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(54) PACKAGING MEMBER

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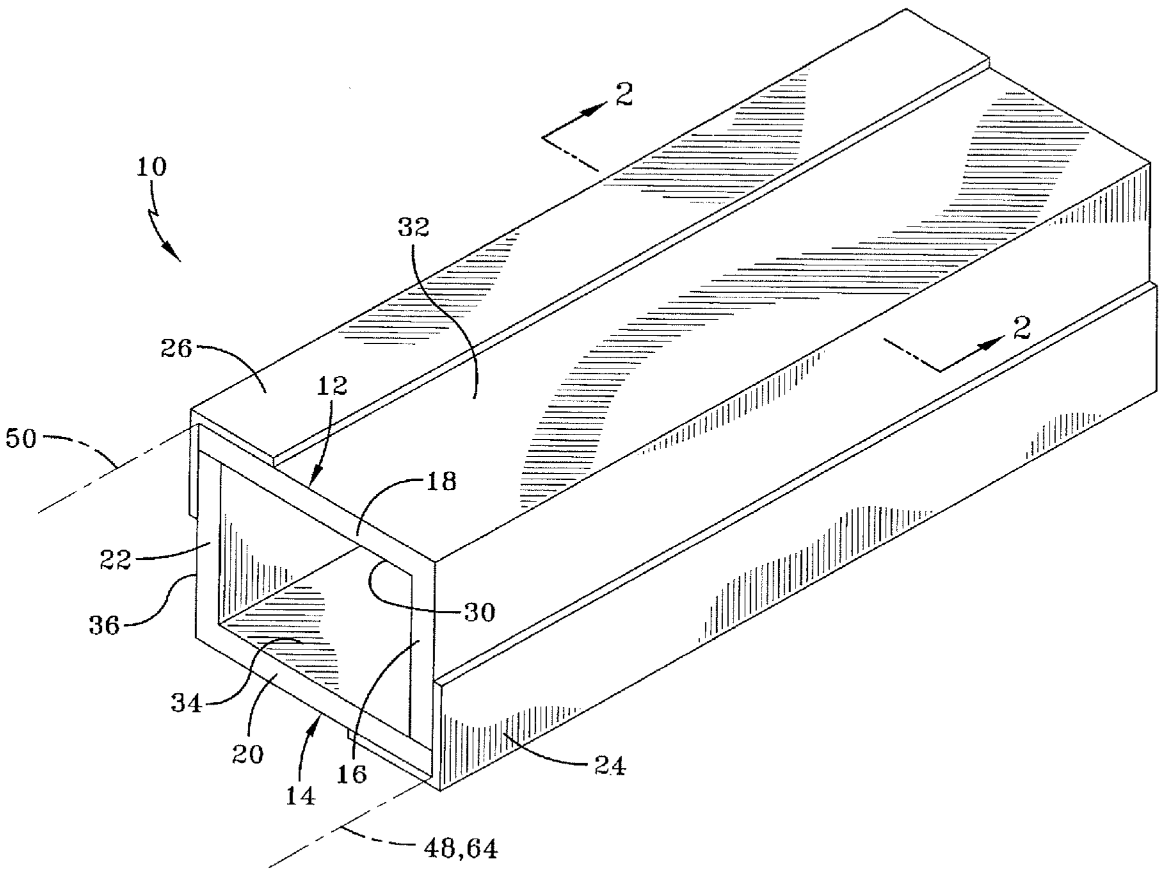
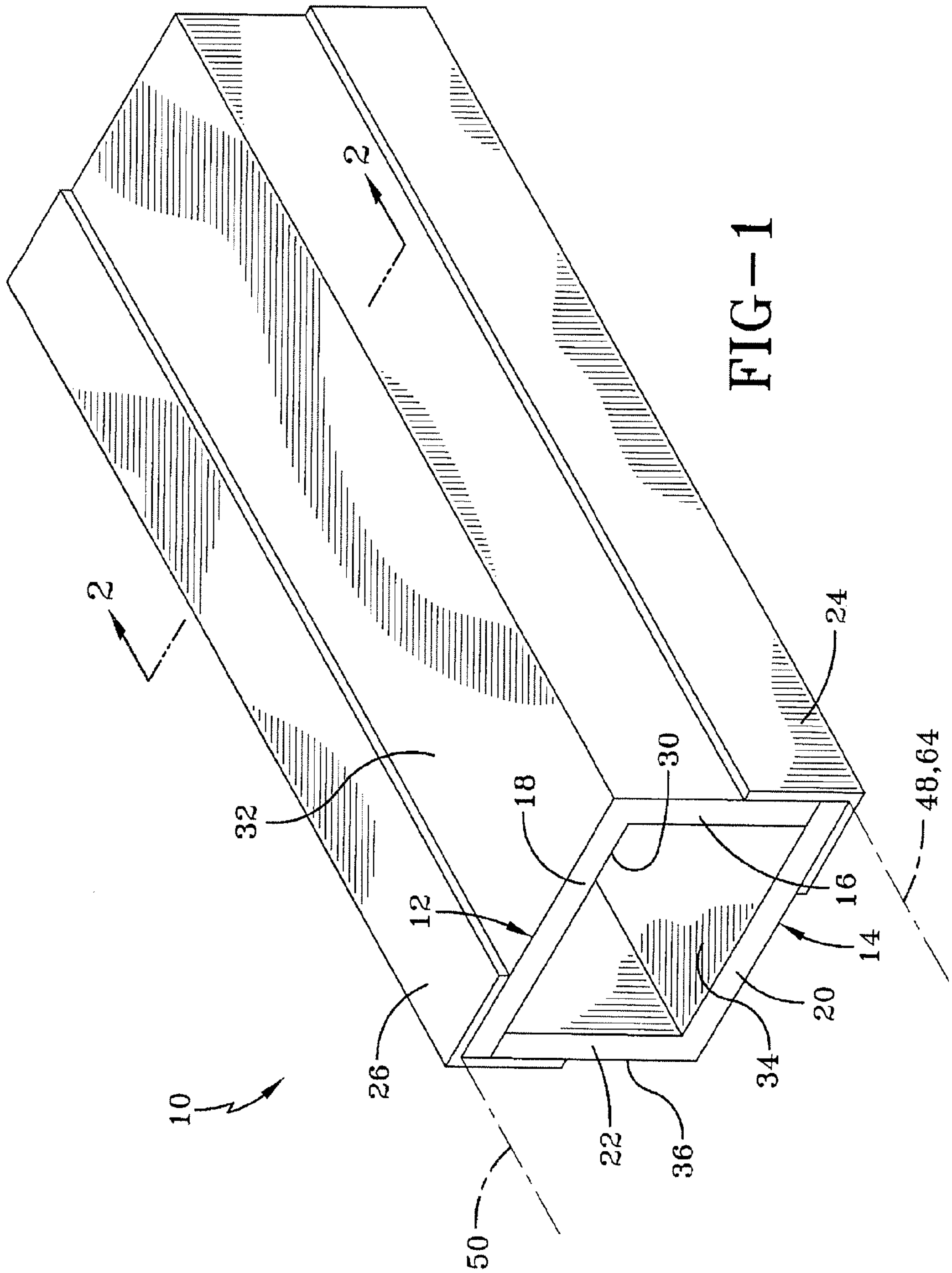
(57) **ABSTRACT**

A packaging member for protecting an edge of an article includes a member having a first leg and a second leg disposed at a predetermined angle to each other along a junction. At least two material plies are integrally connected along the junction. Each of the at least two material plies define a bend having a first width and a second width, wherein the first width and second width define different magnitudes.





FIG—1

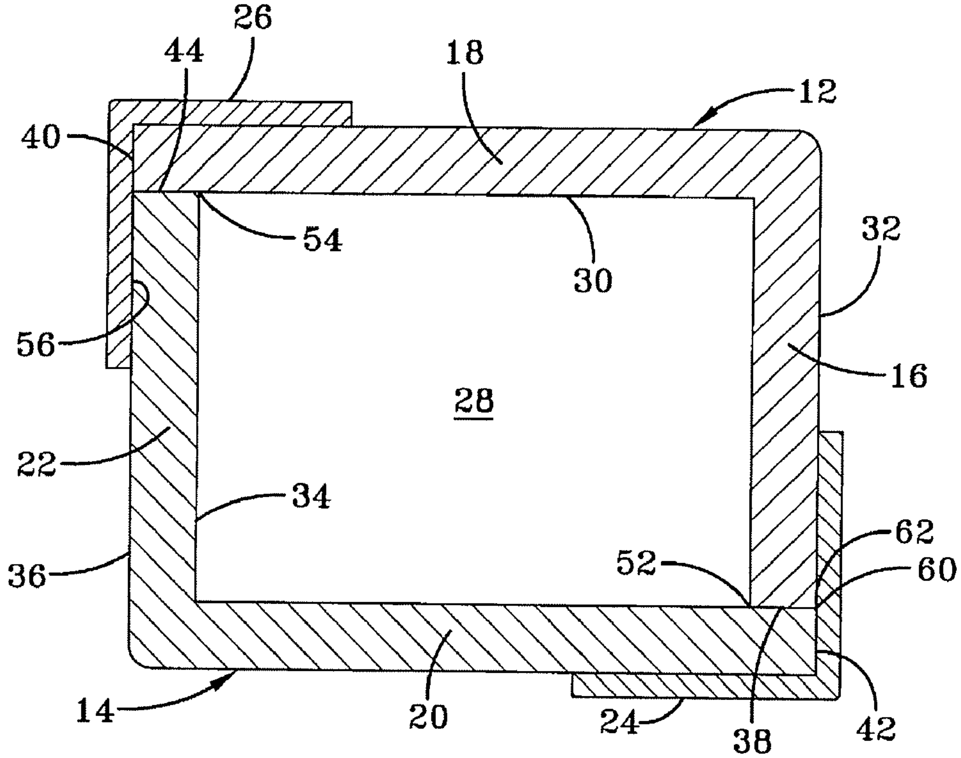

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FIG-2

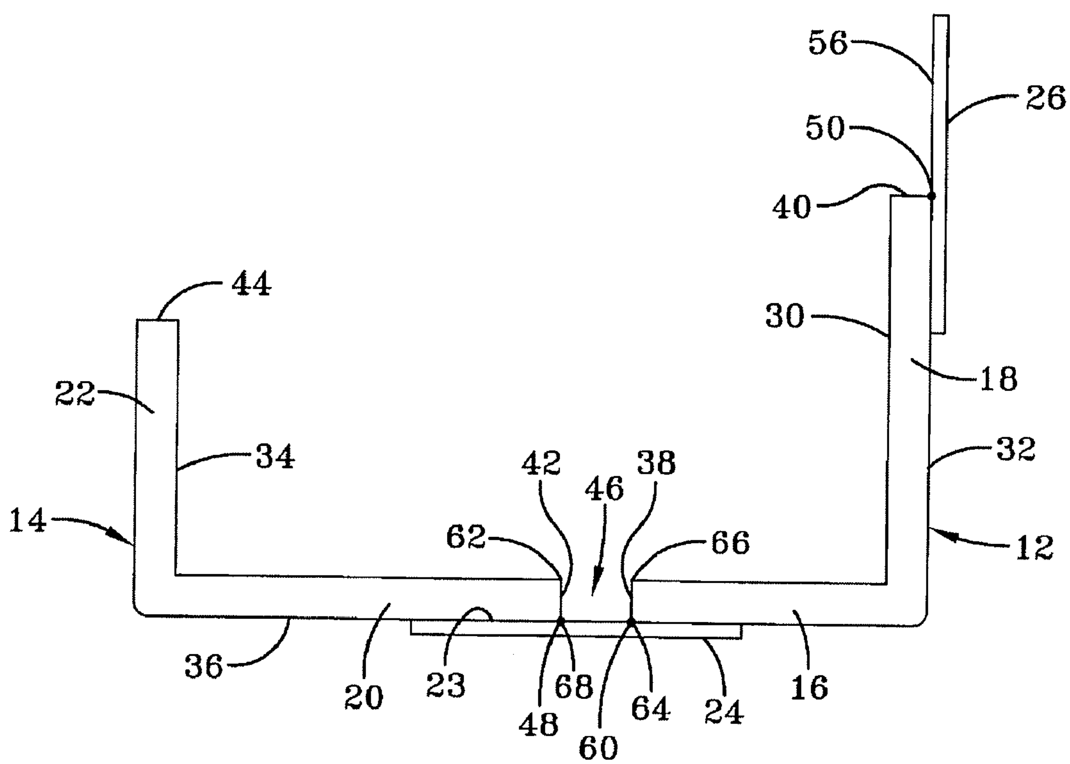
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FIG-3

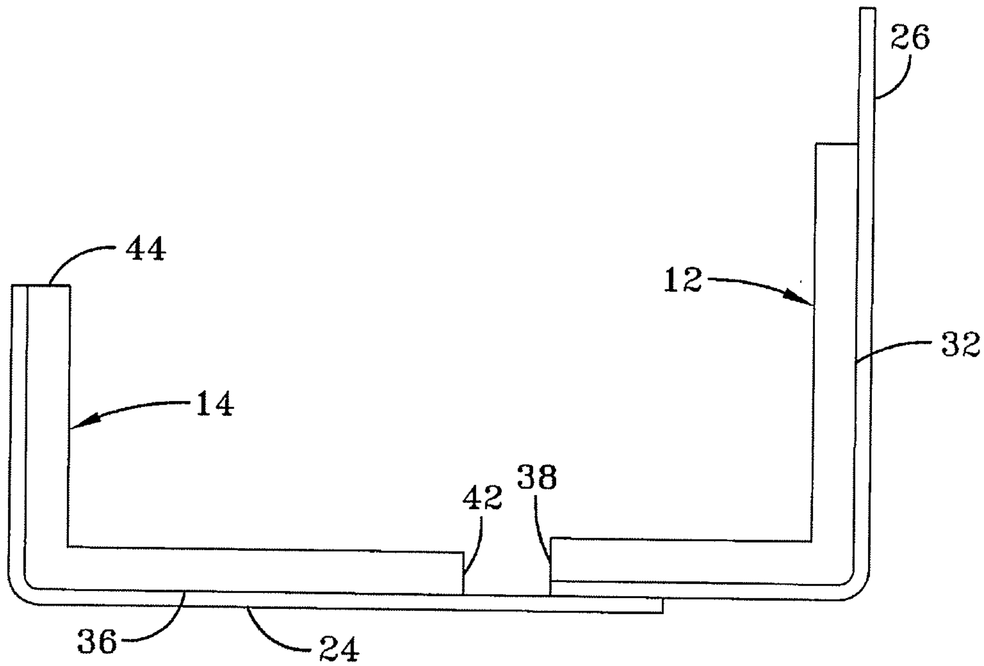

FIG-4

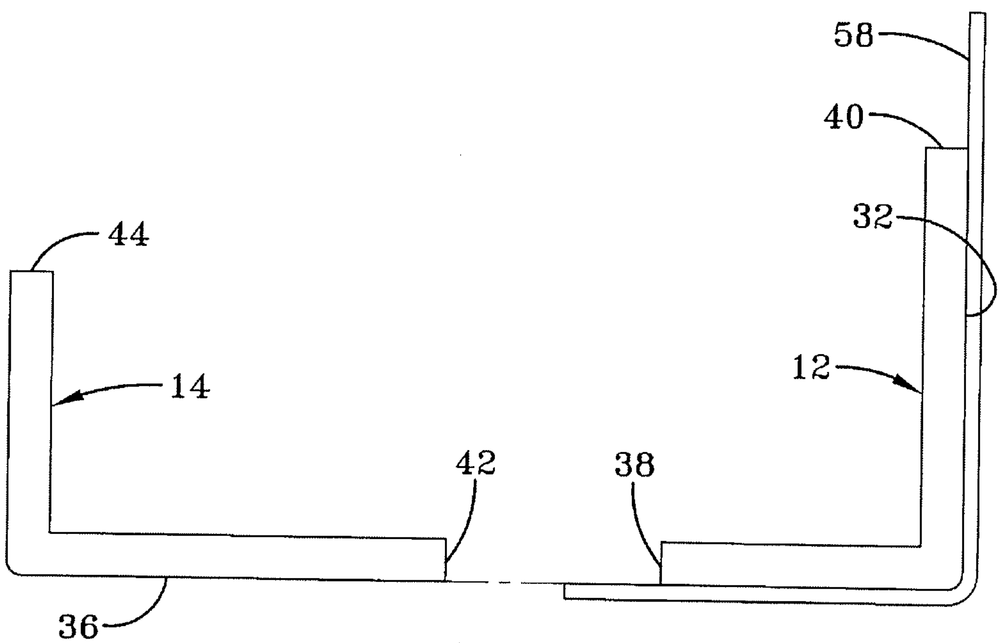

FIG-5

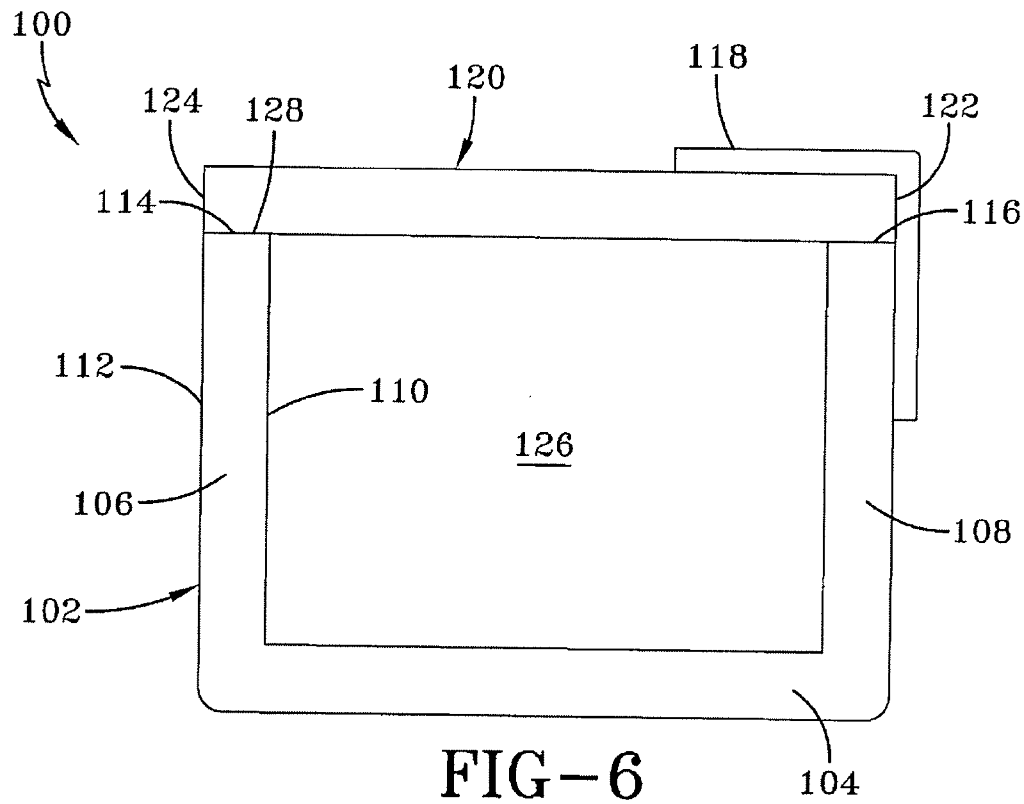
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FIG-6

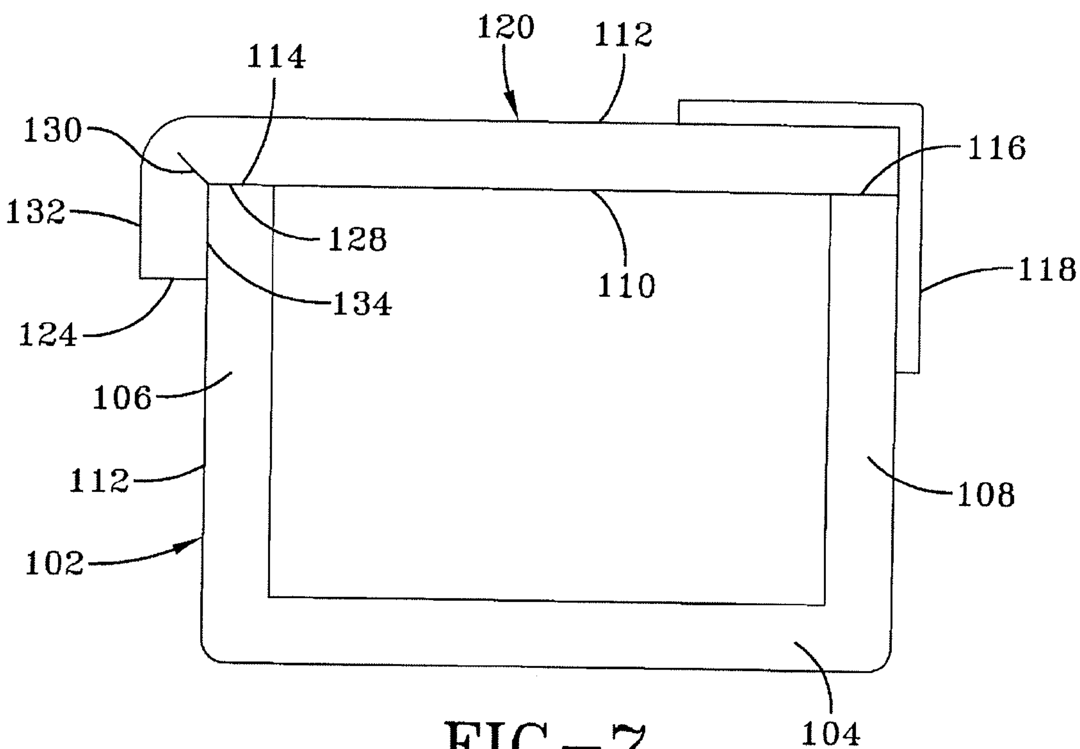
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FIG-7

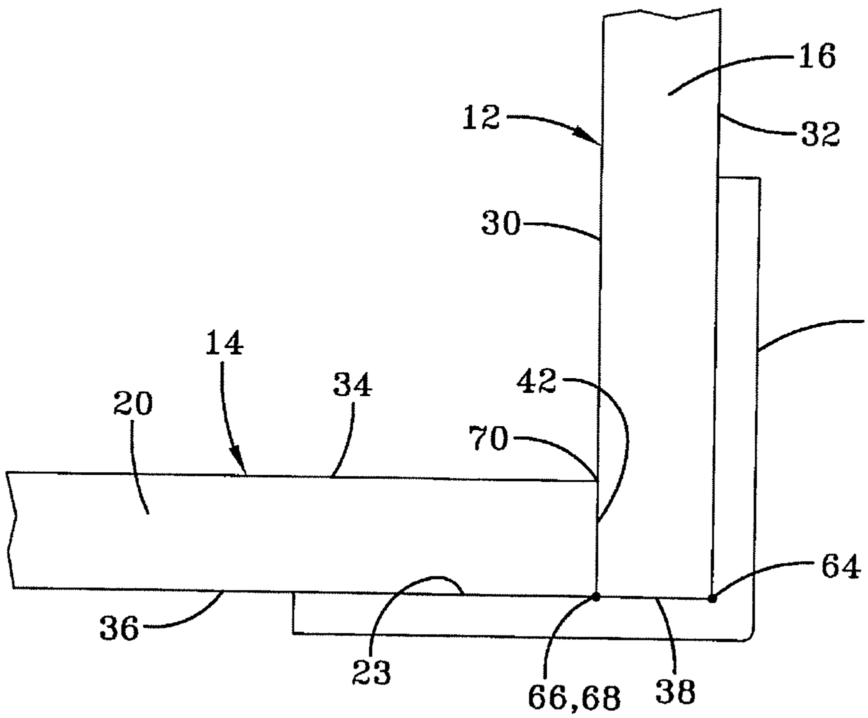
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FIG-8

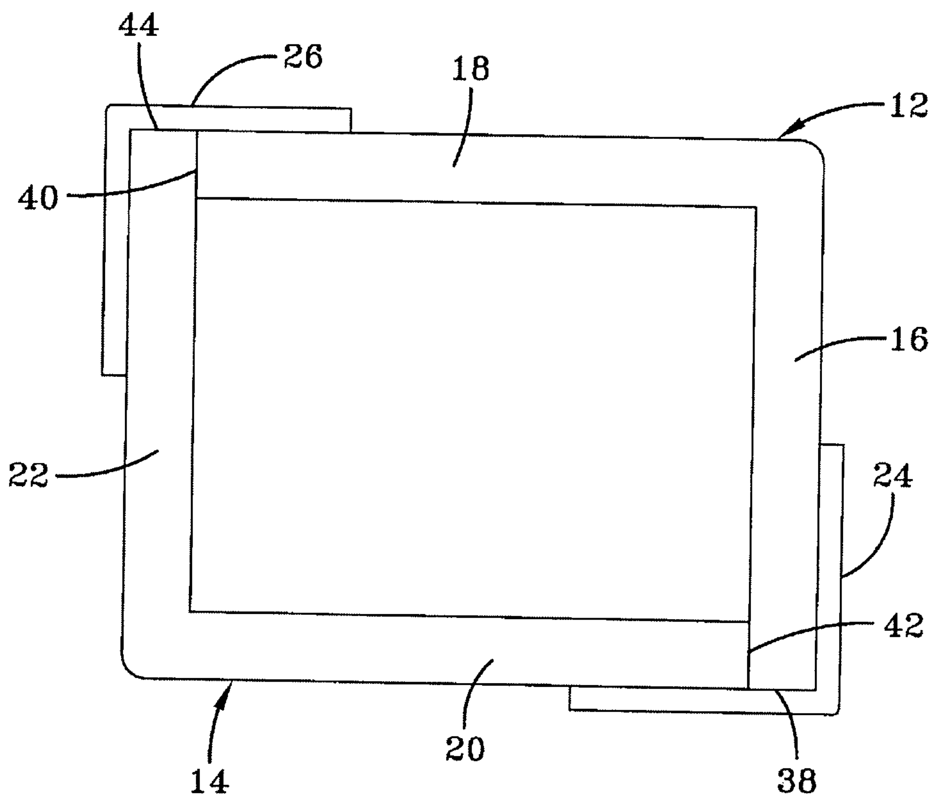
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FIG-9

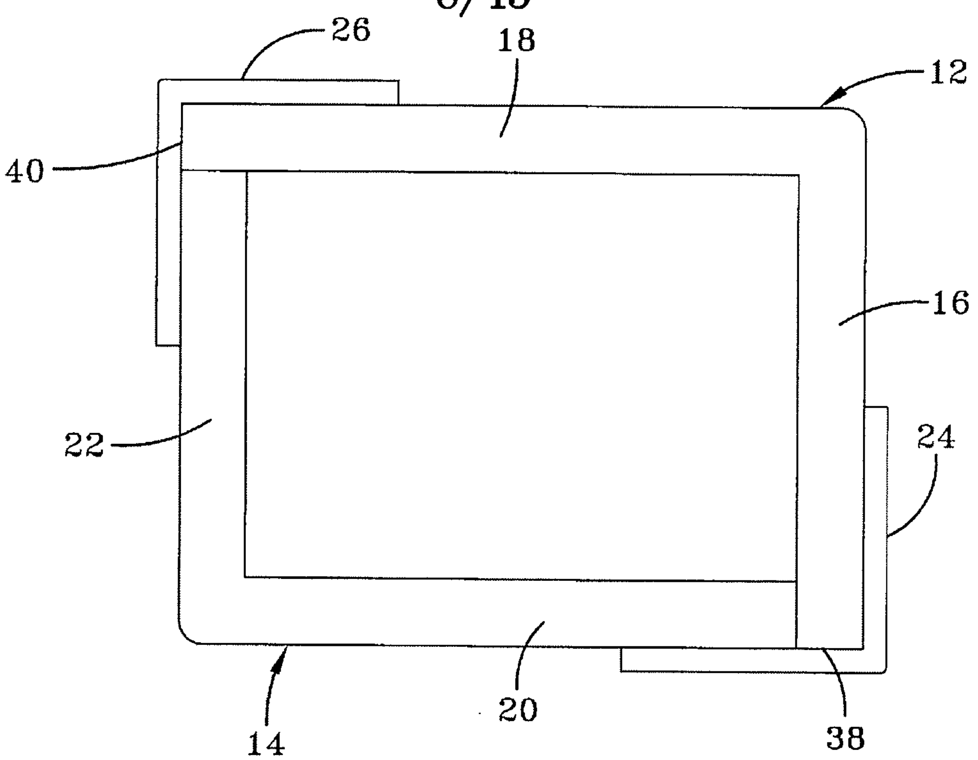
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FIG-9A

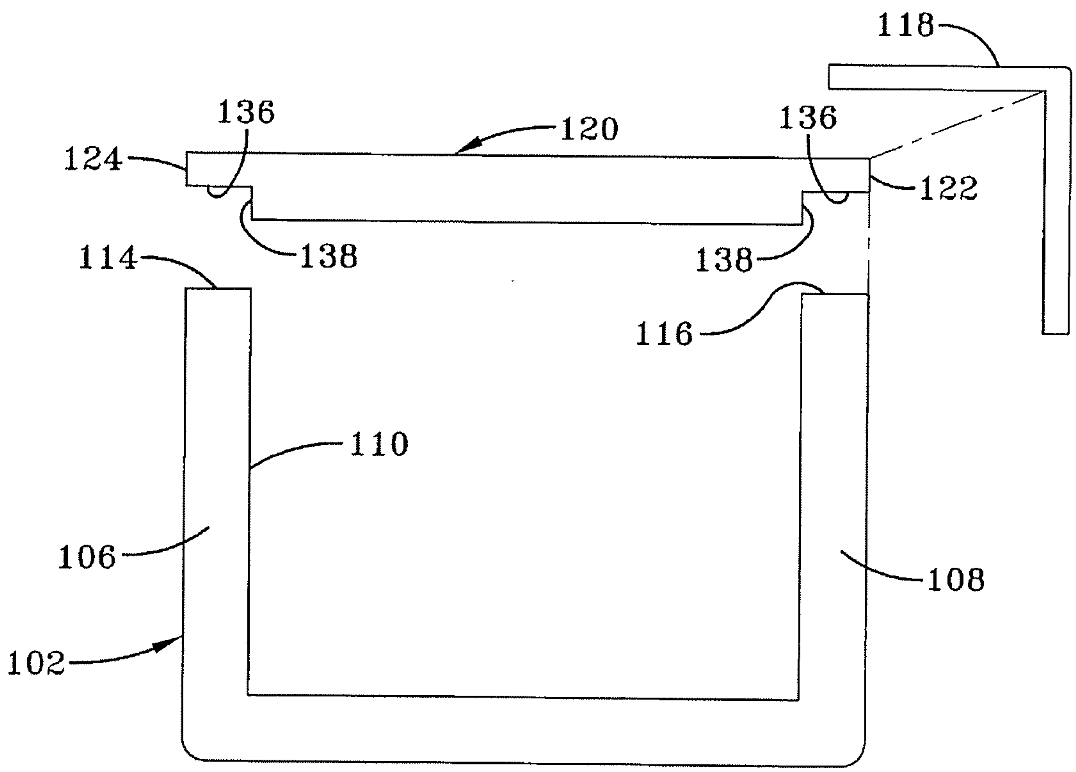
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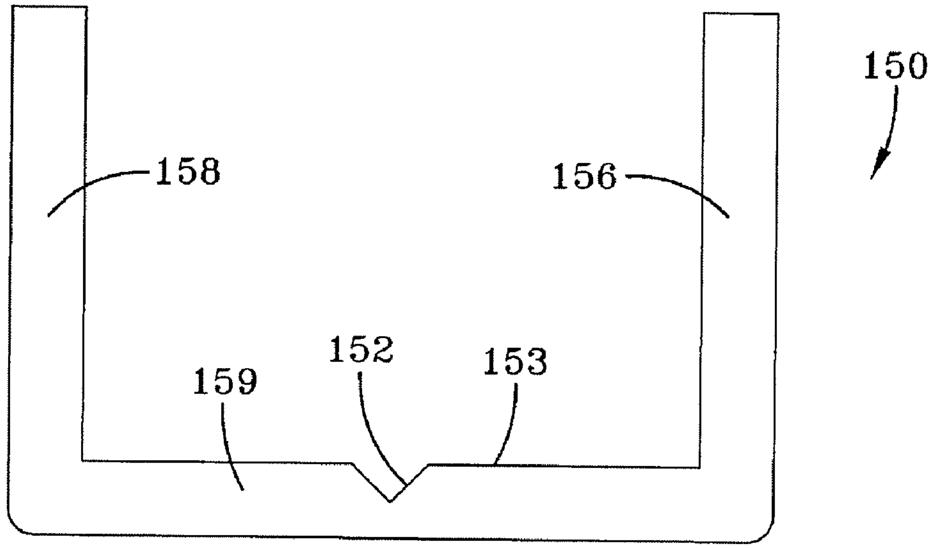
FIG-10



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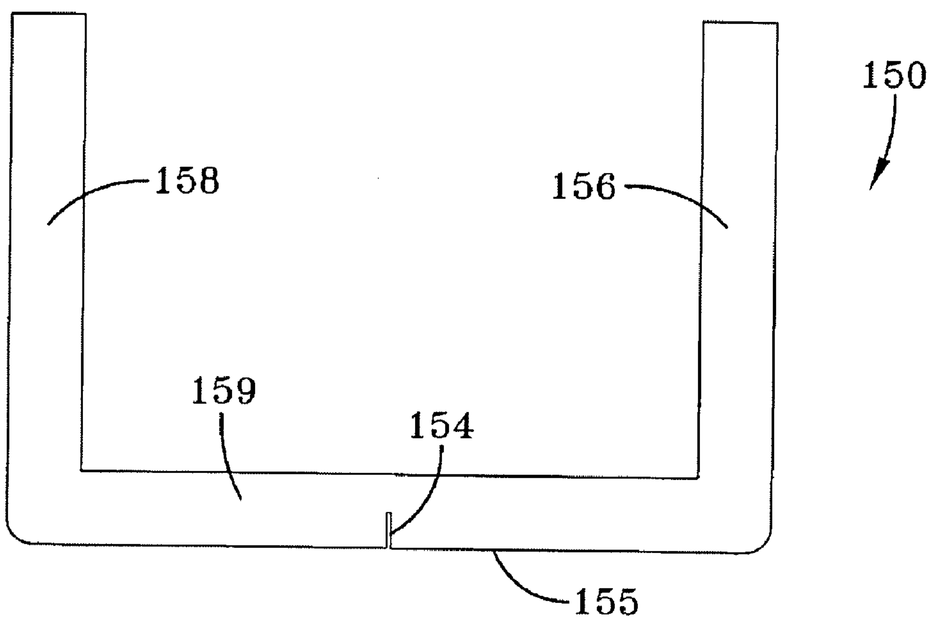

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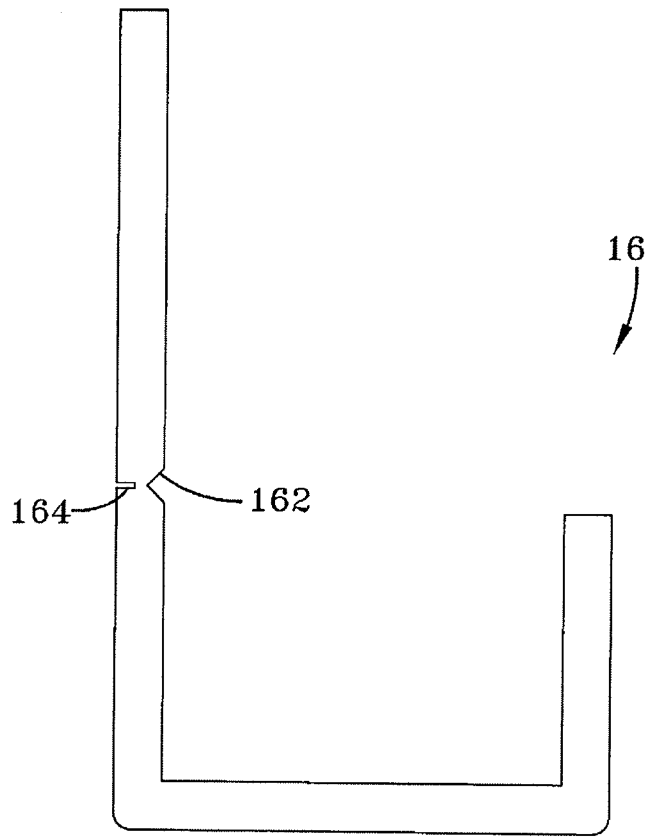

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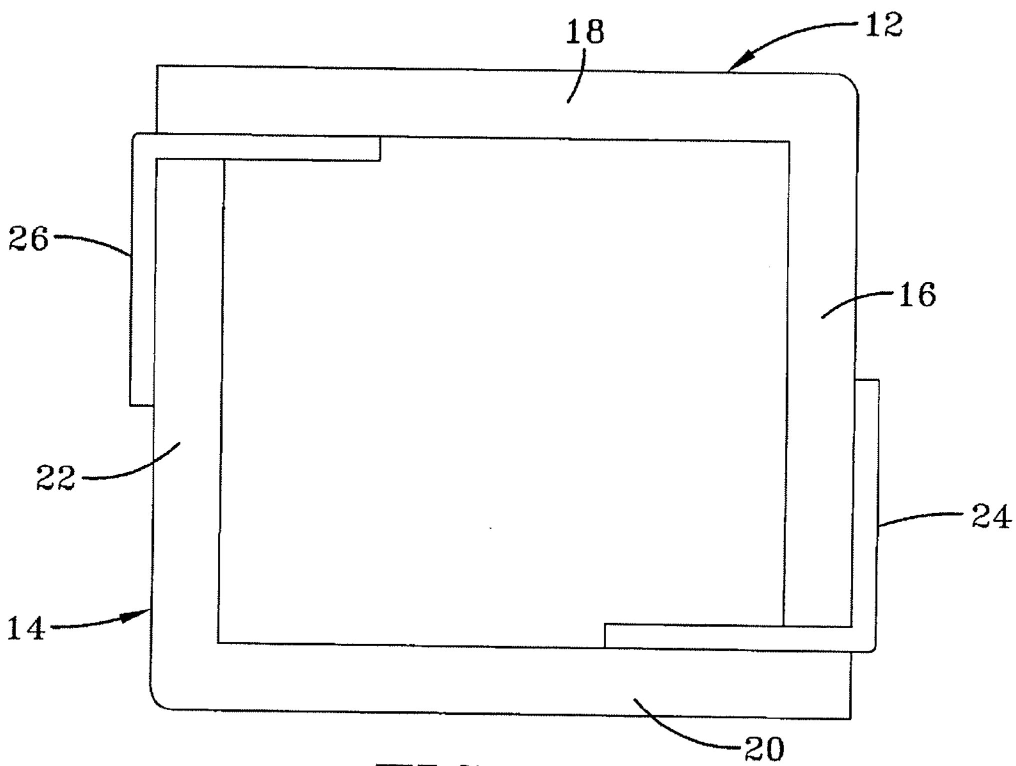

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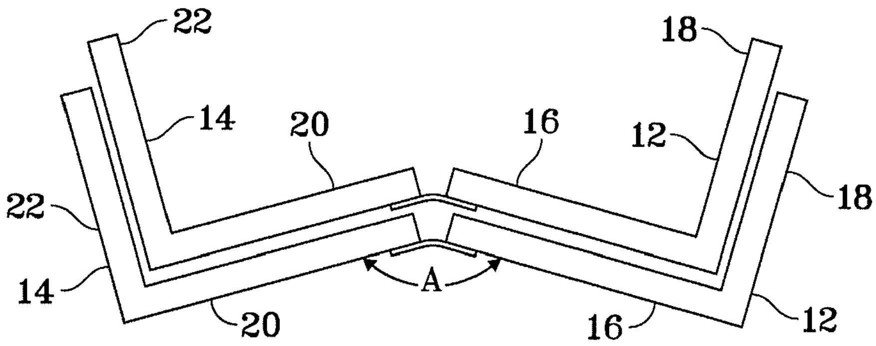

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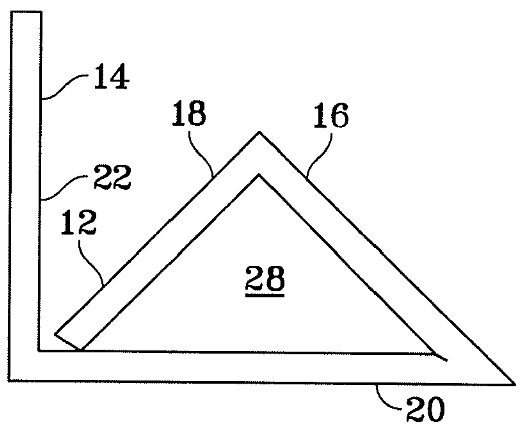


FIG-15A

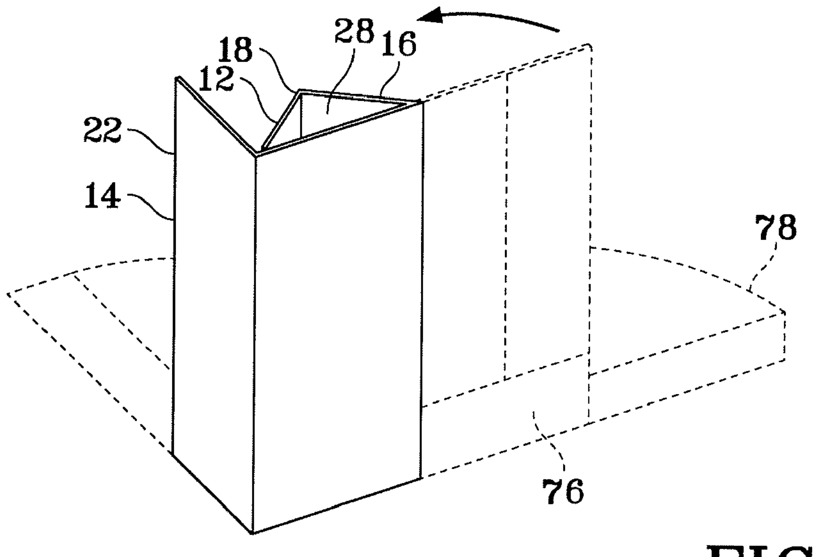
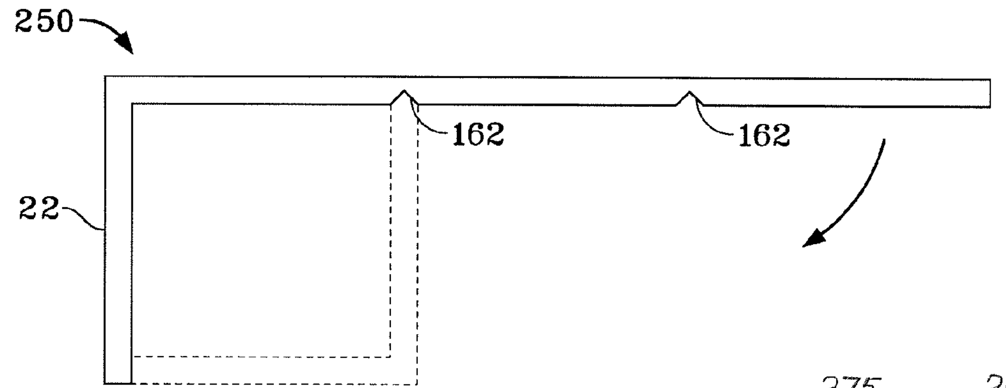


FIG-15B



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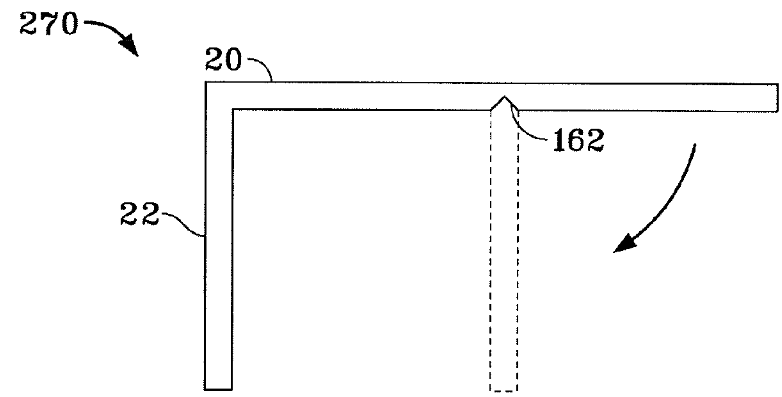


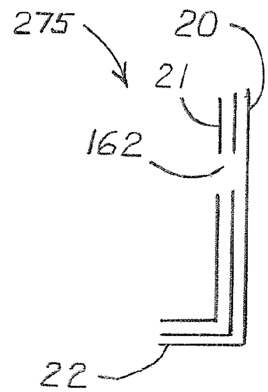
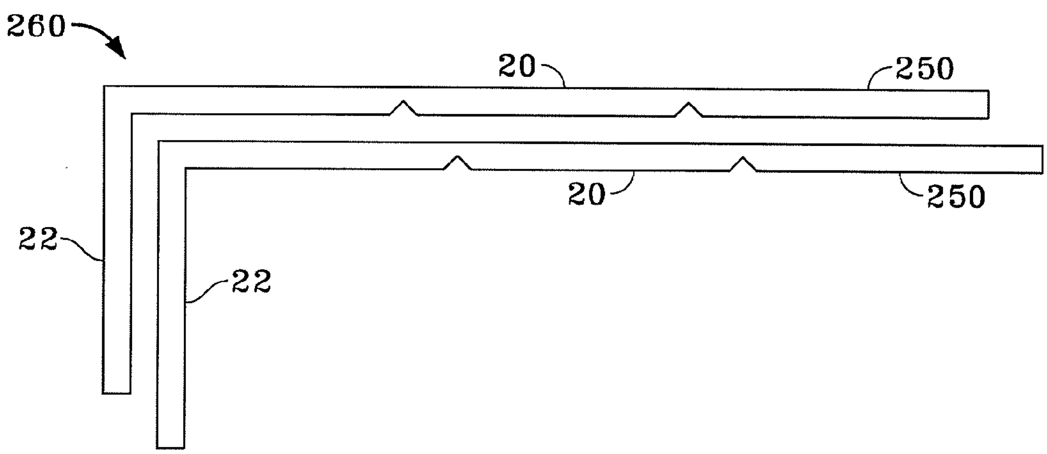


FIG-16B

FIG-16A



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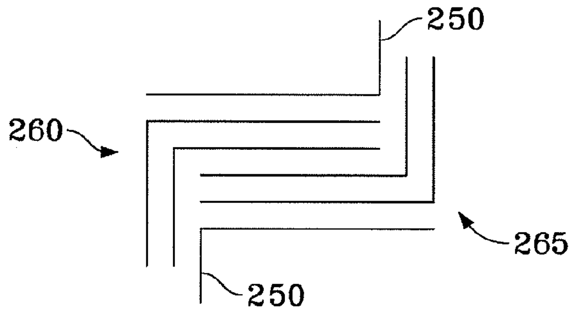
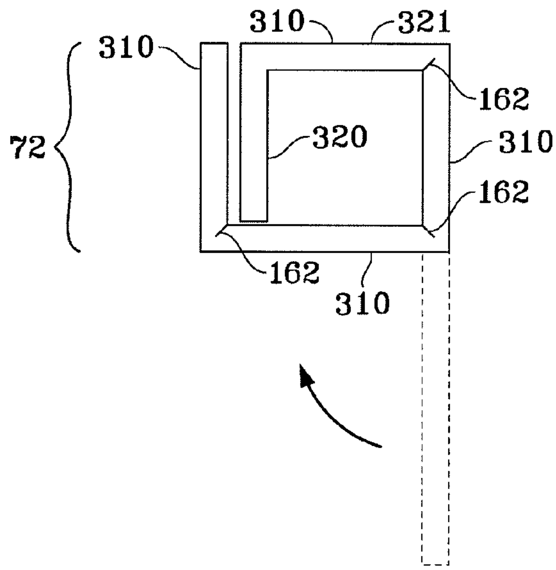


FIG-17A



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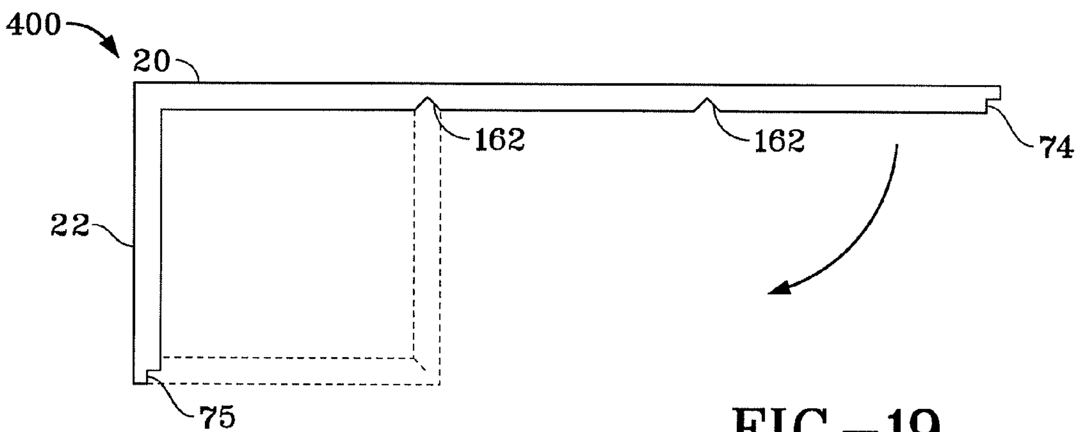

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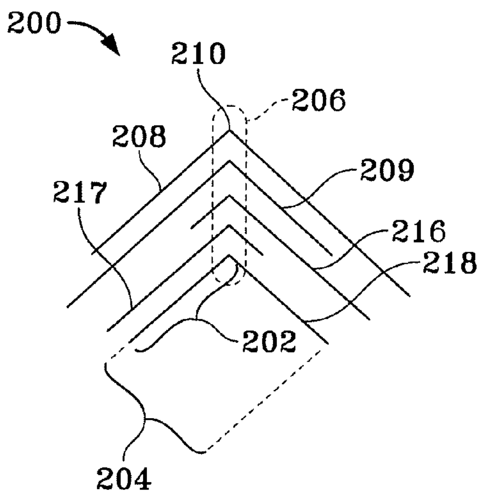

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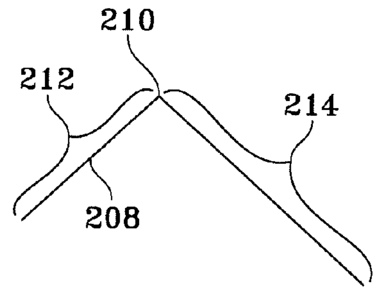

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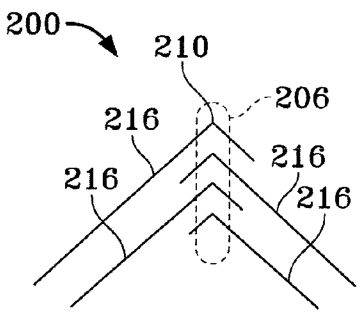

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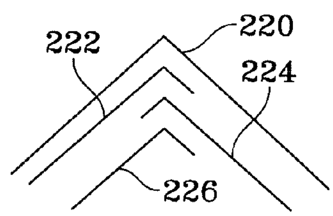

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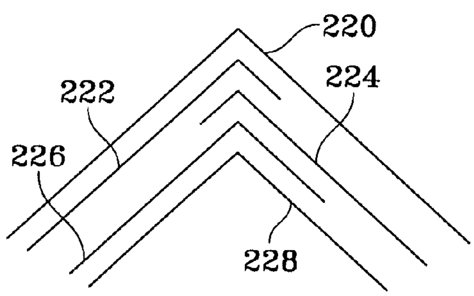

FIG-24

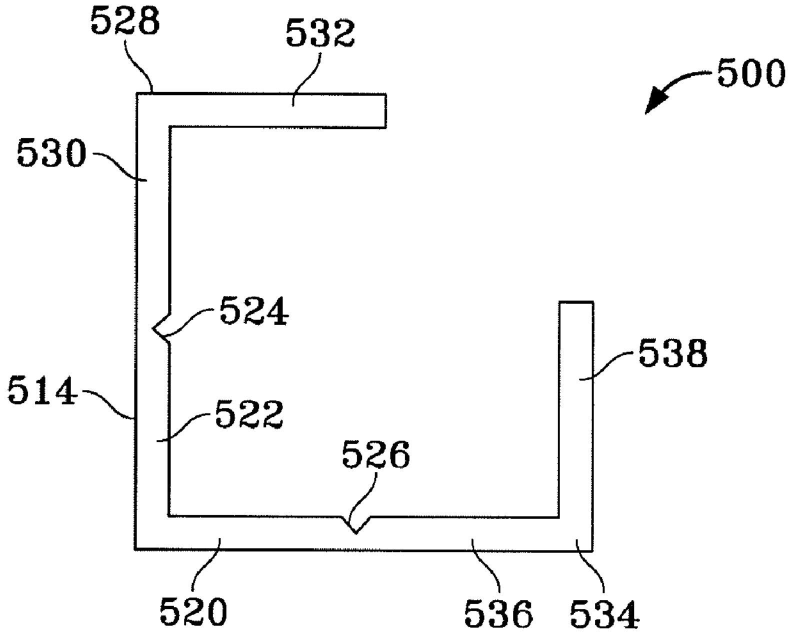

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FIG-25

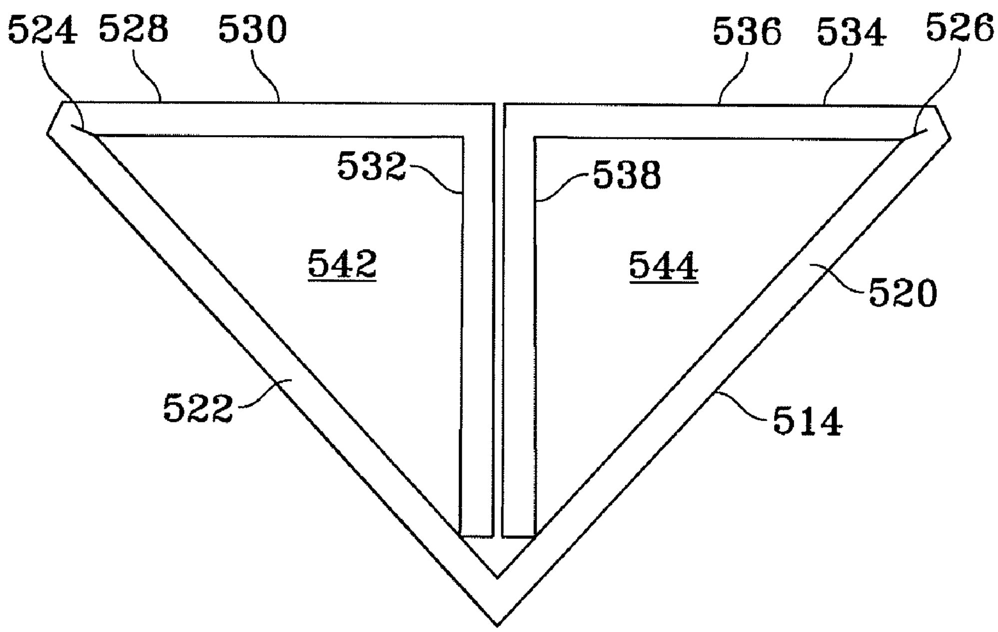

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FIG-26

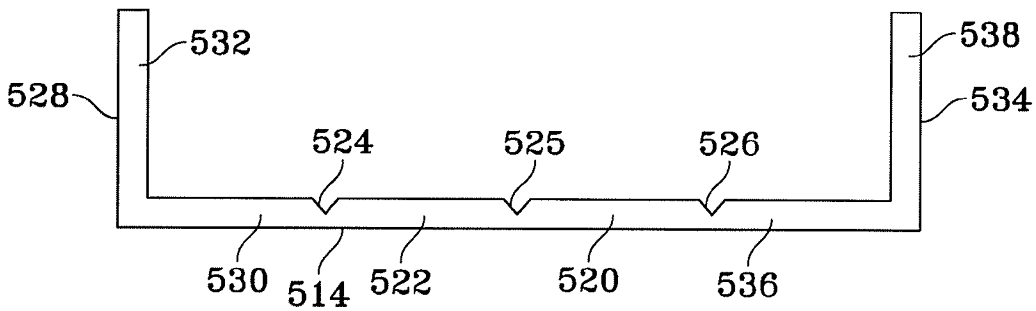

FIG-25A

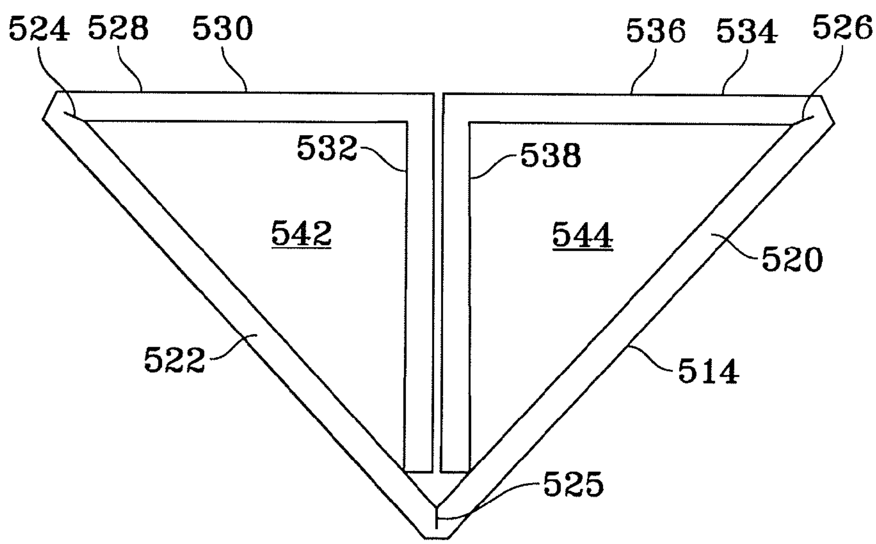

FIG-26A

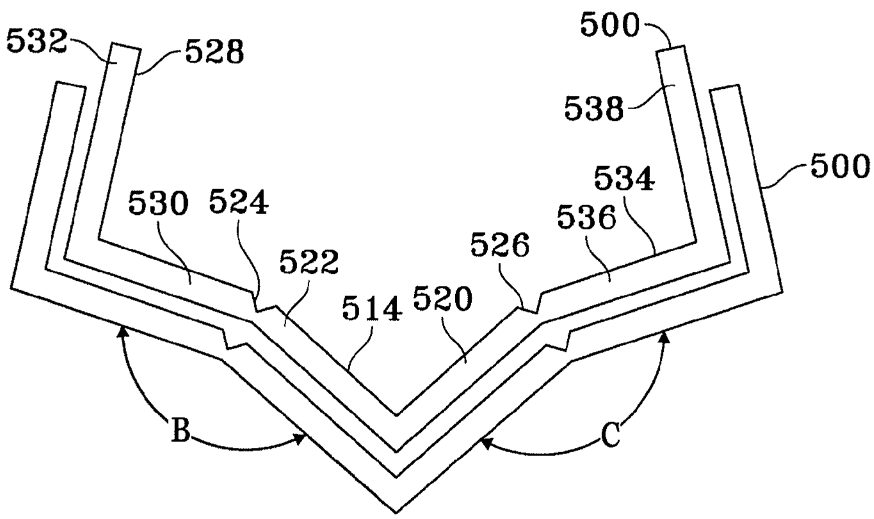

FIG-27

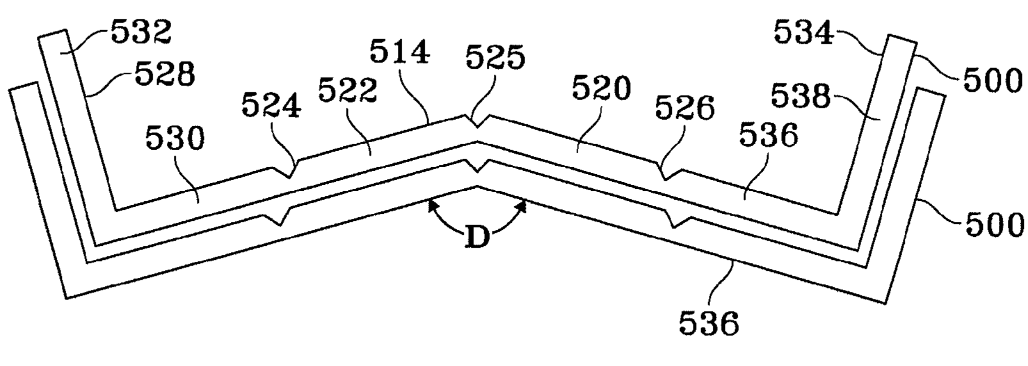

FIG-27A

PACKAGING MEMBER

BACKGROUND OF THE INVENTION

[0001] The present invention relates generally to packaging members, and more particularly to laminated paperboard packaging members for enclosing a product.

[0002] Elongated products, especially those having small cross sectional areas typically require special packaging containers for protection from damage while the products are transported. Tubular containers are well known for this purpose. However, tubular containers are expensive to manufacture and require the product be directed into one end of the container, which is cumbersome, and further requires the "packaging loading area" for the product into the packaging member to be at least twice the length of the product. In addition, transport of already formed empty tubular containers is costly.

[0003] Another type of packaging member, typically an angle member, protects the edges of larger articles, such as appliances. It is desirable to reduce the costs of these packaging members without adversely affecting their function.

[0004] Thus, there is a need for a packaging member which may be used to protect elongated products that can be more cheaply transported. Similarly, there is a need for a packaging member, which may be used to protect article edges, that is less expensive to manufacture, while maintaining structural rigidity.

SUMMARY OF THE INVENTION

[0005] The present invention relates to a packaging member for securing an article including a preformed laminated paperboard member having a preselected length. The member has a first leg and a second leg forming a substantially L-shaped cross section of rigid construction across the length of the member. The first leg has at least one substantially parallel discontinuity formed substantially along the preselected length of the member, each discontinuity forming at least two adjacent leg portions connected together. In response to the first leg and the second leg being directed toward each other, one of the at least two adjacent leg portions is directed into contact with the second leg to define an enclosed region for securing an article therein. The packaging member can be nested with additional packaging members in an unassembled position and corresponding surfaces of first and second legs of adjacent nested packaging members can be maintained in abutting contact.

[0006] In another embodiment, the present invention relates to a packaging member for protecting an edge of an article. The packaging member includes a first leg and a second leg disposed at a predetermined angle to each other along a junction. At least two different material plies are integrally connected along the junction. Each of the material plies defines a bend having a first width and a second width, wherein the first width and second width defining different magnitudes.

[0007] In still another embodiment, the present invention relates to a packaging member for securing an article. The packaging member includes a preformed laminated paperboard member having a preselected length. The member has a first leg and a second leg forming a substantially L-shaped cross section of rigid construction across the length of the member. The first leg has at least two substantially parallel discontinuities formed substantially along the preselected length of the member. The at least two discontinuities form at least three adjacent leg portions connected together. In response to the first leg and the second leg being directed toward each other, a distance between the first and second leg is defined. Multiple packaging members can be nested in an unassembled position, and corresponding surfaces of first and second legs of adjacent nested packaging members can be maintained in abutting contact.

[0008] In yet another embodiment, the present invention relates to a packaging member for securing an article. The packaging member includes a preformed laminated paperboard member having a preselected length, the member having a first leg and a second leg forming a substantially L-shaped cross section of rigid construction across the length of the member. The first leg has a substantially parallel discontinuity formed substantially along the preselected length of the member. The discontinuity forms two adjacent leg portions forming an angled joint in the first leg in response to the first leg and the second leg being directed toward each other to define a distance between the first and second leg. A first group of multiple packaging members can be nested in an unassembled position, and corresponding surfaces of first and second legs of adjacent nested packaging members can be maintained in abutting contact.

[0009] One advantage of the present invention is that adjacent packaging members can fully nest with each other, minimizing the space required for transport.

[0010] Another advantage of the present invention is that the packaging member is inexpensive to manufacture due to savings of material costs.

[0011] Other features and advantages of the present invention will be apparent from the following more detailed description of the preferred embodiment, taken in conjunction with the accompanying drawings which illustrate, by way of example, the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG. **1** is a perspective view of a packaging member.

[0013] FIG. **2** is a cross sectional view of the packaging member taken along line **2-2** from FIG. **1**.

[0014] FIG. **3** is an end view of the packaging member in an unassembled position.

[0015] FIG. **4** is an end view of a further embodiment of the packaging member in an unassembled position.

[0016] FIG. **5** is an exploded end view of a still further embodiment of the packaging member in an unassembled position.

[0017] FIG. **6** is an end view of another embodiment of a packaging member.

[0018] FIG. **7** is an end view of still another embodiment of a packaging member.

[0019] FIG. **8** is an enlarged partial end view of a corner from an embodiment of the packaging member.

[0020] FIG. **9** is an end view of an embodiment of a packaging member.

[0021] FIG. **9**A is an end view of a further embodiment of a packaging member.

[0022] FIG. **10** is an exploded end view of a still further embodiment of a packaging member.

[0023] FIGS. **11-14** are additional embodiments of a packaging member.

[0024] FIG. **15** illustrates an embodiment for transporting multiple packaging members of the present invention.

[0025] FIGS. **15**A and **15**B illustrate an embodiment of a packaging member in an assembled position.

[0026] FIGS. **16**, **16**A and **16**B are end views of embodiments of the packaging member of the present invention in an unassembled position.

[0027] FIGS. **17** and **17**A illustrate embodiments for transporting multiple packaging members of the present invention.

[0028] FIG. **18** is an end view of an embodiment of a packaging member of the present invention in an assembled position.

[0029] FIG. **19** is an end view of an embodiment of a packaging member of the present invention in an unassembled position.

[0030] FIG. **20** illustrates an embodiment of an arrangement of material plies in a packaging member.

[0031] FIG. **21** is an embodiment of a material ply.

[0032] FIGS. **22-24** illustrate additional embodiments of arrangements of material plies in packaging members.

[0033] FIGS. **25** and **25**A illustrate additional embodiments of packaging members in unassembled positions.

[0034] FIGS. **26** and **26**A illustrate packaging members in assembled positions of FIGS. **25** and **25**A, respectively.

[0035] FIGS. **27** and **27**A illustrate embodiments for transporting multiple packaging members of FIGS. **25** and **25**A, respectively, of the present invention.

[0036] Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

DETAILED DESCRIPTION OF THE INVENTION

[0037] FIG. **1** illustrates a packaging member **10** for protecting an article (not shown) that is placed inside packaging member **10** prior to transporting the article. Packaging member **10** includes an opposed pair of rigid members **12**, **14**, commonly referred to as corner posts, angles or L-shaped members. Angles or L-shaped members **12**, **14** each have a pair of respective legs **16**, **18** and **20**, **22**. It is to be understood that the legs of L-shaped members can be of identical widths or different widths. Each pair of legs **16**, **18** and **20**, **22** are substantially perpendicular to one another, are of rigid construction with one another and have an L-shaped cross section along their length. The legs **16**, **18** and **20**, **22** collectively define the structural sides of packaging member **10** when assembled. Referring to FIGS. **1-3**, angle **12** has an inner surface **30**, outer surface **32** and legs **16**, **18**. Angle **14** has an inner surface **34**, outer surface **36** and legs **20**, **22**. In one embodiment, an external member applied to an outer surface, such as a hinge **24**, is secured to the outer surface **36** of angle **14** substantially adjacent to end **42** of leg **20** and is secured to outer surface **32** of angle **12** substantially adjacent to end **38** of leg **16**. Ends **38** and **42** of legs **16** and **20** are separated by a gap **46** prior to assembly of the packaging member **10**. In one embodiment, legs **16** and **20** can be a single leg, forming a U-shaped member, in which hinging can be brought about by a discontinuity formed directly in the leg, such as a score **152** (FIG. **11**) or cut **154** (FIG. **12**) formed therein that permits hinging.

[0038] In order to save space, when transporting empty packaging members, it is desirable to place multiple packaging members in a nested, unfolded or unassembled arrangement. As used herein, the terms unfolded or unassembled are intended to include orientations between angle **12**, **14** in addition to those in which leg **20** of angle **14** and leg **16** of angle **12** are parallel to each other. For example, as shown in FIG. **15**, leg **20** of angle **14** and leg **16** of angle **12** which together resemble a U-channel are disposed at an orientation angle A from each other. The magnitude of orientation angle A is sufficient to account for the inward offset that occurs due to stacking of packaging members. In other words, properly configured orientation angles A, which are a function of the thickness of the legs of the angle **12**, **14** and combined length of legs **16** and **20** of respective angles **12**, **14**, permit nesting of each of the corresponding portions of adjacent packaging members. That is, the corresponding surfaces of each of the legs of adjacent nested packaging members can be maintained in abutting contact therewith. Upon assembly, packaging members have enhanced structural strength and rigidity by virtue of the two rigid angles.

[0039] As shown in FIGS. **15**A and **15**B, an embodiment of angle **14** and angle **12** that is transportable as shown in FIG. **15**, leg **20** of angle **14** is of sufficient length so that angle **12** can be rotated toward leg **20**. By further rotating angle **12** toward leg **20** until leg **18** of angle **12** abuts leg **20**, or in one embodiment, leg **18** abuts the juncture between legs **20**, **22** of angle **14**, legs **16**, **18** of angle **12** and leg **20** of angle **14** forms an enclosed region **28** when assembled, providing enhanced structural strength. In a further embodiment, leg **18** abuts leg **22** at any position along the length of leg **22**, forming enclosed region **28**. As further shown in FIG. **15**B, which shows a perspective view of angles **12** and **14** in an assembled position ready for use, such as fastened to a corner of a pallet **78**, a removed portion **76** from each of legs **16**, **18** of angle **12** permits angle **12** to rotate with respect to pallet **78** and angle **14** to achieve enclosed region **28**. It is appreciated that the angle **14** and angle **12** construction as shown in FIG. **15**A may be secured to the corners of a pallet **78** after placing an article, such as an appliance (not shown) onto the pallet **78** and then applying a layer of plastic wrap (not shown) as is known in the art around the loaded pallet construction. The resulting loaded pallet construction has sufficient structural strength for loading in the vertical direction, by virtue of the assembled angle **12**, **14** construction with enclosed region **28** for pallet stacking, increasing warehousing space. In addition, such loaded pallet construction provides visual evidence of damage to the appliance, thereby decreasing costs associated with handling appliances. That is, damaged appliances are less likely to be shipped to a customer, requiring subsequent return and replacement of the appliance.

[0040] An alternate packaging member construction is shown in FIGS. **16** and **17** in packaging member **250**, which includes leg **20** having at least one discontinuity, such as notch **162**, to form a hinged connection defining an enclosed region (shown with dotted lines in FIG. **16**) for securing an article therein as will be discussed in additional detail below. In an alternate embodiment, shown in FIG. **16**A, packaging member **250** may be configured to form a U-shaped member (shown with dotted lines in FIG. **16**A). Discontinuities, as used herein, include notches, slots, perforations, creases or other features formed in a leg or material connecting different portions of a leg to permit a hinged connection of the leg along the feature. For example, as shown in FIG. **16**B for a packaging member **275**, at least one portion of leg **20** may be composed of a separate leg **21**, containing a discontinuity **162** therebetween. That is, for one ply, legs **20**, **22** are constructed from a single contiguous piece of material, with the shortened legs **20** of the remaining plies including corresponding separate plies, leg **21**, separated by discontinuity **162**. It is appreciated by those skilled in the art that if only one discontinuity, e.g., notch **162**, is formed in leg **20**, the enclosed region that can be formed is triangular, such as shown in FIG. **16**A. In alternate embodiments, more than two discontinuities may be formed in one or both of legs **20**, **22** to form enclosed regions. In a further alternate embodiment, legs **20**, **22** may be brought toward one another, but not into contact with each other, i.e., a space or distance is maintained between legs **20**, **22**, so that an enclosed region is not formed. It is contemplated that in addition to forming enclosed regions having more sides than a triangle, one or more of the portions of legs **20**, **22** can overlap, thereby providing additional combined material thickness and support for the assembled packaging members. For example, in an alternate embodiment, packaging member **300** can have overlapping legs **310**, **320** or an overlapping region **72** as shown in FIG. **18**. In another embodiment as shown in FIG. **19**, the ends of legs **20**, **22** are configured with corresponding notches **74**, **75** that are brought into engagement when legs **20**, **22** are directed toward each other and into contact with one another to define an enclosed region for packaging member **400**. As shown in FIG. **17**, packaging members **250** can be transported together. The corresponding surfaces of each of legs **20** and **22** of adjacent nested packaging members **250** can be maintained in abutting contact therewith, forming a group of nested members **260**. In an alternate arrangement, as shown in FIG. **17**A, a second group of nested members **265** is nested with the group of nested members **260**. In addition to groups of nested members **260**, **265**, single packaging members **250** may additionally be arranged for transport. It is appreciated that multiple arrangements of groups may be used to minimize the amount of space required to transport the nested member groups. Upon assembly, packaging members **250** have enhanced structural strength and rigidity by virtue of the rigid construction by the junction of legs **20** and **22**.

[0041] Referring to FIGS. **1**-**3**, to assemble packaging member **10**, angle **12** is rotated with respect to angle **14** about an axis **48** along hinge **24**, preferably defined by the intersection of outer surface **36** and end **42** of leg **20** as will be discussed in additional detail below. This rotation of angle **12** brings end **38** into contact with the inner surface **34** of angle **14** substantially adjacent to end **42** of leg **20**, forming a corner **52** and also brings inner surface **30** adjacent end **40** of leg **18** into contact with end **44** of leg **22**, forming a corner **54** that is opposite to corner **52**. Alternately, angle **14** can be rotated with respect to angle **12** to assemble packaging member **10**. At this point, inner surfaces **30**, **34** of respective angles **12**, **14** define a rectangular enclosed region **28** for protecting an article placed therein. The article is preferably placed on an angle **12**, **14** prior to rotating the other angle **14**, **12**. To maintain the position of angles **12**, **14** once an angle **12**, **14** has been rotated, flap **26** which is separately secured to outer surface **32** of angle **12** adjacent to end **40** of leg **18** is rotated about an axis **50** preferably located at the junction of outer surface **32** of angle **12** and end **40** of leg **18** until flap **26** contacts outer surface **36** of angle **14** adjacent to end **44** of leg **22**. A bonding substance **56**, such as adhesive, is provided along flap **26** to secure flap **26** to outer surface **36** of angle **14** substantially adjacent to end **44** of leg **22**, thereby providing an efficient, stable packaging member **10** for transporting articles therein. Optionally, in addition to or in place of flap **26**, tape, straps, or other securing materials may also be employed to secure packaging member **10** in its closed or assembled condition. Although not shown, the opposed open ends of packaging member **10** may be sealed or plugged by blocks, such as wood, or any available material suitable for this purpose.

[0042] Further referring to FIGS. **1**-**3**, angles **12**, **14** are now discussed. Angles **12**, **14** are preferably formed by bonding layers (not shown) of paperboard together that have a preselected width and length corresponding to the desired width (horizontal distance) and height (vertical distance) of the legs of the angle and length (depth) of the angle. A bend, preferably of ninety degrees is then placed in the bonded layers or paperboard to produce angles **12**, **14** having substantially L-shaped cross sections and a rigid construction. The composition of the angle **12**, **14** may include any material that may be formed into a substantially rigid L-shaped cross section. Preferably legs **16**, **22** and legs **18**, **20** of respective angles **12**, **14** are of substantially the same span (width or height), thereby forming a rectangle when the packaging member **10** is assembled. The rectangular shape of packaging member **10** provides a stable structure amenable to efficient stacking. In addition to the stable shape, if the corresponding leg spans of angles **12**, **14** are substantially equal, a single angle piece or component can be manufactured and then used for either angle **12** or **14**. However, to accommodate the shape of an article, legs **16** and **22**, as well as legs **18** and **20** can be formed of different spans, so long as one angle **12**, **14** can rotate to the other angle **14**, **12** to assemble the packaging member **10** similar to that shown in FIG. **2**. Preferably, the thicknesses of angles **12**, **14** range from about 0.060 inches to about 0.500 inches, and the preferred rectangular constructions include 2 inches wide by 2 inches high, or 2"×2", as well as 3"×3", 4"×4", 1"×3", 2"×4" and 3"×5". However, other thicknesses and constructions may be employed which may be significantly larger or smaller than the preferred size ranges, such limitations being imposed by the capabilities of the particular machine utilized to form the angles. While the angles are shown having flat or "squared" ends, it is understood that any shape which permits the angles to be brought into a closed contact to form the packaging member, including tapered or even curved ends, may be used herein.

[0043] Hinge **24**, which hingedly connects angle **12** to angle **14**, is preferably constructed of a flexible layer, such as paper, tape, cloth or any flexible material that may be secured to the outer surface of an angle. Hinge **24** may be secured to the outer surface of an angle by employing adhesives, tape, bands, rivets, Velcro®, staples, nails, brads, nuts and bolts, application of heat and/or pressure or any other suitable technique or component to attach a flexible material layer to the outer surface of the angle, although it is also possible to attach the flexible layer to the inner surface of the angle. Preferably, hinge **24** includes a narrow strip of flexible material, such as illustrated in FIGS. **2** and **3**, wherein one end of hinge **24** is secured along outer surface **36** of angle **14** adjacent to end **42** of leg **20** and the other end of angle **24** is secured along outer surface **32** of angle **12** adjacent to end **38** of leg **16**. However, if desired, for reasons possibly including manufacturing convenience, the flexible material layer defining hinge **24** may be secured to any additional portion of angle **14**, up to and including the entire span of outer surface **36** of angle **14** as shown in FIG. **4**. In this construction, the flexible layer defining flap **26** is similarly secured to angle **12** up to and including the entire span of outer surface **32** of angle **12**. Angle **12** can be rotated with respect to angle **14** prior to securing flap **26** to angle **14** to produce the packaging member **10**, or angle **14** can be rotated with respect to angle **12** to achieve the same result. Although not shown, a single flexible member defining both hinge **24** and flap **26** may be secured to the entire span of outer surface **36** of angle **14** and to the entire span of outer surface **32** of angle **12**, if desired. Alternately, referring to FIG. **5**, a closing member **58**, which combines the features of hinge **24** and flap **26** in a single span of flexible material, is secured along the entire span of outer surface **32** of angle **12**, the portion of closing member **58** extending past end **40** in a direction away from angle **12** performing the function of flap **26**, and the portion of closing member **58** extending past end **38** in a direction away from angle **12** performing the function of hinge **24**. In other words, hinge **24** may extend in secured contact with any proportion of the outer surfaces of the angles so long as there is sufficient flexible material to permit operation as a hinge.

[0044] Flap **26**, similar to hinge **24**, is an external member applied to an outer surface of a leg of a structural element and constructed of a flexible layer that is preferably connected to the outer surface **32** of leg **18** of angle **12** or to outside surface **36** of leg **22** of angle **14**. Upon assembly of packaging member **10**, wherein angle **12** and angle **14** are rotated toward each other about an axis along hinge **24** as will be discussed in further detail below, leg **18** adjacent to end **40** of angle **12** is then brought into contact with leg **22** adjacent to end **44** of angle **14**. Preferably, a portion of flap **26** is secured to the outer surface of one of the legs, such as surface **32** of leg **18**, so that the remaining portion of flap **26** is loose, extending past the end **40** of leg **18**. The loose portion of flap **26** that extends past the end **40** of leg **18** is then attached of the outer surface **36** of leg **22** of angle **14** that is adjacent to end **44** by bonding means **56** to secure packaging member **10** in its closed or assembled position. Optionally, in addition to or in place of flap **26**, tape, straps, or other securing materials or methods previously discussed may also be employed.

[0045] Referring back to FIGS. **1-3**, the rotation of angle **12** with respect to angle **14** shall be further discussed. Preferably, angle **12** is rotated about axis **48** as illustrated in FIGS. **1** and **3**, axis **48** being illustrated in FIG. **3** as a point, since axis **48** extends along the length of angle **14**, which is not shown in FIG. **3**. In one embodiment of the packaging member **10**, as illustrated by FIG. **3**, a plane defined by outer surface **36** of leg **20** of angle **14** is coincident with a plane defined by outer surface **32** of leg **16** of angle **12**. In this position, end **42** is preferably parallel to end **38** and separated from end **38** by gap **46** along hinge **24**. Preferably, to avoid structurally damaging hinge **24** due to excessive tensile loading, during or subsequent to assembly of packaging member **10**, gap **46** is at least equal in width to the thickness of leg **20**. Further, along gap **46** during the rotation of angle **12**, hinge **24** remains substantially straight and the flexible material of hinge **24** overlying gap **46** also remains substantially coincident with the plane defined by outer surface **32** of leg **16** of angle **12**. Therefore, as angle **12** is rotated about axis **48** in a direction toward angle **14**, edge **60**, which is defined by the intersection of outer surface **32** and end **38** of leg **16** of angle **12**, traces the path of an arc having a radius substantially equal to gap **46**. Edge **60** continues to trace this arc as angle **12** is further rotated about axis **48** until edge **60** is substantially coincident with edge **62**, which is defined by the intersection of inner surface **34** and end **42** of leg **20** on angle **14**. In this position, end **38** rests upon inner surface **34** adjacent to end **42**. FIG. **2** illustrates the locations of the elements in this embodiment after the rotation of angle **12** is completed which defines corner **52** as previously discussed. Alternately, angle **14** can be rotated about axis **48** with respect to angle **12** to achieve identical results.

[0046] Alternately, referring to FIGS. **3** and **8**, a rotation axis **64** may be employed to rotate angle **12** as discussed above. Axis **64** is defined by the intersection of outer surface **32** and end **38** of leg **16** on angle **12** and is illustrated as a point in FIGS. **3** and **8**, for the same reasons as previously discussed for axis **48**. In this embodiment, as angle **12** is rotated about axis **48**, an edge **66**, which is defined by the intersection of inner surface **30** and end **38** of leg **16**, traces an arc having a radius substantially equal to the thickness of angle **12**. An inner surface **23** of hinge **24** remains substantially coincident with outer surface **36** of leg **20** as angle **12** is rotated. Edge **66** continues to trace this arc as angle **12** is further rotated about axis **64** until edge **66** is substantially coincident with an edge **68**, which is defined by the intersection of outer surface **36** and end **42** of leg **20** on angle **14**. In this position, end **38** rests upon the portion of inner surface **23** of hinge **24** defined by gap **46** (FIG. **3**) that is substantially coincident with outer surface **36** of leg **20**. End **42** abuts inner surface **30** of angle **12** adjacent end **42** of leg **16**. FIG. **8** provides an enlarged view illustrating the locations of the elements of this embodiment after the rotation of angle **12** is completed thereby defining corner **70**, which is similar to corner **52**, discussed in detail above. FIG. **9** illustrates an embodiment wherein corresponding legs **18**, **20** and **16**, **22** of angles **12**, **14** have a substantially equal span. One difference between FIG. **2** and FIG. **9** is the relative positioning of ends **38**, **40** of angle **12** with respect to ends **42**, **44** of angle **14**. In FIG. **2**, end **40** is positioned above and abuts end **44** and end **42** horizontally abuts the end portion of leg **20** adjacent end **42**. In FIG. **9**, end **40** horizontally abuts leg **22** adjacent end **44** and end **42** horizontally abuts the end portion of leg **16** adjacent end **38**. Although the FIG. **9** embodiment is equally workable as the embodiment in FIG. **2**, the FIG. **9** embodiment may be less desirable than the preferred embodiment illustrated in FIG. **2** in that the embodiment in FIG. **9** can have a reduced ability to support external vertical loading, especially if the external vertical load is concentrated on leg **18** adjacent to end **40**. For this loading condition, structural support is provided primarily by hinge **26**, as opposed to the supporting arrangement in FIG. **2**, in which leg **22** is directly beneath end **40** and provides additional vertical structural support. If additional vertical support is required while maintaining corner **70**, the embodiment shown in FIG. **9**A may be more effectively employed. In FIG. **9**A, leg **16** of angle **12** is longer than leg **22** of angle **14** by the thickness of leg **20** of angle **14**. Similarly, leg **18** of angle **12** is longer than leg **20** of angle **14** by the thickness of leg **22** of angle **14**. While this embodiment provides additional vertical support for reacting to vertical loads applied to leg **18**, the span of the legs of angles **12** and **14** are now different, which requires the manufacturing of different angles.

[0047] FIG. **6** illustrates an alternate embodiment of the packaging member. Packaging member **100** includes a substantially U-shaped member **102** having a base **104** with legs **106**, **108** preferably extending upwardly parallel from opposed ends of base **104**. Legs **106**, **108** have respective ends **114**, **116** for supporting a substantially flat or planar member **120** having opposed ends **122**, **124**. U-shaped member **102** and flat member **120** have an outer surface **112** and an inner surface **110** which defines an enclosed region **126** for securing the article therein. Hinge **118** is preferably secured to the outer surface **112** of U-shaped member **102** adjacent to end

116 of leg 108 and to the outer surface 112 of flat member 120 adjacent to end 122 for hingedly connecting flat member 120 to leg 108 of U-shaped member 102. Hinge 118 is otherwise similar to hinge 24 as previously discussed. Hinge 118 can also be secured to the inner surface 112. After the article is placed within U-shaped member 102, flat member 120 is rotated with respect to U-shaped member 102 about an axis along hinge 118 until ends 122, 124 of flat member 120 are supported by respective ends 114, 116 of legs 106, 108. Although a flap similar to that employed in FIG. 2 should not be necessary to secure flat member 120 in the closed or assembled position, a bonding means 128, as previously discussed, may optionally be employed.

[0048] In another embodiment as shown in FIG. 7, a discontinuity such as a score 130, or a V-shaped notch as shown in FIG. 7, may be formed in flat member 120 adjacent to end 124 so that an applied force (not shown) substantially perpendicular to outer surface 112 at end 124 can form a portion 132 that extends substantially perpendicularly to the plane defined by outer surface 112 of flat member 120. Portion 132 has an outer surface 112 and an extension surface 134. With flat member 120 in its closed position and supported by U-shaped member 102, extension surface 134 of portion 132 preferably abuts the outer surface 112 of the U-shaped member 102 adjacent to end 128 of leg 106 to further secure flat member 120 in place. To even further secure flat member 120, bonding means 128, similar to those employed to secure hinge 24, can also be used. Similarly achieving the collective shape defined by flat member 120 and portion 132, an angle may be formed with a leg having the desired span of portion 132. Referring to FIG. 10, flat member 120 may have opposed notches 136 formed adjacent ends 122, 124 defining opposed surfaces 138 for abutting legs 106, 108 adjacent respective ends 114, 116 along inner surface 110 for forming a more secure connection with legs 106, 108 of flat member 120.

[0049] Referring to FIGS. 11-14, it is apparent that forming a discontinuity such as a score 152 (FIG. 11), or a V-shaped notch, along an inside surface of a web 159 having opposed ends extending into legs 156, 158 of U-channel 150 in a manner similar to that described in FIG. 7 for folding portion 132, may produce hinged angles of the present invention. In other words, an embodiment of the present invention may be achieved by folding along an axis defined by score 152, in effect a hinged connection, so that the enclosed region of the resulting packaging member is defined by legs 156, 158, with adjacent segments of web 159 effectively forming the other two legs of the packaging member. Similarly, another embodiment may be achieved by forming a discontinuity such as a cut 154, or back score, in an outside surface 155 of web 159 having opposed ends extending into legs 156, 158 of U-channel 150. Alternately, as shown in FIG. 13, a combination of discontinuities such as a groove 162 and a cut 164 may be employed to achieve the desired hinging effect, possibly depending upon the material composition and thickness of the U-channel being manipulated. Although not shown, optional flap members similar to flap 26 previously discussed may be used to secure the packaging member in its closed or assembled position, although tape, straps, or other securing materials or methods previously discussed may also be employed. While it is contemplated that multiple grooves/cuts may be formed in an angle member to achieve the packaging member, or even forming three grooves/cuts in a flat member that define respective axes for folding the flat member to form a rectangular packing member, a degree of structural stiffness inherent with an embodiment employing a single groove/cut in a U-channel is forfeited. It is also contemplated that a single groove/cut may be formed in a surface of an angle member, or an aligned pair of grooves/cuts may be formed on opposed surfaces of an angle member to achieve a packaging member that defines a triangle.

[0050] One skilled in the art can appreciate that in addition to variations of shape and material composition, hinges and flaps may be located anywhere along the thickness of the angles. In other words, a flexible layer may be secured along the inner surface of the angles and may be formed anywhere between the inner and outer surfaces, including being formed from the same material being used to construct the angles themselves. In other words, the hinge may extend from any position or portion of one end of an angle to any position or portion of the corresponding angle, not being limited to the outer surfaces of respective angle members. Additionally, it is apparent that inclusion of the flap is optional, especially if adhesive, tape, straps or other means of securing the angles in affixed position are employed.

[0051] As shown in FIGS. 20-23, packaging member 200 is configured to protect edges or corners of an article (not shown), such as during transportation of the article. These packaging member embodiments save material costs, while substantially maintaining structural strength and rigidity. In one embodiment, as shown in FIG. 20, packaging member 200 includes a leg 202 and a leg 204 disposed at a predetermined angle to each other, such as 90 degrees, along a junction 206. Material plies 208, 216 and 218, as shown in FIG. 20, are integrally connected along junction 206. An exemplary material ply, such as material ply 208 as shown in FIG. 21, defines a bend 210 having a width 212 to the left hand side of bend 210 and a width 214 to the right hand side of bend 210. As shown, width 212 has a different magnitude than width 214. In other words, bend 210 is not disposed at a substantially centered position with respect to widths 212, 214.

[0052] FIG. 20 includes an embodiment of a packaging member 200 having legs 202, 204 each having, for example, respective lengths of 3 inches, or a 3"×3" construction. It is to be understood that legs of packaging members can have different lengths and that the length of one leg can be different from the other leg. As further shown in FIG. 20, the left and right hand portion (LHP, RHP) widths of the exposed, i.e., outer material ply 208 can be, for example, 2 inches and 3 inches in width, respectively. For example, as further shown in FIG. 21, material ply 208 has a LHP width 212 of 2 inches and a RHP width 214 of 3 inches, separated by bend 210.

[0053] As further shown in FIG. 20, a second material ply 209 is adjacent to outer material ply 208. The second material ply 209 can be, for example, 3 inches (LHP) and 2 inches (RHP) or reversed in orientation from the outer material ply 208. In other words, the plies of the pair of material plies 208, 209 are alternately disposed, or reversed along junction 206. As used herein, "alternately disposed" is not limited to mean that adjacent material plies must strictly follow a reversed orientation. That is, multiple adjacent plies can have similar orientation, but that in the overall arrangement of the material plies, at least two of the material plies are disposed in a reversed orientation. This definition of "alternatively disposed" is also intended to apply where there are material plies having different RHP, LHP lengths, thicknesses or other differences, such as material types, between the material plies. The next material ply adjacent to the second material ply 209 is material ply **216** which can be, for example, 1 inch (LHP) and 3 inches (RHP) with the following adjacent material ply **217** reversed, from material ply **216**, i.e., having a 3 inch (RHP) and a 1 inch (LHP), for example. Finally, an inner material ply layer **218** which can be, for example, 3 inches (LHP) and 3 inches (RHP) is disposed adjacent to material ply **217**. In an alternate embodiment, material layer **218** defines the outer material layer. As used in FIGS. **20-24**, the term inner material ply identifies the material ply that is in contact with or adjacent to the article being protected. Conversely, the term outer material ply identifies the material ply that is opposite the article being protected.

[0054] FIG. **22** shows an embodiment of packaging member **200** comprising a plurality of alternately disposed material plies **216**. It is appreciated that in an embodiment of material plies **216** having 3 inch and 1 inch portions, the amount of savings of material is 33% when compared to a packaging member having 3 inch by 3 inch portions, while maintaining material ply thickness adjacent junction **206**.

[0055] FIG. **23** shows an embodiment of packaging member **200** comprising an outer material ply **220** disposed adjacent to a first material ply **222**, which first material ply **222** is disposed adjacent to a second material ply **224**. The second material ply **224** is alternately disposed from the first material ply **222**. Material ply **226** is disposed adjacent to the second material ply **224**. Outer material ply **220** can be similar to inner material ply **218** of FIG. **20**. First material ply **222** can be similar to second material ply **224** and material ply **226**, but each of material plies **222**, **224**, **226** can be sized differently.

[0056] FIG. **24** shows an embodiment of packing member **200** similar to FIG. **23**, except for the addition of inner ply **228** disposed adjacent to material ply **226**. As shown inner and outer material plies **220**, **228** can be similar, and in one embodiment, the LHP and RHP widths of inner and outer plies can be the same.

[0057] It is to be understood that although material ply pairs **224** and **226** are adjacent to each other, many combinations of arrangement and orientation of material plies are possible, including a combination of material layers that are each differently sized and/or having different thickness, and/or different material type. Although material plies are shown in which the longer width of each material ply substantially corresponds to the length of the legs of the packaging member, the material ply widths are not limited to such constructions, as either or both of left and right hand portion widths of at least one material ply can be less than the leg lengths of the packaging member. A benefit of such material plies having reduced width portions results in greater material savings, although such savings must be balanced by a reduction in strength of the resulting packaging member.

[0058] Referring to FIG. **25**, an alternate embodiment of a packaging member **500** includes an angle **514** having legs **520** and **522**, an angle **528** having legs **530** and **532**, and an angle **534** having legs **536** and **538**. Leg **522** of angle **514** is hingedly connected to leg **530** of angle **528** by a discontinuity **524**, and leg **536** of angle **534** is hingedly connected to leg **520** of angle **514** by a discontinuity **526**. Each pair of legs **520**, **522**, legs **530**, **532** and legs **536**, **538** are substantially perpendicular to one another, are of rigid construction with one another and have an L-shaped cross section along their length. In an alternate embodiment, as shown in FIG. **25**A, an additional discontinuity **525** is formed at the junction of legs **520**, **522**, so that the packaging member is in the form of a U-shaped member, so that legs **520**, **522** are not components of a rigid angle (i.e., angle **514**). FIG. **26** shows packaging member **500** in an assembled position in which leg **532** of angle **528** is brought toward angle **514** and into abutment with angle **514** via discontinuity **524**, and leg **538** of angle **534** is brought toward angle **514** and into abutment with angle **514** via discontinuity **526** when assembled. Angle **528** and leg **522** form an enclosed region **542** and angle **534** and leg **520** form an enclosed region **544**. As shown in FIG. **26**, the ends of legs **532** and **538** substantially coincide with the junction between legs **520** and **522** of angle **514**. When assembled, packaging member **500** provides enhanced stacking strength, such as when used as a corner member on a pallet as previously described with FIGS. **15**A and **15**B.

[0059] FIG. **26**A, similar to FIG. **26**, shows the embodiment of packaging member **500** of FIG. **25**A in an assembled position. The ends of legs **532** and **538** substantially coincide with the junction between legs **520** and **522** of angle **514**. When assembled, packaging member **500** provides enhanced stacking strength, such as when used as a corner member on a pallet as previously described with FIGS. **15**A and **15**B.

[0060] In order to save space, when transporting empty packaging members, it is desirable to place multiple packaging members in a nested, unfolded or unassembled arrangement. As shown in FIG. **27**, leg **530** of angle **528** and leg **522** of angle **514** which together resemble a U-channel are disposed at an orientation angle B from each other. Similarly, as further shown in FIG. **27**, leg **520** of angle **514** and leg **536** of angle **534** which together resemble a U-channel are disposed at an orientation angle C from each other. The magnitude of orientation angles B and C is sufficient to account for the inward offset that occurs due to stacking of packaging members. In other words, properly configured orientation angles B and C, which are a function of the thickness of the legs of the angles **528**, **514** and combined length of legs **530** and **522** of respective angles **528**, **514** for angle B, and which are a function of the thickness of the legs of the angles **514**, **534** and combined length of legs **520** and **536** of respective angles **514**, **534** for angle C, permit nesting of each of the corresponding portions of adjacent packaging members **500**. That is, the corresponding surfaces of each of the legs of adjacent nested packaging members **500** can be maintained in abutting contact therewith. Upon assembly, packaging members **500** have enhanced structural strength and rigidity by virtue of the three rigid angles **514**, **528**, **534** and enclosed regions **542**, **544**.

[0061] FIG. **27**A shows a space-saving arrangement of empty packaging members of FIG. **25**A. As further shown in FIG. **27**A, the combined span of leg **530** of angle **528** and leg **522** and the combined span of leg **520** leg **536** of angle **534**, which together resemble a U-channel, are disposed at an orientation angle D from each other.

[0062] The magnitude of orientation angle D is sufficient to account for the inward offset that occurs due to stacking of packaging members. In other words, properly configured orientation angle D, which are a function of the thickness of the legs of the angles **528**, **514** and combined the combined spans of leg **530** of angle **528** and leg **522** as well as leg **520** and leg **536** of angle **534** for angle B, permit nesting of each of the corresponding portions of adjacent packaging members **500**. That is, the corresponding surfaces of each of the legs of adjacent nested packaging members **500** can be maintained in abutting contact therewith. Upon assembly, as shown in FIG. **26**A, packaging members **500** have enhanced structural strength and rigidity by virtue of the two rigid angles **514** and **528** and enclosed regions **542**, **544**.

[0063] While the invention has been described with reference to a preferred embodiment, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from the essential scope thereof. 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.

What is claimed is:

1. A packaging member for securing an article comprising a preformed laminated paperboard member having a preselected length, the member having a first leg and a second leg forming a substantially L-shaped cross section of rigid construction across the length of the member; the first leg having at least one substantially parallel discontinuity formed substantially along the preselected length of the member, each discontinuity forming at least two adjacent leg portions connected together; in response to the first leg and the second leg being directed toward each other, one of the at least two adjacent leg portions is directed into contact with the second leg to define an enclosed region for securing an article therein; wherein the packaging member can be nested with additional packaging members in an unassembled position, and wherein corresponding surfaces of first and second legs of adjacent nested packaging members can be maintained in abutting contact.

2. The packaging member of claim **1** wherein the preformed member further comprises a third leg opposite the second leg, the first leg and a third leg forming a substantially L-shaped cross section of rigid construction across the length of the member; the at least two adjacent leg portions forming an angled joint in the first leg in response to the third leg and the second leg being directed toward each other and into contact with one another to define an enclosed region for securing an article therein; wherein multiple packaging members can be nested in an unassembled position, and wherein corresponding surfaces of adjacent first, second and third nested legs of adjacent packaging members can be maintained in abutting contact.

3. The packaging member of claim **1** wherein each discontinuity is formed in at least one of an outer surface of the first leg or an inner surface of the first leg.

4. The packaging member of claim **1** wherein the second leg has at least one substantially parallel discontinuity formed along the preselected length of the member; each discontinuity forming at least two adjacent leg portions connected together; one of the at least two adjacent leg portions of the second leg is directed toward the first leg to define a distance between the first and second leg in response to the first and second leg being directed toward each other.

5. The packaging member of claim **4** wherein each discontinuity is formed in at least one of an outer surface of the second leg or an inner surface of the second leg.

6. The packaging member of claim **1** wherein one group of nested packaging members are nested with another group of nested packaging members.

7. The packaging member of claim **6** wherein a surface of one of the first and second legs of one group of nested packaging members abuts a corresponding surface of one of the first and second legs of the other group of nested packaging members.

8. A packaging member for protecting an edge of an article comprising:

a first leg and a second leg disposed at a predetermined angle to each other along a junction; and

at least two different material plies integrally connected along the junction, each of the material plies defining a bend having a first width and a second width, wherein the first width and second width defining different magnitudes.

9. The packaging member of claim **8** wherein the at least two different material plies are paperboard.

10. The packaging member of claim **8** wherein the at least two different material plies use substantially identically sized material plies and the substantially identically sized material plies are alternately disposed along the junction to form the at least two different material plies.

11. The packaging member of claim **8** wherein the at least two different material plies use differently sized material plies alternately disposed along the junction.

12. The packaging member of claim **8** wherein the at least two different material plies have different thicknesses.

13. The packaging member of claim **8** wherein the at least two different material plies comprise a third material ply, the third material ply has a first width and a second width that are substantially the same width and the third material ply is disposed in contact with the article or disposed opposite the article.

14. A packaging member for securing an article comprising a preformed laminated paperboard member having a preselected length, the member having a first leg and a second leg forming a substantially L-shaped cross section of rigid construction across the length of the member; the first leg having at least two substantially parallel discontinuities formed substantially along the preselected length of the member, the at least two discontinuities forming at least three adjacent leg portions connected together; in response to the first leg and the second leg being directed toward each other a distance between the first and second leg is defined; wherein multiple packaging members can be nested in an unassembled position, and wherein corresponding surfaces of first and second legs of adjacent nested packaging members can be maintained in abutting contact.

15. The packaging member of claim **14** wherein corresponding surfaces of a leg portion of the first leg and the second leg are brought into abutting contact to define an enclosed region for securing an article therein.

16. The packaging member of claim **14** wherein the preformed member further comprises a third leg opposite the second leg, the first leg and a third leg forming a substantially L-shaped cross section of rigid construction across the length of the member; the at least three adjacent leg portions forming an angled joint in the first leg in response to the third leg and the second leg being directed into contact with one another to define an enclosed region for securing an article therein; wherein multiple packaging members can be nested in an unfolded position, and wherein corresponding surfaces of adjacent first, second and third legs of adjacent nested packaging members can be maintained in abutting contact.

17. The packaging member of claim **16** wherein corresponding surfaces of the second leg and the third leg are brought into abutting contact.

18. The packaging member of claim **16** wherein the discontinuities are formed in at least one of an outer surface or an inner surface of the first leg.

19. The packaging member of claim **1** wherein at least one leg portion of the first leg overlaps at least a segment of the other leg.

20. A packaging member for securing an article comprising a preformed laminated paperboard member having a preselected length, the member having a first leg and a second leg forming a substantially L-shaped cross section of rigid construction across the length of the member; the first leg having a substantially parallel discontinuity formed substantially along the preselected length of the member, the discontinuity forming two adjacent leg portions forming an angled joint in the first leg in response to the first leg and the second leg being directed toward each other to define a distance between the first and second leg; wherein a first group of multiple packaging members can be nested in an unassembled position, and wherein corresponding surfaces of first and second legs of adjacent nested packaging members can be maintained in abutting contact.

21. The packaging member of claim **1** wherein the second leg has at least one substantially parallel discontinuity formed along the preselected length of the member; each discontinuity forming at least two adjacent leg portions connected together; one of the at least two adjacent leg portions of the second leg is directed toward the first leg to define an enclosed region for securing an article therein.

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