(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 661 817 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
31.05.2006 Bulletin 2006/22

(51) Int Cl.:
B65D 33/25 *(2006.01)*

(21) Application number: **05257131.2**

(22) Date of filing: **18.11.2005**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

(30) Priority: **24.11.2004 US 998108**

(71) Applicant: **ILLINOIS TOOL WORKS INC.**
Glenview
Illinois 60026-1215 (US)

(72) Inventor: **Ausnit, Steve**
New York, NY 10021 (US)

(74) Representative: **Finnie, Peter John**
Gill Jennings & Every LLP
Broadgate House
7 Eldon Street
London EC2M 7LH (GB)

(54) String zipper designs for slider-operated reclosable packaging

(57) A reclosable package comprising a receptacle having a mouth, a string zipper joined to the receptacle at the mouth, the string zipper comprising first and second mutually interlockable zipper strips, and a slider mounted over the string zipper to cause the first and second zipper strips to separate when the slider is moved in one direction along the string zipper and to cause the first and second zipper strips to interengage each other when the slider is moved in an opposite direction along the string zipper. In one exemplary embodiment, the first flangeless zipper strip comprises two monohook elements, and the second flangeless zipper strip also comprises two monohook elements. In another exemplary embodiment, the first flangeless zipper strip comprises one monohook element and one double hook element, while the second flangeless zipper strip comprises three monohook elements.

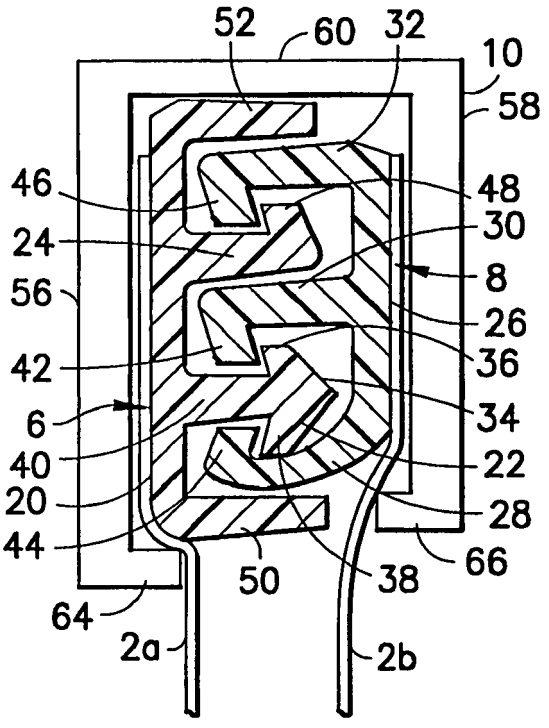

FIG.2

EP 1 661 817 A2

Description

Background to the Invention

[0001] This invention generally relates to zippers for use in reclosable packaging, such as bags or pouches. In particular, the invention relates to string zippers for reclosable bags.

[0002] Reclosable bags are finding ever-growing acceptance as primary packaging, particularly as packaging for foodstuffs such as cereal, fresh vegetables, snacks and the like. Such bags provide the consumer with the ability to readily store, in a closed, if not sealed, package any unused portion of the packaged product even after the package is initially opened.

[0003] Reclosable bags comprise a receptacle having a mouth with a zipper for opening and closing. In recent years, many zippers have been designed to operate with a slider mounted thereon. As the slider is moved in an opening direction, the slider causes the zipper sections it passes over to open. Conversely, as the slider is moved in a closing direction, the slider causes the zipper sections it passes over to close. Typically, a zipper for a reclosable bag includes a pair of interengageable profiled closure strips that are joined at opposite ends of the bag mouth. The profiles of interengageable plastic zipper strips can take on various configurations, e.g. interlocking rib and groove elements having so-called male and female profiles, interlocking alternating hook-shaped closure elements, etc. Reclosable bags having slider-operated zippers are generally more desirable to consumers than bags having zippers without sliders because the slider eliminates the need for the consumer to align the interengageable zipper profiles before causing those profiles to engage.

[0004] In one type of slider-operated zipper assembly, the slider straddles the zipper and has a separating finger at one end that is inserted between the profiles to force them apart as the slider is moved along the zipper in an opening direction. The other end of the slider is sufficiently narrow to force the profiles into engagement and close the zipper when the slider is moved along the zipper in a closing direction.

[0005] In the past, many interlocking closure strips were formed integrally with the bag making film, for example, by extruding the bag making film with the closure strips formed on the film. Such constructions, however, were limited by the conditions required to extrude both the film and zipper together. To avoid such limitations, many bag designs entail separate extrusion of the closure strips, which are subsequently joined to the bag-making film, for example, by conduction heat sealing. These separate closure strips typically have flanges extending therefrom in such a way that the flanges can be joined to bag-making film in order to attach the closure strips to the film. Previous slider-operated, separately extruded zippers used flange-type constructions.

[0006] An alternative zipper design is the so-called flangeless or string zipper, which has substantially no flange portion above or below the interengageable closure profiles. In the case of a string zipper, the bag-making film is joined to the backs of the bases of the closure strips. String zippers can be produced at much greater speeds, allow much greater footage to be wound on a spool, thereby requiring less set-up time, and use less material than flanged zippers, enabling a substantial reduction in the cost of manufacture and processing.

[0007] There is a continuing need for new designs for reclosable bags that can be manufactured at low cost.

Summary of the Invention

[0008] The present invention is directed to zipper improvements in reclosable packages that have a slider-operated string zipper attached to a receptacle, the slider being employed to open or close the string zipper for allowing or denying access to the interior volume of the receptacle.

[0009] One aspect of the invention is a reclosable package comprising: a receptacle comprising first and second walls, respective portions of the first and second walls forming a mouth that communicates with an interior volume of the receptacle; a string zipper comprising mutually interengageable first and second flangeless zipper strips, the first flangeless zipper strip having a back joined to the portion of the first wall, and the second flangeless zipper strip having a back joined to the portion of the second wall; and a slider mounted over the string zipper to cause the first and second flangeless zipper strips to separate when the slider is moved in one direction along the string zipper and to cause the first and second flangeless zipper strips to interengage each other when the slider is moved in an opposite direction along the string zipper, the slider comprising first and second sidewalls, the portions of the first and second walls joined to the first and second flangeless zipper strips passing between the first and second sidewalls of the slider, wherein the first flangeless zipper strip comprises a first monohook element, the second flangeless zipper strip comprises a second monohook element, and the first and second monohook elements interfere with each other during relative movement of the first and second zipper strips into and out of interengagement.

Brief Description of the Drawings

[0010] Embodiments of the present invention will now be described in detail with reference to the accompanying drawings, in which:

FIG. 1 is a drawing showing a reclosable package having a slider-operated string zipper with end stops;

FIG. 2 is a drawing showing a sectioned view of a slider-string zipper assembly in accordance with a first embodiment of the present invention, the section being taken through the zipper at the closing end of

the slider [The packaging film is not shown in section in any drawing to avoid clutter];

FIGS. 3 and 4 are drawings showing respective sectioned views of the string zipper of the first embodiment at respective stages during a zipper closure operation;

FIG. 5 is a drawing showing a sectioned view of the slider-string zipper assembly of the first embodiment of the present invention, the section being taken through the zipper at the opening end of the slider;

FIG. 6 is a drawing showing a sectioned view of a slider-string zipper assembly in accordance with a second embodiment of the invention, the section being taken through the zipper at the closing end of the slider;

FIGS. 7-9 are respective drawings showing sectioned views of respective string zippers in accordance with three variations of a third embodiment of the invention;

FIG. 10 is a drawing showing a sectioned view of a string zipper (attached to walls of a receptacle) in accordance with a fourth embodiment of the invention;

FIG. 11 is a drawing showing a sectioned view of a slider-string zipper assembly in accordance with the fourth embodiment, the section being taken through the zipper at the opening end of the slider;

Detailed Description

[0011] A reclosable package comprising a receptacle 2 and a flexible plastic string zipper 4 operated by manipulation of a slider 10 is shown in FIG. 1. It should be understood that the slider-zipper assemblies disclosed herein can be installed in a reclosable package of the type shown in FIG. 1 or other types of reclosable packages having different structures.

[0012] The receptacle 2 may be made from any suitable film material, including thermoplastic film materials such as low-density polyethylene, substantially linear copolymers of ethylene and a C3-C8 alpha-olefin, polypropylene, polyvinylidene chloride, mixtures of two or more of these polymers, or mixtures of one of these polymers with another thermoplastic polymer. The person skilled in the art will recognize that this list of suitable materials is not exhaustive. The thickness of the film is preferably 2 mils or less. The receptacle 2 comprises opposing walls (only the front panel 2a is visible in FIG. 1) that may be secured together at opposite side edges of the receptacle by seams 30 and 32 (indicated by dashed lines). The opposing bottoms of the walls may be joined, for example, by means of a heat seal made in conventional fashion, e.g., by application of heat and pressure. Typically, however, the bottom of the package is formed by a fold 34 in the original packaging film, as depicted in FIG. 1.

[0013] At its top end, the receptacle 2 has an openable mouth, on the inside of which is an extruded plastic string zipper 4. The string zipper 4 comprises a pair of interengageable zipper strips. One zipper strip 6 is visible in FIG. 1. The profiles of the zipper strips may take any form. For example, the string zipper may comprise interlocking rib and groove elements or alternating hook-shaped closure elements or combinations thereof. The preferred zipper material is polyethylene. The upper margins of the front and rear bag walls are respectively sealed to the backs of the respective zipper strips by a conventional conduction heat sealing technique.

[0014] The string zipper is operated by sliding the slider 10 along the zipper strips. As the slider moves across the zipper, the zipper is opened or closed. As shown in FIG. 1, the slider is slidable along the zipper in a closing direction "C", causing the zipper strips to become engaged, or in an opening direction "O", causing the zipper strips to become disengaged.

[0015] The package shown in FIG. 1 further comprises end stops 26 and 28 for preventing the slider from sliding off the end of the zipper when the slider reaches the zipper closed or fully opened position. Such end stops perform dual functions, serving as stops to prevent the slider from going off the end of the zipper and also holding the two zipper profiles together to prevent the receptacle from opening in response to stresses applied to the profiles through normal use of the bag. In accordance with one embodiment of the invention, the end stops comprise stomped areas on the zipper strips themselves. The stomped end stops comprise sections of the zipper strips that have been fused together and flattened at the ends of the zipper.

[0016] A string zipper design in accordance with a first embodiment of the present invention is depicted in FIGS. 2-4. One of the special attributes of the string zipper shown in FIGS. 2-4 resides in that means are provided for strong resistance to opening from the inside of the bag. Thus, the upper portion of the string zipper is constructed and arranged for relatively easy opening from the top, while the lower portion of the string zipper is constructed and arranged for strong resistance to opening from the inside of the bag. Also, the zipper design seen in FIGS. 2-4 facilitates alignment of the zipper strips.

[0017] The profiles of the lower portion of the string zipper 4 are constructed for effectively resisting opening separation from the interlocking engagement shown in FIG. 2 by separating forces exerted on the walls 2a and 2b from inside the bag body. The string zipper comprises first and second flangeless zipper strips 6 and 8. The first flangeless zipper strip 6 comprises a base 20 and first and second profiled closure elements 22, 24 integrally formed with the base. The first and second profiled closure elements 22, 24 project from one side of the base 20, while a portion of a marginal portion of wall 2a is joined to the back surface of the base 20, e.g., by conventional conduction heat sealing in a band-shaped zone of joinder. The second flangeless zipper strip 8 comprises a base 26 and first through third profiled closure elements 28, 30, 32 integrally formed with the base. The first through third profiled closure elements 28, 30, 32 project

from one side of the base 26, while a portion of a marginal portion of wall 2b is joined to the back surface of the base 26, e.g., by conventional conduction heat sealing in a band-shaped zone of joinder. When the first and second flangeless zipper strips are mutually engaged, the first profiled closure element 22 of the first flangeless zipper strip 6 resides in the space between the first and second profiled closure elements 28, 30 of the second flangeless zipper strip 8, while the second profiled closure element 24 of the first flangeless zipper strip resides in the space between the second and third profiled closure elements 30, 32 of the second flangeless zipper strip.

[0018] In accordance with the embodiment shown in FIGS. 2 and 3, the first profiled closure element 22 of the first flangeless zipper strip is an elongated rib having a generally arrowhead-shaped profile. [This rib is a member of the set of elements referred to hereinafter as "double hook elements", i.e., elements having two hook flanges directed oppositely.] The rib 22 comprises a head 34 having a generally triangular profile with a first lateral hook flange or detent 36 along its upper side and a second lateral hook flange or detent 38 along its lower side. The head 34 is connected to the base 20 by means of a stem 40. The second profiled closure element 24 of the first flangeless zipper strip 6 comprises an elongated hooked element that is spaced apart from and extends in parallel with rib 22. [Each hooked element is a member of the set of elements referred to hereinafter as "monohook elements", i.e., elements having a single hook flange.] The first and second profiled closure elements 28, 30 of the second flangeless zipper strip 8 comprise mutually parallel elongated hooked elements respectively located adjacent to and on opposite sides of the rib 22 when the string zipper is closed. Hooked element 30 projects from the base 26 of the second flangeless zipper strip 8 and comprises a generally downwardly projecting hook flange or detent 42 on its distal end that engages the generally upwardly projecting hook flange or detent 36 of the rib 22 of the first flangeless zipper strip 6, while hooked element 28 projects from the base 26 of the second flangeless zipper strip and has at its distal end a generally upwardly directed hook flange or detent 44 that engages the generally downwardly projecting hook flange or detent 38 of the rib 22. The hooked elements 28 and 30 define a groove within which the head 34 of rib 22 is inserted when the zipper is closed.

[0019] Hook flange 38 of rib 22 is of substantially greater mass, and thus greater stiffness, than the hook flange 36 of rib 22. The hook flange 44 of the hooked element 28 may also be provided with substantial mass, so that the engaged hook flanges 38 and 44 afford substantial resistance to separation due to internal forces generated within the receptacle of the package that tend to push the walls 2a and 2b apart. Further, to assist in the resistance to internal force separation of the hook flanges 38 and 44, the hooked element 28 has a curved profile, providing a concavity that receives hook flange 38 of rib 22, so that there is minimum stress tending to separate the hooked element 28 from the rib 22 when the wall 2b bows outwardly under internal pressure within the bag. Nevertheless, both of the hooked elements 28 and 30 are relatively resiliently flexible for enabling their relative movement past head 34 of rib 22 during zipper closure manipulation. After alignment of the profiled closure elements with the grooves therebetween as shown in FIG. 3, closing pressure applied from opposite sides will cause the hook flanges 42 and 44 to cam past the hook flanges 36 and 38 of rib 22 until the hook flanges 42 and 44 clear the hook flanges 36 and 38 and the resilience of the hooked elements 28 and 30 causes the hook flanges 42 and 44 to snap into interlocking position behind the hook flanges 36 and 38, as shown in FIG. 2.

[0020] The upper portion of the string zipper 4 comprises a hooked element 32 projecting from the base 26 of the second flangeless zipper strip 8 and a hooked element 24 projecting from the base 20 of the first flangeless zipper strip 6. The distal end of hooked element 32 has a generally downwardly projecting hook flange 46, which engages a generally upwardly projecting hook flange 48 of hooked element 24. The hooked element 24 is disposed in back-to-back relation to hooked element 30 in a mutually supportive but separable relation. In addition, the first flangeless zipper strip 6 also comprises first and second backup flanges 50, 52 projecting substantially perpendicularly from the base 20 and respectively overlying the hooked elements 28 and 32 in backup relation. In effect, the hooked element 24 and the backup flange 52 define a groove that receives hooked element 32; and the rib 22 and the backup flange 50 define a groove that receives hooked element 28.

[0021] When maneuvering to close the string zipper 4, the hooked elements 24 and 32 assist in the zipper closing registration or aligning relation as shown in FIG. 3, at the same time that the hook flanges 42 and 44 engage in such relation with the head 34 of rib 22. The multiple alignment guidance cooperatively provided by the several hooked elements of the two sets of profiled closure elements greatly facilitates the zipper closing procedure. Such closing procedure then continues, as zipper closing pressure (indicated by mutually opposing arrows 54 in FIG. 4) is applied, by relative flexing of the flexible profiled closure elements 24, 28, 30, 32, 50 and 52, as indicated by the solid and dashed line positions in FIG. 4. As the several hook flanges in the two sets of profiled closure elements pass by one another, the hook flanges of one set of profiled closure elements snap behind the cooperating hook flanges of the companion profiled closure elements. Then the multiple flexible elements assume their normal unflexed positions in the interlocked, i.e., zipper closed, relation as shown in FIG. 2.

[0022] Although the lower portion of the string zipper 4 is so constructed and arranged that there is efficient, substantially assured resistance against separation due to internal pressures within the receptacle of the package, and the upper portion of the string zipper, together with the lower portion will maintain an effective closure

of the receptacle, opening of the receptacle when desired is easily effected by means of a slider 10, the closing end of which is seen in FIG. 2. Although not seen in FIG. 2, the slider 10 has a separating finger or plow of the type shown in FIG. 5. The slider is not shown in FIGS. 3 and 4.

[0023] To open the closed string zipper, the slider must be moved in an opening direction. During slider movement in the opening direction, the separating finger pries the zipper strips 6 and 8 apart with sufficient force to pull the interengaged profiled closure elements apart. When the hook flanges of flangeless zipper strip 6 clear the hook flanges of the second flangeless zipper strip 8, zipper strips are no longer interlocked and the zipper is open, as seen in FIG. 3.

[0024] As seen in FIG. 2, the slider 10 for opening or closing the reclosable zipper is generally shaped so that the slider straddles the zipper profiles. The upper margins of the bag walls 2a and 2b, which are joined to the back sides of the zipper strips 6 and 8, are disposed between the respective zipper strips and the respective side walls 56 and 58 of the slider. A sealant layer (not shown) may be co-extruded onto the backs of the zipper strips to facilitate sealing of the bag-making film to the flangeless zipper strips.

[0025] As seen in FIG. 5 (which shows the opening end of the slider), the slider 10 comprises a top wall 60, a pair of side walls 56 and 58 connected to opposing sides of the top wall 60, the top wall 60 and side walls 56, 58 forming a tunnel for passage of the string zipper therethrough. The slider 10 further comprises a plow 62 depending from a central portion of the top wall 60 and dividing the slider tunnel into two channels, one for each zipper strip. The ends of the slider are open to allow the zipper to pass through. The width of the tunnel is substantially constant along the section that is divided by the plow 62 and then narrows from a point proximal to the end of the plow to the closing window at one end face of the slider. The narrowing section of the tunnel is formed by a pair of substantially planar, inclined interior surfaces (not shown in FIG. 5), which converge toward the closing window of the slider. These inclined surfaces cam or squeeze the zipper strips toward each other, causing the zipper profiles to interlock, as the slider is moved in the closing direction along the zipper. Retaining projections 64 and 66 project from the side walls 56 and 58 of the slider 10 and extend toward each other. These projections help retain the slider on the zipper.

[0026] The slider may be made in multiple parts and welded together or the parts may be constructed to be snapped together. The slider may also be of one-piece construction. The slider can be made using any desired method, such as injection molding. The slider can be molded from any suitable plastic, such as nylon, polypropylene, polystyrene, acetal, polyketone, polybutylene terephthalate, high-density polyethylene, polycarbonate, or ABS.

[0027] A string zipper design in accordance with a second embodiment of the invention is shown in FIG. 6. This string zipper comprises a pair of flangeless zipper strips 6 and 8, each of which is an extruded plastic part having a generally constant profile along its length. The backs of the flangeless zipper strips 6, 8 are joined to the marginal portions of respective walls 2a, 2b (shown in part) of a receptacle, and a slider 10 having a separating finger or plow (not shown) will be mounted to the string zipper with the joined portions of the receptacle walls 2a, 2b passing between the slider sidewalls 56 and 58.

[0028] The zipper strip 6 comprises a base 82 and first and second hooked elements 84 and 86 projecting from that base, each hooked element having a respective hook flange or detent 88 and 90 at its distal end. The zipper strip 8 comprises first and second hooked elements 70 and 72 projecting from the bottom and top respectively of a base 68. The hook flanges 88, 90 of hooked elements 84, 86 project away from each other; the hook flanges 74, 76 of hooked elements 70, 72 project toward each other. When the string zipper is closed (as depicted in FIG. 6), the hooked elements 84 and 86 of zipper strip 6 are disposed between the hooked elements 70 and 72 of zipper strip 8 in interengaging relationship. The engagement of hook flange 88 with hook flange 76 and of hook flange 90 with hook flange 74 clasps the zipper strips in interlocking relationship.

[0029] The flangeless zipper strip 6 shown in FIG. 6 also comprises first and second backup flanges 50 and 52 projecting substantially perpendicularly from the opposing ends of the base 82 and respectively overlapping the hooked elements 70 and 72 of zipper strip 8 in backup relation. The hooked element 84 and the backup flange 52 define a groove that receives the hooked element 72 of the flangeless zipper strip 8; and the hooked element 86 and the backup flange 50 define a groove that receives the hooked element 70 of flangeless zipper strip 8.

[0030] The zipper design shown in FIG. 6 is provided with a self-alignment features in the form of a large centrally located rib 80 that projects from the base 68 of flangeless zipper strip 8 into a channel 78 defined by the backs of hooked elements 84 and 86 of flangeless zipper strip 6. The rib 80 has tapered side surfaces. Likewise the channel 78 has tapered surfaces. Alignment of the flangeless zipper strips as they are pressed together is facilitated by the rib 80 interacting with the sides of the channel 78. The rib 80 is sized and shaped to fit snugly in the channel 78 during zipper closure. As a result, the rib's tapered surfaces abut against the hooked elements 84 and 86 so as to prevent inadvertent opening of the zipper.

[0031] Different variations of a string zipper design in accordance with a third embodiment of the invention are shown in FIGS. 7-9. Again each string zipper comprises a pair of flangeless zipper strips 6 and 8, each of which is an extruded plastic part having a generally constant profile along its length. The backs of the flangeless zipper strips 6, 8 are joined to marginal portions of respective walls (not shown in FIGS. 7-9) of a receptacle, and a slider (also not shown) having a separating finger or plow will be mounted to the string zipper.

[0032] In each of the variations depicted in FIGS. 7-9, the zipper strip 6 comprises a base 96 and first and second hooked elements 98 and 100 projecting from that base, each hooked element having a respective hook flange or detent 102 and 104 at its distal end. The zipper strip 8 comprises first and second hooked elements 112 and 114 projecting from the bottom and top respectively of a base 110, each hooked element having a respective hook flange or detent 116 and 118 at its distal end. The hook flanges 102, 104 of hooked elements 98, 100 project away from each other; the hook flanges 116, 118 of hooked elements 112, 114 project toward each other. When the string zipper is closed (as depicted in each of FIGS. 7-9), the hooked elements 98 and 100 of zipper strip 6 are disposed between the hooked elements 112 and 114 of zipper strip 8 in interengaging relationship. The engagement of hook flange 102 with hook flange 116 and of hook flange 104 with hook flange 118 clasps the zipper strips in interlocking relationship. The flangeless zipper strip 6 shown also comprises first and second backup flanges 106 and 108 projecting substantially perpendicularly from the opposing ends of the base 96 and respectively overlapping the hooked elements 112 and 114 of zipper strip 8 in backup relation. The hooked element 98 and the backup flange 106 define a groove that receives the hooked element 112 of the flangeless zipper strip 8; and the hooked element 100 and the backup flange 108 define a groove that receives the hooked element 114 of flangeless zipper strip 8.

[0033] Each of the zipper designs shown in FIGS. 7-9 is further provided with a feature for providing improved waterproofing and more effective sealing of the package. The feature consists of a spreader, projecting from the base of one zipper strip, that fits between and spreads the hooked elements on the other zipper strip, thereby bringing the zipper strips into a more positive interlocked condition. More specifically, zipper strip 8 of the variation shown in FIG. 7 comprises a spreader in the form of a wedge120 having a triangular profile. When the zipper strips 6 and 8 are interlocked, the wedge 120 spreads the hooked elements 98 and 100 of zipper strip 6 apart to bring them into a more positive interlocked condition with the hooked elements 112 and 114 of zipper strip 8. In accordance with an alternative variant, a split wedge could be provided by forming a slot that would extend from the apex of the triangle toward the base of the zipper strip 8. This split wedge, due to its reduced mass, may be susceptible to fewer problems during the extrusion process.

[0034] The variation shown in FIG. 8 differs from that shown in FIG. 7 only in that the spreader 122 has a trapezoidal profile instead of a triangular profile. The profile of the spreader may alternatively have a curved (e.g., semi-circular or semi-elliptical) contour.

[0035] In both of the variations depicted in FIGS. 7 and 8, the base of the spreader is integrally formed with the base of zipper strip 8. In accordance with alternative variations (not shown in the drawings), a triangular or trapezoidal spreader can be connected to the base of zipper strip 8 by means of a stem. FIG. 9 shows a variation wherein the spreader 124 has a circular profile and is connected to the base 110 of zipper strip 8 by means of a stem 126. The diameter of the spreader 124 needs to be greater than the width of the gap between the backs of the hooked elements 98 and 100 of zipper strip 6. As a result, when the zipper is closed, the diametrally opposed portions of the circular cylindrical spreader 124 will bear against the backs of the hooked elements 98 and 100 of zipper strip 6, causing them to spread apart and into more positive engagement with the corresponding hooked elements 112 and 114 of zipper strip 8.

[0036] FIGS. 10 and 11 show a fourth embodiment of the invention. The string zipper consists of a pair of flangeless zipper strips 6 and 8 that each comprise a pair of profiled closure elements that are angled relative to the backs of the zipper strips. As seen in FIG. 10, a flangeless zipper strip 6 comprises a base 130 with first and second hooked elements 132 and 134 and a backup element 136 integrally formed therewith and projecting therefrom, while a flangeless zipper strip 8 comprises a base 138 with first and second hooked elements 140 and 142 and a backup element 144 integrally formed therewith and projecting therefrom. The first and second flangeless zipper strips may have substantially identical profiles, with substantially planar back surfaces 146 and 148 that are mutually parallel. When the hooked elements are interlocked, the hook flanges lie in a plane that is inclined (i.e., neither parallel nor perpendicular) relative to the plane of the back surfaces 146 and 148. The hooked elements 132 and 134 of zipper strip 6 define a groove that receives the hooked element 140 of zipper strip 8, while the hooked element 132 and the backup element 136 of the zipper strip 6 define a groove that receives the hooked element 142 of zipper strip 8. Similarly, the hooked elements 140 and 142 of zipper strip 8 define a groove that receives the hooked element 132 of zipper strip 6, while the hooked element 140 and the backup element 144 of zipper strip 8 define a groove that receives the hooked element 134 of zipper strip 6.

[0037] The package in accordance with the fourth embodiment further comprises a slider 10' (shown in FIG. 11) having an angled separating finger or plow 150 (meaning that plow 150 is not perpendicular to slider top wall 60) for prying the interlocked zipper strips apart when moved in an opening direction. The sidewalls 56 and 58 squeeze the zipper strips together when the slider is moved in a closing direction. The angle of the plow 150 preferably matches the angle of inclination of the hook flanges. The slider is retained on the string zipper with the aid of retaining projections 64 and 66 projecting from the bottom marginal portions of sidewalls 56 and 58. Respective marginal portions of walls 2a and 2b are respectively joined to the vertical back surfaces 146 and 148 (and not to the slanted back surfaces 150 and 152), such joined marginal portions passing between the slider sidewalls. Joinder to the vertical surfaces only creates more

of a hinge effect when the bag film 2a and 2b moves outward, thereby improving resistance to opening the zipper from the inside of the bag.

[0038] While the invention has been described with reference to preferred embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for members thereof without departing from the scope of the invention. In addition, many modifications may be made to adapt a particular situation to the teachings of the invention without departing from the essential scope thereof. For example, the zipper strips and frangible connection need not be extruded from the same plastic material. More specifically, the connection could be made of a material that is more brittle than the material used to form the zipper strips. Therefore it is intended that the invention not be limited to the particular embodiment disclosed as the best mode contemplated for carrying out this invention, but that the invention will include all embodiments falling within the scope of the appended claims.

[0039] As used in the claims, the term "package" includes bags, pouches, and any other type of packaging in which a flexible plastic zipper can be incorporated. As used in the claims, the verb "joined" means fused, bonded, sealed, adhered, etc., whether by application of heat and/or pressure, application of ultrasonic energy, application of a layer of adhesive material or bonding agent, interposition of an adhesive or bonding strip, etc. As used in the claims, the term "string zipper" means a zipper comprising two interengageable zipper strips that have substantially no flange portions. As used in the claims, the term "monohook element" means a hook element having a single hook flange; the term "double hook element" means a hook element having two hook flanges directed oppositely; and the term "backup element" means an element not having any hook flanges.

Claims

1. A reclosable package comprising:

a receptacle comprising first and second walls, respective portions of said first and second walls forming a mouth that communicates with an interior volume of said receptacle;

a string zipper comprising mutually interengageable first and second flangeless zipper strips, said first flangeless zipper strip having a back joined to said portion of said first wall, and said second flangeless zipper strip having a back joined to said portion of said second wall; and

a slider mounted over said string zipper to cause said first and second flangeless zipper strips to separate when said slider is moved in one direction along said string zipper and to cause said first and second flangeless zipper strips to interengage each other when said slider is moved in an opposite direction along said string zipper, said slider comprising first and second sidewalls, said portions of said first and second walls joined to said first and second flangeless zipper strips passing between said first and second sidewalls of said slider,

wherein said first flangeless zipper strip comprises a first monohook element, said second flangeless zipper strip comprises a second monohook element, and said first and second monohook elements interfere with each other during relative movement of said first and second zipper strips into and out of interengagement.

2. The package as recited in claim 1, wherein said first flangeless zipper strip further comprises a first backup element, said first backup element and said first monohook element defining a first groove therebetween, said first groove receiving a portion of said second monohook element when said first and second zipper strips are interengaged.

3. The package as recited in claim 1, wherein said second flangeless zipper strip further comprises a third monohook element, said second and third monohook elements defining a first groove therebetween, said first groove receiving a portion of said first monohook element when said first and second zipper strips are interengaged.

4. The package as recited in claim 3, wherein said first flangeless zipper strip further comprises a double hook element, said second flangeless zipper strip further comprises a fourth monohook element, and said third and fourth monohook elements define a second groove therebetween, said second groove receiving a portion of said double hook element when said first and second zipper strips are interengaged.

5. The package as recited in claim 3, wherein said second and third monohook elements comprise respective hook flanges that project in substantially the same direction, while said first monohook element comprises a hook flange that projects in a generally opposite direction.

6. The package as recited in claim 1, wherein said first flangeless zipper strip comprises a third monohook element, said second flangeless zipper strip comprises a fourth monohook element, and said third and fourth monohook elements interfere with each other during relative movement of said first and second zipper strips into and out of interengagement.

7. The package as recited in claim 6, wherein said first and third monohook elements are disposed between said second and fourth monohook elements.

8. The package as recited in claim 6, wherein said second and third monohook elements comprise respective hook flanges that project in generally the same first direction, whereas said first and fourth monohook elements comprise respective hook flanges that project in generally the same second direction, said second direction being opposite to said first direction.

9. The package as recited in claim 6, wherein said first flangeless zipper strip further comprises first and second backup elements, said first backup element and said first monohook element defining a first groove therebetween, said first groove receiving a portion of said second monohook element when said first and second zipper strips are interengaged, and said second backup element and said third monohook element defining a second groove therebetween, said second groove receiving a portion of said fourth monohook element when said first and second zipper strips are interengaged.

10. The package as recited in claim 6, wherein said first and third monohook elements comprise respective hook flanges that project in generally the same first direction, whereas said second and fourth monohook elements comprise respective hook flanges that project in generally the same second direction, said second direction being opposite to said first direction.

11. The package as recited in claim 6, wherein said slider comprises a top wall connected to said first and second sidewalls, and a plow having one end connected to said top wall, said plow being inclined at an angle relative to said top wall that is not a right angle.

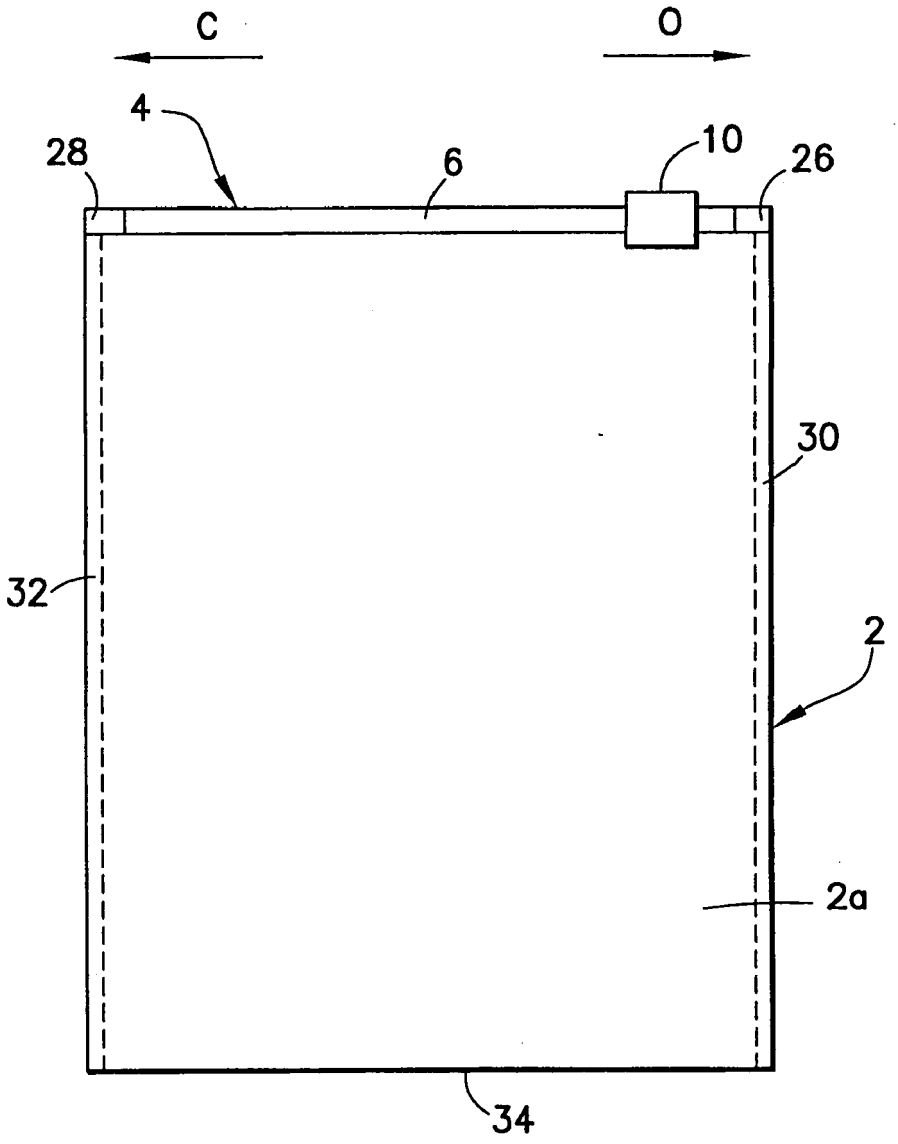

FIG. 1

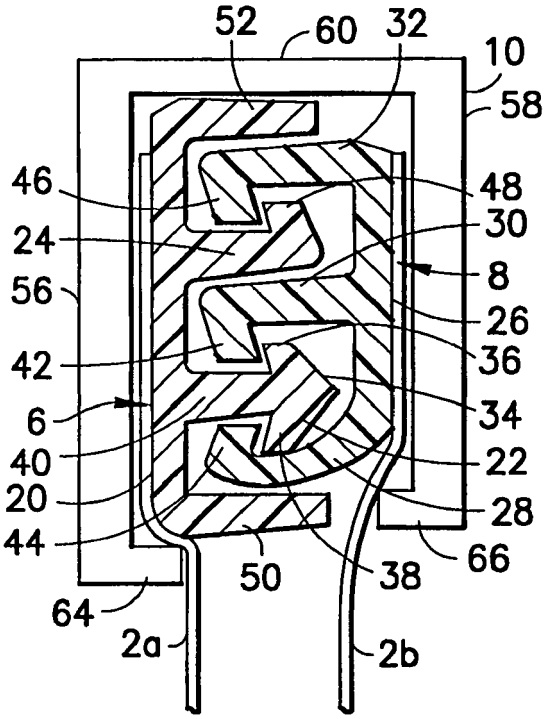
52
60
32
10
58
46
48
24
30
56
8
26
42
36
6
34
40
22
20
28
44
66
50
38
64
2a
2b

FIG.2

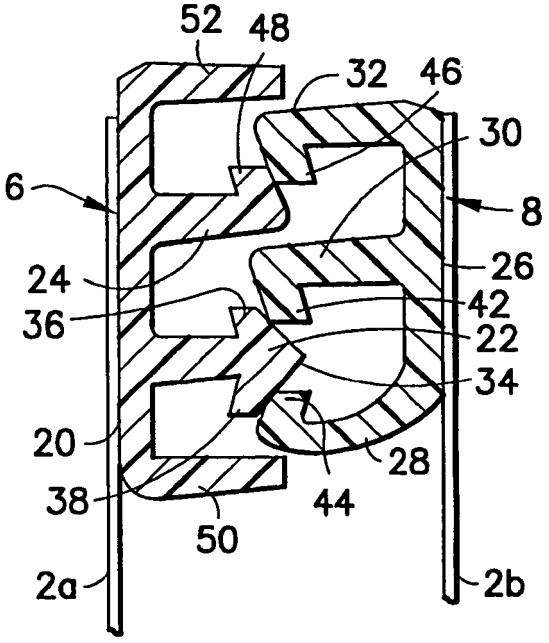
52
48
32
46
30
6
8
26
24
42
36
22
34
20
28
38
44
50
2a
2b

FIG.3

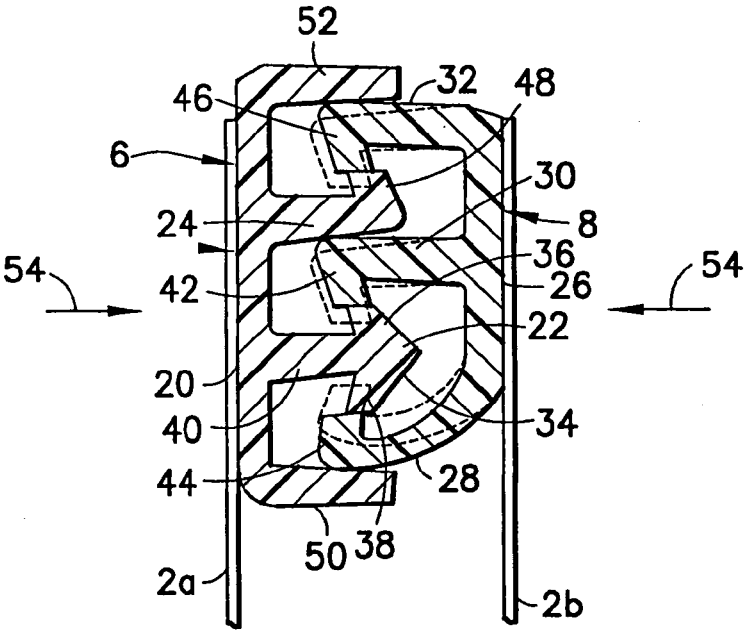
52
46
32
48
6
30
24
8
36
54
42
26
54
22
20
40
34
44
28
50
38
2a
2b

FIG.4

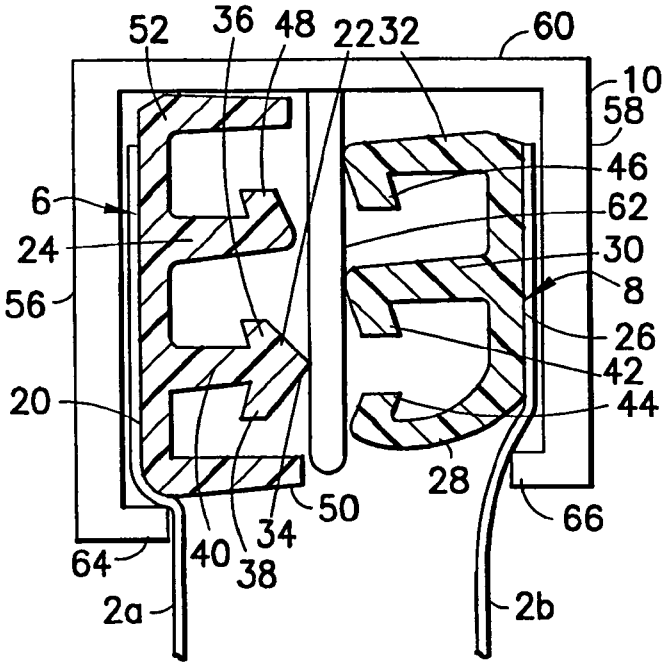
52
36
48
22
32
60
10
58
46
6
62
24
30
56
8
26
42
20
44
28
50
66
34
64
40
38
2a
2b

FIG.5

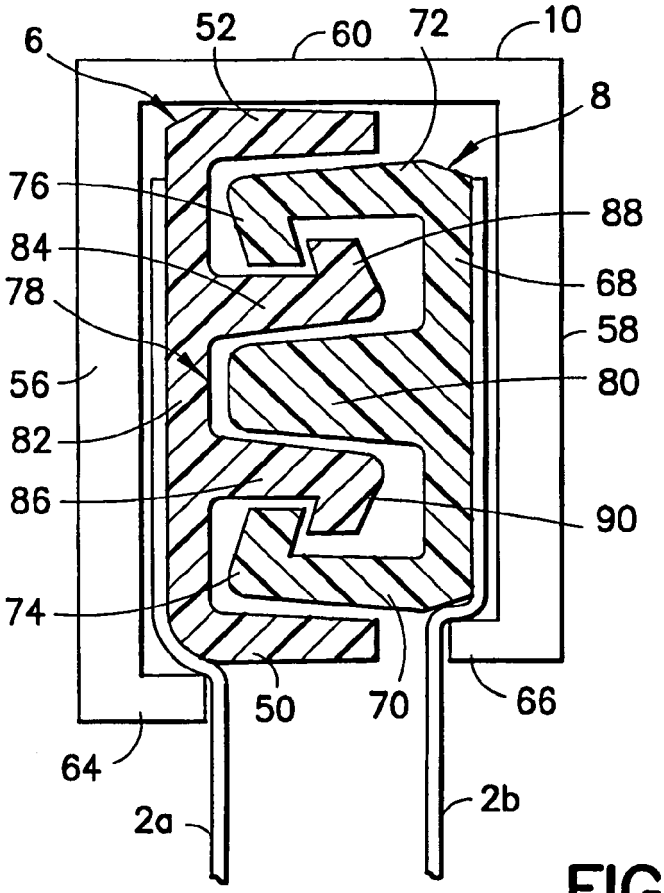
6
52
60
72
10
8
76
88
84
68
78
58
56
80
82
86
90
74
50
70
66
64
2a
2b

FIG.6

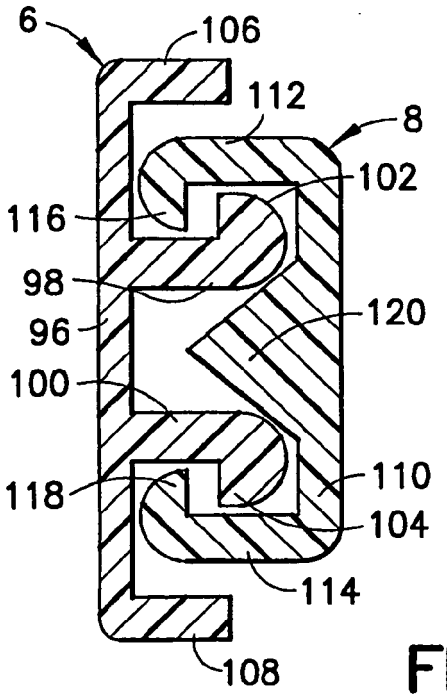
6
106
112
8
102
116
98
120
96
100
118
110
104
114
108

FIG.7

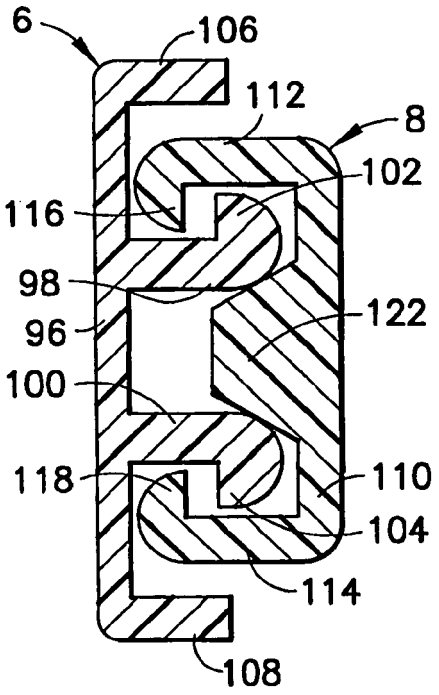
6
106
112
8
102
116
98
122
96
100
118
110
104
114
108

FIG.8

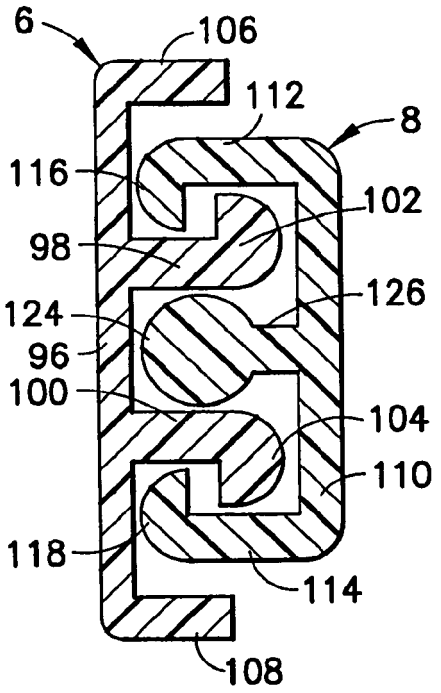
6
106
112
8
116
102
98
126
124
96
100
104
110
118
114
108

FIG.9

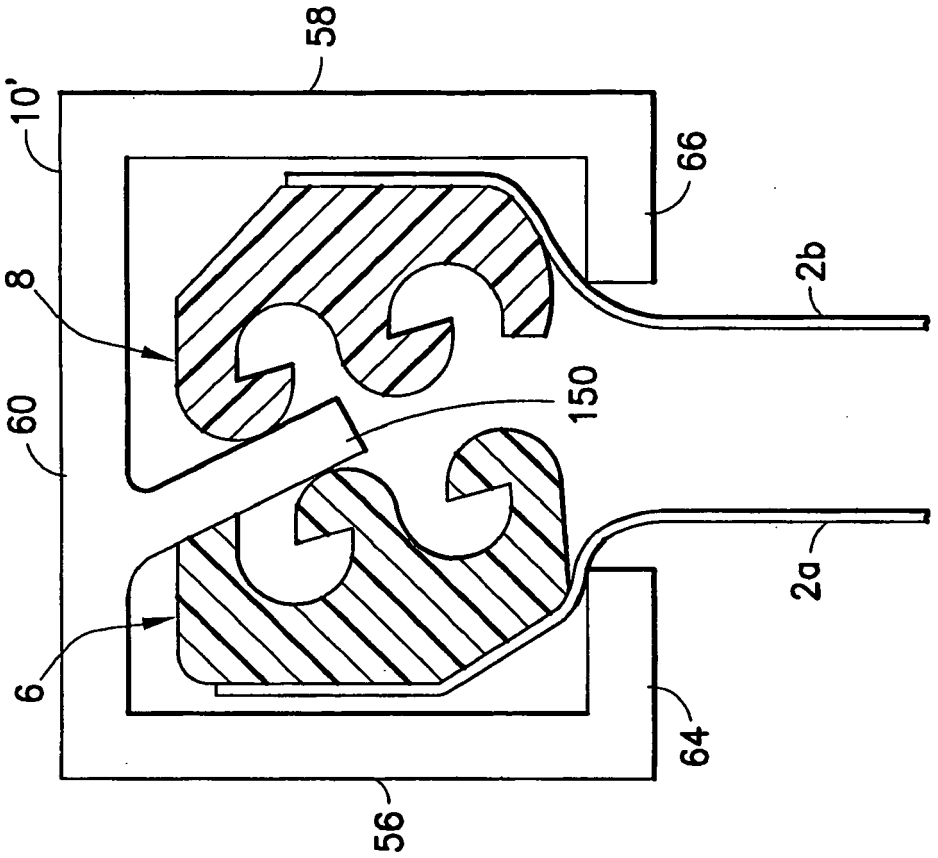
58
10'
66
8
2b
60
150
6
2a
64
56

FIG.11

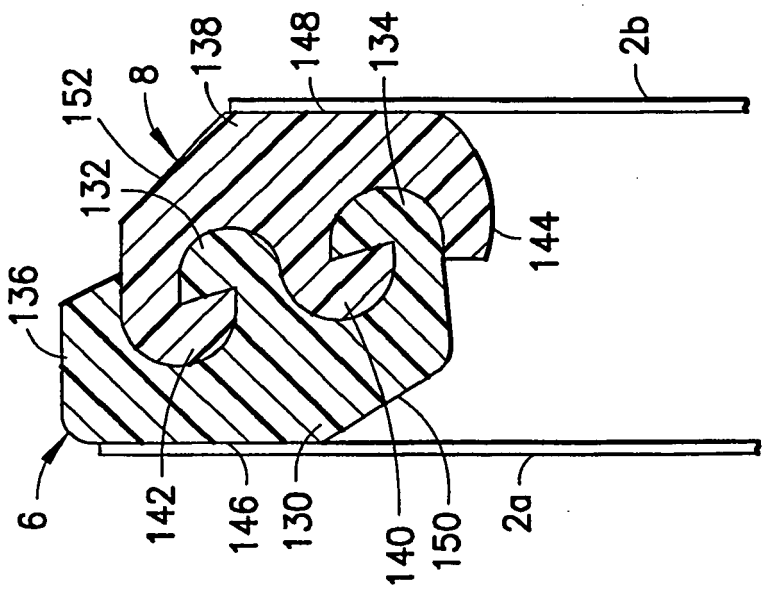
2b
138
148
134
152
8
132
144
136
6
142
146
130
140
150
2a

FIG.10