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(54) **ALL PAPER BLISTER TYPE PACKAGE**

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(57)

ABSTRACT

A paper-based package that can be manufactured using existing blister pack packaging equipment is provided. The package components comprise a face card and a tray blank that can be shipped flat and loaded easily into existing blister package equipment. The package may be formed in the machine just prior to the filling operation, and a paper-to-paper seal may be achieved in the same fashion as in a traditional plastic blister face card seal. Fold lines are formed in the tray blank by ablation.

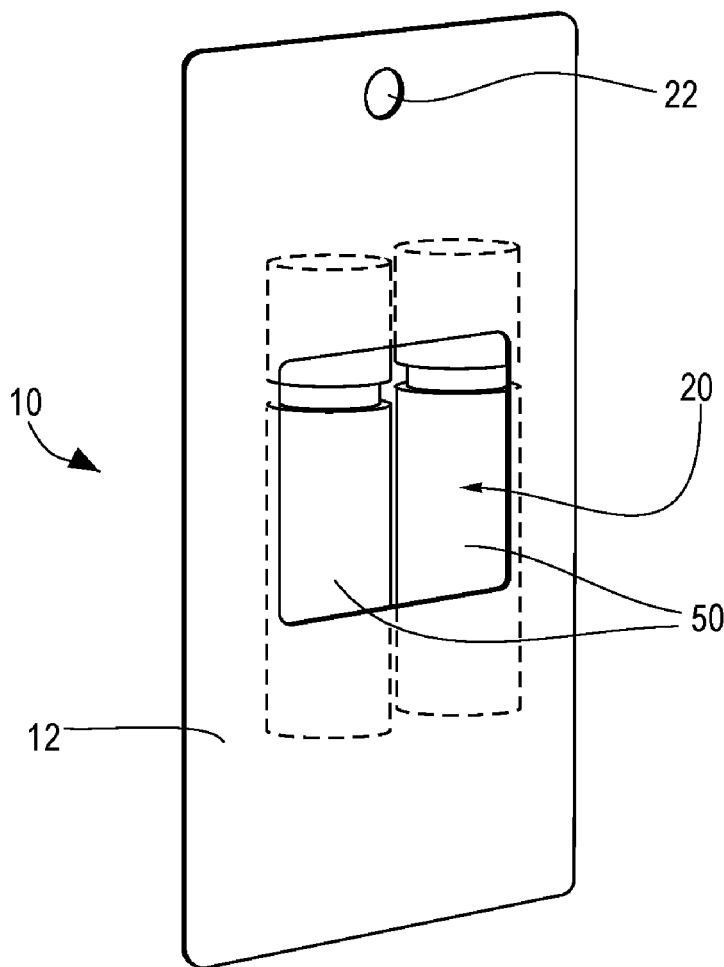


Fig. 1

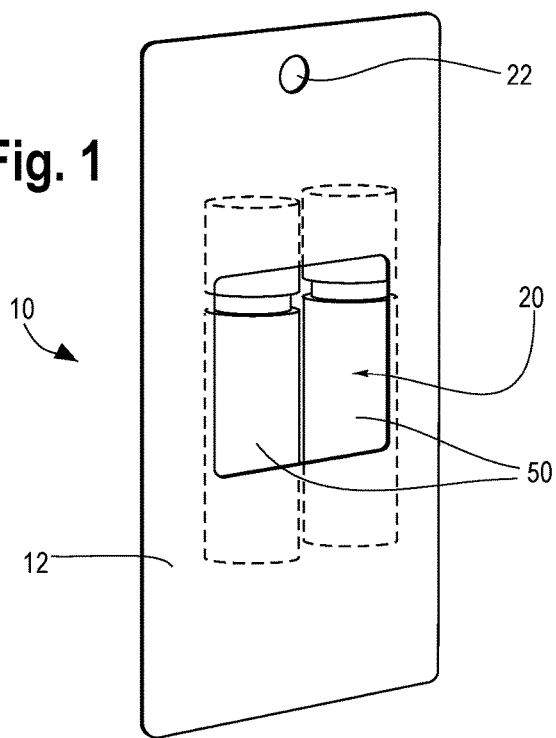


Fig. 2

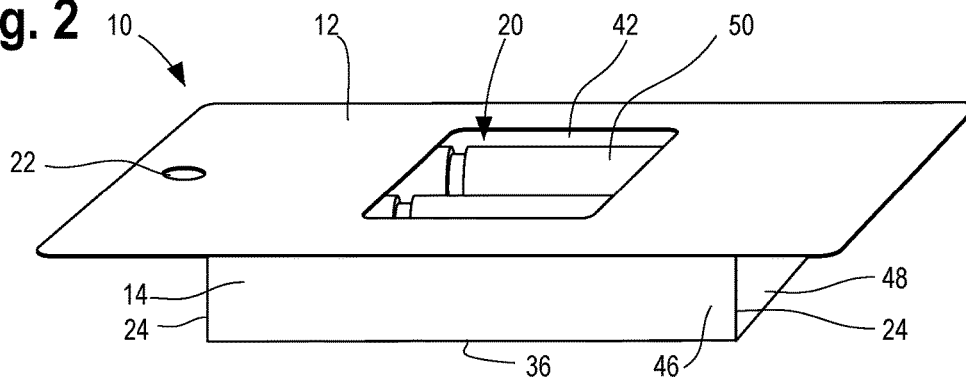
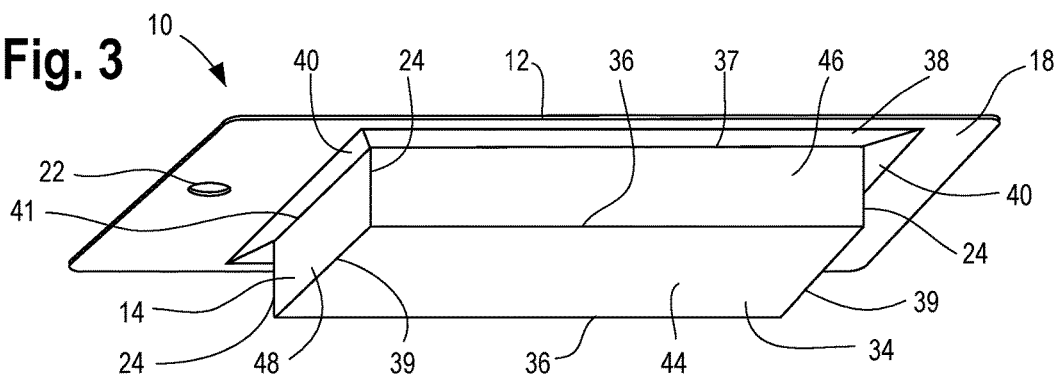
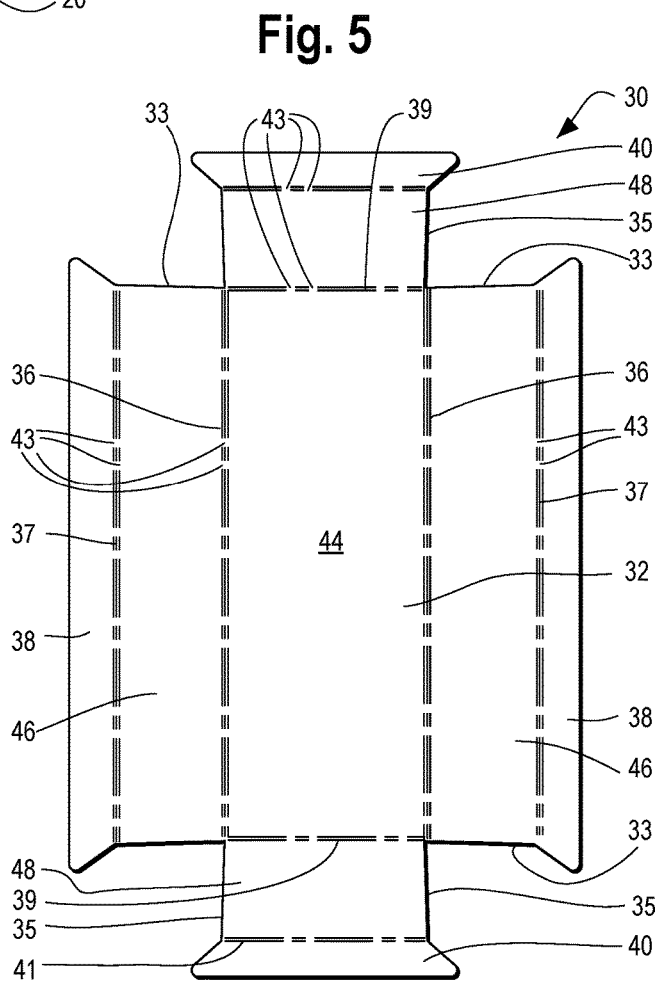
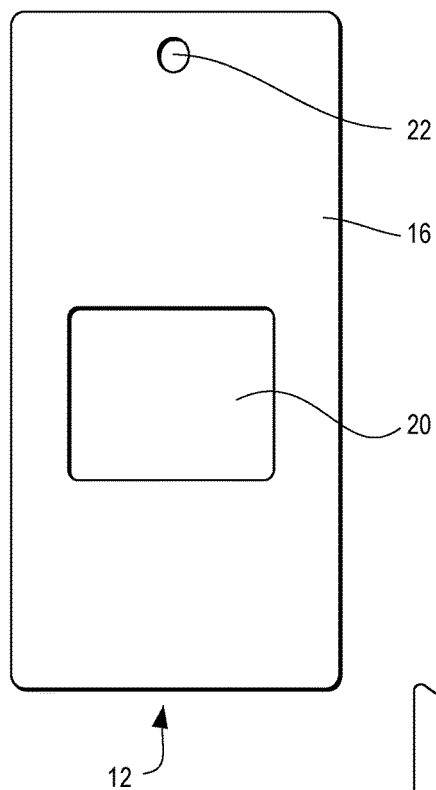


Fig. 3





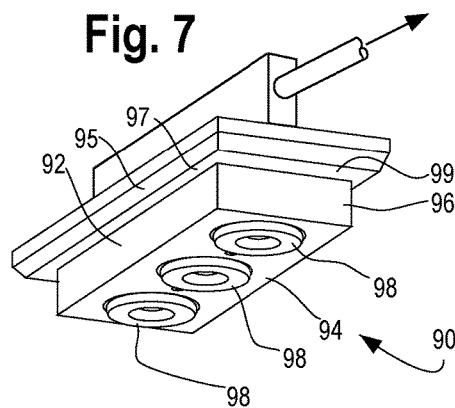
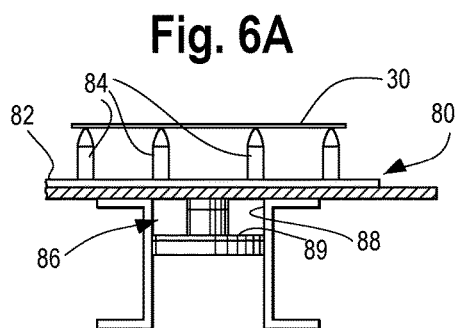
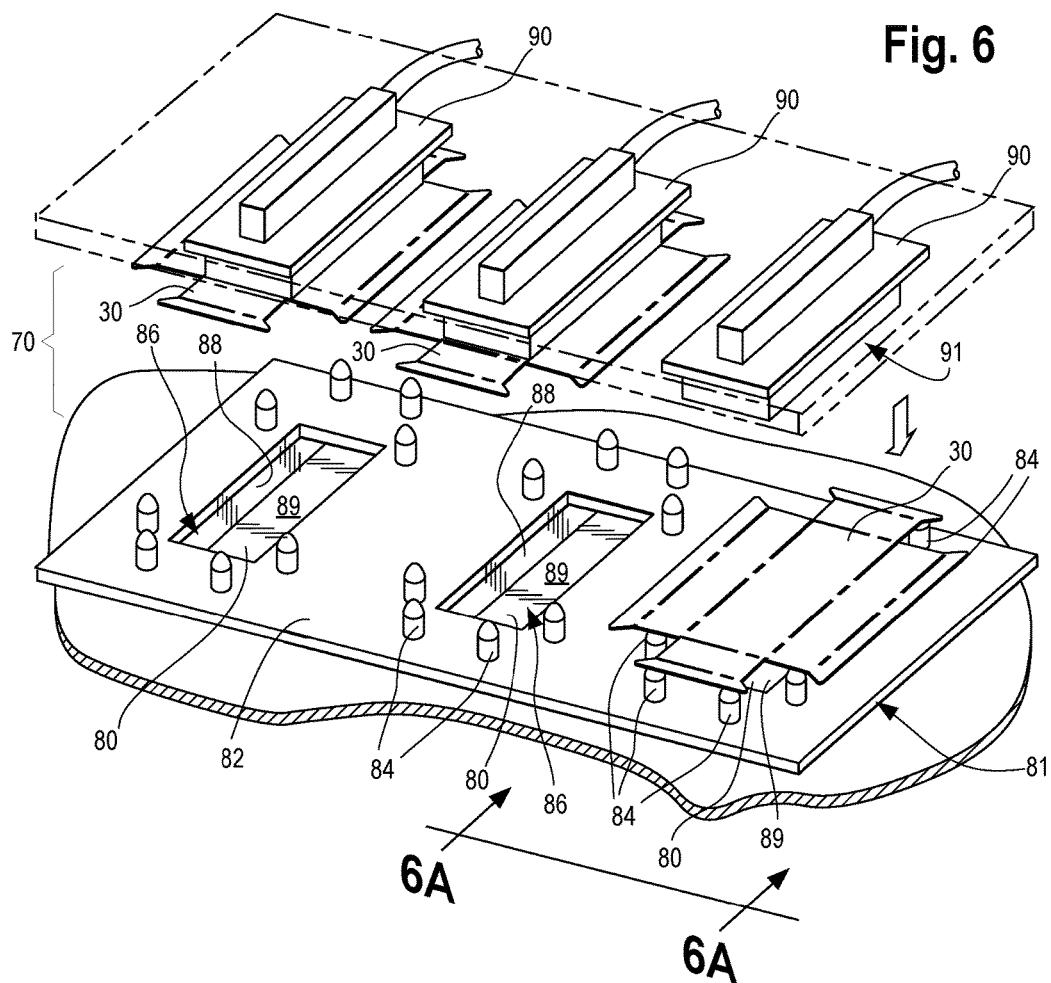


Fig. 8

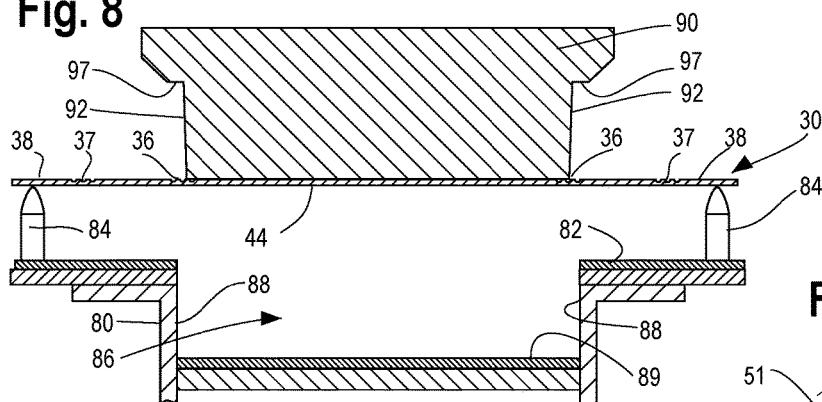


Fig. 9

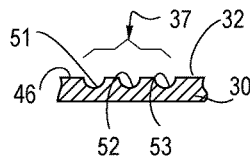


Fig. 10

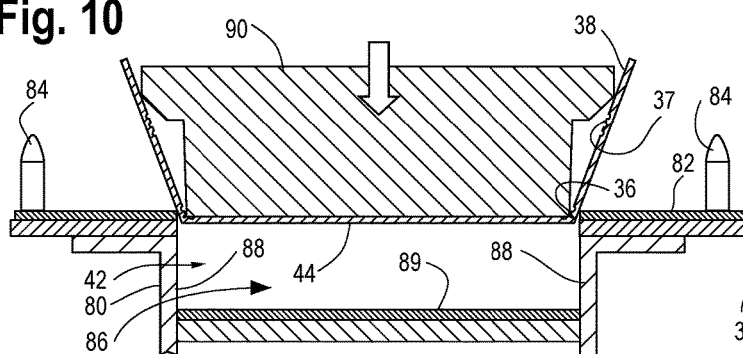


Fig. 11A

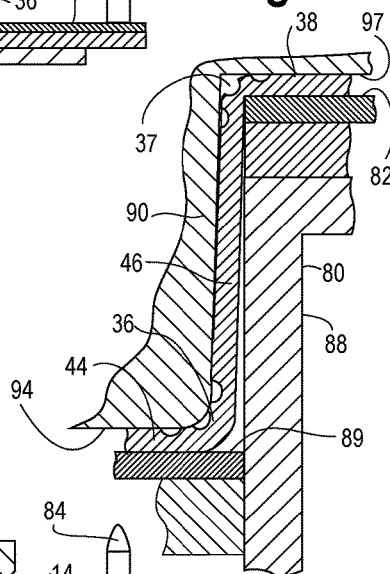


Fig. 11

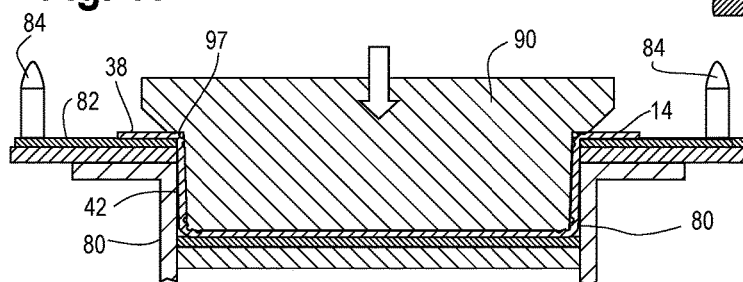


Fig. 12

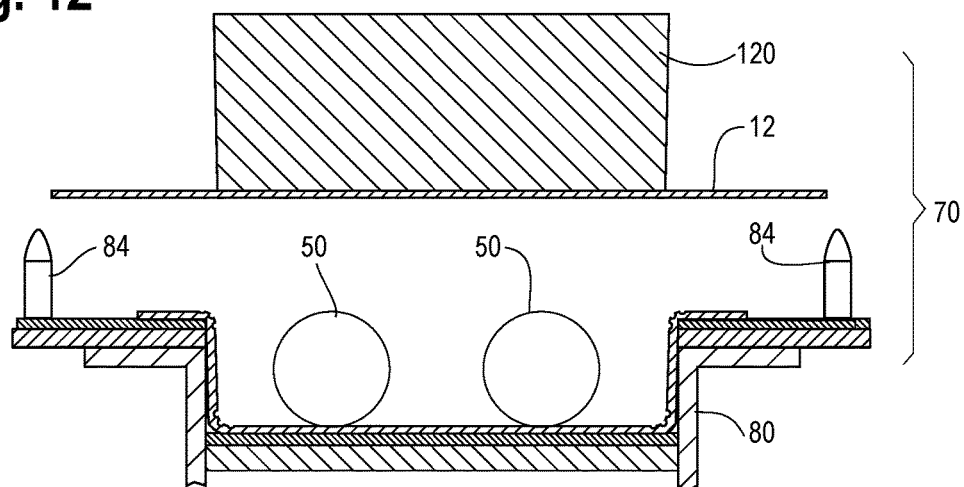


Fig. 13

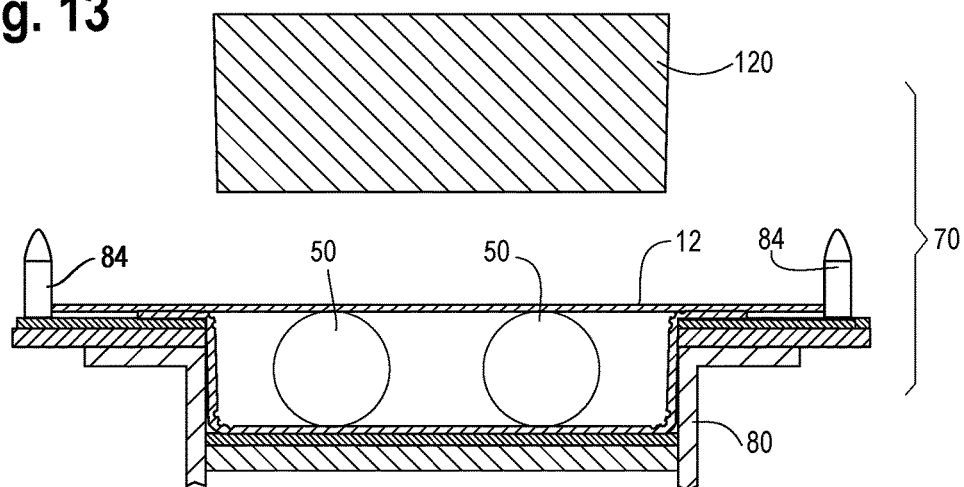


Fig. 14

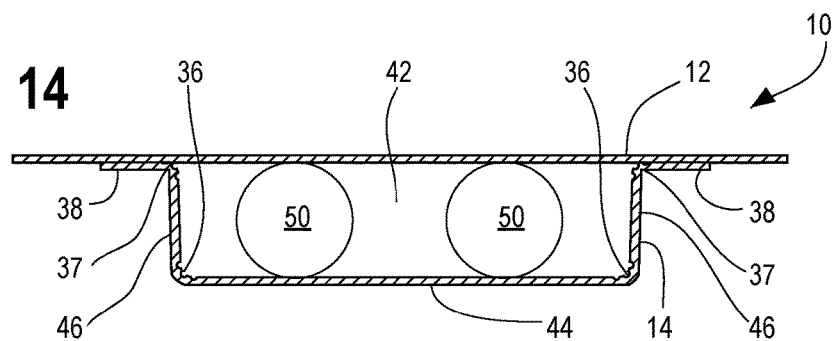


Fig. 15

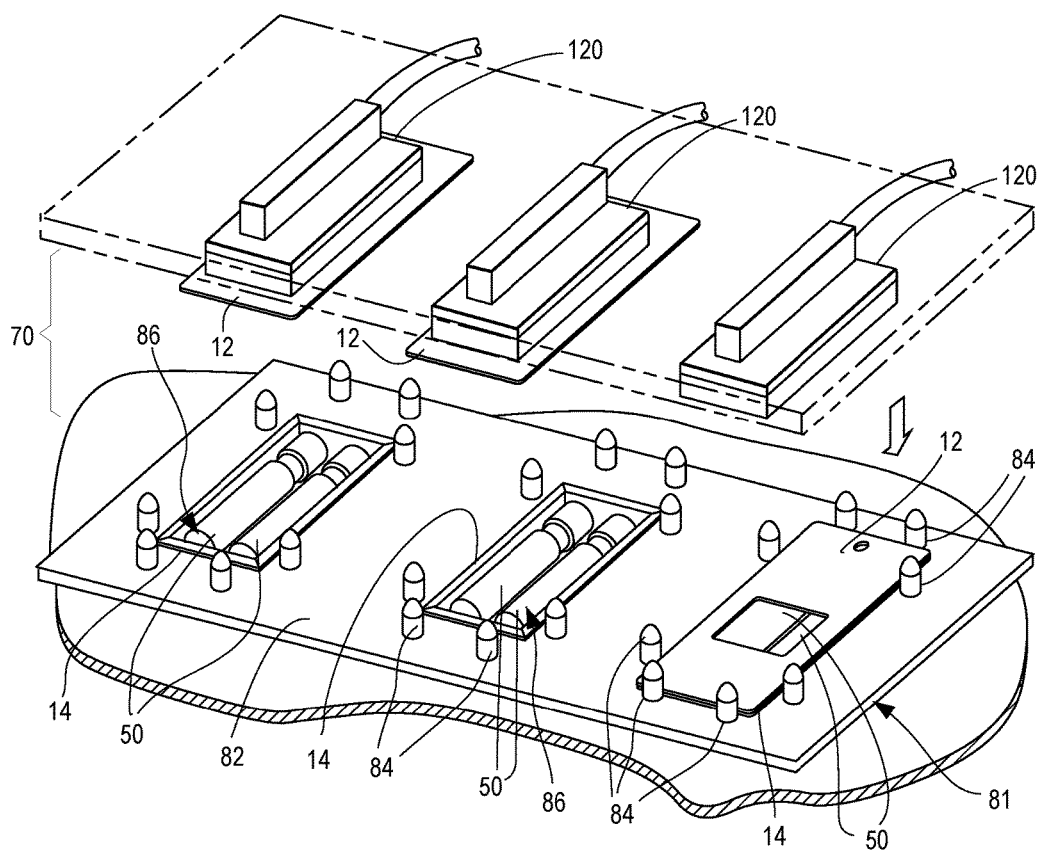


Fig. 16

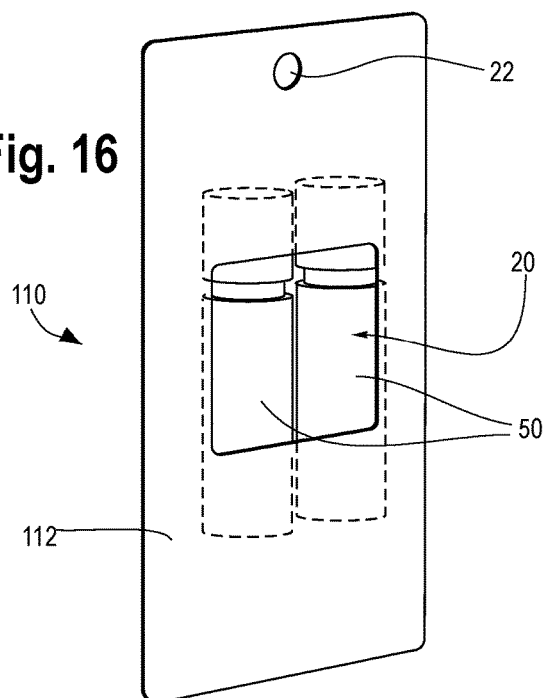


Fig. 17

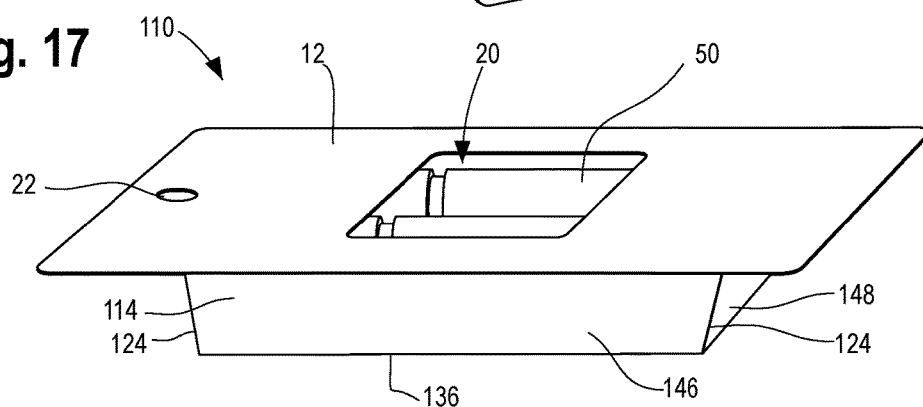


Fig. 18

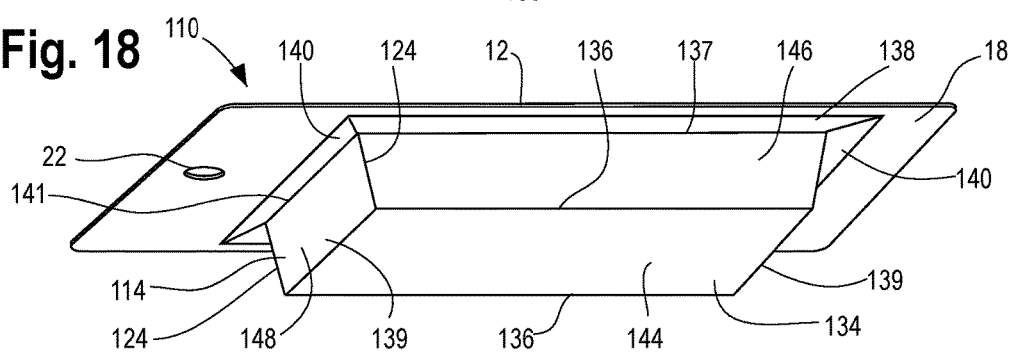


Fig. 19

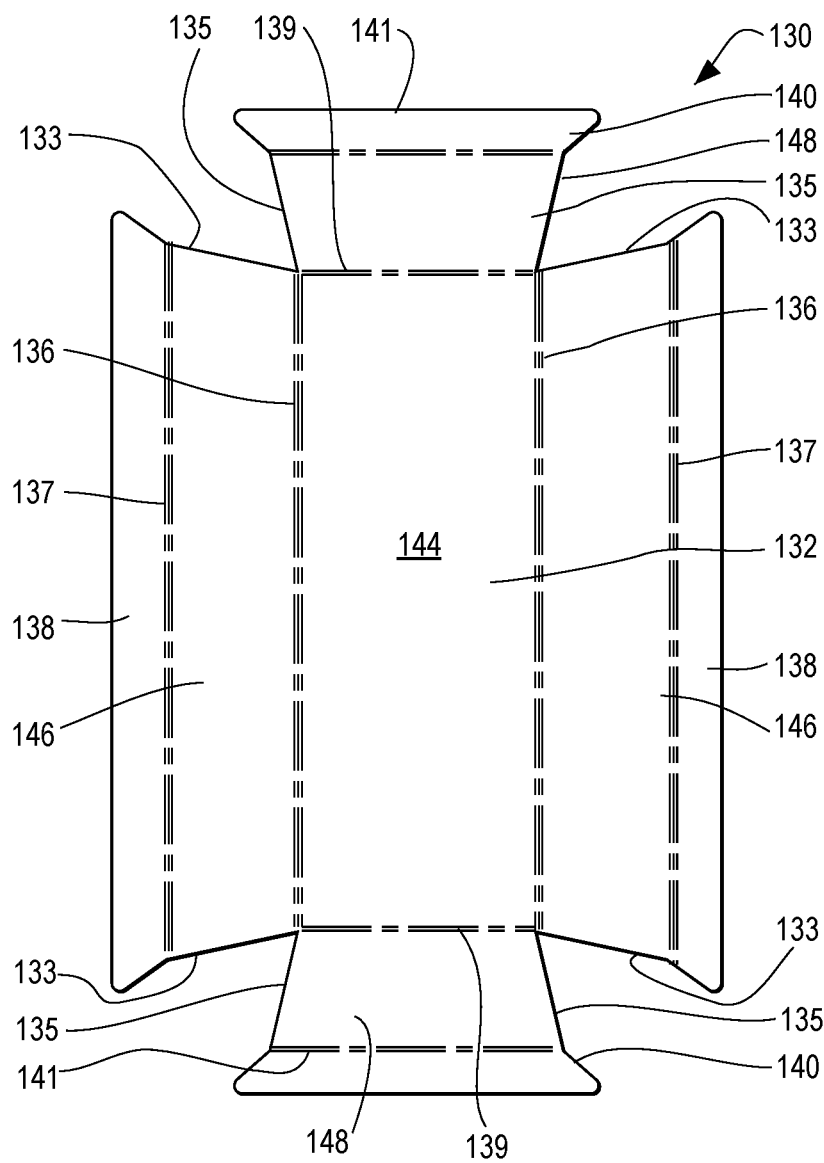
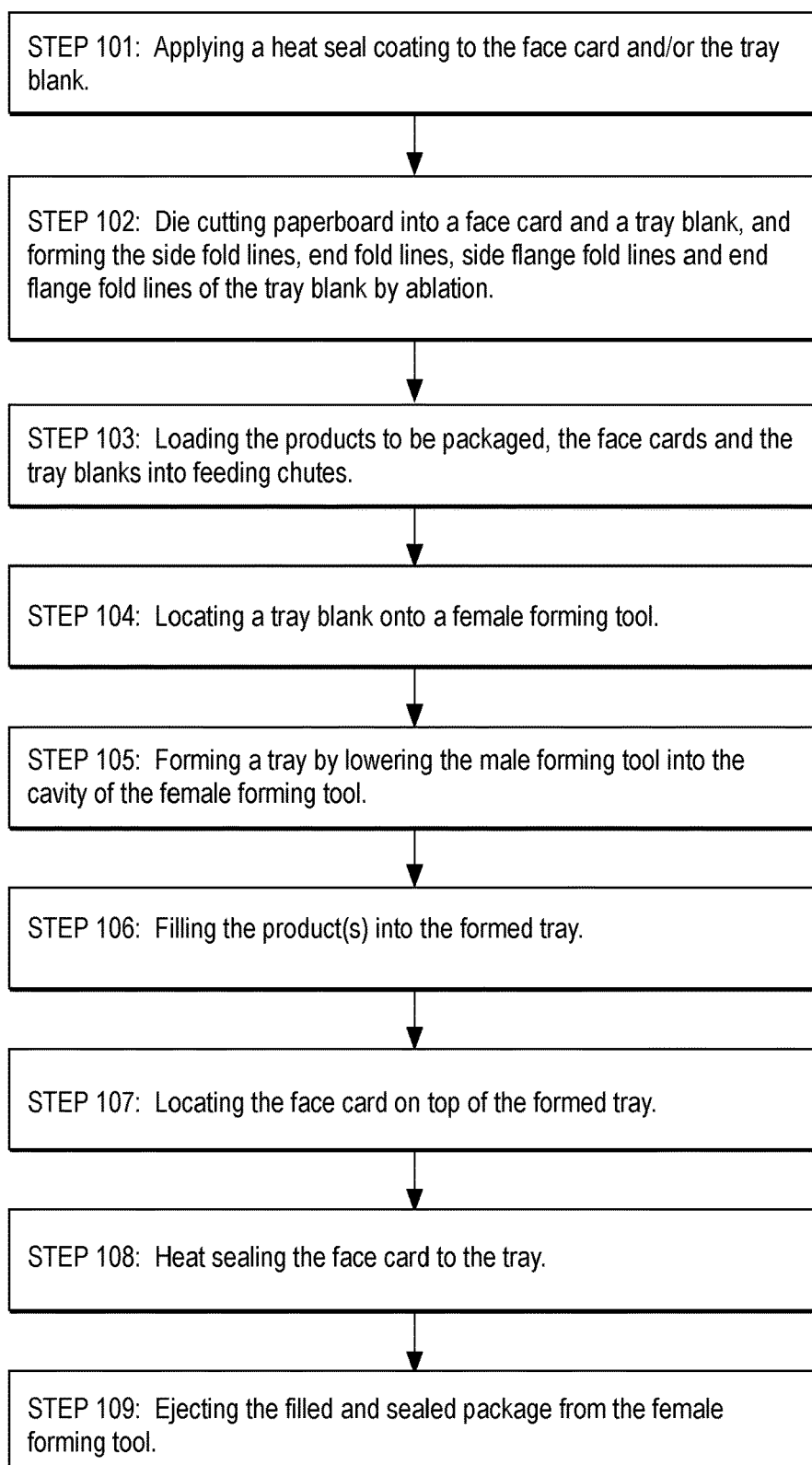


Fig. 20

ALL PAPER BLISTER TYPE PACKAGE

BACKGROUND

Field Of The Invention

[0001] This patent relates to a blister type package. More particularly, this patent relates to a blister type package made entirely or primarily from paper.

Description Of The Related Art

[0002] In traditional face-seal style blister packages, a product or products are dropped into a transparent thermoformed plastic shell and a paper-based backing card is sealed via heat and pressure to a flange extending outwardly from the face perimeter of the plastic shell. Composite (multiple material) blister packages of this type enable the seller to display the product visually for sale and enable the package manufacturer to create the package with just a few packaging components and fast sealing. The package may include a heat seal coating on the paper component and not the plastic shell component.

[0003] Occasionally packages requiring greater security, structure or decoration will incorporate two pieces of paperboard, sandwiching the plastic blister (or blisters) in between in a “trapped” package. Sealing is affected the same way as in the traditional face-seal style blister package, that is, through heat and pressure.

[0004] Recently the packaging industry has been pursuing sustainable, environmentally friendly packaging including little to no plastic and having components that are easily recyclable. Another reason for pursuing “no-plastic” packaging is that, while plastic packaging allows the product to be very visible, it often can obscure necessary text or product graphics that are relevant to consumers. The present disclosure addresses these needs.

SUMMARY OF THE INVENTION

[0005] The present disclosure relates to a paper-based package that can be manufactured using existing blister pack packaging equipment. The package components can be shipped flat and loaded easily into existing blister package equipment. The package may be formed in the machine just prior to the filling operation, and a paper-to-paper seal is achieved in the same fashion as a traditional plastic blister face card seal.

[0006] In one aspect a paper blister type package is provided comprising a face card and a tray blank. The face card is made from a first blank and has a front side and a back side. The paper tray is made from a second blank and has a product facing side and a back side. The tray comprises a tray bottom, two opposing tray sides attached to the tray bottom along side fold lines and extending upwardly from the tray bottom to side flange fold lines, and two opposing tray ends attached to the tray bottom along end fold lines and extending upwardly from the tray bottom to end flange fold lines. The tray further comprises two opposing side flanges and two opposing end flanges. Each side flange extends outwardly from and is attached to a tray side along a side flange fold line. Each end flange extends outwardly from and is attached to a tray end along an end flange fold line. The side fold lines, the end fold lines, the side flange fold lines and the end flange fold lines may be multiple, shallow, ablated channels located on the product facing side of the

tray blank. A heat seal coating adheres the face card to the two opposing side flanges and the two opposing end flanges.

[0007] In another aspect the disclosure relates to a method of making a paper blister package comprising the steps of: Applying a heat seal coating to one side of paperboard stock use to make a face card and/or a tray blank; Cutting paperboard into a face card and a tray blank, and forming side fold lines, end fold lines, side flange fold lines and end flange fold lines in a product facing side of the tray blank by laser ablation; Loading products to be packaged, face cards and tray blanks into feeding chutes; Transferring a tray blank from a feeding chute to a nesting tray and locating the tray blank onto the nesting tray using a vacuum equipped forming block; Forming a tray by lowering the forming block into a cavity of the nesting tray, thereby forcing the tray blank to fold along its fold lines and assume the shape of a tray, and then withdrawing the forming block from the cavity; Loading product(s) into the formed tray while the tray still resides in the nesting tray; Using a feeder to remove a face card from a feeding chute and place the face card on top of the formed tray; and adhering the face card to the tray by heating the heat seal coating.

THE DRAWINGS

[0008] FIG. 1 is a front perspective view of a package according to the disclosure.

[0009] FIG. 2 is a side perspective view of the package of FIG. 1.

[0010] FIG. 3 is a bottom perspective view of the package of FIG. 1.

[0011] FIG. 4 is a top plan view of a face card used to make the package of FIG. 1.

[0012] FIG. 5 is a top plan view of a tray blank used to make the package of FIG. 1.

[0013] FIG. 6 is a perspective view of a forming apparatus comprising a set of nesting trays and a corresponding set of forming blocks.

[0014] FIG. 6A is a cross-sectional view of one of the nesting trays of FIG. 6.

[0015] FIG. 7 is a bottom perspective view of a forming block.

[0016] FIG. 8 is a side cross-sectional view of a forming apparatus and tray blank prior to the formation of a tray.

[0017] FIG. 9 is a close up view of a portion of the tray blank of FIG. 8, showing a side cross-sectional view of several exemplary channels.

[0018] FIG. 10 is a side cross-sectional view of the forming apparatus and tray blank of FIG. 8 during formation of a tray.

[0019] FIG. 11 is a side cross-sectional view of the forming apparatus and tray blank of FIG. 10 after formation of a tray.

[0020] FIG. 11A is a close up view of a portion of FIG. 11.

[0021] FIG. 12 is a side cross-sectional view of a forming apparatus shown after products have been placed into a tray and just before a face card is located onto the tray.

[0022] FIG. 13 is a side cross-sectional view of the forming apparatus of FIG. 12 after the face card has been located onto the tray.

[0023] FIG. 14 is a side cross-sectional view of a finished tray.

[0024] FIG. 15 is a perspective view of a forming apparatus used to make three blister packages simultaneously.

[0025] FIG. 16 is a front perspective view of an alternative package according to the disclosure.

[0026] FIG. 17 is a side perspective view of the package of FIG. 16.

[0027] FIG. 18 is a bottom perspective view of the package of FIG. 13.

[0028] FIG. 19 is a top plan view of a tray blank used to make the package of FIG. 16.

[0029] FIG. 20 is a flowchart showing a method of making a paper blister package according to the disclosure.

DETAILED DESCRIPTION OF THE INVENTION

[0030] While the invention described herein may be embodied in many forms, there is shown in the drawings and will herein be described in detail one or more embodiments, with the understanding that this disclosure is to be considered an exemplification of the principles of the invention and is not intended to limit the invention to the illustrated embodiments.

Definition

[0031] The term “fold line” as used herein may refer to a fold line, a score line, an ablated channel or multiple parallel fold lines, score lines or ablated channels in close proximity so as to function as a fold line.

Paperboard “Blister” Package

[0032] Turning to the drawings, there is shown in FIGS. 1 to 3 one embodiment of the present invention, a package 10 comprised primarily of paperboard. The package 10 may be referred to as a “blister” type package in that the products 50 are dropped into a “shell” or tray 14 and a flat face card 12 is then heat sealed to the tray 14. Except in this case the tray 14 is not a plastic component formed as a “blister”, but rather a paper component.

[0033] The package 10 comprises a tray bottom 44, two opposing tray side walls 46 and two opposing tray end walls 48. Each tray side wall 46 extends upwardly from the tray bottom 44 to a side flange fold line 37, and each tray end wall 48 extends upwardly from the tray bottom 44 to an end flange fold line 41. Together the side flange fold lines 37 and the end flange fold lines 41 comprise the face perimeter of the tray 14. The package 10 may also comprise a side flange 38 extending outwardly from each side wall 46 and an end flange 40 extending outwardly from each end wall 48. Each side flange 38 may be rectangular, trapezoidal or any suitable shape. Likewise, each end flange 40 may be rectangular, trapezoidal or any suitable shape. Together or individually the side flanges 38 and the end flanges 40 may be referred to as a sealing flange. The face card 12 is sealed to the side flanges 38 and the end flanges 40 to enclose and protect the products 50.

[0034] The face cards 12 as well as the blanks 30 used to make the trays 14 may be produced and delivered to a customer as flat components, then the package 10 may be formed in-line with the customer's product filling operation as described in some detail below.

[0035] The package 10 may be used to hold one or more products 50, such as the substantially cylindrical products shown in the figures. Preferably the products 50 have their own “primary” packaging so that a consumer may touch the

exterior of the primary packaging without damaging the actual products (i.e., the primary package contents).

[0036] FIG. 4 is a top plan view of a face card 12 used to make the package 10 of FIGS. 1-3. The face card 12 has a front side 16 and a back side 18 and may have graphics printed on one or both sides. The face card 12 may define an optional opening (“window”) 20 to enable the consumer to see all or part of the product 50. The window 20 may or may not be covered with a transparent film. If not covered, the window 20 allows a consumer to touch the product 50. The window 20 should be of a shape that prevents the products 50 from being removed through the window 20. For example, the window 20 may be shorter and/or narrower than the products 50 so that the products 50 do not protrude through the window 20.

[0037] Other holes or openings may be incorporated into the face card 12 either as decorative features or for more utilitarian purposes. For example, the face card 12 may define a small hole 22 located near the top of the package 10 for accommodating a rod or hook for retail display purposes.

[0038] A heat seal coating may be applied to the face card 12 on the back (tray facing) side 18 prior to the face card 12 being sealed to a tray 14. The heat seal coating can be spot-applied or flooded across the entire face of the card 12. The type and method of coating may be based upon customer need and product shape and geometry. The heat seal coating can be solvent or aqueous-based, and can be activated by heat to affect a seal.

[0039] FIG. 5 is a view of a tray blank 30 used to make the tray 14. The tray blank 30 has a product facing side 32 (viewable in FIG. 5) and a back side 34 (facing away from the viewer in FIG. 5). The tray blank 30 comprises a tray bottom 44, two opposing tray side walls 46 and two opposing tray end walls 48. The tray blank 30 also comprises two opposing side flanges 38 and two opposing end flanges 40. The tray blank 30 may have graphics printed on the product facing side 32, the back side 34 or both.

[0040] The tray bottom 44 may be rectangular or any suitable shape. For example, the tray bottom 44 may have a periphery comprising two opposing parallel side fold lines 36 and two opposing parallel end fold lines 39. The tray bottom 44 may have a width (i.e., the dimension from one side fold line 36 to the opposite side fold line 36) smaller than the width of the face card 12 and a height (i.e., the dimension from one end fold line 39 to the opposite end fold line 39) smaller than the height of the face card 12.

[0041] The tray side walls 46 are attached to the tray bottom 44 along the side fold lines 36. The tray end walls 48 are attached to the tray bottom 44 along the end fold lines 39.

[0042] In the tray blank shown in FIG. 5 each tray side wall 46 extends outwardly from the tray bottom 44 to a side flange fold line 37, and each tray end wall 48 extends outwardly from the tray bottom 44 to an end flange fold line 41.

[0043] Each tray side wall 46 and each tray end wall 48 may be rectangular, trapezoidal or any suitable shape. Each tray side wall 46 extends from a side fold line 36 outward to a side flange fold line 37 and from one side wall free edge 33 to another side wall free edge 33. Each tray end wall 48 extends from an end fold line 39 to an end flange fold line 41 and laterally between opposing parallel end wall free edges 35.

[0044] Each side wall free edge 33 may be collinear with an end fold line 39 and perpendicular to a side fold line 36,

and each end wall free edge **35** may be co-linear with a side fold line **36** and perpendicular to an end fold line **39**.

[0045] Preferably though, each side wall free edge **33** forms a two degree angle with a corresponding end fold line **39** and a ninety-two degree included angle with a corresponding side fold line **36**. Similarly, each end wall free edge **35** may form a two degree angle with a corresponding side fold line **36** and a ninety-two degree included angle with a corresponding end fold line **39**. This configuration facilitates easier removal of the formed tray **14** from the nesting tray **80** as explained further below.

[0046] In the preferred configuration of the formed tray **14**, the side walls **46** and the end walls **48** are not quite perpendicular to the tray bottom **44**, but rather are splayed outward about two degrees from the perpendicular. The side wall free edges **33** and end wall free edges **35** form substantially closed vertical corners **24** with little or no gaps between them.

[0047] The side fold lines **36**, end fold lines **39**, side flange fold lines **37** and end flange fold lines **41** may comprise one or more shallow channels that allow the tray blank **30** to be formed into a three-dimensional tray **14**. For example, the side fold lines **36**, end fold lines **39**, side flange fold lines **37** and end flange fold lines **41** may comprise shallow channels located on the product facing side **32** of the tray blank **30** to enable the tray blank **30** to be easily bent into a tray shape. The shallow channels may be created using a laser or other device to ablate the tray blank **30** on one side only, thereby “thinning” the tray blank **30** in the desired areas. As shown most clearly in FIG. 9, the channels **51**, **53**, **55** do not extend all the way through the tray blank **30**, but are visibly apparent only on one side of the tray blank **30**. Preferably the channels are visible only on the product facing side **32**.

[0048] Each fold line may comprise any suitable number of channels, although it is believed that two to three channels will work best. In the embodiment shown in FIG. 5 each side fold line **36** comprises three parallel channels, each side flange fold line **37** comprises three parallel channels, each end fold line **39** comprises two parallel channels, and each end flange fold line **41** comprises two parallel channels. For example, as perhaps shown more clearly in FIG. 9, the side flange fold line **37** comprises three parallel channels **51**, **53** and **55**. The multiple channels facilitate the forming of the tray blank **30** into a tray **14** as explained further below.

[0049] Each channel may be continuous (uninterrupted) or may comprise discontinuities. In the embodiment shown in FIG. 5 each channel is discontinuous, and includes a number of breaks or discontinuities **43**, that is, areas along the fold line where the blank **30** has not been ablated. The discontinuities **43** among the parallel channels forming each fold line may be aligned or staggered. For example, the discontinuities **43** among the parallel channels forming each fold line in FIG. 5 are aligned.

Forming Apparatus

[0050] FIG. 6 is a perspective view of a forming apparatus **70** that may be used to make the tray of FIGS. 1-3. The forming apparatus **70** comprises a nesting apparatus **81** and a forming block apparatus **91**. The nesting apparatus **81** comprises three nesting trays **80**. The forming block apparatus **91** comprises three forming blocks **90**. Although FIG. 6 depicts three nesting trays **80** and three forming blocks **90** for simultaneously making multiple packages **10**, it should be understood that the forming apparatus **70** may comprise

any number of paired nesting trays **80** and forming blocks **90**, including just a single nesting tray **80** and forming block **90**.

[0051] FIG. 6A is a cross-sectional view of one of one of the nesting trays **80** of FIG. 6. The nesting tray **80** has a top surface **82**, a bottom wall **89** and four sidewalls **88** that define a recess **86** in which a tray **14** can be formed. The nesting tray **80** may comprise locator pins **84** extending upwardly from the top surface **82** and positioned to locate and hold a face card **12** on the nesting tray **80**. In order to form the rectilinear tray shown in FIGS. 2 and 3, the sidewalls **88** and end walls of the nesting tray **80** may be perpendicular to the bottom wall **89** of the nesting tray **80**.

[0052] FIG. 7 is a perspective view of a forming block **90**. The forming block **90** is also used to form the tray **14**, and so may have a shape that is complimentary to the shape of the nesting tray **80** and, more specifically, to the recess **86** defined by the nesting tray **80**. For example, the forming block **90** may have a flat bottom **94** as well as flat sides **92** and flat ends **96** extending upward (away from the nesting tray **80**) from the bottom **94**. In order to form the rectilinear tray shown in FIGS. 2 and 3, the side **92** and ends **96** may be substantially perpendicular to the bottom **94**.

[0053] The forming block **90** may further comprise side extensions **97** extending laterally (horizontally) from the sides **92** and end extensions **99** extending laterally (horizontally) from the ends **96**. As explained further below, the extensions **97**, **99** serve to at least partly backfold the sealing flanges **38**, **40** during formation of the tray **14**. Without the extensions **97**, **99** on the forming block **90**, the sealing flanges **38**, **40** could remain substantially perpendicular to the sealing plane (defined by the top surface **82** of the nesting tray **80**) and substantially parallel to the direction of movement of a heat plate, i.e., the plate that heat seals the face card **12** to the tray **14**, making it difficult to remove the tray **14** from the recess **86**.

[0054] In addition to functioning as a male forming die for shaping the tray **14**, the forming block **90** may be equipped with a vacuum device (suction mechanism) that holds package components (such as the tray blank **30**) to the forming block **90**. The vacuum device may comprise one or more retractable suction cups **98** disposed on the bottom **94** of the forming block **90**. These suction cups **98** can be used to hold the tray blank **30** to the forming block **90**.

[0055] The forming block **90** may be sized proportionately to the desired shape of the tray **14** and can be aligned to the tray blank **30** that it is picking up, so that when it withdraws a tray blank **30** from the feeding chute (generally through a restrictive device, so that only one tray blank **30** is picked up at a time), alignment of the forming block **90** to the tray blank **30** is maintained.

Method of Manufacturing the Package

[0056] Referring to FIGS. 8-15 and FIG. 20, a method **100** of manufacturing a paper “blister” package **10** may be achieved according to the following steps.

[0057] Step **101** (Application of a Heat Seal Coating): A heat seal coating may be spot-applied or flooded across one side of paperboard stock used to make the face card **12** or the tray **14**. Preferably the heat seal coating is applied to those areas of the face card **12** that will be sealed to the tray blank **30**. For example, the heat seal coating may be applied to those areas of the face card **12** that will mate with the side flanges **38** and the end flanges **40** of the tray blank **30**. Of

course, the heat seal coating may be applied to the side flanges 38 and the end flanges 40 of the tray blank 30 instead of or in addition to being applied to the face card 12.

[0058] Step 102 (Cutting and Channel Forming): A face card 12 and a tray blank 30 may be made by cutting the paperboard into the desired shapes, such as those shown in FIGS. 4 and 5 respectively. Preferably at or near the same time that the paperboard for the tray blank 30 is being cut into the desired shape, the side fold lines 36, the end fold lines 39, the side flange fold lines 37 and/or the end flange fold lines 41 of the tray blank 30 are formed, preferably by laser ablation. More specifically, the channels that make up the fold lines are formed, preferably by laser ablation.

[0059] Step 103 (Loading the Feeding Machine): The face cards 12 (preferably bearing a heat seal coating) and the tray blanks 30, as well as the products 50 to be packaged, may be loaded into chutes that feed into or are part of a feeding machine.

[0060] Step 104 (Tray Blank Feeding and Locating): A tray blank 30 may be fed from a chute and located onto a nesting tray 80 using a forming block 90. As noted above, the forming block 90 may have a vacuum device that allows it to grab the tray blank 30 from a tray blank chute and locate the tray blank 30 onto a nesting tray 80. If locator pins 84 are present, the tray blank 30 may be suspended by the locator pins 84 above the recess 86. FIG. 8 is a side cross-sectional view of a tray blank 30 after it has been positioned above the recess 86 by the forming block 90.

[0061] Step 105 (Tray Forming): Next, the forming block 90 is lowered in the direction of the arrow in FIG. 10 in the direction of the recess 86 of the nesting tray 80. As the forming block 90 begins entering the recess 86, the tray blank 30 begins folding along its fold lines 36, 37, 39, 41.

[0062] As the forming block 90 advances further into the recess 86 and eventually bottoms out, the tray blank 30 continues to fold along its fold lines 36, 37, 39, 41 and finally assumes the shape of the tray 14 shown in cross-section in FIG. 11.

[0063] FIG. 11A is a close up view of a portion of FIG. 11. The side flange fold lines 37 are folded backward over the top surface 82 of the nesting tray 80. The side extensions 97 of the forming block 90 press the tray side flanges 38 against the top surface 82 of the nesting tray 80. Although not shown in FIG. 11A, the end extensions 99 of the forming block 90 press the tray end flanges 40 against the top surface 82 of the nesting tray 80. The tray bottom 44 lies flat against the nesting tray bottom wall 89. The side fold lines 36 of the tray blank 30 are folded at a slight obtuse angle (i.e., one that is slightly greater than ninety degrees) and there is a narrow gap or space between the tray sidewall 46 and the sidewall 88 of the nesting tray 80. The gap allow the tray 14 to be easily extracted from the recess 86.

[0064] The forming block 90 is then withdrawn from the recess 86, leaving the formed tray 14 in the recess 86.

[0065] Step 106 (Product Filling): Next, the product(s) 50 are loaded into the formed tray 14 while the tray 14 is still residing in the nesting tray 80. The product(s) 50 may be dropped into the cavity 42 of the tray 14, which is sized appropriately for the products 50. The products 50 should fit snugly. FIG. 12 is a side cross-sectional view of a forming apparatus 70 shown after products 50 have been placed into a tray 14 but before a face card 12 has been located onto the tray 14 by a feeder 120.

[0066] Step 107 (Face Card Locating): The face card 12 is then fed from the feeding chute and placed on top of the formed tray 14 by the feeder 120 and located (positioned) on the formed tray 14 by the locator pins 84. FIG. 13 is a side cross-sectional view of the forming apparatus 70 after a face card 12 has been located onto the tray 14.

[0067] Step 108 (Package Sealing): Next, the package 10 may be sealed by heating the heat seal coating with a heating plate or other heating device (not shown) so that the heat seal coating on the face card 12 and/or the tray 14 causes the two components to bond to each other, effectively sealing the package 10. The heating device may press the face card 12 flat against the pre-folded flanges 38, 40 on the tray 14 during the sealing step.

[0068] Step 109 (Ejection): The filled and sealed package 10 is then ejected out of the nesting tray 80 via conventional means. FIG. 14 is a side cross-sectional view of a sealed package 10 similar to the package of FIGS. 1-3.

[0069] FIG. 15 is a perspective view of a forming apparatus 70 used to make three blister packages 10 simultaneously. Products 50 have been placed into the trays 14. FIG. 15 shows two face cards 12 being held by feeders 120 and one face card 12 located onto a tray 14. Ordinarily all three face cards 12 would be located onto their respective trays 14 simultaneously.

Paperboard "Blister" Package with Outwardly Angled Sides and Ends

[0070] In the paperboard package 10 just described the side walls 46 and the end walls 48 are splayed outward about two degrees from the perpendicular. A paperboard package 110 having side walls 146 and end walls 148 splayed outwardly much more than two degrees will now be described with respect to FIGS. 16-19.

[0071] FIG. 16 is a front perspective view of the package 110. The package 110 comprises a flat face card 12 heat sealed to a tray 114. The face card 12 may be similar to that described in the previous embodiment, and may define a small hole 22 located near the top of the package 110 for accommodating a rod or hook for retail display purposes.

[0072] FIG. 17 is a side perspective view of the package 110 of FIG. 13. The package 110 comprises two opposing tray side walls 146 and two opposing tray end walls 148. The side wall 146 and end walls 148 meet at corners 124.

[0073] FIG. 18 is a bottom perspective view of the package 110 of FIG. 13. Each tray side wall 146 extends upwardly from a tray bottom 144 to a side flange fold line 137, and each tray end wall 148 extends upwardly from the tray bottom 144 to an end flange fold line 141. Together the side flange fold lines 137 and the end flange fold lines 141 comprise the face perimeter of the tray 114. The package 110 may also comprise a side flange 138 extending outwardly from each side wall 146 and an end flange 140 extending outwardly from each end wall 148.

[0074] Unlike in the previous embodiment, the side walls 146 and the end walls 148 are not substantially perpendicular to the tray bottom 144, but rather form obtuse included angles with the bottom 144. As a result, the corners 124 are not square (orthogonal) with the bottom panel 144, but rather extend upwardly from the bottom panel 144 at an oblique angle. The side wall free edges 133 and the end wall free edges 135 form substantially closed vertical corners 124 with little or no gaps between them. The finished tray 114 is

larger at the top of the product cavity (near the side sealing flanges **138** and end sealing flanges **140**) than at the tray bottom **144**.

[0075] FIG. **19** is a top plan view of a tray blank **130** used to make the package **110** of FIGS. **13-15**. The tray blank **130** has a product facing side **132** (viewable in FIG. **16**) and a back side **134** (facing away from the viewer in FIG. **16**). The tray blank **130** comprises a tray bottom **144**, two opposing tray side walls **146** and two opposing tray end walls **148**. The tray blank **130** also comprises two opposing side flanges **138** and two opposing end flanges **140**. The tray bottom **144** may be rectangular and may have a periphery comprising two opposing parallel side fold lines **136** and two opposing parallel end fold lines **139**. The tray side walls **146** are attached to the tray bottom **144** along the side fold lines **136**. The tray end walls **148** are attached to the tray bottom **144** along the end fold lines **139**. In the tray blank shown in FIG. **16** each tray side wall **146** extends outwardly from the tray bottom **144** to a side flange fold line **137**, and each tray end wall **148** extends outwardly from the tray bottom **144** to an end flange fold line **141**. As in the previous embodiment, the side fold lines **136**, end fold lines **139**, side flange fold lines **137** and end flange fold lines **141** may be shallow channels formed into the three-dimensional tray **114** on the product facing side **132** and created by laser ablation.

[0076] The side free edges **133** splay outwardly, away from each other, as they extend away from tray bottom **144**. Likewise, the end free edges **135** splay slightly outwardly, away from each other, as they extend away from tray bottom **144**. As a result, each tray side wall **146** and each tray end wall **148** is trapezoidal, and the tray top perimeter is larger than the tray bottom perimeter.

INDUSTRIAL APPLICABILITY

[0077] Thus there has been described a mono-material package that is paper-based, fully recyclable, and that can be manufactured using existing equipment. The packaging components can be shipped flat and loaded easily into existing blister package equipment. The package may be formed in the machine just prior to the filling operation (replacing the conventional blister feed tooling), and a paper-to-paper seal is achieved in the same fashion as a traditional plastic blister face card seal.

[0078] The advantages of using a paper-to-paper seal include faster sealing times, greater sealing effectiveness and the ability to conceal anti-theft devices more easily within the partially-opaque package. Depending on product geometry, a variable amount of the front card can be removed and cleared for product visibility. Because all components are paperboard, they can all be shipped flat, eliminating many issues associated with formed blisters (blocking, crushing, extra volume during shipping). Furthermore, because the equipment used to cut and score paperboard requires comparatively less (in our case no) tooling, the cost for development, changeover, and customization is greatly reduced.

[0079] It is understood that the embodiments of the invention described above are only particular examples which serve to illustrate the principles of the invention. Modifications and alternative embodiments of the invention are contemplated which do not depart from the scope of the invention as defined by the foregoing teachings and

appended claims. It is intended that the claims cover all such modifications and alternative embodiments that fall within their scope.

1. A paper blister type package for holding one or more products, the package comprising:

- a paper face card made from a first blank and having a front side and a back side;
- a paper tray made from a second blank and having a product facing side and a back side and comprising a tray bottom, two opposing tray side walls attached to the tray bottom along side fold lines and extending upwardly from the tray bottom to side flange fold lines, two opposing tray end walls attached to the tray bottom along end fold lines and extending upwardly from the tray bottom to end flange fold lines, the tray further comprising two opposing side flanges and two opposing end flanges, each side flange extending outwardly from and attached to a tray side wall along a side flange fold line, each end flange extending outwardly from and attached to a tray end wall along an end flange fold line, the side fold lines; and
- a heat seal coating adhering the face card to the two opposing side flanges and the two opposing end flanges, wherein

each end fold line, each side flange fold line and each end flange fold line comprises one or more shallow channels located on the product facing side of the tray blank.

2. The paper blister type package of claim 1 wherein: each channel is visibly apparent only on the product facing side of the tray blank.

3. The paper blister type package of claim 1 wherein: the number of channels varies among the fold lines.

4. The paper blister type package of claim 1 wherein: each fold line comprises two to three channels.

5. The paper blister type package of claim 1 wherein: each side fold line comprises three parallel channels; each side flange fold line comprises three parallel channels;

each end fold line comprises two parallel channels; and each end flange fold line comprises two parallel channels.

6. The paper blister type package of claim 1 wherein: at least one channel comprises discontinuities.

7. The paper blister type package of claim 1 wherein: each channel comprises discontinuities.

8. The paper blister type package of claim 7 wherein: the discontinuities among the channels forming at least one fold line are aligned.

9. The paper blister type package of claim 7 wherein: the discontinuities among the channels forming each fold line are aligned.

10. The paper blister type package of claim 7 wherein: the discontinuities among the channels forming at least one fold line are staggered.

11. The paper blister type package of claim 1 wherein: each tray side wall and each tray end wall is rectangular; and

the tray side walls and the tray end walls are perpendicular to the tray bottom and form substantially closed vertical corners.

12. The paper blister type package of claim 1 wherein: the face card defines a window through which the one or more products may be viewed.

13. The paper blister type package of claim **12** wherein: the window is of a shape that prevents the products from being removed through the window.

14. The paper blister type package of claim **1** wherein: each tray side wall and each tray end wall is trapezoidal; and

each tray side and each tray end wall forms an obtuse included angle with the tray bottom.

15. A method of making a paper blister package comprising the steps of:

Step 101: Cutting paperboard into a face card and a tray blank, and forming fold lines in the tray blank to create a tray blank having a product facing side and a back side and comprising a tray bottom, two opposing tray side walls attached to the tray bottom along side fold lines and extending outwardly from the tray bottom to side flange fold lines, two opposing tray end walls attached to the tray bottom along end fold lines and extending outwardly from the tray bottom to end flange fold lines, the tray further comprising two opposing side flanges and two opposing end flanges, each side flange extending outwardly from and attached to a tray side wall along a side flange fold line, each end flange extending outwardly from and attached to a tray end wall along an end flange fold line, the side fold lines, the end fold lines, the side flange fold lines and the end flange fold lines formed by ablating the product facing surface of the tray blank to create channels;

Step 102: Applying a heat seal coating to the face card and/or the tray blank;

Step 103: Loading products to be packaged, face cards and tray blanks into feeding chutes;

Step 104: Transferring a tray blank from a feeding chute to a nesting tray and locating the tray blank onto the nesting tray using a vacuum equipped forming block;

Step 105: Forming a tray by lowering the forming block into a recess of the nesting tray, thereby forcing the tray blank to fold along its side fold lines, end fold lines, side flange fold lines and end flange fold lines and assume the shape of a formed tray, and then withdrawing the forming block from the recess;

Step 106: Loading product into the formed tray while the formed tray still resides in the nesting tray;

Step 107: Removing a face card from a feeding chute and placing the face card on top of the formed tray; and

Step 108: Adhering the face card to the tray by heating the heat seal coating.

16. The method of claim **15** wherein, during the tray forming step, side extensions and end extensions of the forming block press the tray flanges against a top surface of the nesting tray.

17. The method of claim **15** wherein, during the fold line forming step, two or more parallel channels are formed for each fold line.

18. The method of claim **17** wherein, during the fold line forming step, at least one channel is formed with discontinuities.

19. The method of claim **17** wherein, during the fold line forming step, at least two parallel channels are formed with discontinuities that are aligned.

20. The method of claim **17** wherein, during the fold line forming step, at least two parallel channels are formed with discontinuities that are staggered with respect to each other.

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