the present invention.

Fig. 8 is an illustration of a stand up bag with the cohesive reclosure of the present invention.

Figs. 9 and 10 are illustrations of boxes having the cohesive reclosure of the present invention.

Fig. 11 is an illustration of a vacuum/ shrink-wrap bag with the cohesive reclosure of the present invention.

Fig. 12 is an illustration of a stand up rigid container having the cohesive reclosure of the present invention.

Fig. 13 is an illustration of a stand up bag having the cohesive reclosure of the present invention.

Fig. 14 is an illustration of a food storage container having the cohesive reclosure of the present invention.

Figs. 15A and 15B are illustrations of a food storage container with the cohesive reclosure of the present invention.

Figs. 16A and 16B are illustrations of a cover with cohesive layers on opposing sides and surfaces which form a sleeve when rolled and cohesively sealed.

Figs. 17A and 17B are illustrations of covers for personal electronic devices with the cohesive reclosure of the present invention.

Fig. 17C is an expanded cross sectional view within the dashed box of the cohesive closure of the personal electronic device.

Figs. 18A and 18B are illustrations of pencil or disk containers with the cohesive reclosure of the present invention.

Figs. 19A, 19B, 20A and 20B are illustrations of personal care bags with the cohesive foldover reclosure of the present invention.

Figs. 20A and 20B are illustrations of personal care bags with a protruding cohesive reclosure.

## Detailed Description of the Preferred Embodiments

In one embodiement, the reclosure systems utilize two layers of cohesive material. The reclosure systems provide a way of sealing and resealing the container through the use of two cohesive layers. The cohesive layers are bonded directly to each other and separate to provide access to the containers and then resealed with pressure, typically finger pressure. The separation of the cohesive layer is accomplished without destruction of the containers or any other layers of the reclosure system, if present.

In one embodiment, the reclosure system is made up of two layers of cohesive material applied along the edges of two opposing surfaces of a container. Opposing surfaces of a container are those which are brought into contact to close or seal the container. For example, in a simple pouch, the non-sealed edges of the pouch have two surfaces that are brought together to seal the pouch. Those two surfaces are the opposing surfaces. For a box, the opposing surfaces are those portions of the lid or lids which close the box.

In another embodiment, the reclosure system is a multilayer construction containing two layers of cohesive material resealably adhered. The multilayer construction may contain additional carrier layers, such as cloth, paper or polymeric carrier layers, and adherent layers, such as adhesive or heat seal layers. The closures are discussed further below.

In yet another embodiment, the reclosure system is made up of a single cohesive layer that is permanently adhered to a first sealing edge of a package. The cohesive layer may be directly adhered to the sealing edge, or may be adhered to the sealing edge through a carrier layer positioned between the sealing edge and the cohesive layer. To repeatedly seal and reopen the package, the cohesive layer on the first sealing edge removably contacts and adheres to a cohesive target on a second sealing edge of the package. The cohesive target may be a second cohesive layer, or may be a portion of the package itself. Where the package is made of a flexible polymeric film, for example, a polyolefin film, the cohesive target may be any region of the package to which the cohesive layer will adhere to seal the package.

## Cohesive Materials

The cohesive layers are typically prepared from polymers that have cohesive properties. Cohesive property is the property of adhering to material of like nature and is known to those in the art. The cohesive is typically nonadhesive to dissimilar materials. These polymers are know as cohesive or autoadhesive polymers. The cohesive layers are typically a thermoplastic elastomer material having cohesive properties at room temperature. The cohesive materials are characterized by physical cross-links which are labile and therefore may be rendered ineffective by processing techniques involving the application of heat.

In one embodiment, the cohesive layers each have a thickness of about 0.5 to about 200, or about 2 to about 100, or about 4 to about 50 microns. It should be noted that this thickness is for both cohesive layers. Generally the cohesive layers will have an equal thickness although it is not required they have the same thickness.

The cohesive materials may be natural or synthetic rubbers and are known to those in the art. Examples of useful synthetic rubbers include styrenic rubbers, ethylene propylene rubbers, and mixtures thereof.

Cohesive materials include multiblock copolymers of radial, triblock and diblock structures including non-rubbery segments of mono- and polycyclic aromatic hydrocarbons, and more particularly, mono- and polycyclic arenes. Illustrative mono- and polycyclic arenes include substituted and unsubstituted poly(vinyl)arenes of monocyclic and bicyclic structure. In one embodiment, the cohesive materials include non-rubbery segments of substituted or unsubstituted monocyclic arenes of sufficient segment molecular weight to assure phase separation at room temperature.

In one embodiment, the cohesive material comprises at least one rubber based elastomer material. The rubber elastomer comprises linear, branched, or radial block copolymers represented by the diblock structure A--B, the triblock A--B--A, the radial or coupled structures $(A\text{--}B)_n$, and combinations of these where A represents a hard thermoplastic phase or block that is non-rubbery or glassy or crystalline at room temperature but fluid at higher temperatures, and B represents a soft block which is rubbery or elastomeric at service or room temperature. The cohesive materials may comprise from about 75% to about 95% by weight of rubbery segments and from about 5% to about 25% by weight of non-rubbery segments.

The non-rubbery segments or hard blocks comprise polymers of mono- and polycyclic aromatic hydrocarbons, and more particularly vinyl-substituted aromatic hydrocarbons which may be monocyclic or bicyclic in nature. Useful rubbery blocks or segments are polymer blocks of homopolymers or copolymers of aliphatic conjugated dienes. Rubbery materials such as polyisoprene, polybutadiene, and styrene butadiene rubbers may be used to form the rubbery block or segment. Particularly useful rubbery segments include polydienes and saturated olefin rubbers of ethylene/butylene or ethylene/propylene copolymers. The latter rubbers may be obtained from the corresponding unsaturated polyalkylene moieties such as polybutadiene and polyisoprene by hydrogenation thereof.

The block copolymers of vinyl aromatic hydrocarbons and conjugated dienes that may be utilized include any of those that exhibit elastomeric properties. The block copolymers may be diblock, triblock, multiblock, starblock, polyblock or combinations thereof. Throughout this specification and claims, the terms diblock, triblock, starblock, multiblock, and polyblock with respect to the structural features of block copolymers are to be given their normal meaning as defined in the literature, such as in the Encyclopedia of Polymer Science and Engineering, Vol. 2, (1985) John Wiley & Sons, Inc., New York, pp. 325-326, and by J. E. McGrath in Block Copolymers, Science Technology, Dale J. Meier, Ed., Harwood Academic Publishers, 1979, at pages 1-5.

Such block copolymers may contain various ratios of conjugated dienes to vinyl aromatic hydrocarbons including those containing up to about 40% by weight of vinyl aromatic hydrocarbon. Accordingly, useful multi-block copolymers may be linear or radial symmetric or asymmetric and may have structures represented by the formulae A--B, A--B--A, A--B--A--B, B--A--B, $(AB)_{0,1,2}\ldots BA$, etc., wherein A is a polymer block of a vinyl aromatic hydrocarbon or a conjugated diene/vinyl aromatic hydrocarbon tapered copolymer block, and B is a rubbery polymer block of a conjugated diene.

The block copolymers may be prepared by any of the well-known block polymerization or copolymerization procedures including sequential addition of monomer, incremental addition of monomer, or coupling techniques as illustrated in, for example, U.S. Pat. Nos. 3,251,905; 3,390,207; 3,598,887; and 4,219,627. Tapered copolymer blocks can be incorporated in the multi-block copolymers by copolymerizing a mixture of conjugated diene and vinyl aromatic hydrocarbon monomers utilizing the difference in their copolymerization reactivity rates.

Various patents describe the preparation of multi-block copolymers containing tapered copolymer blocks, including U.S. Pat. Nos. 3,251,905; 3,639,521; and 4,208,356, the disclosures of which are hereby incorporated by reference.

Conjugated dienes that may be utilized to prepare the polymers and copolymers are those containing from 4 to about 10 carbon atoms and more generally, from 4 to 6 carbon atoms. Examples include from 1,3-butadiene, 2-methyl-1,3-butadiene(isoprene), 2,3-dimethyl-1,3-butadiene, chloroprene, 1,3-pentadiene, 1,3-hexadiene, etc. Mixtures of these conjugated dienes also may be used. The preferred conjugated dienes are isoprene and 1,3-butadiene.

Examples of vinyl aromatic hydrocarbons which may be utilized to prepare the copolymers include styrene and the various substituted styrenes such as o-methylstyrene, p-methylstyrene, p-tert-butylstyrene, 1,3-dimethylstyrene, alpha-methylstyrene, beta-methylstyrene, p-isopropylstyrene, 2,3-dimethylstyrene, o-chlorostyrene, p-chlorostyrene, o-bromostyrene, 2-chloro-4-methylstyrene, etc. The preferred vinyl aromatic hydrocarbon is styrene.

Many of the above-described copolymers of conjugated dienes and vinyl aromatic compounds are commercially available. The number average molecular weight of the block copolymers, prior to hydrogenation, is from about 20,000 to about 500,000, or from about 40,000 to about 300,000. Here and elsewhere in the specification and claims, the range and ratio limits may be combined.

The average molecular weights of the individual blocks within the copolymers may vary within certain limits. In most instances, the vinyl aromatic block will have a number average molecular weight in the order of about 2000 to about 125,000, and or between about 4000 and 60,000. The conjugated diene blocks either before or after hydrogenation will have number average molecular weights in the order of about 10,000 to about 450,000 and or from about 35,000 to 150,000.

Also, prior to hydrogenation, the vinyl content of the conjugated diene portion generally is from about 10% to about 80%, and the vinyl content is typically from about 25% to about 65%, or from about 35% to about 55% when it is desired that the modified block copolymer exhibit rubbery elasticity. The vinyl content of the block copolymer can be measured by means of nuclear magnetic resonance.

Specific examples of diblock copolymers include styrene-butadiene (SB), styrene-isoprene (SI), and the hydrogenated derivatives thereof. Examples of triblock polymers include styrene-butadiene-styrene (SBS), styrene-isoprene-styrene (SIS), styrene-isobutylene-styrene (SIBS), alpha-methylstyrene-butadiene-alpha-methylstyrene, and alpha-methylstyrene-isoprene alpha-methylstyrene. Examples of commercially available block copolymers useful as the cohesives in the present invention include those available from Shell Chemical Company and include Styrene/Rubber Kraton D1101 (Linear SBS), D1107P (Linear SIS), D1111 (Linear SIS), D1112P (Linear SIS), D1113P (Linear SIS), D1117P (Linear SIS), and D1320X (Multi-arm (SI)n). Also useful are the SIBS triblocks SIBSAR 102T and SIBSAR 072T available from Kaneka Corporation of Japan.

Upon hydrogenation of the SBS copolymers comprising a rubbery segment of a mixture of 1,4 and 1,2 isomers, a styrene-ethylene-butylene styrene (SEBS) block copolymer is obtained. Similarly, hydrogenation of an SIS polymer yields a styrene-ethylene propylene-styrene (SEPS) block copolymer.

The selective hydrogenation of the block copolymers may be carried out by a variety of well-known processes including hydrogenation in the presence of such catalysts as Raney nickel, noble metals such as platinum, palladium, etc., and soluble transition metal catalysts. Suitable hydrogenation processes that can be used are those wherein the diene-containing polymer or copolymer is dissolved in an inert hydrocarbon diluent such as cyclohexane and hydrogenated by reaction with hydrogen in the presence of a soluble hydrogenation catalyst. Such procedures are described in U.S. Pat. Nos. 3,113,986 and 4,226,952, the disclosures of which are incorporated herein by reference. Hydrogenation of the block copolymers may be carried out in a manner and to an extent as to produce selectively hydrogenated copolymers having a residual unsaturation content in the polydiene block of from about 0.5% to about 20% of their original unsaturation content prior to hydrogenation.

In one embodiment, the conjugated diene portion of the block copolymer is at least 90% saturated and more often at least 95% saturated while the vinyl aromatic portion is not significantly hydrogenated. Particularly useful hydrogenated block copolymers are hydrogenated products of the block copolymers of styrene--isoprene-styrene such as a styrene-(ethylene/propylene)-styrene block polymer. When a polystyrene-polybutadiene-polystyrene block copolymer is hydrogenated, it is desirable that the 1,2-polybutadiene to 1,4-polybutadiene ratio in the polymer is from about 30:70 to about 70:30. When such a block copolymer is hydrogenated, the resulting product resembles a regular copolymer block of ethylene and 1-butene (EB). As noted above, when the conjugated diene employed as isoprene, the resulting hydrogenated product resembles a regular copolymer block of ethylene and propylene (EP).

In one embodiment, the cohesive material comprises SEBS block copolymers sold by the Shell Chemical Company under the designations KRATON G1650, G1652 and G1657. KRATON G1650 and G1652 and are primarily of triblock structure having a styrene/rubber ratio of about 30/70. KRATON G1657 is a mixture of triblock and diblock structures in about a 70/30 ratio and has a styrene/rubber ratio of about 13/87.

In one embodiment, the cohesive material comprises an ethylene propylene rubber or EP rubber. The materials are also known as EPM and EPDM rubbers. These materials are known to those in the art. The ethylene-propylene rubbers include ethylene propylene copolymers including random copolymers, and terpolymers of ethylene and propylene with nonconjugated dienes, such as those described above, and particularly 5-ethyldiene-2-norbornene, 1,8 octadiene, 1,4 hexadiene cyclopentadiene (EPDM) and the like. EPDM rubbers are commercially available from Exxonmobil under the tradename Vistalon.

In one embodiment, the cohesive materials contains less than 5%, or less than 1% by weight tackifier. In another embodiment, the cohesive material is free of tackifier. In one embodiment, the cohesive material contains less than 5%, or less than 1% by weight plasticizer. In another embodiment, the cohesive material is free of plasticizer. In one embodiment, the cohesive materials contain less than 5%, or less than 1% by weight of polyurethane. In one embodiment, the cohesive materials are free of polyurethane. In another embodiment, the composition contains less than 5%, or less than 1% by weight of polymers of styrene and acrylic or methacrylic acids or esters. In one embodiment, the cohesive material is free of polymers of styrene and acrylic or methacrylic acids or esters. In one embodiment, the cohesive materials contain less than 5% by weight, or less than 1% by weight of a polymer derived from vinyl pyrrolidone. These polymers include homopolymers as well as copolymers. In one embodiment, the cohesive material is free of any polymers derived from vinyl pyrrolidone.

In one embodiment, the cohesive layer comprises a styrene-isobutylene-styrene (SIBS) block copolymer. The cohesive composition may comprise at least 50% by weight, based on the total weight of the cohesive composition, of SIBS copolymer. In one embodiment the SIBS content is at least 60% by weight, or at least 70% by weight, or at least 80% by weight, or at least 90% by weight. One or more other block copolymers may be blended with the SIBS copolymer in the cohesive composition. For example, the cohesive composition may comprise a blend of SIBS and SEBS (styrene-ethylene-butylene-styrene) block copolymers.

The cohesive layers may be present as a reclosure having only cohesive layers or a multilayer construction having cohesive layers and adherent layers. In one embodiment, the cohesive material is coextruded with a carrier layer, which is then adhered to the packaging material. The cohesive material may be applied in a strip directly to the sealing surface of the package. The cohesive material may be applied by coating, extruding, brushing or spraying onto the package surface. Figs. 1A and 1B illustrate the resealable cohesive reclosure having only cohesive layers. The reclosure 100 has cohesive layers 101 and 102 which are adhered to opposing surfaces of a container illustrated by layers 103. The cohesive layers 101 and 102 are bonded to the container layers 103 in such a manner to provide a lift or separator tab 104. This tab may be conveniently formed by portions of the container which extend beyond the bonded area of the cohesive layers 101 and 102. These tabs provide means for separating the cohesive layers. The bond strengths between the cohesive layers 101 and 102 and the container 103 are greater than the bond strength between the cohesive layers 101 and 102. When the container layers are separated, the cohesive layers 101 and 102 separate and the interior of the container is accessible. As illustrated in Fig. 1B, the separation of cohesive layers 101 and 102 is shown. The separation of the cohesive layers 101 and 102 is effected by use of exerting a separating force on lift tabs 104 of the container 103. When desired, by pressing the cohesive layers 101 and 102 together, the container is re-closed. In one embodiment, the cohesive layers cover a length of greater than 50% of the distance which is the widest distance across the container parallel to the sealing edge. In one embodiment, the cohesive layers have a length that is equal to the sealing edge. The sealing edge is the edge of the container nearest the opposing surfaces which when sealed closes the container.

In one embodiment, the reclosure comprises a single layer of cohesive material that is removably adhered to a target region on the container. In this embodiment, the target region of the container is polymeric and similar in nature to the composition of the cohesive material such that the cohesive material will releasably adhere to the target region without the use of a second cohesive layer. For this embodiment, in Fig 1, as well as in Figs 2-20, where the second cohesive layer is illustrated, the target region of the container would be positioned.

In another embodiment, the reclosure is a multilayer construction having two cohesive layers and a carrier layer. As shown in Fig 2A, cohesive layers 201 and 202 are adhered to carrier layers 203 and 204. The carrier layers 203 and 204 are adhered to container 205. As shown in Fig. 2A, portions of the container 205 extend beyond the cohesive reclosure. The portions that extend beyond form lift tabs 206. By exerting a force to separate lift tabs 206, the cohesive reclosure is opened.

Fig. 2B illustrates the opening of the reclosure. Container 200 has cohesive layers 201 and 202 which are adhered to carrier layers 203 and 204. The carrier layers 203 and 204 are adhered to the walls of container 205. The bond strength between the cohesive layers 201 and 202 is less than the bond strengths between (a) cohesive layer 201 and carrier layer 203; (b) cohesive layer 202 and carrier layer 204; (c) carrier layer 203 and container wall 205; and (d) carrier layer 204 and the carrier wall 205. By exerting outward force on the lift tabs 206, the reclosure separates along cohesive layers 201 and 202.

### Carrier Layers

The carrier layers may be any material that adheres to the cohesive material at a bond strength greater than the bond strength between the cohesive layers. In one embodiment, the carrier layer has a thickness of about 2 to about 500, or from about 10 to about 125 or from about 20 to about 80 microns. The carrier layers may be comprised thermoplastic materials. The thermoplastic material layer may comprise a wide range of polymers, copolymers, interpolymers and blends thereof selected to meet the end use application. Illustrative thermoplastics that may be used alone or in blends include polyolefins such a polyethylene, polypropylene and polybutylene, thermoplastic polyesters, polyamides such as nylon, polysulfones, acrylic polymers such as polyethylene methyl polyacrylic acid, polyethylene ethyl acrylate and polyethylene methyl acrylate, polystyrene, polyurethanes, polycarbonates, halogenated polymers such as polyvinylchloride and polyvinylidene chloride, cellulosics, polyacrylonitriles, and ionomers based on sodium or zinc salts of ethylene/methacrylic acid.

The polyolefins include polymers and copolymers of ethylene, propylene, 1-butene, etc., or blends of such polymers and copolymers. In one embodiment, the polyolefin comprises propylene homopolymers, and copolymers such as propylene-ethylene and propylene-1-butene copolymers. Blends of polypropylene and polyethylene with each other, or blends of either or both of them with polypropylene-polyethylene copolymer also are useful. In another embodiment, the polyolefin film materials are those with a very high propylenic content, either polypropylene homopolymer or propylene-ethylene copolymers or blends of polypropylene and polyethylene with low ethylene content, or propylene-1-butene copolymers or blend of polypropylene and poly-1-butene with low butene content.

Various polyethylenes can be utilized as the carrier layer including low, medium, and high density polyethylenes, and mixtures thereof. An example of a useful low density polyethylene (LDPE) is REXENE™ 1017 available from Huntsman. An example of a useful high density polyethylene (HDPE) is Formoline LH5206 available from Formosa Plastics. In one embodiment, the polymer film material comprises a blend of about 80% to about 90% HDPE and about 10-20% of LDPE.

The propylene homopolymers that can be utilized as the carrier layer in the invention, either alone, or in combination with a propylene copolymer as described herein, include a variety of propylene homopolymers such as those having melt flow rates (MFR) from about 0.5 to about 45, or from about 2 to about 20 as determined by ASTM Test D 1238. In one embodiment, propylene homopolymers having MFR's of less than about 10, or from about 4 to about 9 are particularly useful. Useful propylene homopolymers also may be characterized as having densities in the range of from about 0.88 to about 0.92 g/cm$^3$. A number of useful propylene homopolymers are available commercially from a variety of sources, including 5A97, available from Union Carbide and having a melt flow of 12.0 g/10 min and a density of 0.90 g/cm$^3$; DX5E66, also available from Union Carbide and having an MFI of 8.8 g/10 min and a density of 0.90 g/cm$^3$; and WRD5-1057 from Union Carbide having an MFI of 3.9 g/10 min and a density of 0.90 g/cm$^3$. Useful commercial propylene homopolymers are also available from Fina, Basell Polyolefins and Montel.

In one embodiment, propylene copolymers may be used as the carrier layer. These propylene copolymers generally comprise copolymers of propylene and up to about 40% by weight of at least one alpha-olefin selected from ethylene and alpha-olefins containing from 4 to about 8 carbon atoms. Examples of useful alpha-olefins include ethylene, 1-butene, 1-pentene, 4-methyl-1-pentene, 1-hexene, 1-heptene, and 1-octene. More often, the copolymers of propylene that are utilized in the present invention comprise copolymers of propylene with ethylene, 1-butene or 1-octene. The propylene alpha-olefin copolymers useful in the present invention include random as well as block copolymers, with the random copolymers generally being particularly useful.

Blends of the copolymers as well as blends of the copolymers with propylene homopolymers can be utilized as the composition for the base layer. In one embodiment, the propylene copolymers are propylene-ethylene copolymers with ethylenic contents of from about 0.2% to about 10%, or from about 3% to about 10%, or from about 3% to about 6% by weight. With regard to the propylene-1-butene copolymers, 1-butene content of up to about 15% by weight is useful. In one embodiment, the 1-butene content generally may range from about 3% by weight up to about 15%, or from about 5% to about 15% by weight. Propylene-1-octene copolymers useful in the present invention may contain up to about 40%, or up to about 20% by weight of 1-octene. Examples of propylene copolymers include DS4D05 ( 14% 1-butene; MFR 14), DS6D20 (3.2% ethylene; MFR 1.9) and DS6D81 (5.5% ethylene; MFR 5.0) all available form Union Carbide; and Profax 8523 (MFR 4) available from Basell Polyolefins.

The propylene copolymers and homopolymers may be prepared by techniques well known to those skilled in the art, and many such copolymers are available commercially. For example, the copolymers useful in the present invention may be obtained by copolymerization of propylene with an alpha-olefin such as ethylene or 1-butene using single-site metallocene catalysts.

In one embodiment, the carrier layer is polypropylene. In one embodiment, the polypropylene is isotactic or syntactic. In one embodiment, the polypropylene is uniaxially oriented in the machine direction, or uniaxially oriented in the cross direction. In one embodiment, the polypropylene is oriented biaxially.

In one embodiment, the carrier layers independently comprise polyolefins including low, medium and high density polyethylene and, polypropylene. Polyesters are also useful to form the thermoplastic layer.

Polyesters prepared from various glycols or polyols and one or more aliphatic or aromatic carboxylic acids also are useful film materials. Polyethylene terephthalate (PET), PETG (PET modified with cyclohexanedimethanol), and polybutyleneterephthalate (PBT) are useful film forming materials that are available from a variety of commercial sources, including Eastman. For example, KODAR® 6763 is a PETG available from Eastman Chemical. Another useful polyester from Du Pont is SELAR® PT-8307 which is polyethylene terephthalate.

Examples of useful polyamide resins include resins available from EMS American Grilon Inc., Sumter, S.C., under the general tradename GRIVORY®, such as CF6S, CR-9, XE3303 and G-21. GRIVORY® G-21 is an amorphous nylon copolymer having a glass transition temperature of 125°C., GRIVORY® CF65 is a nylon 6/12 film grade resin having a melting point of 135°C., a melt flow index of 50 ml/10 min, and an elongation at break in excess of 350%. GRIVORY® CR-9 is another nylon 6/12 film grade resin having a melting point of 200°C., a melt flow index of 200 ml/10 min, and an elongation at break at 250%. GRIVORY® XE 3303 is a nylon 6.6/6.10 film grade resin having a melting point of 200°C., a melt flow index of 60 ml/10 min, and an elongation at break of 100%. Other useful polyamide resins include those commercially available from, for example, Union Camp of Wayne, New Jersey under the UNI-REZ® product line, and dimer-based polyamide resins available from Bostik, Emery, Fuller, Henkel (under the VERSAMID® product line). Other suitable polyamides include those produced by condensing dimerized vegetable acids with hexamethylene diamine. Examples of polyamides available from Union Camp include UNI-REZ® 2665; UNI-REZ® 2620; UNI-REZ® 2623; and UNI-REZ® 2695.

In one embodiment, the carrier layer is oriented. Machine direction or biaxial orientation of the polymer films useful as the carrier layer can be accomplished by techniques known in the art. For example, the carrier layer can be oriented in the machine direction by using tentering frames where the clips at the edge of the tentering frame travel faster in the machine direction thereby stretching the composite in the machine direction. Alternatively, the clips can be programmed to travel faster in the machine direction or to widen in the cross direction, or to stretch in both directions thereby orienting the composite in both directions. When the composite is to be stretched using a tenter frame, the edges of the film are generally free of adhesive so that the clips will not stick to the film. After orientation on the tentering frame, the carrier layer materials then can be applied to a reclosure for use with a bag or container as further described below.

In one embodiment, the carrier layers include meltable film-forming thermoplastics which substantially do not adhere to the cohesive material at room or service temperature. In one embodiment, the carrier layer has a melt temperature sufficiently close to that of the cohesive material to enable coextrusion of the materials and formation of a permanent melt bond therebetween, with or without the use of a tie coat, which is retained after cooling. In practice, any thermoplastic material may be used that is capable of being formed into a self-supporting continuous sheet or film having adequate mechanical properties to withstand normal handling and to fulfill the requirements of the end use application including satisfactory bonding with the cohesive material at elevated temperatures. Suitable thermoplastic materials include various hydrocarbon polymers such as polyolefins, polyesters, polyamides, polyurethanes, polycarbonates, acrylics, cellulosics, halocarbons, ionomers, vinyls and other polymers, and their blends, interpolymers and copolymers. In one embodiment, the thermoplastic materials include polyolefins and polyesters.

Tie Layers

If the carrier layer has high polarity, then a tie coat may be used between the cohesive and the carrier layer to ensure adhesion. In one embodiment, useful tie layers include the polymers of the cohesive which are functionalized by grafting a carboxylic acid, anhydride or ester onto the cohesive polymers. The block copolymers may also include functionalized polymers such as may be obtained by reacting an alpha, beta-olefinically unsaturated monocarboxylic or dicarboxylic acid reagent onto selectively hydrogenated block copolymers of vinyl aromatic hydrocarbons and conjugated dienes as described above. The reaction between the carboxylic acid reagent in the graft block copolymer can be effected in solutions or by a melt process in the presence of a free radical initiator.

The preparation of various selectively hydrogenated block copolymers of conjugated dienes and vinyl aromatic hydrocarbons which have been grafted with a carboxylic acid reagent is described in a number of patents, including U.S. Pat. Nos. 4,578,429; 4,657,970; and 4,795,782, and the disclosures of these patents relating to grafted selectively hydrogenated block copolymers of conjugated dienes and vinyl aromatic compounds, and the preparation of such compounds are hereby incorporated by reference. U.S. Pat. No. 4,795,782 describes and gives examples of the preparation of the grafted block copolymers by the solution process and the melt process. U.S. Pat. No. 4,578,429 contains an example of grafting of KRATON® G1652 (SEBS) polymer with maleic anhydride with 2,5-dimethyl-2,5-di(t-butylperoxy) hexane by a melt reaction in a twin screw extruder.

Examples of commercially available maleated selectively hydrogenated copolymers of styrene and butadiene include KRATON FG1901X, FG1921X, and FG1924X from Shell, often referred to as maleated selectively hydrogenated SEBS copolymers. FG1901X contains about 1.7% w bound functionality as succinic anhydride and about 28% wt of styrene. FG1921X contains about 1% wt of bound functionality as succinic anhydride and 29% wt of styrene. FG1924X contains about 13% styrene and about 1% bound functionality as succinic anhydride.

An example of a suitable tie coat material is a maleic anhydride functionalized triblock copolymer comprising polystyrene end segments and poly(ethylene/butylene) mid-segments sold under the designation KRATON FG1901X by the Shell Chemical Company. Due to its functionality, KRATON FG1901X is adhesive with respect to many polar and non-polar thermoplastics.

In another embodiment, as illustrated in Fig. 3A and 3B, the reclosure contains cohesive layers, carrier layers and an adherent layer. As shown in Fig. 3A, cohesive layers 301 and 302 are bonded together. Cohesive layer 301 is bonded to carrier layer 303 which in turn is bonded on its other surface to adherent layer 305. Adherent layer 305 is also bonded to container 307. Cohesive layer 302 is bonded to carrier layer 304 which is bonded to adherent layer 306. Adherent layer 306 is bonded to container 307. In one embodiment, the container with reclosure has lift tabs 308 for separating the reclosure. As illustrated in Fig. 3B, when a separating force is applied at lift tabs 308, cohesive layers 301 and 302 are separated. As above, cohesive layer 301 is bonded to carrier layer 303 which in turn is bonded to adherent layer 305 which is in turn bonded to container 307. Likewise, cohesive layer 302 is bonded to carrier layer 304 which in turn is bonded to adherent layer 306 which in turn is bonded to container 307. It is understood in this embodiment that the cohesive bond between cohesive layers 301 and 302 is less than the cohesive bonds between the layers consecutively cohesive layer 301, carrier layer 303, adherent layer 305 and container 307. Likewise, the strength of the bonds between the consecutive layers of cohesive layers 302 to carrier layer 304 to adherent layer 306 to container 307 are greater than the strength of the bond between cohesive layers 301 and 302.

## Adherent Layer

In another embodiment, the carrier layers are adhered to the container by an adherent layer, such as an adhesive, for example a pressure sensitive adhesive or a permanent adhesive, or a heat seal layer. In one embodiment, the adherent layer has a thickness of about 2 to about 150, or from 5 to about 50 microns. In one embodiment, the layer is a pressure sensitive adhesive having a release liner which is removed when the reclosure is applied to the container. The bond strength between (a) the cohesive material and the carrier layer (b) the carrier layer and the adherent layer and (b) the adherent layer and the container are greater than the bond strength between the cohesive layers. When the bond strengths are as described, the cohesive layers separate to provide access to the interior of the container.

In one embodiment, the adherent layer may be a permanent or a pressure sensitive adhesive. The adhesive may be a heat-activated adhesive, a hot melt adhesive, or a pressure sensitive adhesive (PSA). The adhesive may be an acrylate or methacrylate polymer, a rubber-based material, an ethylene-vinyl acetate copolymer, an ethylene vinyl alcohol copolymer, a silicone-based adhesive or combinations of two or more thereof.

The adhesives that make up the adherent layer may generally be classified into the following categories:

(a) random copolymer adhesives such as those based upon acrylate and/or methacrylate copolymers, a-olefin copolymers, silicone copolymers, chloroprene/acrylonitrile copolymers, and the like;

(b) block copolymer adhesives including those based upon linear block copolymers (i.e., A-B and A-B-A type), branched block copolymers, star block copolymers, grafted or radial block copolymers, and the like; and

(c) natural and synthetic rubber adhesives.

A description of useful pressure-sensitive adhesives may be found in Encyclopedia of Polymer Science and Engineering, Vol. 13. Wiley-Interscience Publishers (New York, 1988). Additional description of useful pressure-sensitive adhesives may be found in Encyclopedia of Polymer Science and Technology, Vol. 1, pp. 476-546, Wiley-Interscience Publishers, 2nd Ed. (New York, 1985).

In one embodiment, the adhesives provide a permanent adherence of the attached parts. The peel strength of these adhesives is greater than about 1 lb/in, or about 2 lb/in, or about 5 lb/in, or about 10 lb/in. In one embodiment, the peel strength of the adhesive may be such that the substrate is damaged prior to the adhesive peeling. The coating weight of the adhesive applied is generally in the range of about 0.1 to about 1000 gsm, or about 0.1 to about 500 gsm, or about 0.5 to about 250 gsm, or about 1 to about 100 gsm, or about 1 to about 50 gsm.

Commercially available pressure-sensitive adhesives are useful as the adhesives in the invention. Examples of these adhesives include the hot melt pressure-sensitive adhesives available from H. B. Fuller Company, St. Paul, Minn. as HM-1597, HL-2207-X, HL-2115-X, HL-2193-X. Other useful commercially available pressure-sensitive adhesives include those available from Specialty Polymers & Adhesives Division of Ashland, Inc., Columbus, Ohio.

The pressure sensitive adhesive materials that are useful can be in the form of solutions or emulsions, or they can be in the form of hot melt adhesives. The pressure sensitive adhesives may contain as a major constituent an adhesive polymer such as natural, reclaimed or styrene butadiene rubber, tackified natural or synthetic rubbers, styrene butadiene or styrene isoprene block copolymers, random copolymers of ethylene and vinyl acetate, ethylene-vinyl-acrylic terpolymers, polyisobutylene, poly(vinyl ether), poly(acrylic) ester, etc. The pressure sensitive adhesive materials are typically characterized by glass transition temperatures in the range of about –70°C. to about 10°C.

In one embodiment, the adhesive is an acrylic emulsion pressure-sensitive adhesive polymer. The acrylic emulsion pressure-sensitive adhesive polymers may contain on a percent by weight basis from 30% to about 98% percent by weight of one or more alkyl acrylates containing about 4 to about 12, or from about 4 to about 8 carbon atoms in the alkyl group. In one embodiment, the total alkyl acrylate concentration is from about 60 to about 95% by weight based on the total weight of the monomers. Useful monomers include alkyl acrylate esters containing from about 4 to about 10 carbon atoms in the alkyl group. Exemplary alkyl acrylate esters include isooctyl acrylate, 2-ethyl hexyl acrylate, butyl acrylate, sec-butyl acrylate, methyl butyl acrylate, 4-methyl 2-pentyl acrylate and the like. Comonomers which can be used include unsaturated mono- and dicarboxylic acids such as methacrylic acid, acrylic acid, fumaric acid and the like, dibutyl fumarate, dioctyl maleate and the like. Other comonomers include methacrylates such as methyl methacrylate, isodecyl methacrylate and the like; styrene, vinyl acetate, vinyl pyrrolidone and the like. An example of an acrylic emulsion PSA sold under the tradename S-490 by from the Fasson Division of Avery Dennison Corporation.

The acrylic adhesives may contain as a major constituent acrylic type polymers containing carboxylic acids which are obtained from vinyl type monomers containing carboxyl groups such as acrylic acid, methacrylic acid, etc., and acrylic type polymers containing hydroxyl groups which are obtained from vinyl type monomers containing hydroxyl groups such as 2-hydroxyethyl methacrylate, etc. In one embodiment, the acrylic adhesive material is obtained from the copolymerization of an alkyl acrylate such as butyl acrylate, 2-ethylhexyl acrylate, or isononyl acrylate; a polar monomer such as acrylic acid, acrylamide, or N-vinyl-2-pyrrolidone, and another monomer such as an acrylate other than the acrylate mentioned above, methacrylate, styrene, vinyl acetate, etc.

In one embodiment, the adhesive comprises a rubber based elastomer as used in the cohesive layer. These rubber based adhesive generally contain a tackifier and/or a plasticizer.

Other examples of useful commercially available adhesive or adhesive components include: 150P, C2075, C-2500, DL50, E828, P910, S3000, S-246, and S4800 adhesives available from the Fasson Division of Avery Dennison Corporation; hot melt PSAs from National Starch under the designation DURO-TAK® 34-424A; low molecular weight polyisobutylene polymers such as VISTANEX® LM-MS-LC, VISTANEX® LM-MM-LC and VISTANEX® LM-MH-LC from Exxon Chemical Company; low density polyethylene such as LD509 from

Exxon-Mobil; EVA such as UE 639-67 (containing 28% VA) available from Equistar Chemicals LP, Houston, Tex.; etc.

As mentioned above, in one embodiment, the adhesive compositions comprise at least one thermoplastic elastomeric block copolymer which include linear, branched, graft or radial block copolymers. In addition, the adhesives may also contain at least one tackifier resin component. In one embodiment the tackifier is a solid. A solid tackifier is defined herein as one having a softening point above 80°C. When the solid tackifier resin component is present, the pressure-sensitive adhesive compositions generally comprise from about 40% to about 80% by weight of a thermoplastic elastomer component and from about 20% to about 60% by weight (or from about 55 to 65% by weight) of a solid tackifier resin component.

Conventional solid tackifier resins include hydrocarbon resins, rosin, hydrogenated rosin, rosin esters, polyterpene resins, and other resins which exhibit the proper balance of properties. A variety of useful solid tackifier resins are available commercially such as terpene resins which are sold under the trademark ZONATAC® by Arizona Chemical Company, and petroleum hydrocarbons resins such as the resins sold under the trademark ESCOREZ® by Exxon Chemical Company. One particular example of a useful solid tackifier is ESCOREZ® 2596 which is a C5-C9 (aromatic modified aliphatic) synthetic tackifier having an Mw of 2100 and a dispersity (Mw/Mn) of 2.69. Another useful solid tackifier is ESCOREZ® 1310LC, identified as an aliphatic hydrocarbon resin having an Mw of 1350 and a dispersity of 1.8. WINGTACK® 95 is a synthetic tackifier resin available from Goodyear, Akron, Ohio consisting predominantly of polymerized structure derived from piperylene and isoprene. REGALREZ® 1094 and REGALREZ® 6108 are hydrogenated solid tackifiers available from Hercules. The adhesive compositions also may include one or more hydrogenated liquid tackifiers such as REGALREZ® 1018 from Hercules. The amount of the hydrogenated liquid tackifier included in the adhesive compositions may range from about 0.1 to about 20% by weight based on the weight of resin or rubber in the adhesive. In another embodiment, from about 5% to about 15%

by weight of the hydrogenated liquid tackifier is included in the adhesive formulations.

The adhesives also may include other materials such as antioxidants, heat and light stabilizers, ultraviolet light absorbers, viscosity modifiers, fillers, colorants, antiblocking agents, reinforcing agents, processing acids, mineral oil, etc.

In one embodiment, the adherent layer may be a heat activatable layer or heat seal layer. As described above, the carrier layer may have heat seal properties and be directly adhered to the container. In the present embodiment, it is contemplated that a separate adherent layer, which is a heat seal, would be bonded to both the container and the carrier layer. Tie layers may be used to provide good adhesion between the carrier layer and the adherent layer.

The heat-activatable adhesive layer may be made from any heat-activatable adhesive or thermoplastic film material. These include polyolefins; (linear or branched), polyamides; such as nylon, polyester copolymers, ionomers based on sodium or zinc salts of ethylene methacrylic acid, polyacrylonitriles, and ethylene-vinyl acetate copolymers. Included in this group are the acrylates such as ethylene methacrylic acid, ethylene methyl acrylate, ethylene acrylic acid and ethylene ethyl acrylate. Also, included in this group are polymers and copolymers of olefin monomers having, for example, from 2 to about 12 carbon atoms, or from 2 to about 8 carbon atoms. These include the polymers of $\alpha$-olefins having from 2 to about 4 carbon atoms per molecule. These include polyethylene, polypropylene, poly1-butene, etc. An example of a copolymer within the above definition is a copolymer of ethylene with 1-butene having from about 1 to about 10 weight percent of the 1-butene comonomer incorporated into the copolymer molecule. Examples of a commercially available heat activatable adherent materials include Adsyl 3C37F, 5C30F, 5C37F, 5X37F and 7222XCP available commercially from Basell Polyolefins.

In one embodiment, the polyolefins include amorphous polyolefins. The polyethylenes that are useful have various densities including low, medium and high density ranges as defined above. The ethylene/methyl acrylate copolymers available from Chevron under the tradename EMAC can be used. These include EMAC 2260, which has a methyl acrylate content of 24% by weight and a melt index of 2.0 grams/10 minutes at 190°C, 2.16 Kg; and EMAC SP 2268T, which also has a methyl acrylate content of 24% by weight and a melt index of 10 grams/10 minutes at 190°C, 2.16 Kg. Polymer film materials prepared from blends of copolymers or blends of copolymers with homopolymers are also useful.

Typically, the melting point, as determined by differential scanning colorimetry at second heat cycle, of the heat-activatable adhesive layer is in the range of about 50°C to about 150°C, and in one embodiment about 70°C to about 85°C.

## Containers

The cohesive reclosures may be applied to containers such as bags, garments and boxes. Examples of containers where the cohesive reclosure may be used include, food bags, shipping boxes, carry out food boxes, enclosures for personal electronic devices such as cell phones, pagers and PDAs, personal care bags, such as make up bags, dop kits, backpacks, wallets, purses and luggage. The reclosure is usually added at a sealing edge. The sealing edge is the portion of the container which is not sealed. The containers also have a means for opening the cohesive reclosure. This could be accomplished by having a portion of the container extending beyond the cohesive reclosure so that a separating force applied to the edges of the container will separate the cohesive reclosure. It is also contemplated that separate lift tabs including those that could be adhered by pressure sensitive adhesives, such as pressure sensitive adhesives, may be used to separate the cohesive reclosure.

The container may have any number of adhered layers. The adhered layers are formed during the preparation of the container. The adhered layers may be welded, glued, heat sealed, or adhered with adhesive. The containers may be prepared from a sheet which has a single longitudinal seam, such as a fin type seam or an overlap welding seam, to form a tubular structure. This tubular structure could have one or more welds that form pouches or containers. It is contemplated that the cohesive reclosure would be used for closing or sealing the container. The preparation of containers is known to those skilled in the art.

In the container there is an opening for the introduction of material into the interior of the container. The opening has an edge defined by the area where the layers are sealed to keep the contents of the container within the container. The sealing area may be internal to the container or external. An example of an external sealing area is the lid of a box. The containers have at least one reclosure of the present invention. Some containers may have two or more reclosures.

The containers may be made of single or multiple layers of, e.g., paper, polymer or composites of paper and polymer, or of other materials such as cloth, leather, nonwoven fabrics, cardboard, metal foils or metallized polymers. In one embodiment, the container is made of paper. The paper may be light, medium or heavy weight, with heavy weight paper typically used. There can be from two to about eight layers. In one embodiment, the container is made of a three layer material. Included among the types of paper that can be used are clay coated paper, glassine, polymer coated paper, paperboard from straw, bark, wood, cotton, flax, cornstalks, sugarcane, bagasse, bamboo, hemp, and similar cellulose materials prepared by such processes as the soda, sulfite or sulfate (kraft) processes, the neutral sulfide cooking process, alkali-chlorine processes, nitric acid processes, semi-chemical processes, etc.

In one embodiment, the substrate for the container may be a polymer film. Examples of polymer films include those disclosed above for the carrier layers. The polymer films may be non-oriented film, uniaxially oriented film or biaxially oriented film. When uniaxially oriented, the orientation may be either in the machine direction or in the cross direction. The polymer films useful in making the container include polystyrenes, polyolefins, polyamides, polyesters, polycarbonates, polyvinyl alcohol, poly(ethylene vinyl alcohol), polyvinyl chloride, polyurethanes, polyacrylates including copolymers of olefins such as ethylene and propylene with acrylic acids and esters, copolymers of olefins and vinyl acetate, ionomers and mixtures thereof. In one embodiment, the polymer film material is a polyolefin.

In addition to these polymers, any of the polymers and copolymers disclosed above may be employed, and may be suitably selected with due consideration to cost, application, availability, etc. For example, the polyolefin films may comprise homopolymers and copolymers of monoolefins having from 2 to about 12 carbon atoms, or from 2 to about 8 carbon atoms, or from 2 to about 4 carbon atoms per molecule. Examples of such homopolymers include polyethylene, polypropylene, poly-1-butene, etc. The examples of copolymers within the above definition include copolymers of ethylene with from about 1% to about 10% by weight of propylene, copolymers of propylene with about 1% to about 10% by weight of ethylene or 1-butene, etc. Films prepared from blends of copolymers or blends of copolymers with homopolymers also are useful. The polymer films may be extruded in mono- or multilayers.

Another type of material which can be used for the container is a polycoated kraft liner that includes a kraft liner that is coated on either or both sides with a polymer coating. The polymer coating, may include any of the above-described polymers, for example, high, medium, or low density polyethylene, propylene, polyester, and other similar polymer films. The polymer is coated onto the substrate surface to add strength and/or dimensional stability to the substrate. The weights of these substrates typically range from about 30 to about 100 pounds per ream, or from about 40 to about 94 pounds per ream. In total, the final substrate typically includes between about 10% and about 40% polymer and from about 60% to about 90% paper. For two sided coatings, the quantity of polymer is approximately evenly divided between the top and bottom surface of the paper.

In one embodiment, the container may be a carton, a box or a box-like enclosure. An example of such a container is a plastic-wrap container/dispenser. In another embodiment, the container may be rigid rather than flexible. The carton or box may be made of cardboard, paperboard or similar material. The box lids are typically sealed with the reclosure system.

The container may comprise both a carton or box and a flexible inner liner, as in a breakfast cereal box. In such an embodiment, either the inner, flexible container or the outer, rigid carton or box, or both, may include a closure in accordance with the present invention.

The containers to which the present invention may be applied may include heavy-duty bags made from multi-ply high strength polyolefins, such as LDPE polyethylene, as well as other woven or nonwoven, synthetic or natural web materials. Such bags are typically used to package materials such as dry cement, salt, potting soil, small landscaping rocks, pet food and similar heavy materials.

The face layer or layers of the bag liner or bag outer surface may comprise a major amount of a thermoplastic copolymer or terpolymer derived from ethylene or propylene (typically ethylene) and a functional monomer selected from the group consisting of alkyl acrylate, acrylic acid, alkyl acrylic acid, vinyl acetate and combinations of two or more thereof. In one embodiment, the above described polymers may be used as the face layer. In one embodiment, the functional monomer is selected from the group consisting of alkyl acrylate, acrylic acid, alkyl acrylic acid, and combinations of two or more thereof. The alkyl groups in the alkyl acrylates and the alkyl acrylic acids typically contain 1 to about 8 carbon atoms, and in one embodiment 1 to about 2 carbon atoms. The copolymer or terpolymer generally has a melting point in the range of about 50°C. to about 120°C., and in one embodiment about 60°C. to about 110°C.

The functional monomer(s) component of the copolymer or terpolymer ranges from about 1 to about 15 mole percent, and in one embodiment about 1 to about 10 mole percent of the copolymer or terpolymer molecule. Examples include: ethylene/vinyl acetate copolymers; ethylene/methyl acrylate copolymers; ethylene/ethylacrylate copolymers; ethylene/butyl acrylate copolymers; ethylene/methacrylic acid copolymers; ethylene/acrylic acid copolymers; ethylene/methacrylic acid copolymers containing sodium or zinc (also referred to as ionomers); acid-, anhydride- or acrylate-modified ethylene/vinyl acetate copolymers; acid- or anhydride-modified ethylene/acrylate copolymers; anhydride-modified low density polyethylenes; anhydride-modified linear low density polyethylene, and mixtures of two or more thereof. In one embodiment, ethylene/vinyl acetate copolymers that are particularly useful include those with a vinyl acetate content of at least about 20% by weight, and in one embodiment about 20% to about 40% by weight, and in one embodiment about 22% to about 28% by weight, and in one embodiment about 25% by weight.

Examples of commercially available copolymers and terpolymers that can be used as the face layer include the ethylene/vinyl acetate copolymers available from DuPont under the tradename ELVAX®. These include ELVAX® 3120, ELVAX® 3124, ELVAX® 3150, ELVAX® 3174, ELVAX® 3177, ELVAX® 3190, ELVAX® 3175, ELVAX® 3180, ELVAX® 3182, ELVAX® 3185 and ELVAX® 3190LG. Ethylene acid copolymers available from DuPont under the tradename NUCREL® can also be used. These include NUCREL® 0407 and NUCREL® 0910. The ethylene/acrylic acid copolymers available from Dow Chemical under the tradename PRIMACOR® are also useful. These include PRIMACOR® 1430. The ethylene/methyl acrylate copolymers available from Chevron under the tradename EMAC® can be used. These include EMAC® 2205 and EMAC® 2268, which has a methyl acrylate content of 24% by weight,.

Ionomers (polyolefins containing ionic bonding of molecular chains) also are useful as the face layers. Ionomer resins available from DuPont under the tradename SURLYN® can also be used. These are identified as being derived from sodium, lithium or zinc and copolymers of ethylene and methacrylic acid. These include SURLYN® 1601, SURLYN® 1605, SURLYN® 1650, SURLYN® 1652 , SURLYN® 1702, SURLYN® 1765-1, SURLYN® 1707, SURLYN® 1802, SURLYN® 1855, SURLYN® 1857, and SURLYN® 1901.

Polycarbonates also are useful as the face layer, and these are available from the Dow Chemical Co. (CALIBRE®) G. E. Plastics (LEXAN®) and Bayer (MAKROLON®). Most commercial polycarbonates are obtained by the reaction of bisphenol A and carbonyl chloride in an interfacial process.

Generally, the reclosure may be used with any container to provide a resealing closure. The containers may be prepared by means known to those in the art. During the manufacture, layers of cohesive material may be placed along the edge to provide sealing of the container. The sealing does not need to be applied along the entire length of the sealing edge. The closure length is typically sufficient to maintain the closure of the container during normal handling. As described above, in one embodiment, the cohesive layer is at least 50% of the length of the widest length of a line segment running parallel to the sealing edge. In another embodiment, the closure has a length of at least about 40%, or at least about 50% or at least about 70%, or at least about 80% of the length of the sealing edge. In another embodiment, the reclosure runs the complete length of the sealing edge.

As described above, the reclosure provides the container with the ability to be opened and resealed. The opening and resealing are accomplished by the cohesive layers. The cohesive layers may be added to the container by directly coating the cohesive layers onto the surfaces of the container. The cohesive can be applied, for example, by spraying, brushing, gravure printing, flexographic techniques, extrusion coating, etc. The cohesive is generally applied and dried prior bringing the cohesive into engagement with the other cohesive layer. Heat lamps or drying oven are typically used to dry the cohesives. The cohesives may also be applied from a multilayer construction such as a tape or strip of cohesive. The construction is made by coating the cohesive onto a surface and drying the cohesive. A second layer of cohesive is prepared on another substrate. The two layers of cohesive are then pressed together to form a multilayer construction. The carrier layers may be used to prepare the cohesive layers or they may be added after formation of the layers. Also the multilayer construction may be coextruded as is known to those in the art.

As used herein, the term container is intended to refer to any materials which when sealed with the cohesive reclosure are able to hold a material. For instance, a garment pocket may be sewed on three sides and provided with a cohesive reclosure on the inside of the pocket. The pocket is a container as used in this invention.

Examples of the use of the cohesive reclosures may be better understood with reference to the examples. Fig. 4 illustrates a packing envelope 400 which incorporates therein a cohesive reclosure 401 according to the present invention. As is shown in Fig. 4, cohesive reclosure 401 has two sub-parts 401a and 401b. Sub-part 401a is located on the flap portion 402 of envelope 400, while sub-part 401b is located on the body portion 403 of envelope 400. When an individual desires to close envelope 400, flap portion 402 is folded along score line 404 in order to cover the opening in envelope 400 present at the top end 405.

Although cohesive reclosure 401 is shown as having two sub-parts, the present invention is not limited thereto. In this embodiment, as well as any other, a cohesive reclosure in accordance with the present invention can be formed of more than two sub-parts. For example, a cohesive reclosure in accordance with the present invention could be formed in an intermittent pattern so long as enough cohesive reclosure is present to ensure satisfactory closure of envelope 400. Alternatively, when a more “airtight” seal is desired, a cohesive reclosure in accordance with the present invention may be formed with no gaps in coverage.

Fig. 5 illustrates another embodiment of the present invention where a cohesive reclosure 501 in accordance therewith is incorporated into a packing envelope 500. As is shown in Fig. 5, the cohesive reclosure 501 has two sub-parts 501a and 501b. Sub-part 501a is located on one inside surface 502a of opening 503 of envelope 500, while sub-part 501b is located on the other inside portion 502b of opening 503. Alternatively, the cohesive reclosure 501 of this embodiment could be formed continuously around the inside edge of opening 503 rather than being formed in two separate portions as discussed above.

When an individual desires to close envelope 500, opening 503 is closed by bringing together the cohesive reclosure parts 501a and 501b.

Fig. 6 illustrates yet another embodiment of the present invention where a cohesive reclosure 601 in accordance therewith is incorporated into a packing envelope 600 that has an opening 602 in the middle of one side of the envelope. As is shown in Fig. 6, the cohesive reclosure 601 has two sub-parts 601a and 601b. Sub-part 601a is located on one outside surface 603 of the envelope in, for example, the middle, while sub-part 601b is located on an inside portion 604 of opening 602. As would be apparent to one of skill in the art, the portion of envelope 600 which contains sub-part 601b needs to overlap outer surface 603 of envelope 600 so that cohesive reclosure 601 can be closed. When an individual desires to close envelope 600, opening 602 is closed by bringing together the two sub-parts of cohesive reclosure 601.

Although a cohesive reclosure in accordance with the present invention has been shown in connection with packing envelope, the present invention is not limited thereto. Rather, a cohesive reclosure in accordance with the present invention can be utilized with any type of envelope as a replacement and/or supplement to commonly used adhesive closures.

Fig. 7 illustrates a bag 700 which can be used to store food items (e.g., a sandwich bag). As is known in the art, such bags can be made from a variety of materials including, but not limited to, plastic, paper and aluminum foil. Bag 700 incorporates therein a cohesive reclosure 701 according to the present invention. As is shown in Fig. 7, cohesive reclosure 701 has two sub-parts 701a and 701b. Sub-part 701a is located on one upper inside surfaces of bag 700, while sub-part 701b is located on the other upper inside surface of bag 700. When an individual desires to close bag 700, sub-parts 701a and 701b are brought together.

In this embodiment, although it is not required, it is desirable that cohesive reclosure 701 be formed so that an “airtight” seal is possible. This permits bag 700 to be used to store perishable food items.

Fig. 8 illustrates another embodiment of the present invention which is similar to the embodiment of Fig. 7 except that the bottom of bag 800 is gusseted. As is shown in Fig. 8, cohesive reclosure 801 is incorporated into bag 800 which is formed with a gusseted bottom 802. Gusseted bottom 802 permits bag 800 to stand upright on its bottom end. Such bags are particularly useful as packaging for food articles which are to be stocked on a grocery store shelf.

Fig. 9 illustrates a stand up bag 900 which can be used to store food items (e.g., potato chips, cereal, etc.). As is known in the art, such bags can be made from a variety of materials including, but not limited to, plastic, paper and aluminum foil. Bag 900 incorporates therein a cohesive reclosure 901 according to the present invention. As is shown in Fig. 9, cohesive reclosure 901 has two sub-parts 901a and 901b. Sub-part 901a is located on one upper inside surfaces of bag 900, while sub-part 901b is located on the other upper inside surface of bag 900. When an individual desires to close bag 900, sub-parts 901a and 901b are brought together. Bag 900 has creases 902, 903 and 904 which permit the bag to stand on a flat surface. Such bags and the methods by which they are formed are known in the art.

In this embodiment, although it is not required, it is desirable that cohesive reclosure 901 be formed so that an "airtight" seal is possible. This permits bag 900 to be used to store perishable food items.

In another embodiment, bag 900 can be formed of a clear plastic material and be designed to store and/or protect items such as undergarments, clothing, towels and linens. In this embodiment, the creased bottom permits bag 900 to be expandable, thereby permitting the packing of large and/or thick objects such as blankets, towels, etc.

Fig. 10 illustrates a container 1000 in the shape of a box which can be used to store, pack or hold items. As is known in the art, such containers can be made from a variety of materials including, but not limited to, plastic, paper and metal. Container 1000 can be formed to be any size or shape depending upon its desired use. Container 1000 incorporates therein a cohesive reclosure 1001 according to the present invention. As is shown in Fig. 10, cohesive reclosure 1001 has two sub-parts 1001a and 1001b. Sub-part 1001a is located on the outer surface of flap 1002, while sub-part 1001b is located on the inner surface of flap 1003. When an individual desires to close container 1000, sub-parts 1001a and 1001b are brought together by folding flap 1002 over to cover flaps 1004 and 1005 (which were previously closed) and then folding flap 1003 so that sub-parts 1001a and 1001b come into contact with one another. As would be apparent to one of skill in the art, the portion of container 1000 which contains sub-part 1001b needs to overlap the outer surface of flap 1002 so that cohesive reclosure 1001 can be closed.

Fig. 11 illustrates a vacuum and/or shrink wrap bag 1100 which can be used to store one or more food items 1102 that are subject to spoilage (e.g., cheese, meat, fist, poultry, etc.). As is known in the art, such bags can be made from a variety of materials including, but not limited to, plastic, paper and aluminum foil. Bag 1100 can be formed to be any size or shape depending upon its desired use. Bag 1100 incorporates therein a cohesive reclosure 1101 according to the present invention. As is shown in Fig. 11, cohesive reclosure 1101 is in the closed state.

In this embodiment, cohesive reclosure 1101 can be formed around the inside upper surface of bag 1100 to have at least two sub-parts as described above or can be formed in a continuous manner around the inside upper surface of bag 1100. Ideally, given that bag 1100 is to be used to store items which are prone to spoilage, cohesive reclosure 1101 should be formed to ensure that an airtight seal is possible. If bag 1100 is to be used as packing for a perishable food item to be sold in a store, bag 1100 should be formed from a material the can be doubly sealed (e.g., by heat sealing). As is shown in Fig. 11, bag 1100 has a one-time only seal 1103. Once a consumer breaks seal 1103, cohesive reclosure 1101 is used to reclose bag 1100.

In still another embodiment, vacuum and/or shrink wrap bag 1100 can be used to store or package any type of item which needs some sort of protection (e.g., surface protection, corrosion protection, etc.). For example, bag 1100 could be used to replace shrink wrapping commonly used to protect golf club heads during delivery to a retailer or a consumer. Of course this is just one of many possible uses for shrink wrap/vacuum packing and the present invention is equally applicable to a wide variety of shrink wrap/vacuum bag uses.

Fig. 12 illustrates a stand up rigid container 1200 that can be used to store food items (e.g., potato chips, cereal, pet food, pet treats, etc.) or other items (e.g., mothballs, bath salts, etc.). As is known in the art, such containers can be made from a variety of materials including, but not limited to, plastic, paper and metal foil. Container 1200 incorporates therein a cohesive reclosure 1201 according to the present invention. As is shown in Fig. 12, cohesive reclosure 1201 is closed. However, as is discussed above, cohesive reclosure 1201 generally has at least two sub-parts. Each sub-part is located on the inner surface of flaps 1202 and 1203. When an individual desires to close container 1200, the two or more sub-parts of cohesive reclosure 1201 are brought into contact with one another.

In this embodiment, although it is not required, it is desirable that cohesive reclosure 1201 be formed so that an "airtight" seal is possible. This permits container 1200 to be used to store perishable food items or items which may give off an odor when exposed (e.g., mothballs).

In another embodiment, as is shown in Fig. 13, the stand-up rigid container may be a stand-up bag 1300. In this embodiment, bag 1300 has a cohesive reclosure 1301 similar to cohesive reclosure 1201 of Fig. 12 except that the cohesive sub-parts of reclosure 1301 are positioned so that the top of bag 1300 lies flat (or substantially flat) when closed.

Fig. 14 illustrates a box 1400 for the storage or packaging of food items. As is known in the art, such boxes can be made from a variety of materials including, but not limited to, plastic, paper and metal foil. Box 1400 can be formed to be any size or shape depending upon its desired use. Box 1400 incorporates therein a cohesive reclosure 1401 according to the present invention. As is shown in Fig. 14, cohesive reclosure 1401 has two sub-parts 1401a and 1401b. Sub-part 1401a is located on the inner surface of flap 1404, while sub-part 1401b is located on the outer surface of flap 1403. When an individual desires to close container 1400, sub-parts 1401a and 1401b are brought together by folding flap 1403 over to cover flaps 1405a and 1405b (side flaps) and flap 1404 so that sub-parts 1401a and 1401b come into contact with one another closing box opening 1402. As would be, apparent to one of skill in the art, the portion of bag 1400 which contains sub-part 1401a needs to overlap the outer surface of flap 1404 so that cohesive reclosure 1401 can be closed.

Figs. 15A and 15B illustrate a food storage container, with Figure 15B being a cross-sectional view of container 1500 of Fig. 15A taken at the A-A= line. Container 1500 can be any size or shape and is not limited to rectangular containers such as the one depicted in Figs. 15A and 15B.

As is shown in Figs. 15A and 15B, container 1500 has a bottom 1503 with a lip 1504 which runs partially or all of the way around container bottom 1503 and a top or lid 1505. Bottom 1503 of container 1500 has a sub-part 1501a of a cohesive reclosure 1501 that is included on container 1500. Top/lid 1505 of container 1500 has sub-part 1501b of cohesive reclosure 1501. Container 1500 is closed by contacting the two sub-parts of cohesive reclosure 1501 together. In this embodiment, although it is not required, it is desirable that cohesive reclosure 1501 be formed so that an "airtight" seal is possible.

In another embodiment, a cohesive reclosure in accordance with the present invention can be formed on the opposite sides of a sheet of paper or other material, such as a plastic sheet. As illustrated in Fig. 16A, the cohesive reclosure 1601, which is made up of sub-parts 1601a and 1601b, is positioned on the sheet ends of the sheet 1602a. As illustrated in Fig. 16B, the cohesive reclosure 1601 is positioned on the long ends of sheet 1602b. Sub-parts 1601a and 1601b are positioned on opposite ends and opposite surfaces of the sheet 1602. Sheet 1602 can be formed into a cylinder that can be used to cover, but not totally enclose a variety of items For example, sheet 1602 can be used to wrap around a loaf of bread, thereby permitting the bread to remain exposed to the air, but protecting it from debris and contaminants during handling by workers and consumers.

In another embodiment, as shown in Fig. 17A, personal electronic device such as a cell phone have cover 1700. The cover may be leather or synthetic leather. The cohesive reclosure replaces the typical velcro closure system. As see in Fig. 17B, cover 1701 is closed by cohesive layer 1702. As shown in Fig. 17C, the cohesive layer 1702 is composed of two components, 1701a and 1701b on the sealing surfaces of the cover.

In another embodiment, as shown in Fig. 18A, a carrier 1800, such as one used in notebooks to carry pencils or computer disks is composed of a paper. polymeric or cloth container 1801 which is sealed with cohesive reclosure 1802. As see in Fig. 18B, the cohesive layer is composed of two parts 1802a and 1802b on the sealing surfaces of container 1801. Container 1801 may have one or more holes for fitting the container into a ring binder.

In another embodiment, as shown in Figs. 19A, 19B, 20A and 20B, the containers may be bags used for person care item, such are often used when traveling. Although illustrated for a travel case, the cohesive reclosure would be applicable to luggage, purses, backpacks, etc. Bag 1900 of Fig. 19A has a body 1901 with a flap over sealing style. Cohesive layer 1902 is present on the external side of the bag but mating with the flap to form the reclosable seal. An open view of the bag 1900 is shown in Fig. 19B, where the body 1901 has two cohesive layers 1902a and 1902b which for the sealing cohesive reclosure.

Similar to the bag of Figs. 19A and 19B, Fig. 20A illustrates a bag with a fin type closure for bag body 2001 and cohesive reclosure 2002. An open view is illustrated but Fig. 20B, where the bag body 2001 is open to review two cohesive layers 2001a and 2001b which for the cohesive reclosure.

Other possible uses for the cohesive reclosures of the present invention include, but are not limited to, disposable booties (e.g., the kind typically used in hospitals), disposable patient hospital gowns, bibs (e.g., those used in dental offices or those used in restaurants). In such cases a cohesive reclosure in accordance with the present invention can be used to replace and/or supplement a string tie, a VELCRO® closure, a button, a zipper or finger seal (e.g., a ZIPLOCK® closure), and/or a snap closure. For example, a cohesive reclosure in accordance with the present invention could be used to replace the VELCRO® closure on a golf glove.

## Examples

In the examples, all parts are parts by weight, unless otherwise indicated. The following abbreviations are used throughout the examples:

SEBS styrene-ethylene-butylene-sytrene block copolymer
SIBS styrene-isobutylene-styrene block copolymer
SIS styrene-isoprene-styrene block copolymer
EVA ethylene vinyl acetate polymer
PS polystyrene
LLDPE linear low density polyethylene
PE polyethylene

The following tests are used to measure the various test results reported below:

T-Peel Strength:

This test is used to determine the peel force required to cause two cohesive layers to release from each other when the carrier film of the reclosure is secured to a 2-mil splice tape and when pulling the edges of the reclosure in opposite directions away from and perpendicular to the interface of the cohesive bond. After the two cohesive layers are placed in contact, the two layers are engaged by means of a 4.5 lb rolldown bar. After the engaged cohesive layers are allowed to stand at room temperature, or at elevated temperature for the specified time period (dwell time), one end of each cohesive layer is secured to a jaw of an Instron tensile tester, and the jaws are moved apart at a rate of 10 inches per minute.

180° Peel Strength:

This test is run according to ASTM-D1000 using various surfaces to which the reclosure is applied using a 4.5 lb roll down bar. Samples were permitted to dwell for the specified time and temperature before being separated at a rate of 12 inches per minute.

In Examples 1-14, the cohesive reclosure is made by coextruding a cohesive layer with a carrier layer. Table 1 below shows the composition and thickness of the cohesive layer and carrier layer of Examples 1-14.

Table 1

| **Example** | Carrier | Thickness | Tie Layer | Cohesive | Thickness |
|---|---|---|---|---|---|
| 1 | PS | 1.5 mil | no | SEBS | 1 mil |
| 2 | PS | 1.5 mil | no | SEBS | 1 mil |
| 3 | LLDPE | 1 mil | no | SEBS | 1 mil |
| 4 | LLDPE | 1 mil | no | 85% SEBS<br>15% Endex PS | 1 mil |
| 5 | LLDPE | 1 mil | no | 70% SEBS<br>30% Endex PS | 1 mil |
| 6 | LLDPE | 1 mil | no | SEBS (Washed) | 1 mil |
| 7 | LLDPE | 1 mil | no | SEBS (Washed) | 1 mil |
| 8 | LLDPE | 1 mil | no | 70% SIBS<br>20% SEBS<br>10% Escorez 5380 (tackifier) | 1 mil |
| 9 | LLDPE | 1 mil | SIS | SEBS | <1 mil |
| 10 | LLDPE | 1.5 mil | EVA | SEBS | 1 mil |
| 11 | LLDPE | 1 mil | no | 75% SIBS<br>25% SEBS | 1 mil |
| 12 | LDPE | 1 mil | no | 80% SIBS<br>20% SEBS | 1.5 mil |
| 13 | PE | 5 mil | no | 90% SIBS<br>10% SEBS | 2 mil |
| 14 | PE | 5 mil | no | 85% SIBS<br>15% SEBS | 1 mil |

The T-peel strength and 180° peel tests were performed on the cohesive reclosures of Examples 1-14. The one-inch strips of the reclosures were first backed with a green 2-mil splice tape to prevent stretching of the reclosure during testing. The results of the T-peel test wherein the cohesive layers of two reclosure strips were contacted with each other are shown in Table 2 below.

The reclosure strips of Examples 1-14 were applied to the inside and printed outside surfaces of a conventional multilayer polyolefin film used in packaging chips and other snacks and the 180° peel strength was measured. Table 2 below shows the 180° peel test results.

Table 2

| Example | T-Peel Initial (gms/in) | T-Peel 1 hr. dwell 100°F (gms/in) | 180° Peel initial Chip Bag Inside (gms/in) | 180° Peel initial Chip Bag Outside (gms/in) | 180° Peel 1 hr. dwell 100°F Chip Bag Inside (gms/in) | 180° Peel 1 hr. dwell 100°F Chip Bag Outside (gms/in) |
|---|---|---|---|---|---|---|
| 1 | 211 | Blocked | 17 | 12 | 53 | 37 |
| 2 | -- | -- | -- | -- | -- | -- |
| 3 | 284 | Blocked | 12 | 13 | 53 | 37 |
| 4 | 310 | Blocked | 10 | 8 | 96 | 23 |
| 5 | 346 | Blocked | 9 | 7 | 26 | 22 |
| 6 | 295 | Blocked | 12 | 11 | 540 | 437 |
| 7 | 325 | Blocked | 10 | 8 | 78 | 42 |
| 8 | 377 | Blocked | 22 | 16 | 190 | 186 |
| 9 | 206 | Blocked | 13 | 8 | 72 | 41 |
| 10 | 242 | Blocked | 12 | 4 | 26 | 16 |
| 11 | 205 | 380 | 144 | 50 | 506 | 370 |
| 12 | 252 | 429 | 114 | -- | 467 | -- |
| 13 | -- | -- | -- | -- | -- | -- |
| 14 | 184 | 160 | 40 | -- | 69 | -- |

The T-peel strength and 180° peel strength of the reclosures of Examples 11 and 12 were measured after the samples were subjected to a dwell time of 5 days. For the T-peel test, the cohesive layer of reclosures were contacted with the same cohesive layer. For the 180° peel test, the cohesive layer of the reclosures were adhered to the inside of a conventional multilayer polyolefin film used in packaging chips and other snacks. Table 3 below shows the results of these tests.

Table 3

| Example | T-Peel Room Temp. (gms/in) | T-Peel 100°F (gms/in) | 180° Peel Room Temp. Chip Bag-inside (gms/in) | 180° Peel 100°F Chip Bag-inside (gms/in) |
|---|---|---|---|---|
| 11 | 796 | 1673 | 565 | 831.2 |
| 12 | 549.8 | 762.4 | 692.8 | 831.8 |

While the invention has been explained in relation to its preferred embodiments, it is to be understood that various modifications thereof will become apparent to those skilled in the art upon reading the specification. Therefore, it is to be understood that the invention disclosed herein is intended to cover such modifications as fall within the scope of the appended claims.

## Claims

1. A container comprising a body forming a container and at least two sealing surfaces and a cohesive reclosure adhered to the sealing surfaces, wherein the cohesive reclosure comprises two cohesive layers, wherein the bond strength between the cohesive layers is less than the bond strength between the cohesive layers and the sealing surfaces.

2. The container of claim 1 wherein the cohesive layers comprise a natural or synthetic rubber.

3. The container of claim 1 wherein the cohesive layers comprise a styrenic rubber.

4. The container of claim 1 wherein the container is a bag having an internal surface and an external surface.

5. The container of claim 4 wherein the cohesive reclosure and sealing surfaces are positioned on the internal surface of the bag.

6. The container of claim 4 wherein the sealing surfaces and cohesive reclosure are positioned on the external surface of the bag.

7. The container of claim 1 wherein the container is a box having an interior surface and an external surface.

8. The container of claim 7 wherein the cohesive reclosure and sealing surfaces are positioned on the internal surface of the box.

9. The container of claim 7 wherein the sealing surfaces and cohesive reclosure are positioned on the external surface of the box.

10. The container of claim 1 wherein the cohesive reclosure comprises two cohesive layers each having a first and second surface, wherein the first surfaces of the cohesive layers are bonded to each other and the second surfaces of the cohesive layers are each bonded to a carrier layer, and wherein the carrier layers are adhered to the sealing surfaces.

11. The container of claim 10 wherein the bond strength between the cohesive layers is less than the bond strength between (a) the cohesive layers and the carrier layers and (b) the carrier layers and the sealing surfaces.

12. The container of claim 10 wherein the carrier layer is heat sealable.

13. The composition of claim 10 further comprising an adherent layer positioned between each carrier layer and sealing surface.

14. The composition of claim 13 wherein the bond strength of the cohesive layers is less than the bond strength of (a) the cohesive layers and the carrier layers, (b) the carrier layers and the adherent layers; and (c) the adherent layers and the sealing surfaces.

15. The composition of claim 13 wherein the adherent layer is a heat sealable layer.

16. The composition of claim 13 wherein the adherent layer is an adhesive.

17. A cohesive reclosure comprising

at least one cohesive layer comprising styrene-isobutylene-styrene copolymer and

at least one cohesive target, wherein the cohesive layer is repeatedly removable and adherable to the cohesive target.

18. The cohesive reclosure of claim 17 further comprising a carrier layer permanently adhered to the cohesive layer.

19. The cohesive reclosure of claim 18 further comprising a tie layer between the cohesive layer and the carrier layer.

20. The cohesive reclosure of claim 17 wherein the cohesive layer comprises a blend of a styrene-isobutylene-styrene block copolymer and a second block copolymer.

21. The cohesive reclosure of claim 20 wherein the second block copolymer comprises styrene-ethylene-butylene-styrene copolymer.

22. The cohesive reclosure of claim 17 wherein the cohesive target comprises a second cohesive layer.

23. The cohesive reclosure of claim 22 wherein the second cohesive layer comprises styrene-isobutylene-styrene copolymer.

24. The cohesive reclosure of claim 17 wherein the cohesive target comprises a polymeric packaging film.

25. The cohesive reclosure of claim 24 wherein the packaging film comprises a polyolefin film.

26. The cohesive reclosure of claim 18 wherein the cohesive layer and the carrier layer are coextruded films.

27. A method of making a resealable package comprising:

applying a cohesive layer comprising a styrene-isobutylene-styrene copolymer to a first sealing surface of the package;

providing a cohesive target on a second sealing surface of the package;

wherein the cohesive layer is repeatedly removable and adherable to the cohesive target.

28. The method of claim 27 wherein the package comprises a polymeric film.

29. The method of claim 27 wherein the cohesive target comprises a second cohesive layer.

30. The method of claim 29 wherein the second cohesive layer comprises a styrene-isobutylene-styrene copolymer.

31. The method of claim 27 wherein the cohesive layer is extruded onto the first sealing surface of the package.

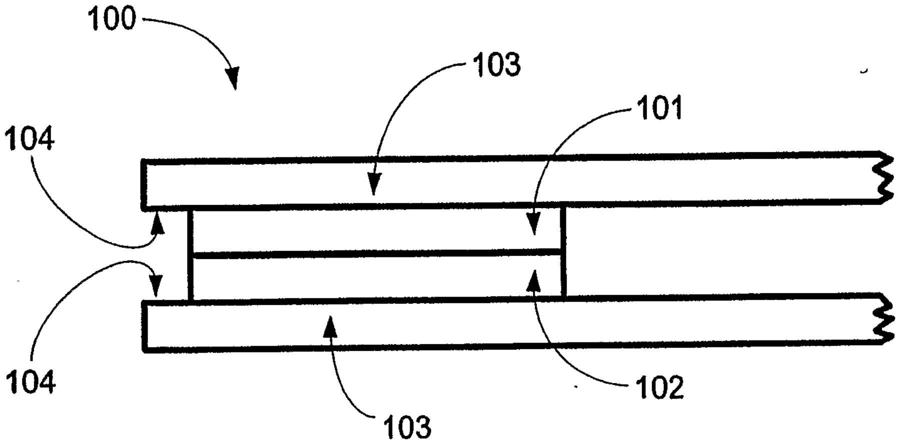

FIG. 1A

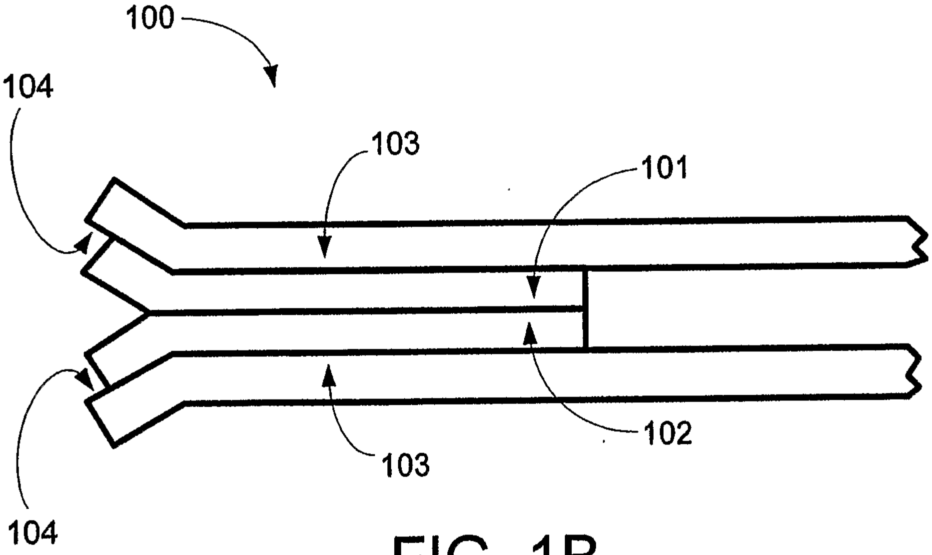

FIG. 1B

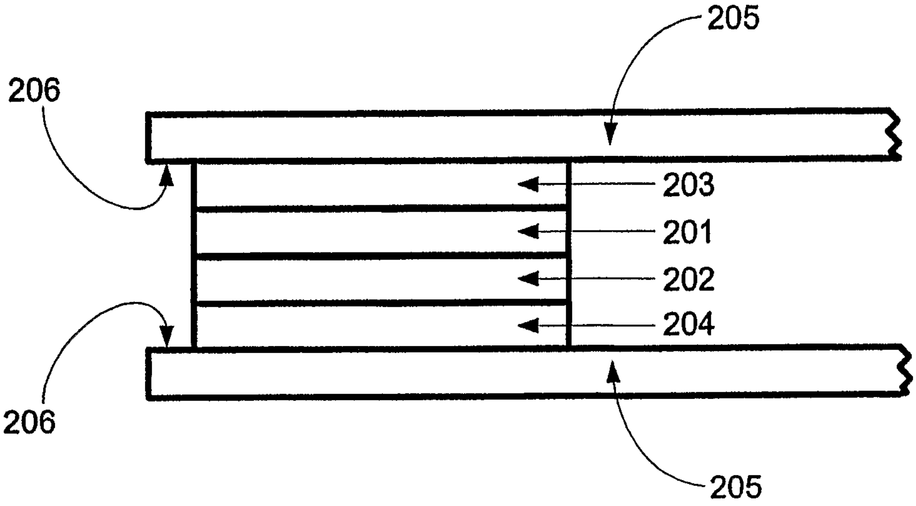

FIG. 2A

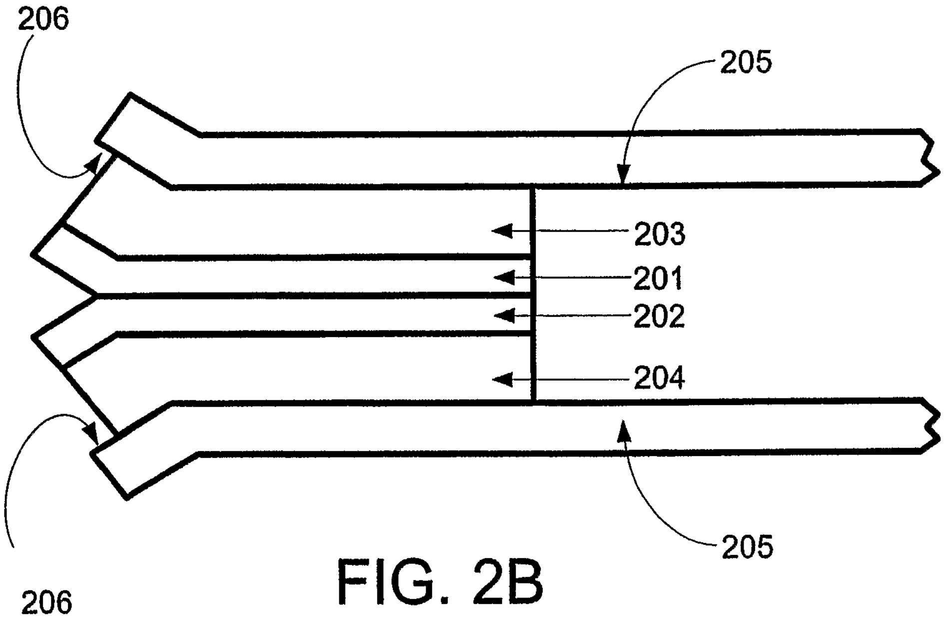

FIG. 2B

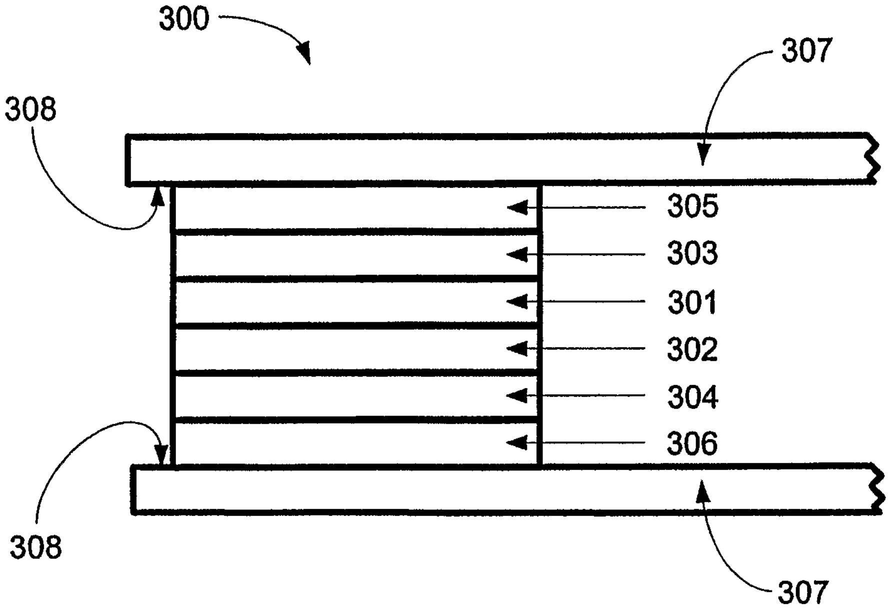
300
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FIG. 3A

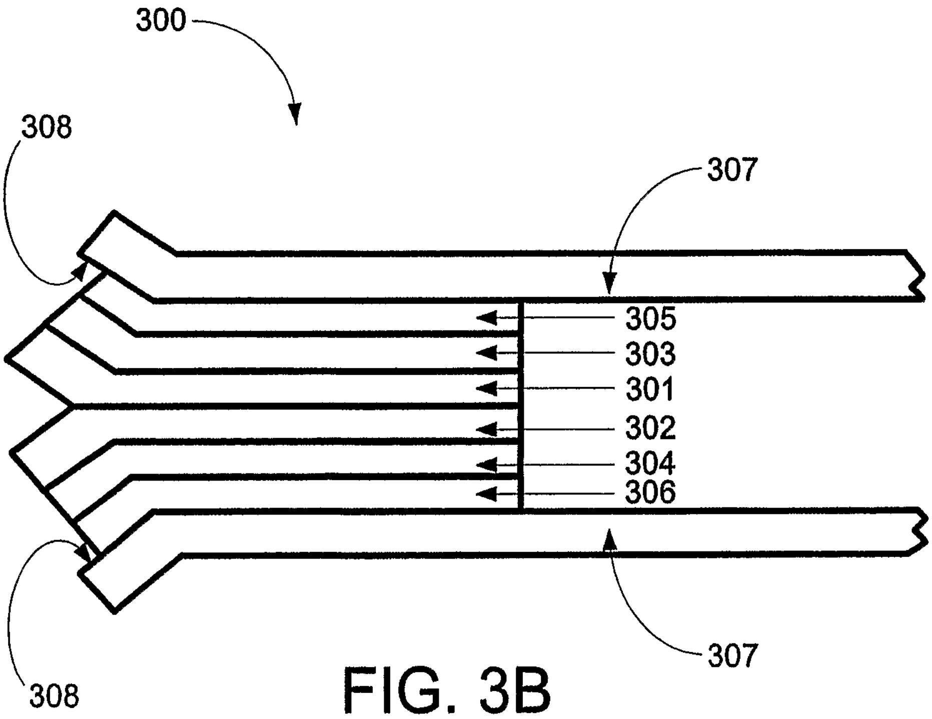
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FIG. 3B

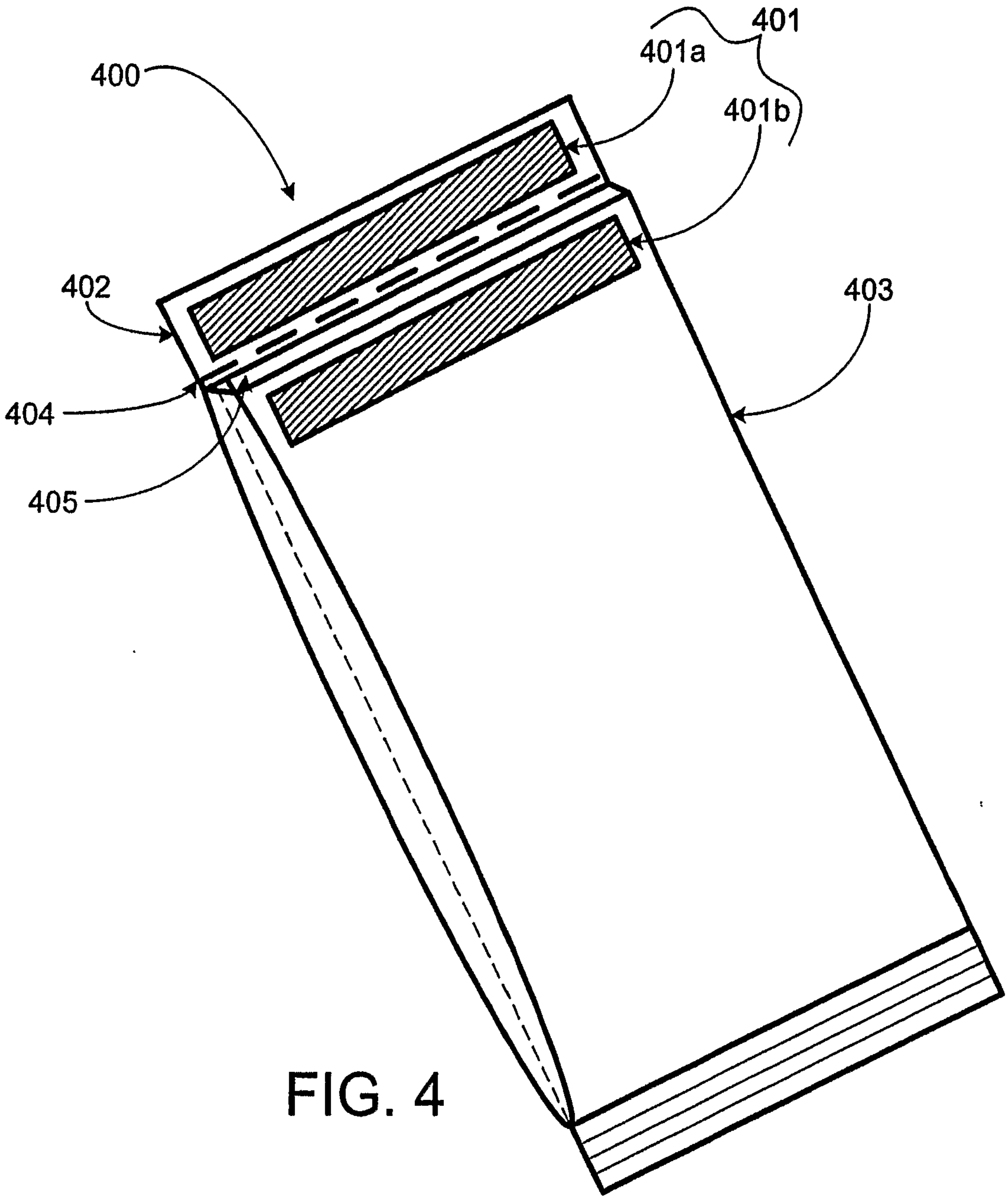

FIG. 4

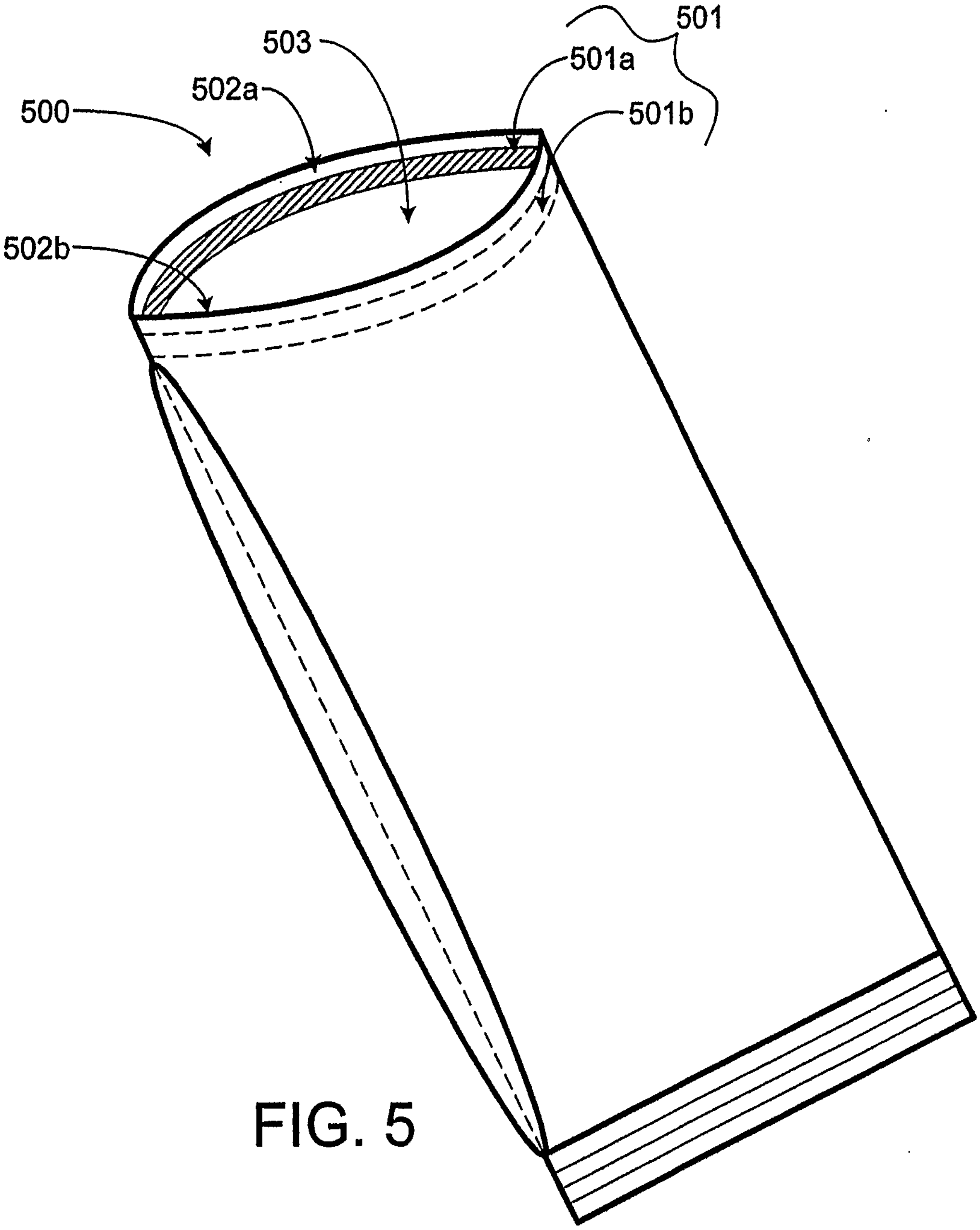

FIG. 5

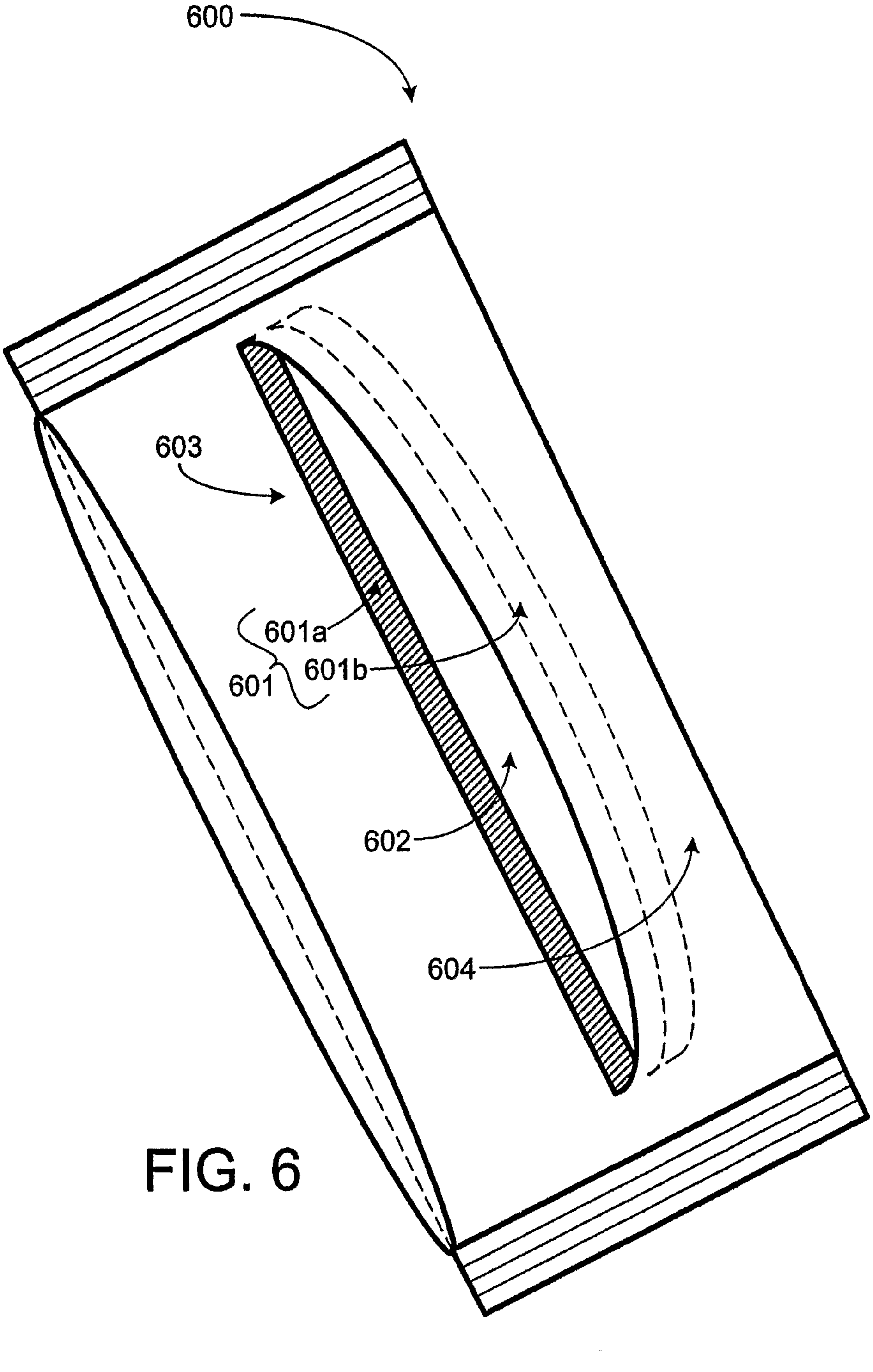

FIG. 6

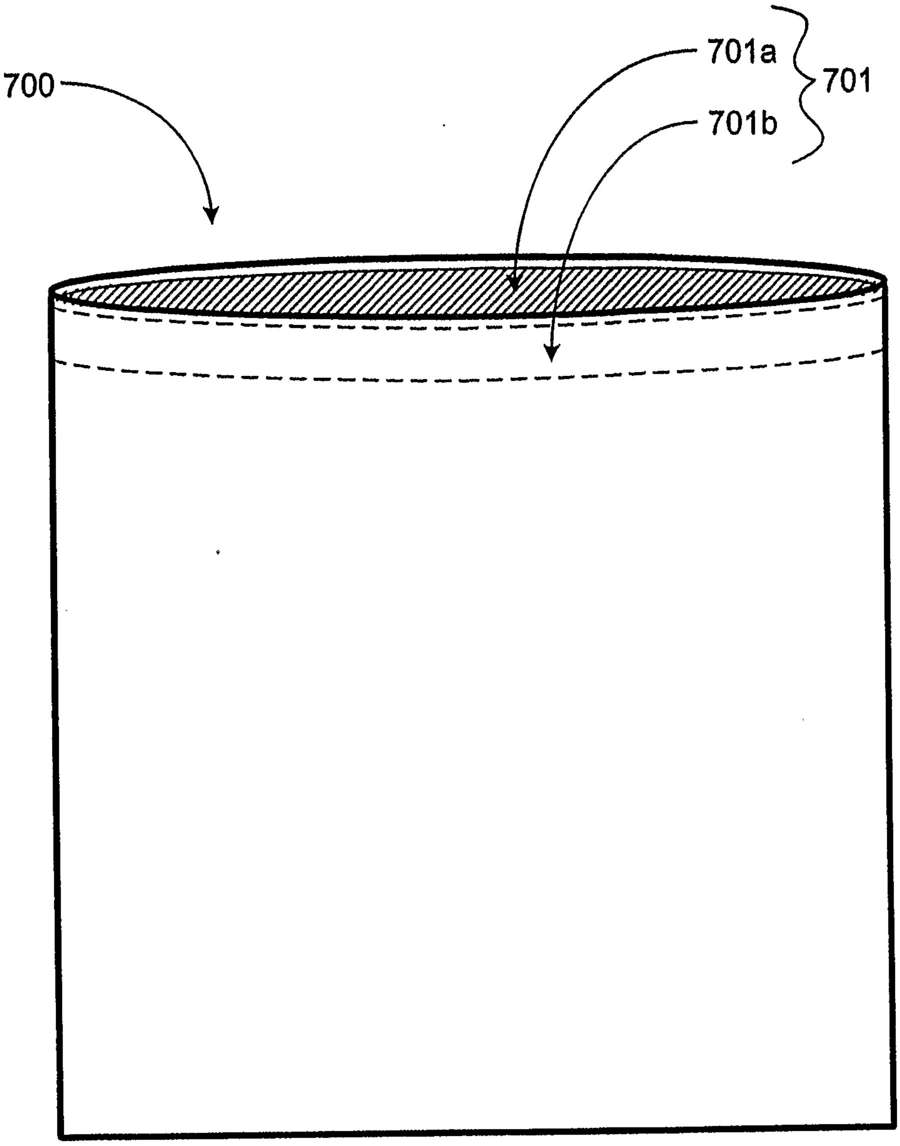

FIG. 7

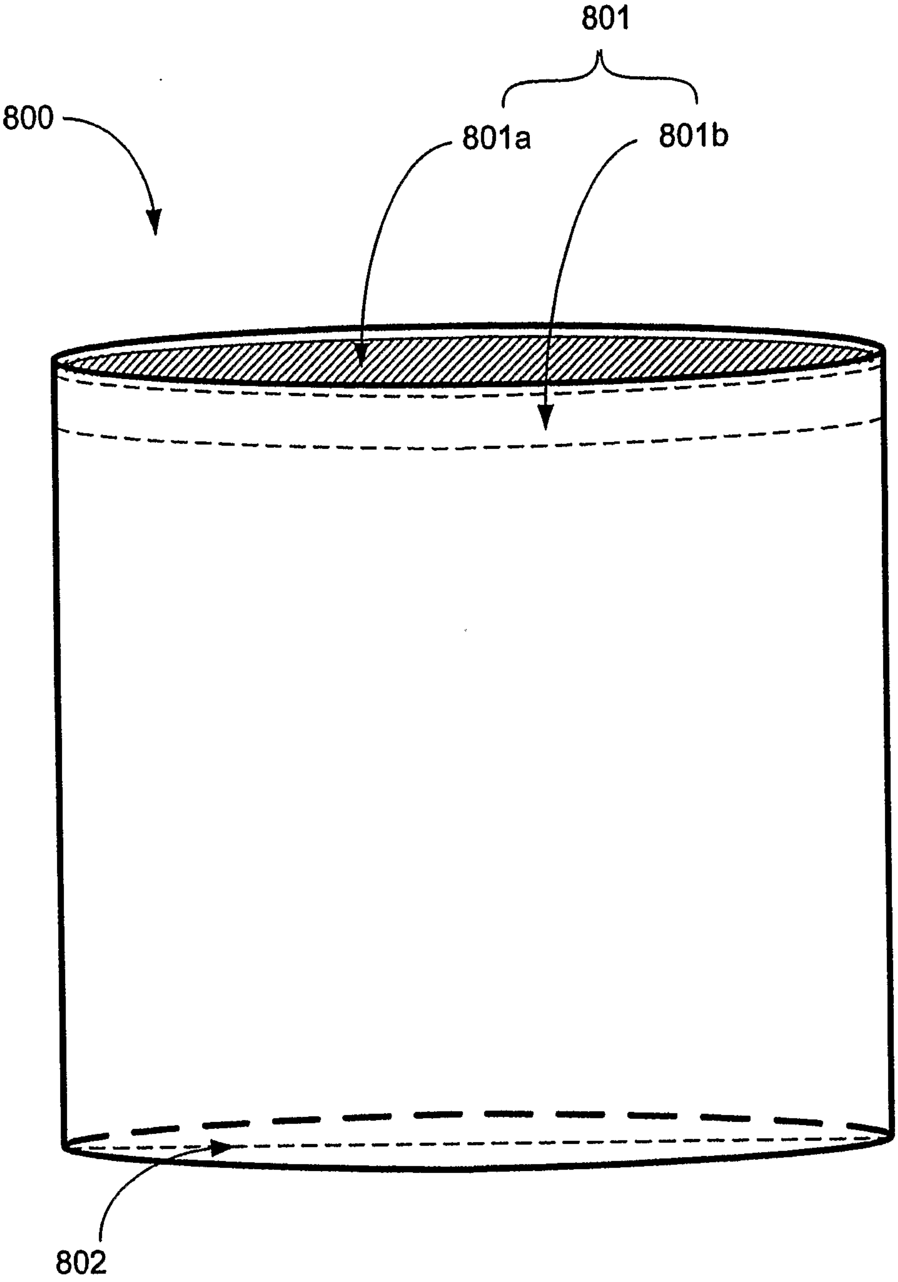

FIG. 8

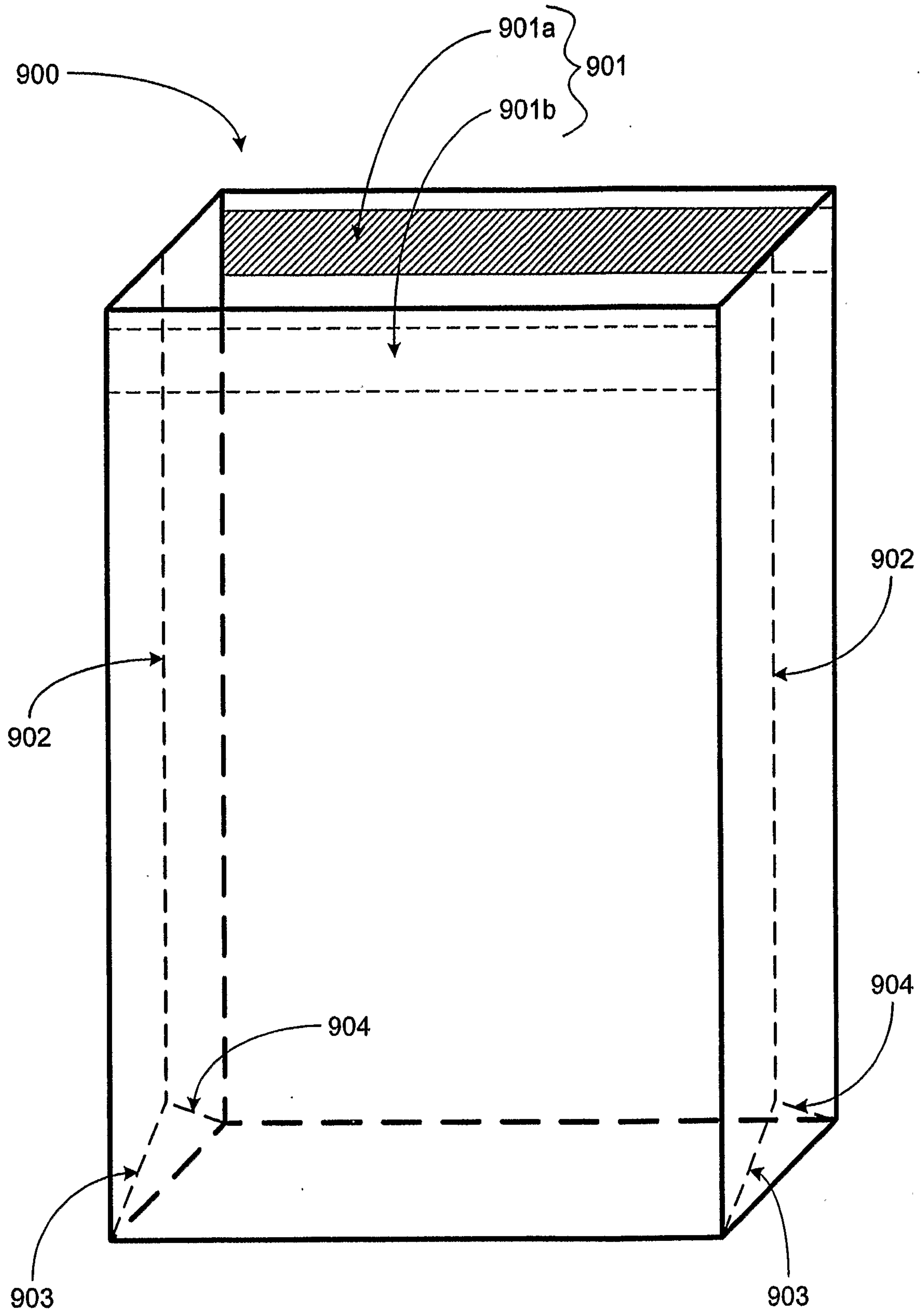

FIG. 9

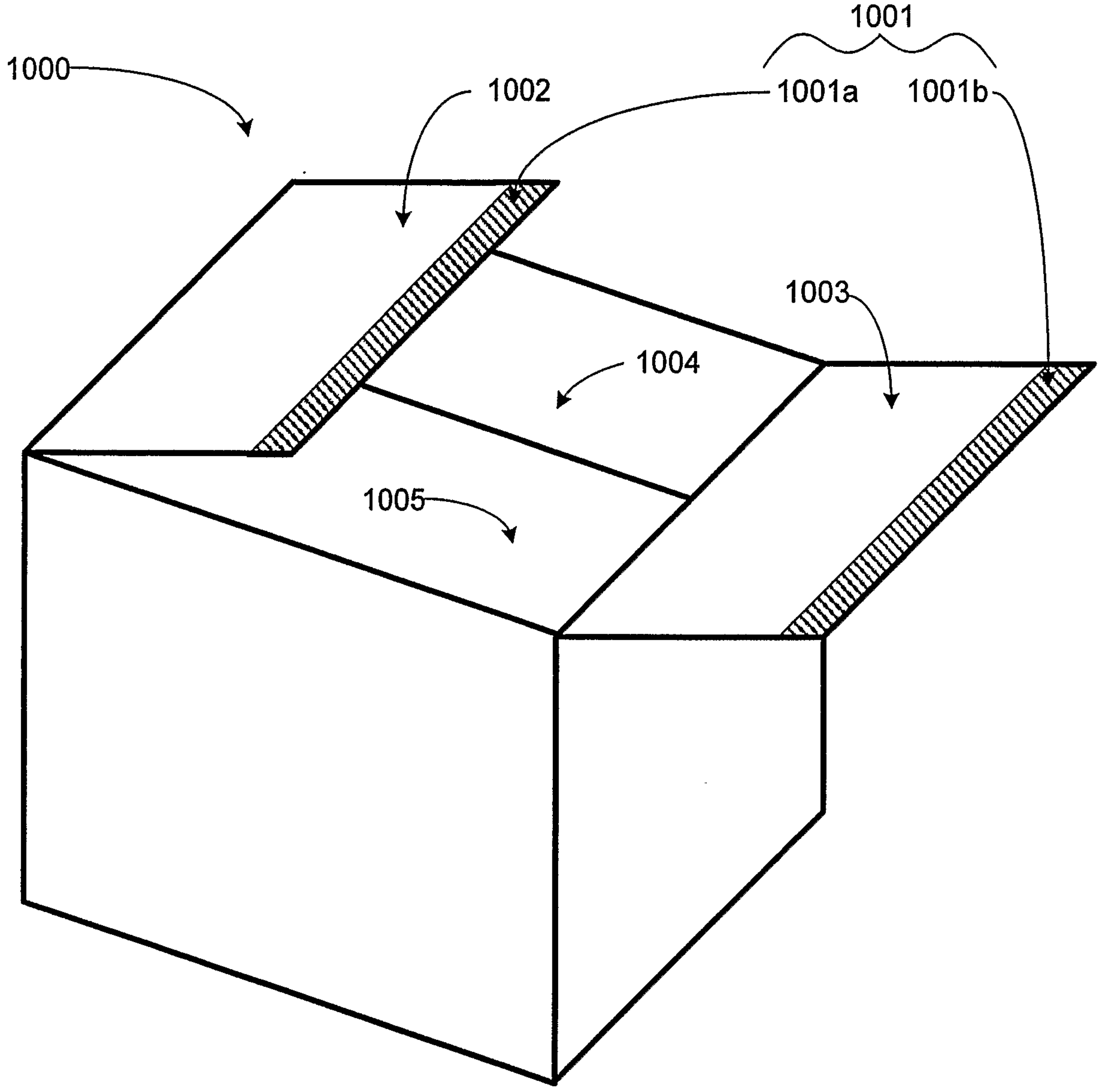

FIG. 10

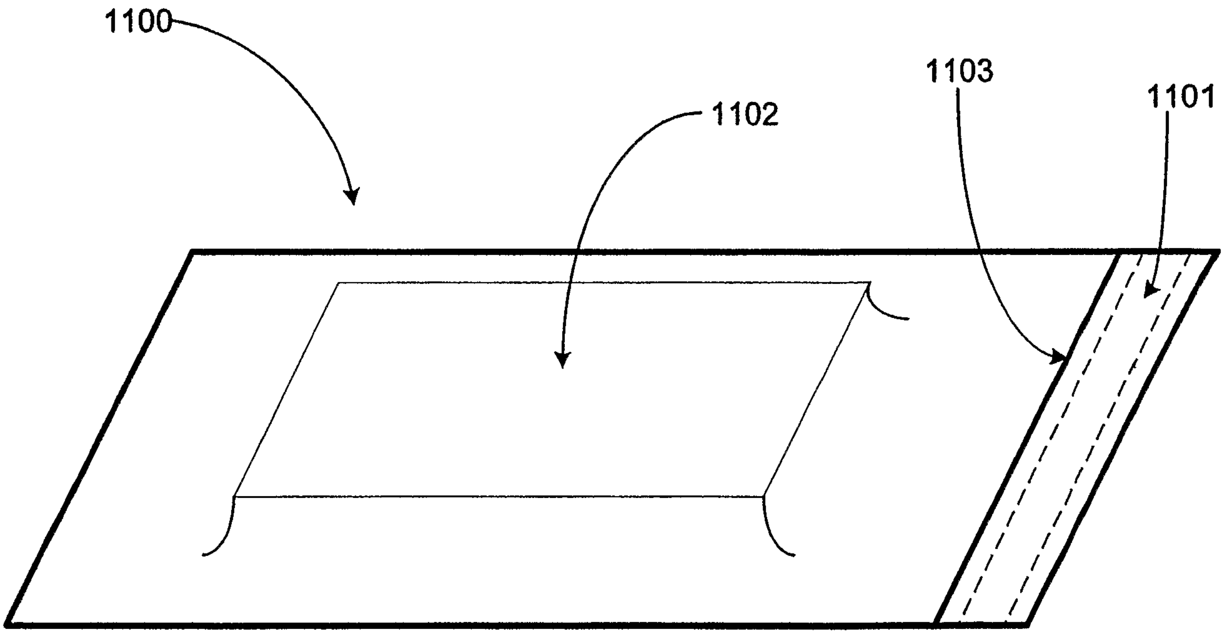

FIG. 11

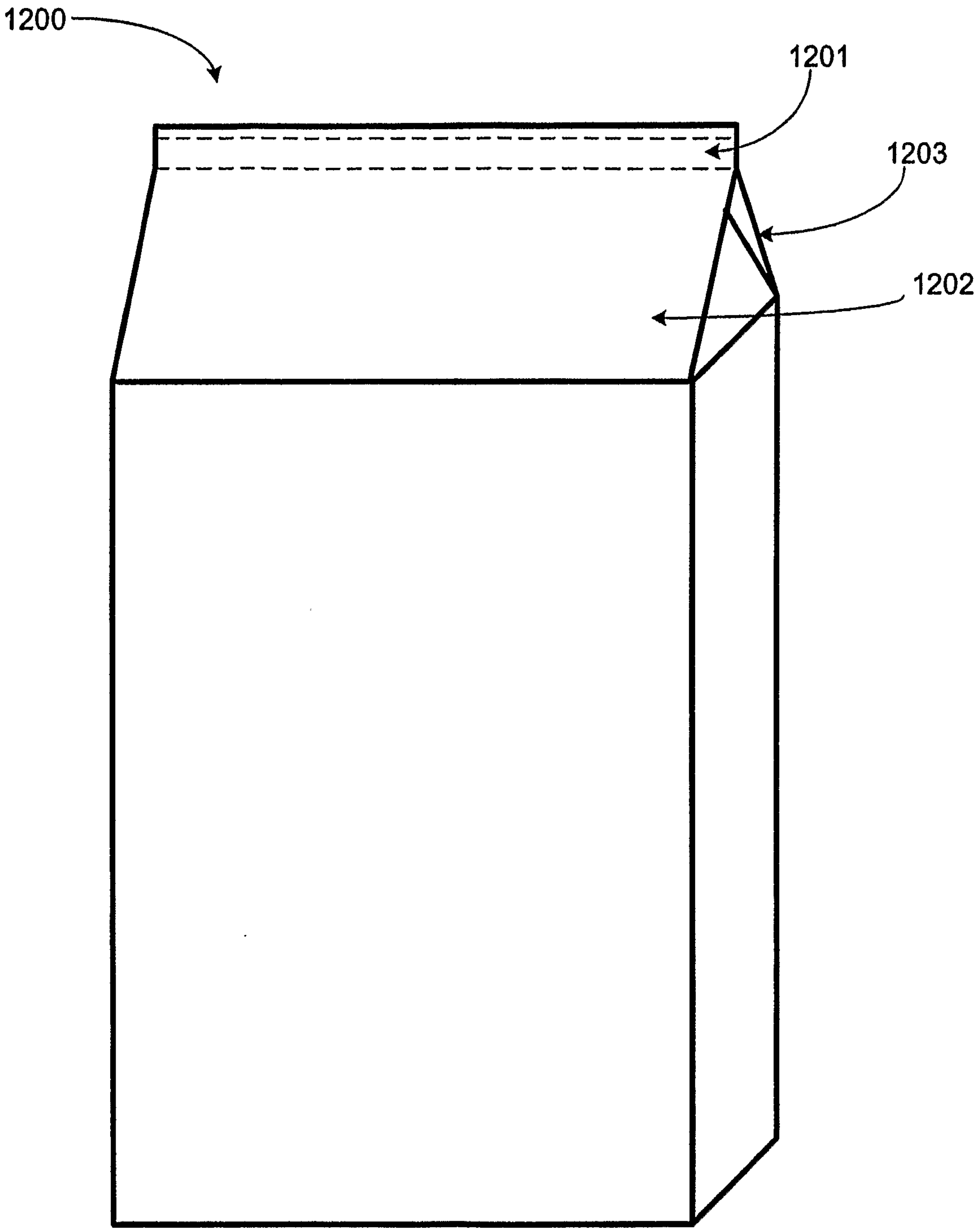

FIG. 12

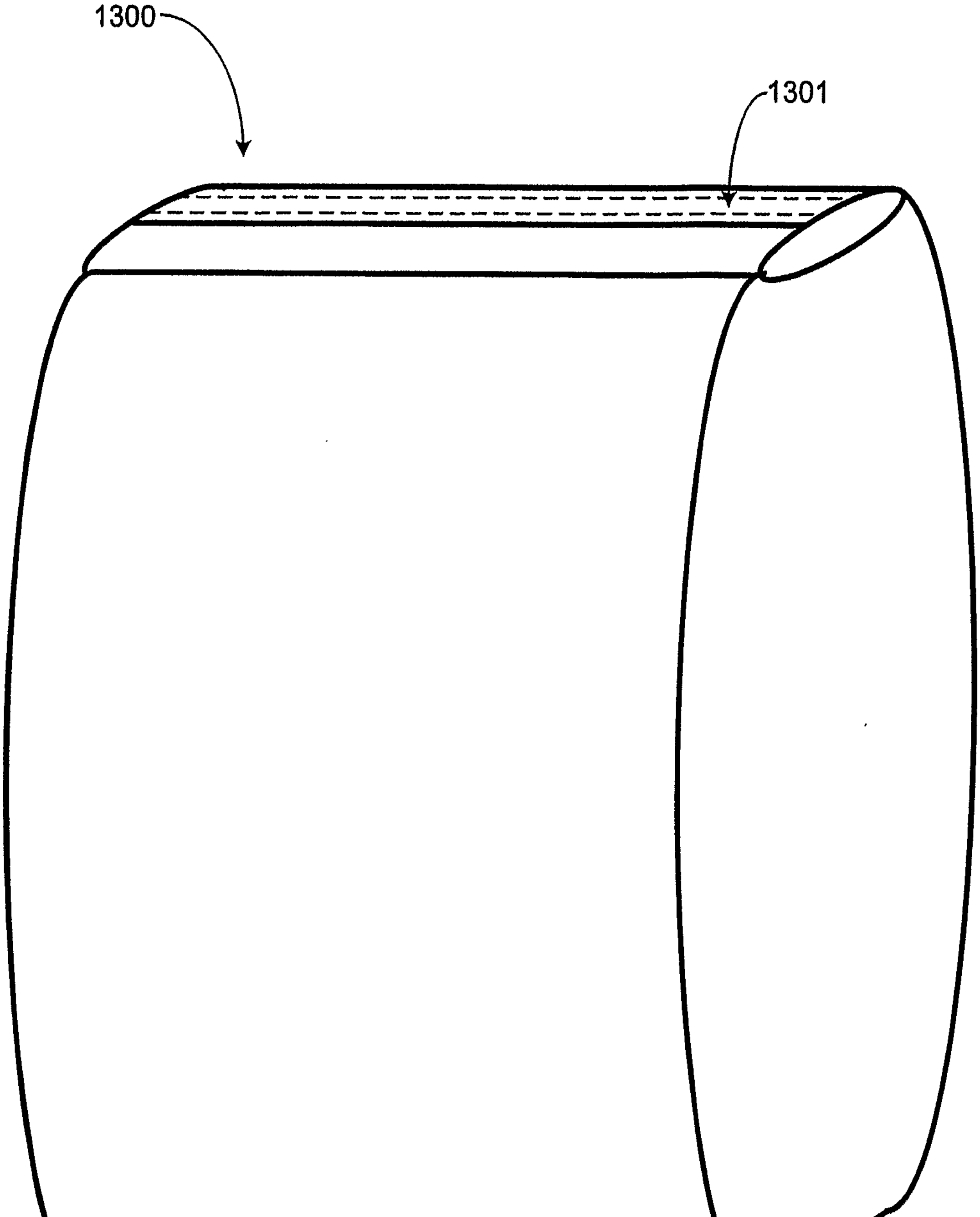

FIG. 13

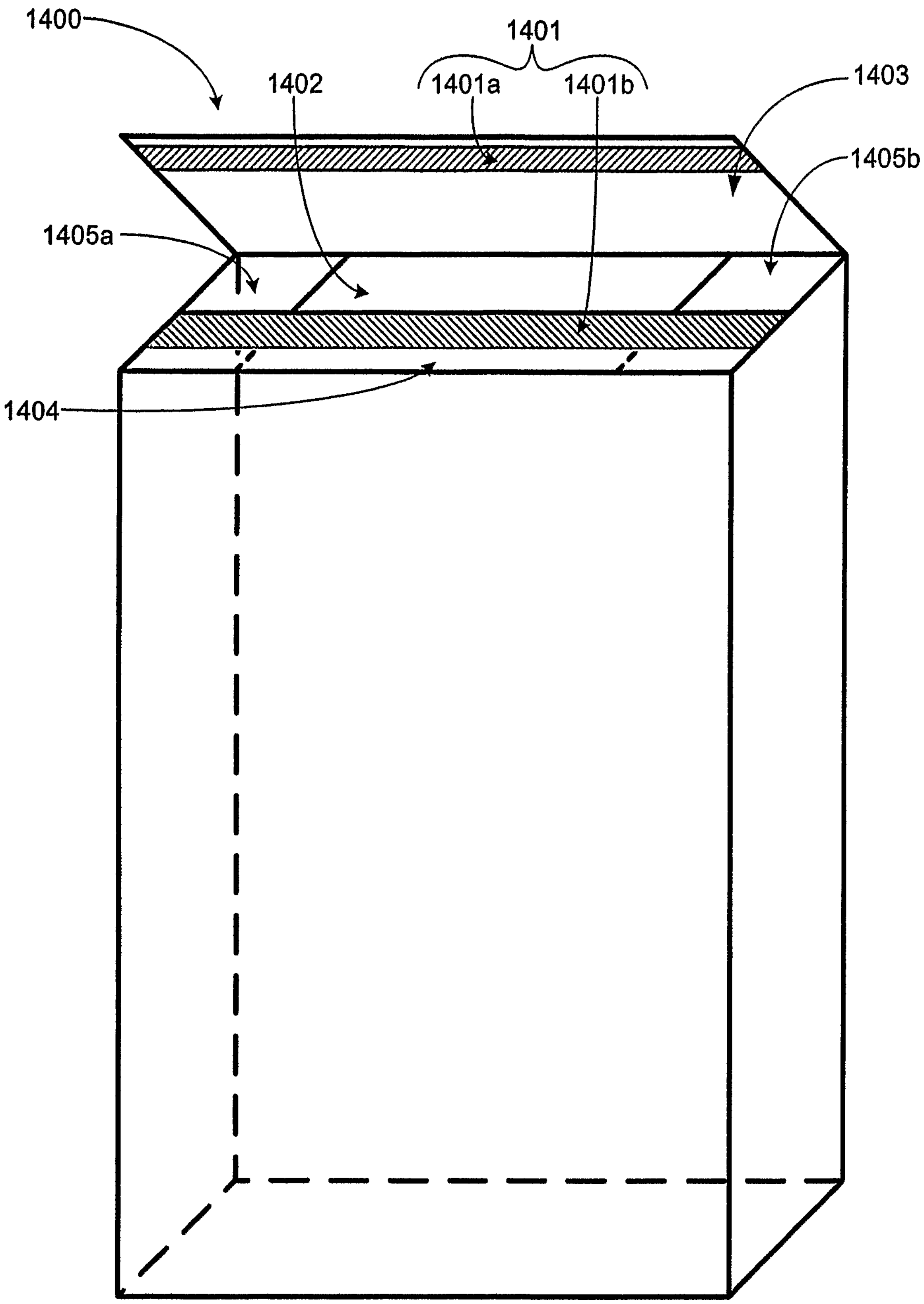

FIG. 14

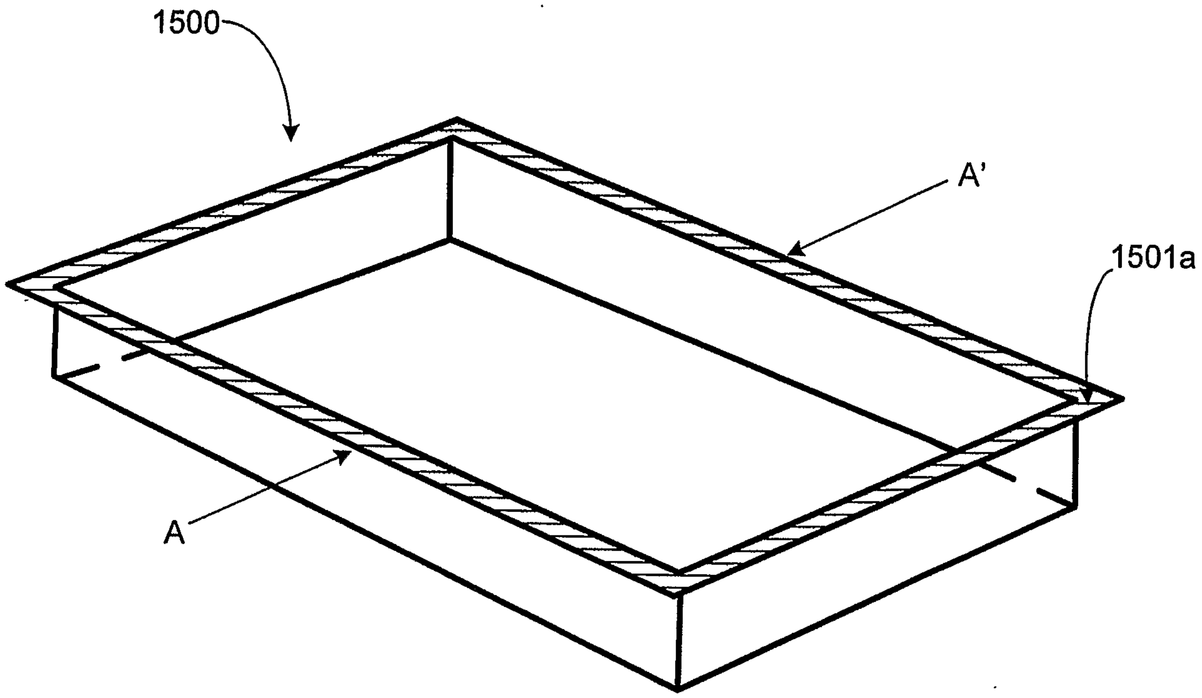

FIG. 15A

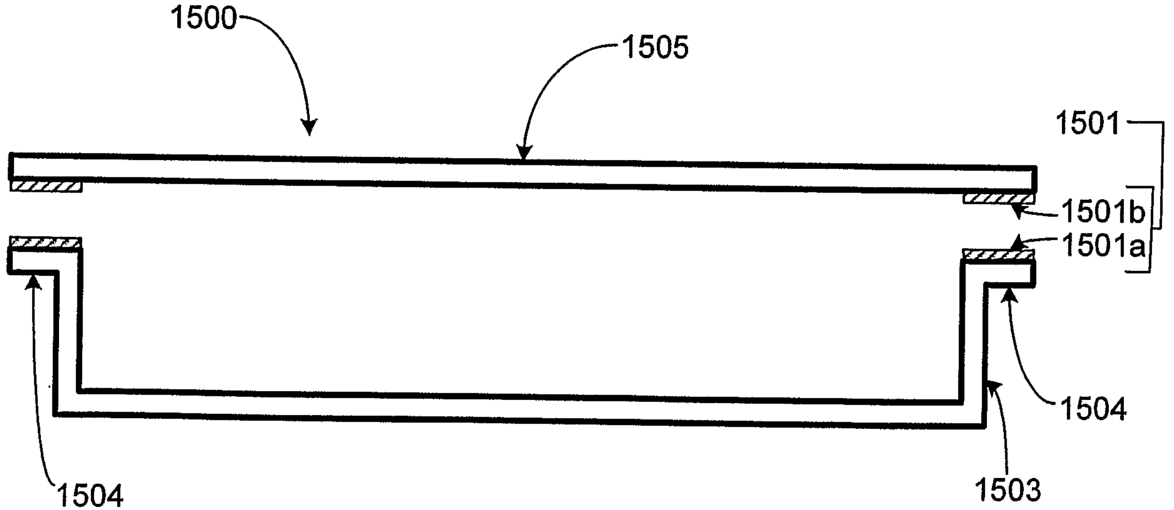

FIG. 15B

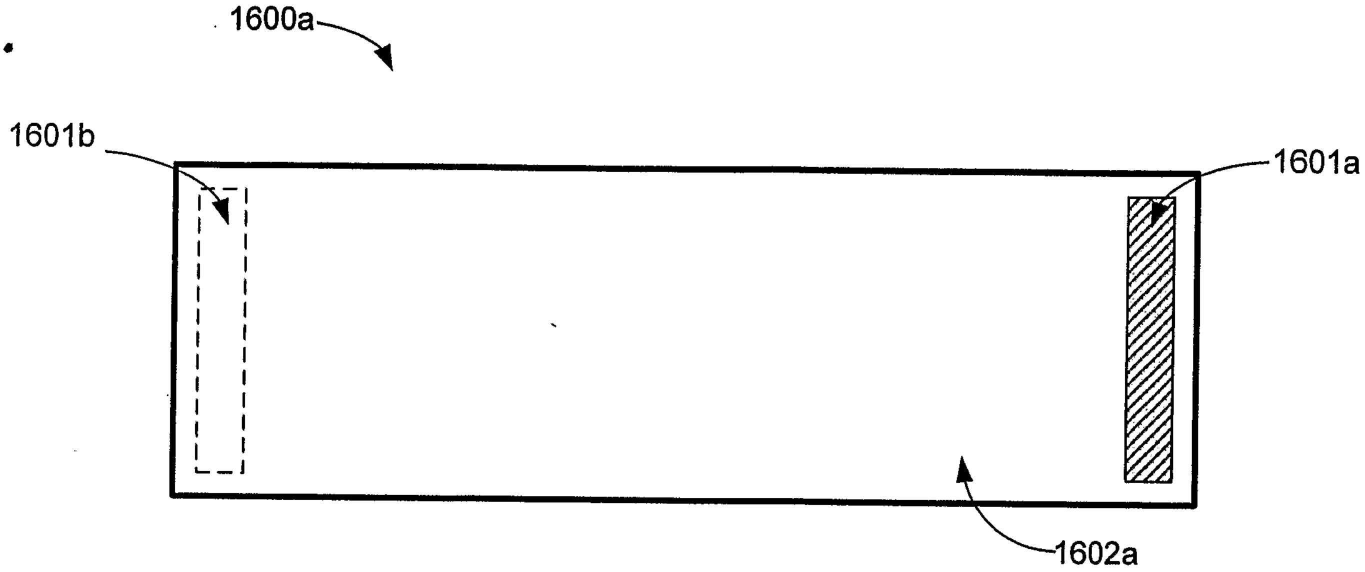

FIG. 16A

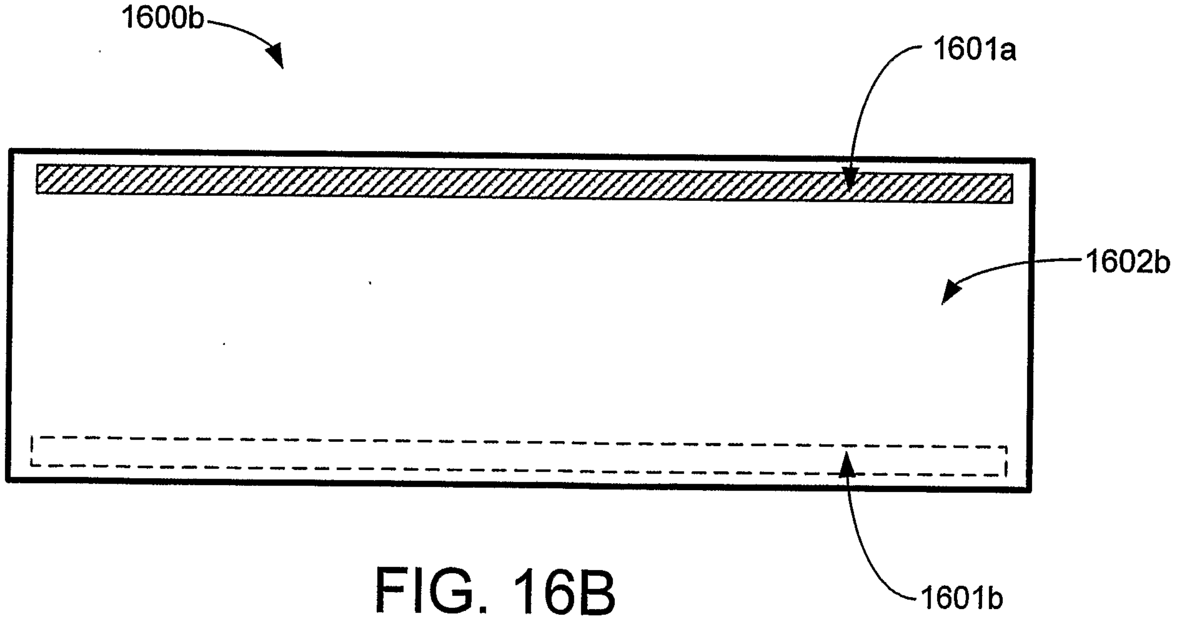

FIG. 16B

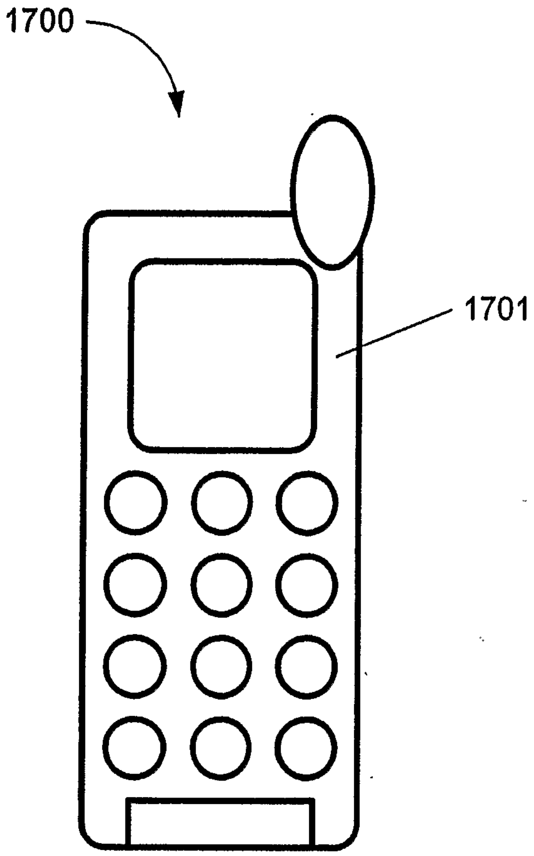

FIG. 17A

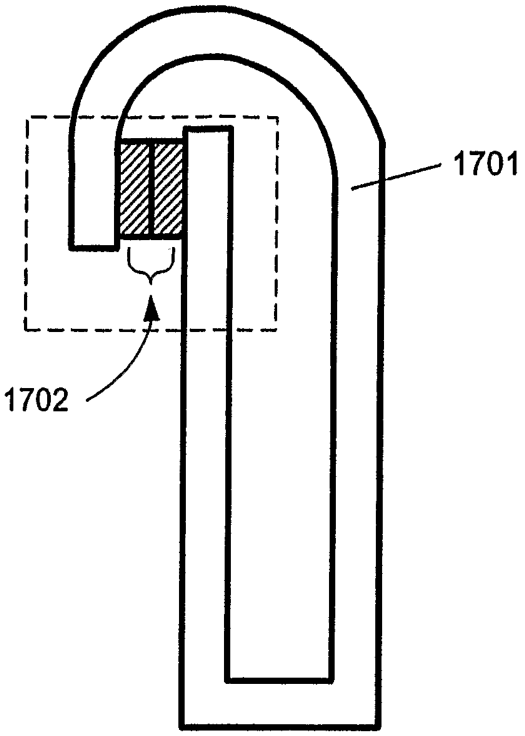

FIG. 17B

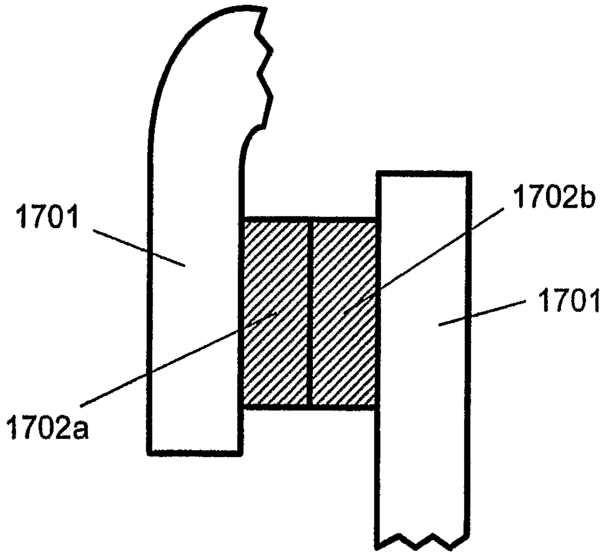

FIG. 17C

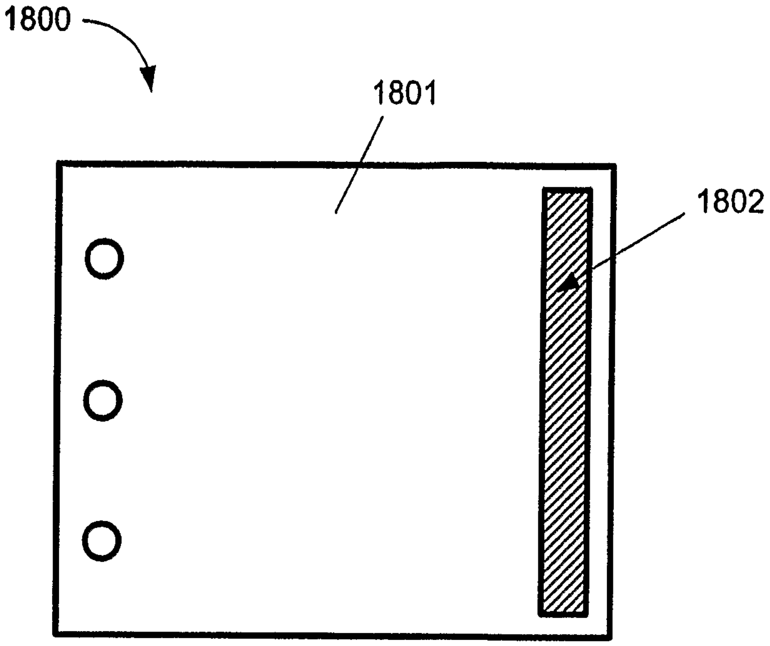

FIG. 18A

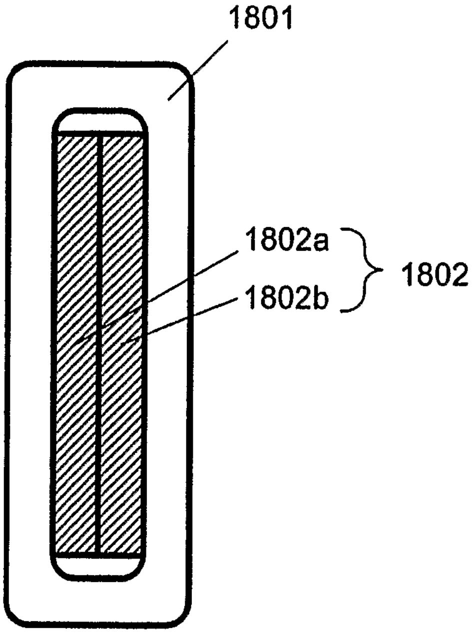

FIG. 18B

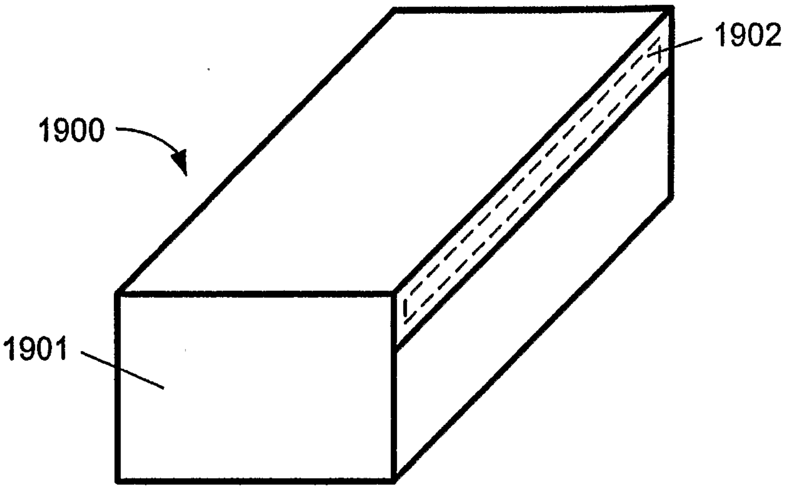

FIG. 19A

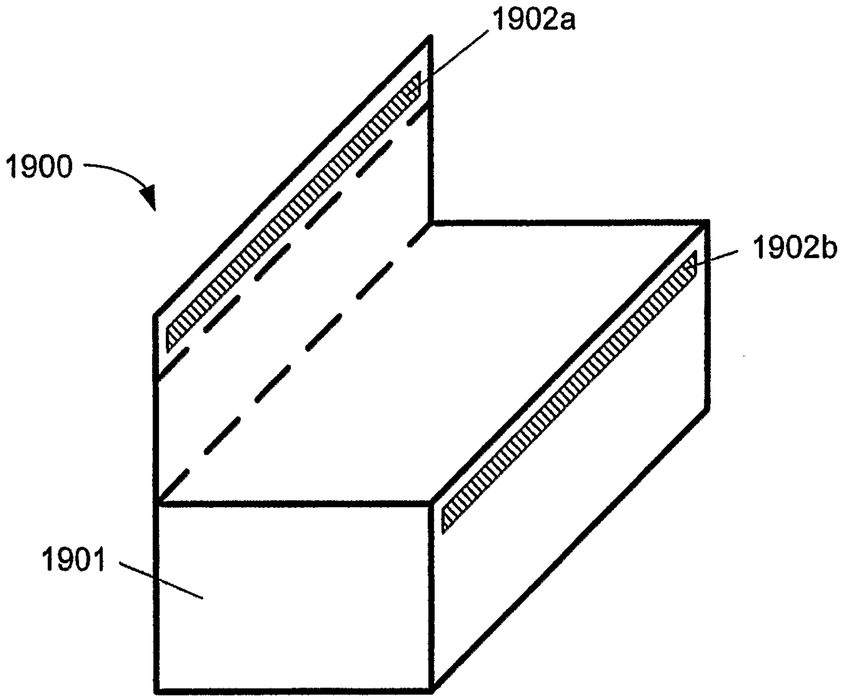

FIG. 19B

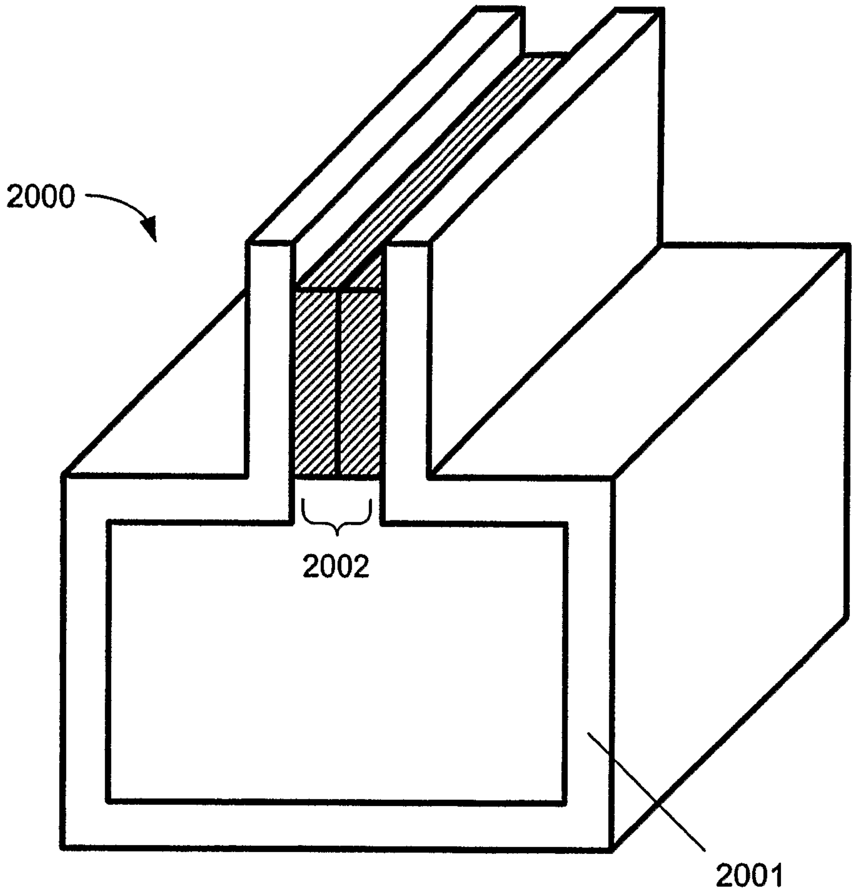

FIG. 20A

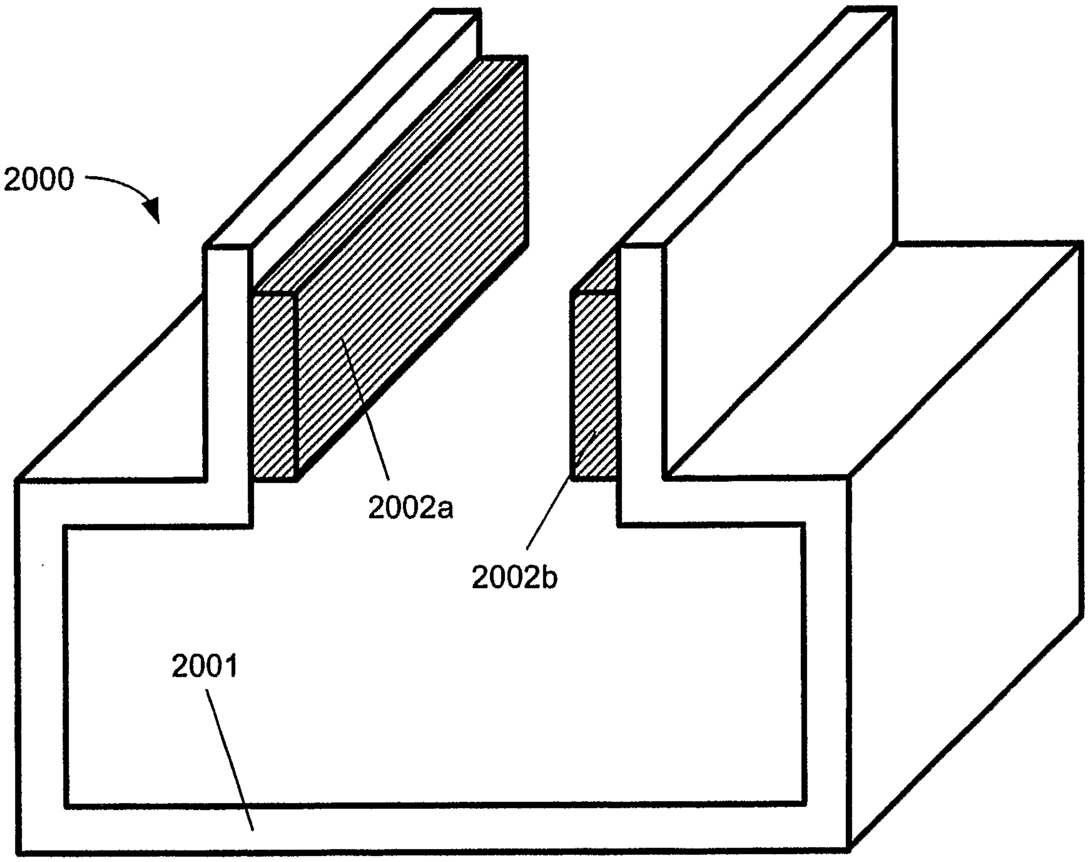

FIG. 20B