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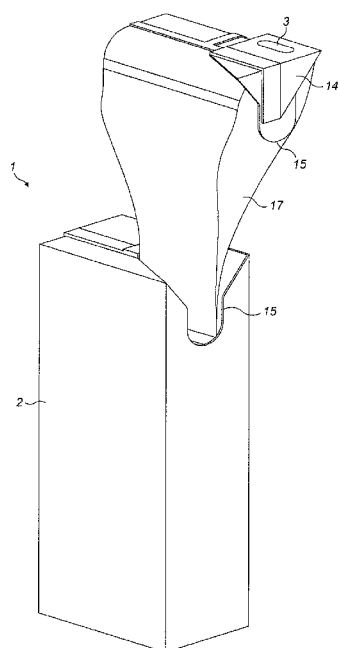


FIG. 2A

(57) Abstract: A carton blank, reel of carton blanks, and a method for manufactur-
ing the carton blank or reel of carton blanks. The carton blank is for use in a vertical
form fill sealing machine to form a carton. The carton blank includes a card outer
(2) and a liner (17). The card outer is perforated to define a removable portion (14).
The liner is attached to the card outer using an adhesive, the liner overlaying the
removable portion. The adhesive is disposed about a periphery of the liner, over
the perforations in the card outer, and over at least a part of the removable portion.

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CARTON, CARTON BLANK, AND METHOD OF MANUFACTURING A**CARTON BLANK****Field**

The present invention relates to a carton for liquids, including a carton blank and a method of manufacturing a carton blank.

Background

Cartons for liquid, for example juice, are typically made from a laminate material formed of a card layer and a polymeric inner layer laminated onto the card to provide a sealed inner surface and prevent contact of the liquid contents with the card.

In such cartons it is not possible to easily separate the card layer of the laminate material from the polymeric inner layer. The laminate material also cannot be easily recycled because the polymeric layer prevents the card recycling process (usually mixing the card with water) from working on the card component.

Summary

According to an aspect of the present invention, there is provided a method of manufacturing a carton blank for use in a vertical form fill sealing machine, the carton blank comprising a card outer and a liner, the method comprising:

- perforating the card outer to form perforations that define a removable portion, and
- attaching the liner to the card outer using an adhesive, the liner being attached to the card to overlie the removable portion, and wherein the adhesive is disposed:

- about a periphery of the liner,
 - over the perforations in the card outer, and
 - over at least a part of the removable portion.

In examples the adhesive is disposed about an entire periphery of the liner.

The adhesive may be disposed only:

- about the periphery of the liner,
- over the perforations in the card outer, and
- over at least the part of the removable portion.

The step of attaching the liner to the card outer may further comprise attaching the liner to the card outer using a low tack glue. The low tack glue may be disposed in a region where no adhesive is disposed.

The method may further comprise applying a band of hot melt adhesive along an edge of the card outer. The hot melt adhesive may overlie an edge of the liner, or the liner may overlie an edge of the hot melt adhesive. Alternatively, the edge of the liner and the hot melt adhesive may be adjacent to each other.

The method may further comprise weakening the liner along lines overlying the adhesive disposed about the periphery of the liner. The step of weakening the liner may comprise scoring the liner. Scoring the liner may comprise scoring only partially through the thickness of the liner.

The card outer may have four edges, and the liner may have four edges, and at least some of the edges of the liner can be aligned with edges of the card outer.

The card outer may be provided in a reel of card outers joined end-to-end, and the liner can be provided in a reel of liners joined end-to-end. In this case, the step of attaching the liner to the card outer may comprise attaching the reel of liners to the reel of card outers to form a plurality of carton blanks joined end-to end.

The plurality of carton blanks joined end-to-end may be reeled up into a reel of carton blanks for use in a vertical form fill sealing machine.

According to a further aspect of the invention, there is also provided a method of manufacturing a reel of carton blanks for use in a vertical form fill sealing machine, each carton blank comprising a card outer and a liner, the method comprising:

- perforating a reel of card outers such that each card outer comprises a removable portion defined by a line of perforations, and

attaching a reel of liners to the reel of card outers using adhesive, the adhesive being disposed:

- about a periphery of each liner of the reel of liners,
- over the perforations in each card outer, and
- over at least a part of the removable portion of each card outer.

According to a further aspect of the invention, there is also provided a carton blank for use in a vertical form fill sealing machine, the carton blank comprising:

- a card outer having a line of perforations defining a removable portion, and
- a liner attached to the card outer by an adhesive, the adhesive being disposed:
 - about a periphery of the liner,
 - over the line of perforations, and
 - over at least a part of the removable portion.

In examples, the adhesive may be disposed about the entire periphery of the liner.

The adhesive may be disposed only:

- about the periphery of the liner,
- over the perforations in the card outer, and
- over at least the part of the removable portion.

The liner may be adhered to the card outer by a low tack glue within a region where no adhesive is disposed.

The card outer may have four edges and the liner may have four edges. In this example, at least one edge of the liner is aligned with an edge of the card outer. Preferably, three edges of the liner are aligned with three corresponding edges of the card outer.

The liner may comprise an edge that is spaced from a corresponding edge of the card outer, and the carton blank may further comprise a band of hot melt adhesive disposed on the card outer extending along the corresponding edge of the card outer. The hot melt adhesive may overlie the edge of the liner, or the liner may overlie an edge of the hot melt adhesive. Alternatively, the edge of the liner and the hot melt adhesive may be adjacent to each other.

The adhesive may be disposed in bands extending along peripheral edges of the liner. The liner may comprise a line of weakness overlying a band of the adhesive.

The liner may comprise a line of weakness extending along each edge of the liner, each line of weakness overlying a band of the adhesive.

The card outer may comprise a plurality of crease lines for subsequent folding of the carton blank.

According to a further aspect of the invention, there is also provided a reel of carton blanks for use in a vertical form fill sealing machine, the reel of carton blanks comprising a plurality of the carton blanks described above joined end-to-end.

According to a further aspect of the invention, there is also provided a carton comprising an outer shell and a liner formed from a carton blank described above.

The carton may be filled with a liquid product, for example juice or milk.

According to a further aspect of the invention, there is also provided a carton comprising:

- a card outer comprising a line of perforations defining a removable portion,
- a liner adhered to an inside of the card outer over at least a part of the removable portion,
- and
- a sealed seam
- wherein the liner extends into the sealed seam,
- and wherein the liner comprises a line of weakness disposed at the sealed seam such that pulling the removable portion breaks the line of weakness in the liner and separates the removable portion and a remainder of the liner from the card outer.

The carton may comprise a plurality of sealed seams, and the liner may extend into more than one sealed seam of the carton.

The liner may extend into all of the sealed seams of the carton.

According to a further aspect of the invention, there is also provided a method of manufacturing a carton blank for use in a vertical form fill sealing machine, the carton blank comprising a card outer and a liner, the method comprising:

- perforating a card outer to provide a removable portion defined by a line of perforations,
- attaching a liner to the card outer using adhesive disposed about the entire peripheral edge of the liner, and

- scoring the liner along a line spaced from the peripheral edge of the liner and overlying the adhesive.

The method may comprise scoring the liner along a plurality of lines spaced from peripheral edges of the liner and overlying the adhesive.

According to a further aspect of the invention, there is provided a carton blank for use in a vertical form fill sealing machine, the carton blank comprising:

- a card outer having a line of perforations defining a tearable portion that extends along a substantial part of the width or length of the card outer, and

- a liner attached to the card outer by an adhesive, the adhesive being disposed:
 - about a periphery of the liner,
 - over the line of perforations, and
 - over at least a part of the tearable portion.

In accordance with this aspect, the adhesive may be disposed about the entire periphery of the liner. The adhesive may be disposed only about the periphery of the liner, over the perforations in the card outer, and over at least the part of the tearable portion.

The liner may be adhered to the card outer by a low tack glue within a region where no adhesive is disposed.

The card outer may have four edges and the liner may also have four edges. In this case, at least one edge of the liner may be aligned with an edge of the card outer. Preferably, three edges of the liner are aligned with three corresponding edges of the card outer. The liner may comprise an edge that is spaced from a corresponding edge of the card outer, and the carton blank may further comprise a band of hot melt adhesive disposed on the card outer extending along the corresponding edge of the card outer.

The adhesive may be disposed in bands extending along peripheral edges of the liner, and the liner may comprise a line of weakness overlying a band of the adhesive. The line of weakness may extend along each edge of the liner, each line of weakness overlying a band of the adhesive.

The card outer may comprise a plurality of crease lines for subsequent folding of the carton blank.

According to a further aspect of the invention, there is provided a method of manufacturing a carton blank for use in a vertical form fill sealing machine, the carton blank comprising a card outer and a liner, the method comprising:

- perforating the card outer to form perforations that define a tearable portion that extends along a substantial part of the width or length of the card outer, and

- attaching the liner to the card outer using an adhesive, the liner being attached to the card to overlie the removable portion, and wherein the adhesive is disposed:

- about a periphery of the liner,

- over the perforations in the card outer, and

- over at least a part of the tearable portion.

Brief Description of the Drawings

The invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

FIG. 1 shows a carton;

FIGS. 2A and 2B show the carton of FIG. 1 with a removable portion and liner being removed, and after removal, respectively;

FIG. 3 shows a card outer blank for a carton blank;

FIG. 4 shows carton blank for the carton of FIGS. 1 to 2B;

FIG. 5 shows the carton blank of FIG. 4 with lines of weakness formed in the liner;

FIG. 6 shows a web of the carton blanks of FIGS. 4 and 5;

FIG. 7 shows a schematic arrangement of apparatus for manufacturing the web of carton blanks of FIG. 6.

FIG. 8 shows a schematic diagram of a vertical form fill sealing apparatus;

FIG. 9 shows a cross-section A-A of the web of carton blanks during a part of the vertical form fill sealing apparatus of FIG. 8;

FIG. 10 shows a reverse side (outside) of the carton blank of FIG. 5;

FIG. 11 shows a preferred embodiment of a carton, including a tearable portion;

FIG. 12 shows the bottom view of the preferred carton embodiment of FIG. 11;

FIG. 13 shows a card outer blank for the preferred carton of FIG. 11; and

FIG. 14 shows a carton blank for the preferred carton of FIG. 11.

Detailed Description

FIG. 1 shows a carton 1 for liquids, for example juice. The carton 1 is a brick-type carton, having a cuboidal shape. The carton 1 is formed of a card outer 2 and a liner (not visible in FIG. 1). The liner is within the card outer 2 and holds the contents of the carton, i.e. the liquid.

The card outer 2, as illustrated, has an opening 3. In some examples, the opening 3 is an insert, for example a plastics insert that includes a re-closable flap or screw lid. In other examples, the opening 3 may have a pierceable membrane that can be pierced to provide access into the carton. In other examples, the opening may have a peelable membrane adhered over the opening 3 that can be peeled away to expose the opening 3.

The carton 1 shown in FIG. 1 is cuboidal, having a top end 4 and a bottom end 5, opposing major sides 6, 7, and opposing minor sides 8, 9, the major sides 6, 7 being larger in area than the minor sides 8, 9. However, it will be appreciated that in alternative arrangements the minor sides 8, 9 may be the same size as the major sides 6, 7, providing a carton with a square cross-section. In various examples, the relative sizes of the major sides 6, 7 and minor sides 8, 9 can vary to provide a carton of any size.

The opening 3 is formed in the top end 4 of the carton 1. The carton 1 is formed from a carton blank (10, see FIG. 5) that is folded and sealed to form the carton 1, which has three seams: a top seam 11 disposed on the top end 4 of the carton 1, a bottom seam (not visible in FIG. 1) disposed on the bottom end 5 of the carton 1, and a side seam 12 extending between the top

seam 11 and the bottom seam through one of the minor or major sides 6, 7 or minor sides 8, 9, in this example through major side 7. The formation of the top seam 11 creates a pair of top flaps 13 on the top end 4 of the carton 1, one of which is visible in FIG. 1. The top flaps 13 are folded over onto the opposing major sides 6, 7 or minor sides 8, 9, as illustrated. Similarly, the formation of the bottom seam creates a pair of bottom flaps on the bottom end 5 of the carton. The bottom flaps are folded over onto the bottom end 5 of the carton 1. The top flaps 13 and the bottom flaps are glued into their folded positions.

As illustrated in FIG. 1 and FIGS. 2A and 2B, the card outer 2 includes a removable portion 14. The removable portion 14 is defined by a line of perforations 15 in the card outer 2 that can be broken by a user. The removable portion 14 surrounds the opening 3 and is formed on an edge 16 of the carton 1 between the top end 4 and the opposing minor side 8 of the carton 1. In alternatives, the removable portion 14 may extend into any of the minor sides 6, 7 or major sides 8, 9 of the card outer 2.

After the carton 1 has been used (i.e. the liquid emptied from the carton 1) the user can 30 break the line of perforations 15 and pull the removable portion 14 away from the remainder of the card outer 2. As illustrated in FIGS. 2A and 2B, this removes the liner 17 from within the card outer 2, as explained in more detail hereinafter. Removal of the liner 17 allows the remainder of the card outer 2 to be recycled as it is substantially or all card material. Removal of the liner 17 also permits the card recycling process to take effect on the inside surface of the card outer 2, which can be uncoated card as it does not contact the liquid contents of the carton 1. The liner 17 and removable portion 14 can also be recycled or disposed of appropriately.

As explained hereinafter, when the carton 1 is formed by folding and sealing a carton blank (10, see FIG. 5) the edges of the liner 17 are incorporated into the sealed seams 11, 12 of the card outer 2.

As a result, as illustrated in FIG. 2B, the liner 17 comprises sealed seams corresponding to the sealed seams of the card outer 2. In particular, the liner 17 comprises a top seam 18, a bottom seam 19, and a side seam 20, the side seam 20 extending between the top and bottom seams 18, 19.

On removal of the liner 17 and removable portion 14 from the card outer 2 after use, the liner 17 is broken along lines of weakness in the liner 17 at each seam, allowing the liner 17 to separate from the card outer 2. In addition, as explained further hereinafter, the liner 17 is only adhered to the card outer 2 in certain locations so that the user can separate the liner 17 from the card outer 2 after use. In one alternative, the liner 17 is adhered to the card outer 2 by a glue that is weak and/or that is applied with a low weight (i.e. only a thin layer), so that the user can separate the liner 17 from the card outer 2 after use. The liner 17 is attached firmly to the removable portion 14 of the card outer 2 by adhesive so that the liner 17 is removed when the removable portion 14 is pulled away from the card outer 2.

FIG. 3 shows a card outer blank 21 for a carton blank (10, see FIG. 5) for making the carton 1 described with reference to FIGS. 1 to 2B. The card outer blank 21 is rectangular and has a top edge 22, a bottom edge 23, and opposing side edges 24, 25.

As shown, the card outer blank 21 includes a major side panel 26 corresponding to the major side 6 of the carton 1 of FIGS. 1 to 2B. The card outer blank 21 also includes first and second side panels 27, 28 corresponding to the opposing minor sides 8, 9 of the carton 1 of FIG. 1. The card outer blank 21 also has two major sub panels 29, 30 that are later joined together at the side seam (12, see FIG. 1) to form the major side panel 7 of the carton 1 of FIG. 1.

The card outer blank 21 also includes a major top end panel 31, and top end sub-panels 32, 33, 34, 35 that after the carton 1 has been formed provide the top end 4 of the carton of FIG. 1. The card outer blank 21 also includes a major bottom end panel 36, and bottom end sub-panels 37, 38, 39, 40 that after the carton 1 has been formed provide the bottom end 5 of the carton of FIG. 1. The top end sub-panels 34, 35 and the bottom end sub-panels 39, 40 are folded diagonally on forming the carton of FIG. 1 to provide the top flaps (13, see FIG. 1) 5 and bottom flaps.

The card outer blank 21 also includes an opening 3, as previously described. The opening 3 in this example is a through-hole in the card outer blank 21. The opening 21 is formed in the top end sub-panel 33 so that the opening 3 is formed in the position shown in FIGS. 1 to 2B.

As illustrated, the card outer blank 21 comprises a plurality of crease lines 41 along the edges of each of the panels and along other fold lines (i.e. diagonally across the top end panels 34, 35 and the bottom end panels 39, 40 that form the top flaps and bottom flaps of the carton 1). These crease lines 41 are preferably embossed lines formed by pressing the card material to form a crease to ease folding of the card outer blank 21 along those lines during assembly of the carton 1. However, the crease lines 41 might alternatively be other lines of weakness or variations in material to permit folding of the card outer blank 21.

Crease lines 42 are also provided adjacent to the top edge 22 and bottom edge 23 of the card outer blank 21, where the top seam (11, see FIG. 1) and bottom seam are formed on assembly of the carton 1.

As shown in FIG. 3, the card outer blank includes the line of perforations 15. The line of perforations defines the removable portion 14 illustrated in FIGS. 1 to 2B. As shown, the line of perforations 15 extends from the top edge 22 of the card outer blank 21, in the region of the major top end panel 31, across the intersection of the major side panel 26, minor side panel 27, major top end panel 31, and the top end sub-panel 35, and into the minor side panel 27. From there, the line of perforations 15 defines a looped area in the minor side panel 27, then extends to the intersection of the major side sub-panel 30, minor side panel 27, and the top end sub-panels 35, 33. The line of perforations 15 then extends along the boundary between the top end sub-panel 33 and the major side sub-panel 30, and then extends to the top edge 22 of the card outer blank 21 in the region of the top end sub-panel 33.

Once the carton 1 is erected, and the top and bottom flaps have been folded over, the line of perforations 15 defines the removable portion 14 described with reference to FIG. 1. The removable portion 14 is a corner area of the carton 1.

In a preferred example, the card material of the card outer blank 21 is uncoated on its inner surface to permit conventional recycling of the card outer 2. Specifically, the card outer blank 21 preferably comprises a liquid packaging board. A liquid packaging board preferably comprises a

multi-ply paperboard with strong wet sizing. Preferably, the edge or edges of the card outer blank 21 are resistant to the wicking of water or other liquids.

FIG. 4 illustrates a carton blank 43 that is formed by attaching a liner 17 to the card outer blank 21 of FIG. 3. The liner 17 is adhered to the card outer blank 21 to form a carton blank 43. The opening 3 is shown as a hidden detail as it is underneath the liner 17 as illustrated.

In a preferred example, the liner 17 is a film material having a polymeric component. More preferably, the liner 17 is a laminate film material having a polymeric layer and a metallic layer, for example foil. However, in other examples the liner can be made of other materials, for example the metallic layer could be replaced by an ethylene vinyl alcohol (EVOH) film, which gives similar barrier properties. If EVOH were used as the barrier layer then a heat sealing system could be used to seal the liner, as described further hereinafter.

As shown in FIG. 4, in this example the liner 17 is rectangular and has a top edge 44, a bottom edge 45 that are coincident, i.e. in line with, the top and bottom edges 22, 23 of the card outer blank 21, respectively. The liner 17 also has a first side edge 46 that is coincident with a side edge 25 of the card outer blank 21. The liner 17 also has a second side edge 47. In preferred examples, the second side edge 47 is spaced from the corresponding side edge 24 of the card outer blank 21, as illustrated. The liner 17 covers the majority of the surface area of the card outer blank 21.

The liner 17 is attached to the card outer blank 21 by adhesive about the periphery of the liner 17. As illustrated, bands of adhesive 48 are disposed along the first and second side edges 46, 47 of the liner 17, and bands of adhesive 49 are disposed along the top and bottom edges 44, 45 of the liner 17. In this example, the bands of adhesive 48, 49 extend about the entire periphery of the liner 17.

As shown in FIG. 4, an area of adhesive 50 is also provided to at least a part of the removable portion 14 defined by the line of perforations 15. In particular, an area of adhesive 50 is provided

in the area of the top end sub-panel 33. This is also the location of the opening 3. In some examples, the area of adhesive 50 is applied over an area that surrounds the opening 3, so that the liner 17 is held in place at the opening 3. Also, attaching the liner 17 to the removable portion 14 with adhesive 50 in this location ensures that the liner 17 and removable portion 14 can be separated from the card outer 2, as described with reference to FIGS. 2A and 2B.

Further, as illustrated in FIG. 4, a line of adhesive 51 is disposed along the line of perforations 15 that defines the removable portion 14 of the card outer blank 21. In particular, the line of adhesive 51 is disposed over the perforations that define the removable portion 14.

By arranging the adhesive 48, 49, 50, 51 in this way, when the liner 17 is attached to the card outer blank 21 the area of card covered by the liner 17 is sealed. The bands of adhesive 48, 49 about the periphery of the liner 17 provide a seal to prevent liquids entering between the liner 17 and the card outer blank 21 at the edges 44, 45, 46, 47 of the liner 17. The adhesive 51 provided over the line of perforations 15 prevents liquids from entering between the liner 17 and the card outer blank 21 through the perforations 14. If an opening (3, see FIG. 1) is formed in the card outer blank 21, adhesive surrounding the opening (3, see FIG. 1) prevents liquids from entering between the liner 17 and the card outer blank 21 at the opening (3, see FIG. 1). In the absence of sealing between the liner 17 and the card outer blank 21, liquid may penetrate the card outer blank 21 during a sterilisation process in which the combined liner 17 and card outer blank 21 are immersed in a reservoir of sterilising fluid.

Also shown in FIG. 4, a band of hot melt adhesive 52 is provided along the side edge 24 of the card outer blank 21. Preferably, the band of hot melt adhesive 52 overlaps the side edge 47 of the liner 17, so that none of the material of the card outer 2 is exposed between the liner 17 and the hot melt adhesive 52. In alternative examples, the band of hot melt adhesive 52 is positioned adjacent to the side edge 47 of the liner 17. The hot melt adhesive 52 covers this area of the card outer blank 21 and so protects this part of the card outer blank 21 against contact with the liquids or contamination. The hot melt adhesive 52 is provided to form the side seam (12, see FIG. 1) of the carton (1, see FIG. 1).

In a first example, no adhesive is provided between the liner 17 and the card outer blank 21 over the region 53 covering the majority of their overlapping surface area –only in the bands 48, 49 extending about the periphery of the liner 17, the area of adhesive 50 in the removable portion 14, and a line of adhesive 51 over the line of perforations 15. In this way, the liner 17 can be separated from the card outer blank 21 with a manageable pulling force when the removable portion 14 is pulled away from the card outer 2, as shown in FIGS. 2A and 2B.

In an alternative example, glue is provided between the liner 17 and the card outer blank 21 in the region 53 not covered by the adhesive 48, 49, 50, 51, as described above, but the glue is provided a lower weight (thinner layer), or a low tack glue is used, meaning that the liner 17 can be separated from the card outer blank 21 on pulling the removable portion 14. In particular, a low weight and/or low tack glue can be provided in the area 53 bounded by the bands of adhesive 48, 49 extending about the periphery of the liner 17, the area of adhesive 50 in the removable portion 14, and a line of adhesive 51 over the line of perforations 15.

Alternatively, the low weight and/or low tack glue can be provided in spots on one or more of the major panels 26, 29, 30 and/or the minor panels 27, 28 and/or sub panels 31, 32, 33, 34, 35, 36, 37, 38, 39, 40 of the card outer blank (see FIG. 3). The low weight and/or low tack glue can help to secure the liner 17 to the card outer blank 21 but is low tack, so can be broken by the user when removing the liner 17 from the card outer 2 as illustrated in FIGS. 2A and 2B.

As explained above, once the liner 17 is adhered to the card outer blank 21 the adhesive 48, 49, 50, 51, provides a seal between the liner 17 and the side of the card outer blank 21 that the liner 17 is attached to. The carton blank 43 can then be sterilised, for example in a peroxide bath, without allowing ingress of sterilisation substances in between the liner 17 and the card outer blank 21, from where it would be difficult to remove before forming the carton 1. Sterilisation fluid may also damage the card outer blank 21 if it gets underneath the liner 17.

FIG. 5 shows a carton blank 43 having the card outer blank 21 and liner 17 attached to the card outer blank 21, as described above with reference to FIGS. 3 and 4. As illustrated in FIG. 5, lines

of weakness 54 are provided in the liner 17. In particular, in various examples the lines of weakness 54 might be score lines, lines of perforations, thinning of the material, or a combination of these. A line of weakness 54 is a line along which the material of the liner 17 is weakened, allowing the liner 17 to be broken along that line by the user, as explained further below. It will be appreciated that in certain embodiments, the lines of weakness 54 may penetrate the full thickness of the liner 17.

As illustrated in FIG. 5, the lines of weakness 54 extend in the liner 17 adjacent to, and spaced from, the top edge 22 and the bottom edge 33 of the card outer blank 21. The lines of weakness 17 are proximate to edges 55, 56 of the bands of adhesive 49 provided along the top and bottom edges 44, 45 of the liner 17 to attach to the liner 17 to the card outer blank 21. Preferably, the lines of weakness 54 are formed over the bands of adhesive 49, a small distance from the edges 55, 56 of the bands of adhesive 49, so that if the line of weakness 54 penetrates the thickness of the liner 17 the seal is not breached.

As explained further hereinafter, and as shown in FIGS. 1 to 2B, the carton 1 is formed by folding the carton blank 43 and forming sealed seams 11, 12 between at edges of the carton blank 43. In particular, the hot melt adhesive 52 on the card outer blank 21 is joined to the opposing side edge 25 of the card outer blank 21 to form the side seam 12. After that, the top edges 22, 44 of the card outer blank 21 and the liner 17 are sealed to themselves to form the top sealed seam 11, and the bottom edges 23, 45 of the card outer blank 21 and the liner 17 are sealed to themselves to form the bottom sealed seam. When forming the top and bottom sealed seams, the liner 17 is sandwiched between the card outer blank 21, so that the edges 44, 45 of the liner 17 are incorporated into the top and bottom seams. Forming the top and bottom seams 11 creates the top and bottom flaps 13, which are then folded over, as shown in FIG. 1.

In an alternative example, the liner 17 also extends to, or towards, the side edge 24 of the card outer blank 21, and so the edge 47 of the liner 17 is also trapped in the side seam 12 of the carton 1. In this example, an additional line of weakness may be provided in the liner 17 adjacent to the side edge 47.

After a carton 1 is formed from the carton blank 43 of FIG. 5, the lines of weakness 54 are within the top sealed seam 11 and the bottom sealed seam, and optionally also the side seam 12. In this way, when the user removes the liner 17 from the card outer 2 (see FIG. 2A and 2B), the liner 17 breaks along the lines of weakness 54, such that the top and bottom sealed seams 11 (and optionally the side seam 12) remain almost intact and the bands of adhesive 49 do not have to be broken to remove the liner 17. Therefore, the peripheral edges of the liner 17 in the bottom seam, and in the portion of the top seam 11 outside of the removable portion 14, and optionally in the side seam 12, remain in the card outer 2 when the majority of the liner 17 is removed as shown in FIGS. 2A and 2B.

As shown in FIG. 6, when the carton blanks 43 are produced they are joined end-to-end in a web 57 that can be rolled into a reel. Specifically, in the web 57 of carton blanks 43 illustrated in FIG. 6 the individual blanks 43 are joined to each other along their top and bottom edges. In particular, the card outer blanks 21 are joined along their top and bottom edges 22, 23, and the liner 17 of each carton blank 43 is joined along its top and bottom edges 44, 45. As explained further hereinafter, this is achieved by manufacturing the web 57 from a web of card and a liner web that are joined together by the adhesive. The band of hot melt adhesive 52 (which forms the side seam 12) runs constantly along the edge of the web 57. The adhesive is disposed in the web 57 in bands extending:

In a constant band 58 adjacent to, abutting, or overlapping the band of hot melt adhesive 52. This constant band 58 forms the bands of adhesive 48 adjacent to the hot melt adhesive 52 on each carton blank 43.

In a constant band 59 along the opposing side edge of the web. This constant band 59 forms the bands of adhesive 48 along the opposing side edge 52, 46 of each carton blank 43.

In transversely extending bands 60 across the web 57 at the boundary between two carton blanks 43. These transversely extending bands 60 form the bands of adhesive 49 at the top edges 22, 44 and at the bottom edges 23, 45 of the carton blanks 43.

The transversely extending bands of adhesive 60 are disposed such that a part of each transversely extending band of adhesive 60 is applied to the top edge 22, 44 of one carton blank 43, and the rest of the band of adhesive 60 is applied to the bottom edge 23, 45 of the adjacent carton blank 43.

Apparatus 61 for manufacturing the web 57 of carton blanks 43 illustrated in FIG. 6 is shown in FIG. 7. The apparatus 61 includes a card feed reel 62 that unwinds a card web 63 into the apparatus 61.

The card web 63 is fed through a perforating station 64 that perforates the card web 63 to create the line of perforations 15 for the removable portion 14 of each card outer blank 21, as shown in FIGS. 3 and 4. The card web 63 is then passed through a cutting station 65 that can form the opening 3 in each card outer blank 21, as shown in FIGS. 3 and 4. Alternatively, the opening 3 and the line of perforations can be formed by a single cutting and perforating station.

The perforated card web 63 then passes through an adhesive station 66 that applies the adhesive described with reference to FIGS. 4 and 5. In particular, referring to FIGS. 4 and 5, the adhesive station 66 applies adhesive to the card web 63 in bands extending:

In a constant bands 58, 59 adjacent to the side edges of the card web 63.

In transversely extending bands 60 across the card web 63 at the boundary between two carton blanks 43.

In each removable portion 14 of each carton blank 43.

Over each line of perforations 15.

As illustrated, the card web 63 is passed over a looped arrangement of rollers in the vicinity of the adhesive station 66 so that adhesive is applied to a lower surface of the card web 63 at the adhesive station 66, which is an upper surface of the card web 63 for the other stations.

The adhesive station 66 preferably has a gravure roller for applying the adhesive to the card web 63 in a repeating pattern. However, other adhesive application techniques will be known in the art, for example the adhesive station 66 may have a spray head or a movable dispensing nozzle.

An additional adhesive station may be provided for applying the low tack glue in the area 53 described with reference to FIG. 4, if such low tack glue is to be included. Alternatively, the gravure roller can apply adhesive to the area 53 at a lower weight simultaneously to applying the (relatively) higher weight of adhesive as described above.

A liner feed reel 67 unwinds a liner web 68 into the apparatus 61. The liner web 68 is combined with the card web 63 after the adhesive station 66 at combining rollers 69. The combining rollers 69 press the liner web 68 onto the card web 63 on which the adhesive is disposed.

The combined card web 63 and liner web 68 then pass through a scoring station 70 that scores the liner web 68 to create the lines of weakness 54 described with reference to FIG. 5. The scoring station 70 is configured to score the liner web 68 after the liner web 68 has been adhered to the card web 63. To achieve this, the scoring station 70 includes a scoring roller, having scoring blades protruding from its circumferential surface, and a support that supports the combined card web 63 and liner web 68 as the scoring blades score the liner web 68. The scoring blades extend a fixed and controlled distance between the circumferential surface of the scoring roller and the support, to provide the required depth of score line that extends through the liner web 68 but not into the card web 63. Preferably, the score lines do not penetrate the full thickness of the liner web 68.

The combined card web 63 and liner web 68 then pass through a creasing station 71 which forms the crease lines (41, see FIG. 3) in the card web 63. In particular, the creasing station 71 provides the crease lines 41 defining the individual panels 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40 of the card outer blanks 21, as shown in FIG. 3. It may be advantageous to form the crease lines 41 after joining the liner web 68 to the card web 63 so that the liner web 68 is also creased, preventing a gap forming between the liner web 68 and the card web 63.

However, in an alternative arrangement the crease lines 41 may be created prior to joining the liner web 68 to the card web 68. For example, the creasing station 71 may be positioned upstream of the adhesive station 66.

The combined card and liner webs 63 then passes through a hot melt station 80 that applies the band of hot melt adhesive 52 along the exposed side edge 24 of the card web 63, adjacent to the side edge 47 of the liner web 68, as shown in FIG. 4. In this way, the carton blank web 57 of FIG. 6 is manufactured.

The carton blank web 57 is then reeled up at carton blank web reel 72. The reeled up carton blank web 57 can then be transferred to a vertical form fill sealing machine, as described hereinafter, to erect and fill cartons such as the carton 1 shown in FIG. 1.

The apparatus 61 might additionally comprise tensioning rollers 73 as illustrated in FIG. 7, for maintaining correct tension in the liner web 68, card web 63, and carton blank web 57. In addition, web guides (not shown) might be provided to maintain alignment between the liner web 68, card web 63, carton blank web 57, and the various aspects of the apparatus. In addition, at least one set of nip drive rollers might be provided to drive one or more of the webs 63, 68, 57 through the apparatus.

FIG. 8 shows a schematic diagram of a vertical form fill sealing apparatus 74. The vertical form fill sealing apparatus 74 receives the carton blank web 57 described above and forms and fills it to produce cartons such as the carton 1 described with reference to FIGS. 1 to 2B

.As illustrated, the carton blank web 57 is provided to the vertical form fill sealing apparatus 74 and the carton blank web 57 is initially formed into a vertically moving tube 75 by deforming the carton blank web 57 until the opposing side edges of the card outer 24, 25 overlap, with the band of hot melt adhesive 52 being disposed between the opposing side edges 24, 25, as shown in FIG. 9. The carton blank web 57 is formed into a tube by using guides and/or guide rollers.

Heat and pressure rollers (not shown) act on the overlapping side edges 24, 25 of the carton blank web 57 to activate the hot melt adhesive 52, thereby joining the opposing side edges 24, 25 together to form the side seam 12 of the carton 1 (see FIGS. 1 to 2B).

Optionally, as illustrated in FIG. 8 and in FIG. 9, an adhesive tape 76 is applied on the inside of the tubular web 75, in the location of the side seam 12. The adhesive tape 76 provides an additional barrier that prevents liquids from coming into contact with the card outer blank 21 along the side seam 12, particularly along the edge 24 of the card outer blank 21.

A filling tube (not shown) extends into the vertical web tube 75 from above and the contents of the carton (e.g. juice) are dosed through the filling tube into the vertical web tube 75. The liquid is dosed sequentially with the end sealer assembly 77 described below.

As illustrated in FIG. 8, an end sealer assembly 77 forms the top seam 11 of a first carton 1a and the bottom seam of a second carton 1b simultaneously, while the contents are sequentially dosed into the second carton 1b.

Preferably, the end sealer assembly 77 comprises an induction sealer 78 that induces heat in a metal component of the liner 17 to fuse the opposing parts of the liner 17 together to create the seams 11. The induction sealer comprises induction sealing bars 79 that are wide enough to create the top seam 11 of a first carton 1a and the bottom seam of a second carton 1b simultaneously. Several stages of induction sealing may be provided, to ensure an intact seal. As illustrated in FIG. 8, the apparatus 74 has two stages of induction sealers 78.

In other examples, the liner 17 may not comprise a metal component, in which case the end sealer assembly 77 may comprise heat sealer bars that heat the liner material to form the seams.

In other examples, different types of sealers may be used to form the sealed seams 11, 12. In particular, the sealers may be heat sealers, induction sealers, ultrasonic sealers, or other types of

sealers, depending on the materials of the card web 63 and the liner web 68. In some examples, the sealers may apply adhesive to the carton blank web 57 to form the seams 11, 12.

The formed cartons 1a are then individually cut off through the sealed seams 11. Preferably, one of the sealing bars 79, for example a sealing bar 79 of the final induction sealer 78, includes a cutting blade that separates the cartons 1a, 1b. The formed cartons 1 then pass into a folding machine (not shown) that folds the top and bottom end flaps (13, see FIG. 1) into position to provide a formed carton 1 such as that illustrated in FIG. 1.

Advantageously, the vertical form fill sealing apparatus 74 is existing technology for laminate cartons that can also be used to produce the carton 1 of FIGS. 1 to 2B, from the carton blank web 57 described with reference to FIG. 6 and manufactured by the apparatus of FIG. 7.

FIG. 10 shows an outer surface of a carton blank 43 that is the opposite side to that shown in FIGS. 3 to 6. As illustrated, areas of hot melt adhesive 80 may be provided to each carton blank 43 on the opposite side to the liner 17, i.e. on the outside of the carton 1. These areas of hot melt adhesive 80 are provided for fixing the top and bottom end flaps (13, see FIG. 1) in position on the erected carton 1. The hot melt adhesive 80 is provided at each end of both minor side panels 27, 28, and on the sub panels 34, 35, 39, 40 adjacent to the ends of the minor side panels 27, 28. After folding the end flaps (13, see FIG. 1) the areas of hot melt adhesive 80 can be heated to activate them and adhere the end flaps (13, see FIG. 1) in place on the carton 1.

FIGS. 11 and 12 illustrate a carton 1 according to an alternative embodiment of the present invention. As shown in FIGS. 11 and 12, the card outer includes a tearable portion 90. In the embodiment shown in FIGS. 11 and 12, the tearable portion 90 extends from the bottom seam of the carton 1. In alternative embodiments, the tearable portion 90 may extend from the top seam 11. By providing the tearable portion 90 extending from the bottom seam or top seam 11, the tearing of the tearable portion 90 will tear the seam to give better access to the inside of the carton. It will be appreciated that the tearable portion need not necessarily extend from the bottom seam or top seam 12. The tearable portion 90 may include a portion of the side seam 12.

It will be appreciated that in alternative embodiments the tearable portion 90 may extend along the entire length of the side seam 12. Alternatively, the tearable portion 90 may not include a portion of the side seam 12, and may be formed on any of the major sides 8, 9 or minor sides 6, 7 of the card outer 2. Whilst the tearable portion 90 is shown extending along one side of the carton along the height of the carton, it will be appreciated that the tearable portion 90 could extend along the width of the carton, and in this case may extend along multiple sides to increase the opening of the carton. In each case, the perforations will extend along a substantial portion of the height or width of the carton blank, for example from a one edge of the carton blank towards the opposite edge.

The tearable portion 90 is defined by lines of perforations 91 that can be broken by a user. In the embodiment shown in FIGS. 11 and 12, the tearable portion 90 is defined by two lines of perforations 91, one either side of the side seam 12. The two lines of perforations may be parallel to the side seam 12. In the example shown, the two lines of perforations 91 extend from the bottom seam. It be appreciated that tearable portion 90 may be defined by any number of lines of perforations 91 in the card outer that can be broken by a user.

As shown in FIG 12, the tearable portion may include a tab section 92. The tab section 92 may be formed at one end of the tearable portion 90. The tab section 92 may be defined by a divergence of the lines of perforations 91 such that the width of the tearable portion 90 is increased. The tab section 92 is preferably formed at one end of the tearable portion 90, however it will be appreciated that the tab section 92 of the tearable portion 90 may be formed at any position along the length of the tearable portion 90. In alternative embodiments, the tab section 92 may take any configuration such that the user can easily tear the tearable portion 90. For example, the tab section 92 may comprise a narrowed section of the tearable portion 90. Including the tab section 92 assists the user in tearing the tearable portion 90 by providing the user with better purchase with which to tear the tearable portion 90.

In the embodiment shown in FIGS. 11 and 12, the user may break the lines of perforations 91 defining the tearable portion 90. It will be appreciated that the user may first break the lines of

perforations 91 defining the tearable portion 90, then the line of perforations 15. In particular, the user may break the lines of perforations 91 defining the tab portion 92 of the tearable portion 90. By breaking the line of perforations 91 defining the tab portion 92, a pull-tab may be formed which may assist the user in breaking the remaining lines of perforations 91 defining the tearable portion 90, allowing the card outer 2 to be opened. By opening the card outer 2 in this way, there is a large opening through which the liner 17 can be removed, rather than needing to remove the liner 17 through the relatively small opening created by the removal of the removable portion 14. The liner 17 and removable portion 14 can then be removed by the user through the opening created by the tearable portion 90. To assist with the removal of the liner 17 from the carton 1 in this way, the user can additionally break the line of perforations 15, thus separating the removable portion 14 from the remainder of the carton. As shown in FIG. 12, the removable portion 14 is formed substantially on the top end 4 of the carton 1. The removable portion 14 is rectangular and surrounds the opening 3. In alternative embodiments comprising the tearable portion 90, the removable portion 14 may take any configuration that surrounds the opening 3 and is sufficiently small such that the removable portion 14 may be easily removed through the opening created by tearing the tearable portion 90. In an alternative embodiment described below, the perforations defining a removable portion may be omitted, and in this case the liner may be removed by separating this from the card outer without removing part of the card outer.

It will be appreciated that embodiments of the carton 1 comprising the tearable portion 90 provide an advantage in that the removable portion 14 may be smaller than in embodiments without the tearable portion 90 because it is not necessary to remove the liner 17 via the opening created by line of perforations 15, instead the liner is removed via the opening created by tearing the tearable portion 90. As will be appreciated, it may also be possible to not have a removable portion of the card outer.

FIG. 13 shows a card outer blank 21 for a carton blank 10 for making the carton 1 described with reference to FIGS. 11 and 12. The configuration of the edges, panels, opening 3 and crease lines corresponds to that of the card outer blank 21 illustrated in FIG. 3.

As shown in FIG. 13, the card outer blank 21 includes the line of perforations 15, which defines the removable portion 14 illustrated in FIGS. 11 and 12. As shown, the removable portion 14 forms a rectangle within the sub panel 33 surrounding the opening 3. A portion of the removable portion extends into sub panel 35. It will be appreciated that in certain embodiments, the line of perforations 15 may extend from the top edge 22 of the card outer blank 21. It will be appreciated that the line of perforations 15 need not be rectangular, and may form any shape that surrounds the opening 3 such that when the line of perforations are broken, the removable portion 14 including the opening 3 is separated from the rest of the card outer blank 21. As will be appreciated, it may also be possible to not have a removable portion of the card outer, in which case the perforations 15 can be omitted.

FIG. 14 illustrates a carton blank 43 used to form the carton illustrated in FIGS. 11 and 12. The carton blank 43 is formed by attaching a liner 17 to the card outer blank 21 of FIG. 13. As illustrated in the preferred embodiment of FIG. 14, the attachment of the liner corresponds to that described in reference to FIGS. 4 and 5. The area of adhesive 50 surrounding the opening 3 includes the removable portion 14. It will be appreciated that in alternative embodiments the area of adhesive 50 need not cover the entire removable portion 14, and may take any configuration such that it covers at least the line of perforations 15 and surrounds the opening 3. As will be appreciated, it may also be possible to not have a removable portion of the card outer, in which case the perforations 15 can be omitted.

As shown in FIG. 14, lines of adhesive 93 are disposed along the lines of perforations 91 defining the tearable portion 90 of the card outer blank 21. In particular, the lines of adhesive 93 are disposed over the perforations 91 that define the tearable portion 90. In alternative embodiments, the line of adhesive 48 disposed along the side edge 46 of the liner 17 is of a greater width, such that the line of adhesive 48 is disposed over the line of perforations 91 that define the tearable portion 90. The line of adhesive 48 disposed along the opposing side edge 47 of the liner may additionally/alternatively be of a greater width, such that the line of adhesive is disposed over the line of perforations 91 that define the tearable portion 90.

As noted above, it will be appreciated that in embodiments of the carton comprising the tearable portion, the carton need not include the removable portion. In such embodiments, when separating the card outer from the liner the user may break the line of perforations defining the tearable portion, and may then remove the liner from the carton via the opening created by the tearable portion. The liner may further comprise a line of weakness surrounding the opening of the carton. In such embodiments, the line of weakness may be broken when the user pulls the liner through the opening created by the tearable portion, thus assisting the user in the removal of the liner.

In this specification reference has been made to 'adhesive', 'low tack glue', and 'hot melt adhesive'. It will be appreciated that the 'adhesive' that joins the liner 17 to the card outer blank 21 about its periphery, in the removable portion 14, and over the line of perforations 15 is a strong adhesive intended to provide a permanent bond, not to be broken by the user during normal use of the carton 1 or when separating the liner 17 from the card outer 12 as shown in FIGS. 2A and 2B. In addition, the hot melt adhesive is intended to provide a permanent bond along the side seam 12 of the carton 1, the bond not being intended to be broken a user during normal use. The low tack glue is intended to provide a weak, breakable bond so that the user can separate the liner 17 from the card outer 12 when removing the liner 17 after use. The low tack glue may have a low bonding strength, it may be applied onto to a small area of the liner 17/card outer blank 21, or it may be a peel able or non-permanent glue. Similarly, a 'low weight' adhesive is a thinner layer of adhesive, for example applied by a recessed gravure roller. The lower weight of applied adhesive provides a weaker bond between the liner 17 and the card outer blank 21. The skilled person will be familiar with suitable adhesives, but preferred examples are acrylic emulsion adhesives or vinyl ethyl acetate adhesives. Preferably, the adhesives are heat activated.

It will be appreciated that the carton 1 described herein can be used to contain any liquid, including but not limited to juice, milk, water, and other foodstuffs.

In order to address various issues and advance the art, the entirety of this disclosure shows by way of illustration various embodiments in which the claimed invention(s) may be practiced and provide for a superior carton, carton blank, and associated methods of manufacture. The advantages and features of the disclosure are of a representative sample of embodiments only, and are not exhaustive and/or exclusive. They are presented only to assist in understanding and teach the claimed features. It is to be understood that advantages, embodiments, examples, functions, features, structures, and/or other aspects of the disclosure are not to be considered limitations on the disclosure as defined by the claims or limitations on equivalents to the claims, and that other embodiments may be utilised and modifications may be made without departing from the scope and/or spirit of the disclosure. Various embodiments may suitably comprise, consist of, or consist essentially of, various combinations of the disclosed elements, components, features, parts, steps, means, etc. In addition, the disclosure includes other inventions not presently claimed, but which may be claimed in future.

Claims

1. A method of manufacturing a carton blank for use in a vertical form fill sealing machine, the carton blank comprising a card outer and a liner, the method comprising:
 - perforating the card outer to form perforations that define a removable portion,
 - and
 - attaching the liner to the card outer using an adhesive, the liner being attached to the card to overlie the removable portion, and wherein the adhesive is disposed:
 - about a periphery of the liner,
 - over the perforations in the card outer, and
 - over at least a part of the removable portion.
2. The method of claim 1, wherein the adhesive is disposed about an entire periphery of the liner.
3. The method of claim 1 or claim 2, wherein the adhesive is disposed only:
 - about the periphery of the liner,
 - over the perforations in the card outer, and
 - over at least the part of the removable portion.
4. The method of claim 1 or claim 2, wherein the step of attaching the liner to the card outer further comprises attaching the liner to the card outer using a low tack glue, the low tack glue being disposed in a region where no adhesive is disposed.
5. The method of any preceding claim, further comprising applying a band of hot melt adhesive along an edge of the card outer.
6. The method of any preceding claim, further comprising weakening the liner along lines overlying the adhesive disposed about the periphery of the liner.
7. The method of claim 6, wherein the step of weakening the liner comprises scoring the liner.
8. The method of any preceding claim, wherein the card outer has four edges, and the liner has four edges, and wherein at least some of the edges of the liner are aligned with edges of the card outer.

9. The method of any preceding claim, wherein the card outer is provided in a reel of card outers joined end-to-end, and the liner is provided in a reel of liners joined end-to-end, and wherein the step of attaching the liner to the card outer comprises attaching the reel of liners to the reel of card outers to form a plurality of carton blanks joined end-to end.
10. The method of claim 9, wherein the plurality of carton blanks joined end-to-end are reeled up into a reel of carton blanks for use in a vertical form fill sealing machine.
11. A method of manufacturing a reel of carton blanks for use in a vertical form fill sealing machine, each carton blank comprising a card outer and a liner, the method comprising:
 - perforating a reel of card outers such that each card outer comprises a removable portion defined by a line of perforations, and
 - attaching a reel of liners to the reel of card outers using adhesive, the adhesive being disposed:
 - about a periphery of each liner of the reel of liners,
 - over the perforations in each card outer, and
 - over at least a part of the removable portion of each card outer.
12. A carton blank for use in a vertical form fill sealing machine, the carton blank comprising:
 - a card outer having a line of perforations defining a removable portion, and
 - a liner attached to the card outer by an adhesive, the adhesive being disposed:
 - about a periphery of the liner,
 - over the line of perforations, and
 - over at least a part of the removable portion.
13. The carton blank of claim 12, wherein the adhesive is disposed about the entire periphery of the liner.
14. The carton blank of claim 12 or claim 13, wherein the adhesive is disposed only:
 - about the periphery of the liner,
 - over the perforations in the card outer, and
 - over at least the part of the removable portion.

15. The carton blank of any of claims 12 to 13, wherein the liner is adhered to the card outer by a low tack glue within a region where no adhesive is disposed.
16. The carton blank of any of claims 12 to 15, wherein the card outer has four edges and the liner has four edges, and wherein at least one edge of the liner is aligned with an edge of the card outer.
17. The carton of claim 16, wherein three edges of the liner are aligned with three corresponding edges of the card outer.
18. The carton blank of claim 16 or claim 17, wherein the liner comprises an edge that is spaced from a corresponding edge of the card outer, and wherein the carton blank further comprises a band of hot melt adhesive disposed on the card outer extending along the corresponding edge of the card outer.
19. The carton blank of any of claims 12 to 18, wherein the adhesive is disposed in bands extending along peripheral edges of the liner, and wherein the liner comprises a line of weakness overlying a band of the adhesive.
20. The carton blank of claim 19, wherein the liner comprises a line of weakness extending along each edge of the liner, each line of weakness overlying a band of the adhesive.
21. The carton blank of any of claims 12 to 20, wherein the card outer comprises a plurality of crease lines for subsequent folding of the carton blank.
22. A reel of carton blanks for use in a vertical form fill sealing machine, the reel of carton blanks comprising a plurality of the carton blanks of any of claims 12 to 21 joined end-to-end.
23. A carton comprising an outer shell and a liner formed from a carton blank according to any of claims 12 to 22.
24. The carton of claim 23, wherein the carton is filled with a liquid product.
25. A carton comprising:
 - a card outer comprising a line of perforations defining a removable portion,
 - a liner adhered to an inside of the card outer over at least a part of the removable portion, and

a sealed seam wherein the liner extends into the sealed seam, and
wherein the liner comprises a line of weakness disposed at the sealed seam such
that pulling the removable portion breaks the line of weakness in the liner and separates
the removable portion and a remainder of the liner from the card outer.

26. The carton of claim 25, wherein the carton comprises a plurality of sealed seams, and
wherein the liner extends into more than one sealed seam of the carton.
27. The carton of claim 25 or claim 26, wherein the liner extends into all of the sealed seams
of the carton.
28. The carton of any one of claims 23 to 27, or the or each carton blank of any one of claims
12 to 22, further comprising perforations on the or each card outer that define a tearable
portion that extends along a substantial part of the width or length of the card outer.
29. The carton or carton blank of claim 28, wherein the perforations defining the tearable
portion extend from an edge of the or each carton blank.
30. The carton or carton blank of claim 28 or claim 29, wherein the tearable portion is defined
by two lines of perforations formed adjacent opposed edges of the or each card outer.
31. A method of manufacturing a carton blank for use in a vertical form fill sealing machine,
the carton blank comprising a card outer and a liner, the method comprising:
 perforating a card outer to provide a removable portion defined by a line of
 perforations,
 attaching a liner to the card outer using adhesive disposed about the entire
 peripheral edge of the liner, and
 scoring the liner along a line spaced from the peripheral edge of the liner and
 overlying the adhesive.
32. The method of claim 31, wherein the method comprises scoring the liner along a plurality
of lines spaced from peripheral edges of the liner and overlying the adhesive.
33. The method of any one of claims 1 to 10, 31 or 32, further comprising perforating the or
each card outer to form perforations that define a tearable portion that extends along a
substantial part of the width or length of the card outer.

34. The method of claim 33, wherein the perforations defining the tearable portion extend from an edge of the or each carton blank.
35. The method of claim 33 or claim 34, wherein the tearable portion is defined by two lines of perforations formed adjacent opposed edges of the or each card outer.
36. A carton blank for use in a vertical form fill sealing machine, the carton blank comprising:
a card outer having a line of perforations defining a tearable portion that extends along a substantial part of the width or length of the card outer, and
a liner attached to the card outer by an adhesive, the adhesive being disposed:
about a periphery of the liner,
over the line of perforations, and
over at least a part of the tearable portion.
37. A method of manufacturing a carton blank for use in a vertical form fill sealing machine, the carton blank comprising a card outer and a liner, the method comprising:
perforating the card outer to form perforations that define a tearable portion that extends along a substantial part of the width or length of the card outer, and
attaching the liner to the card outer using an adhesive, the liner being attached to the card to overlie the removable portion, and wherein the adhesive is disposed:
about a periphery of the liner,
over the perforations in the card outer, and
over at least a part of the tearable portion.

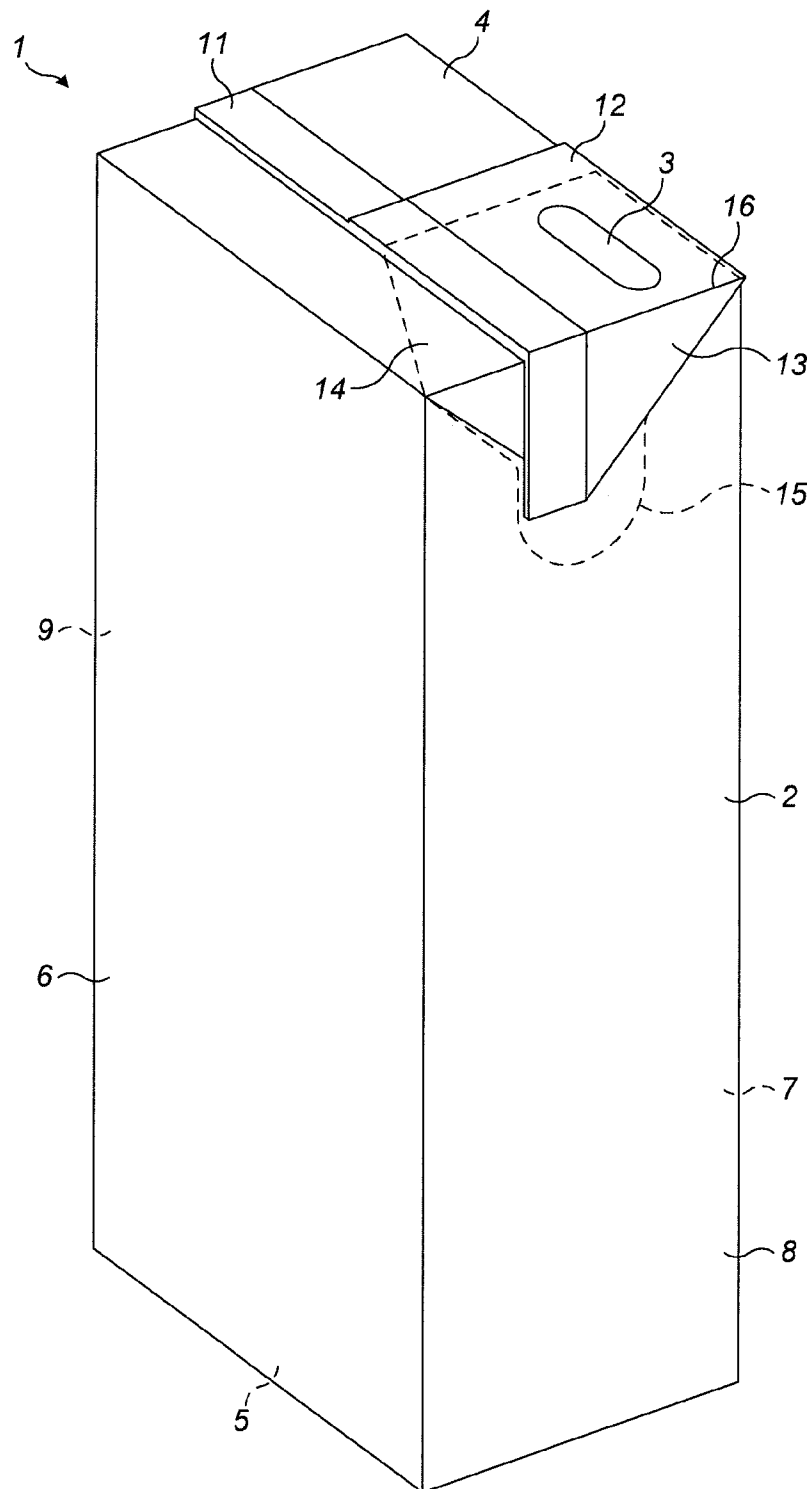
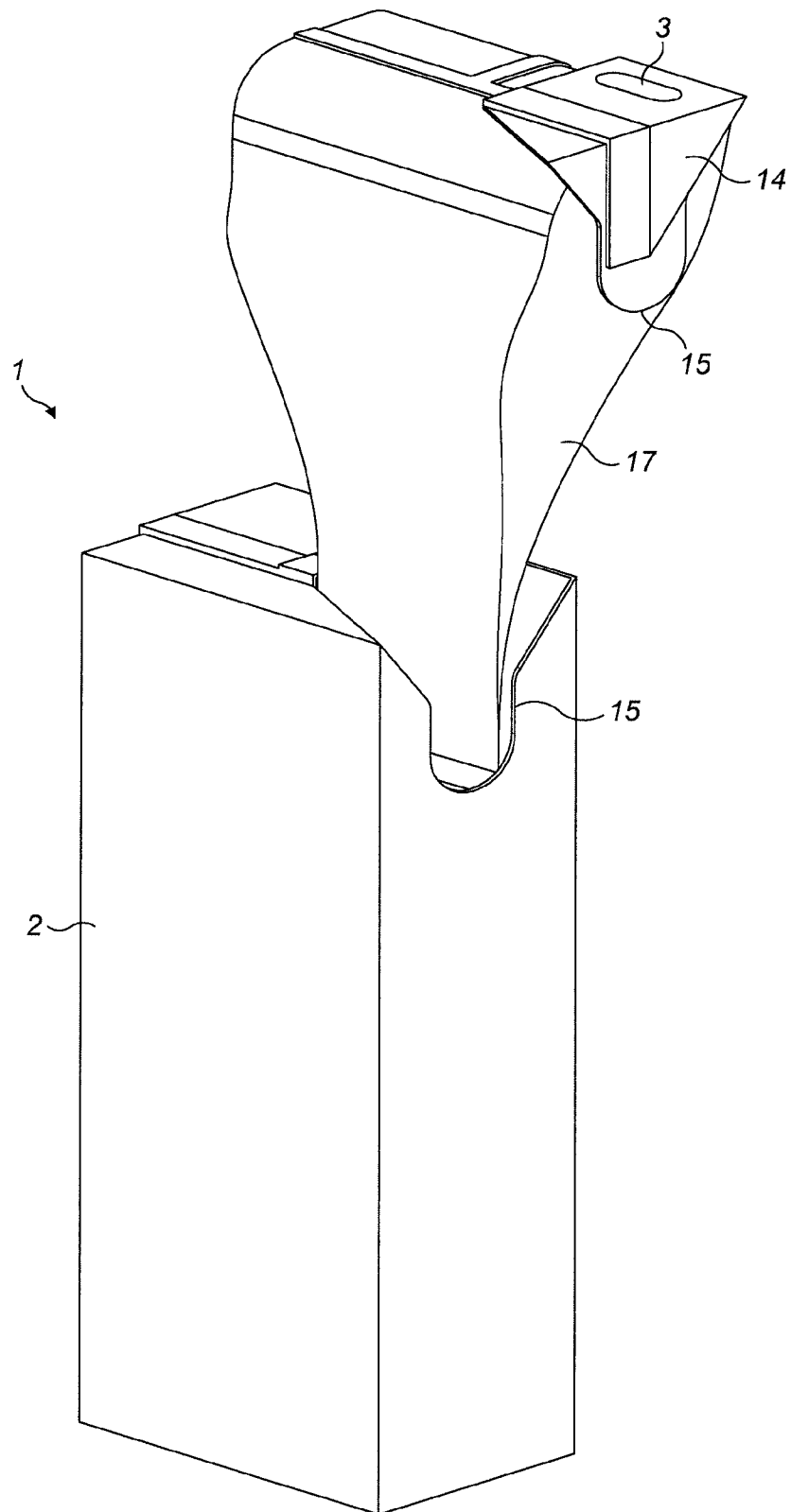
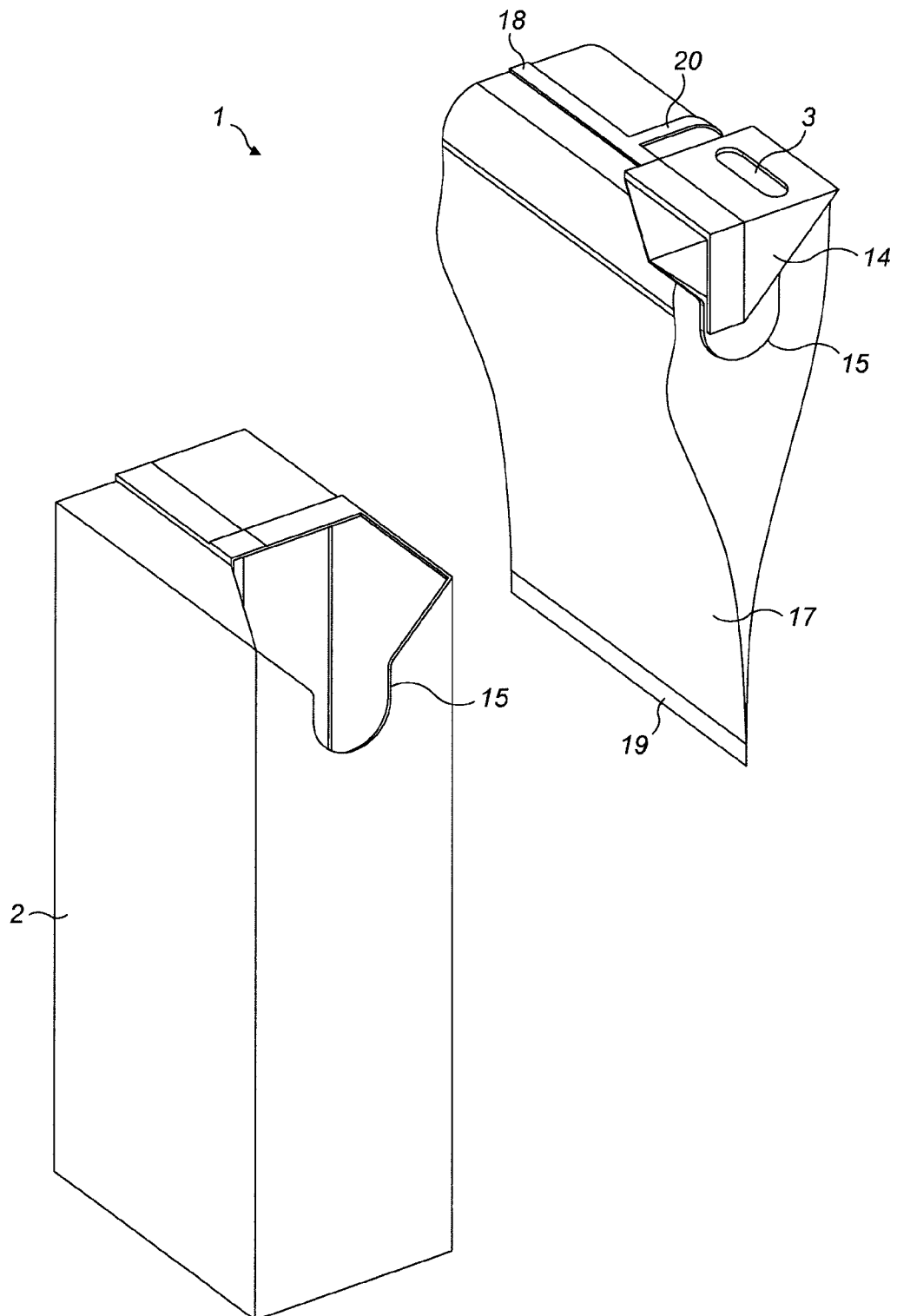


FIG. 1

**FIG. 2A**

*FIG. 2B*

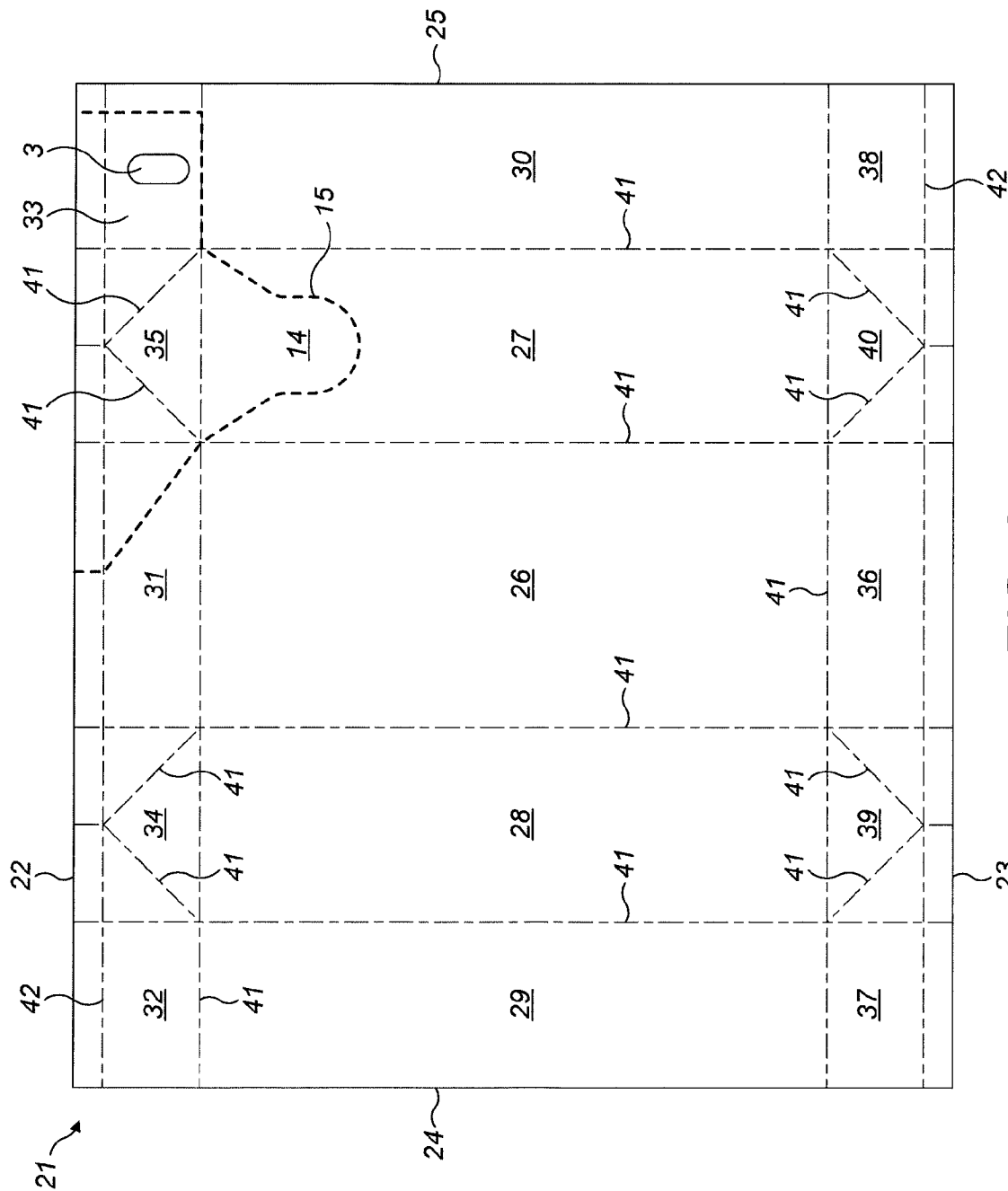


FIG. 3

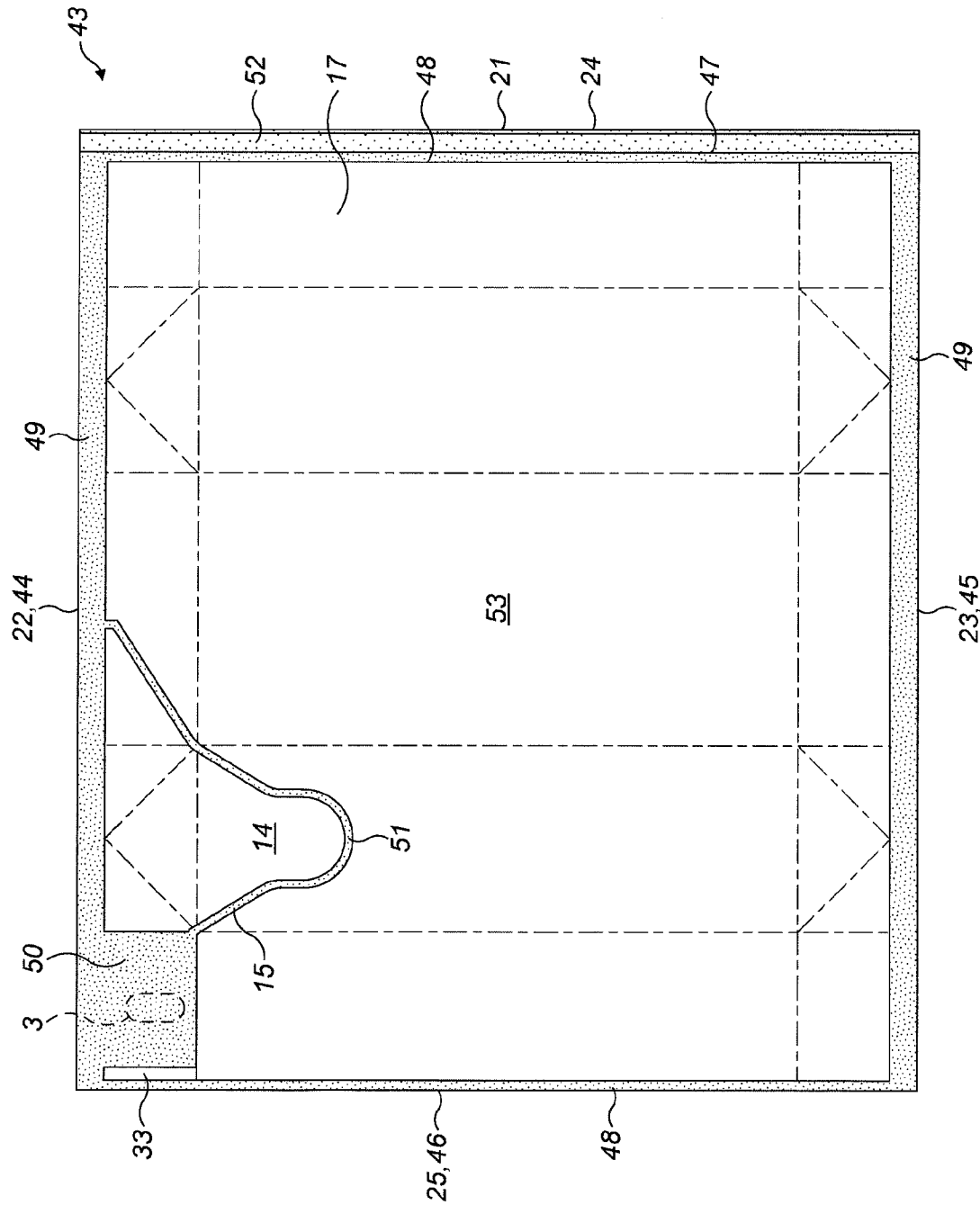


FIG. 4

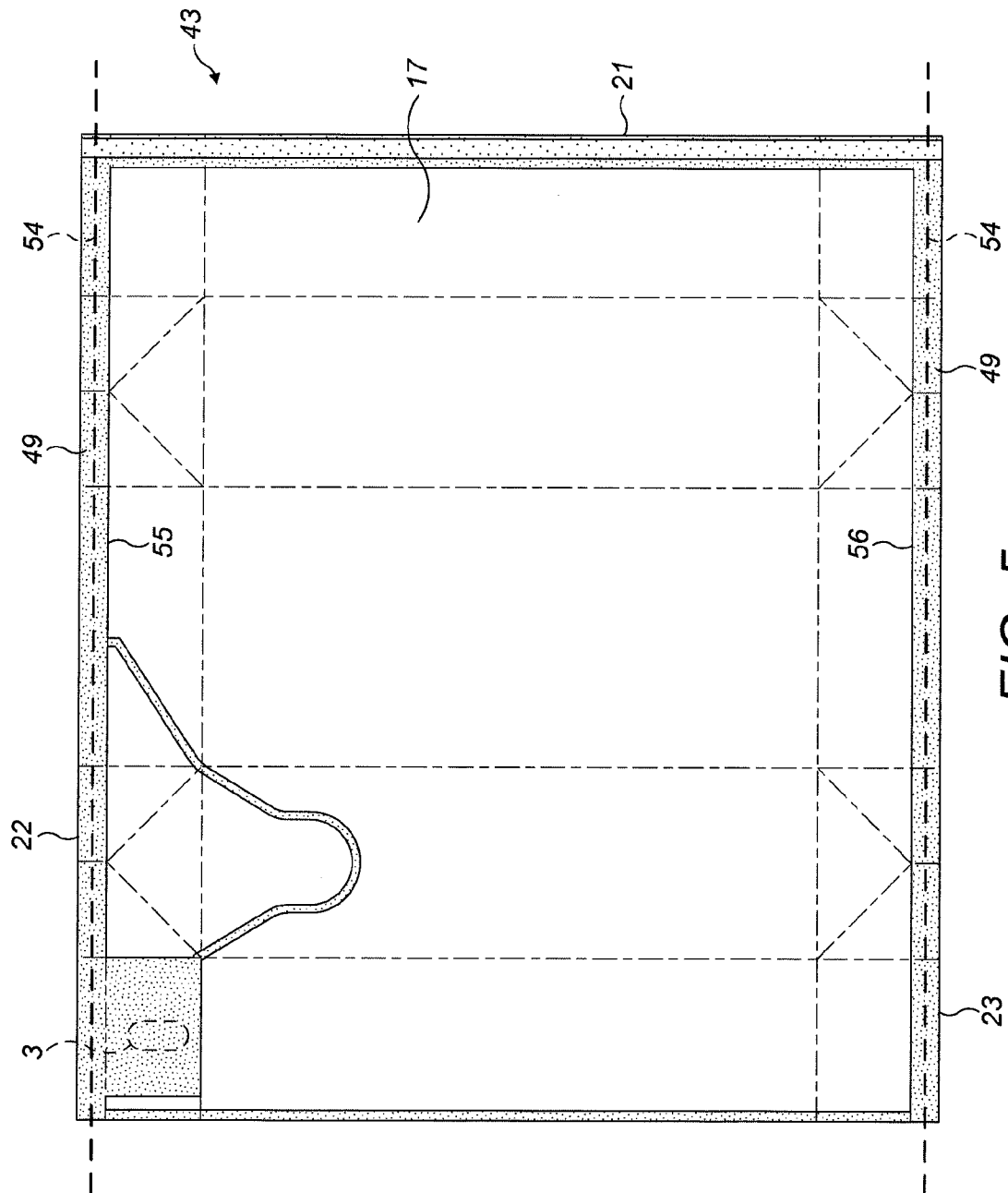


FIG. 5

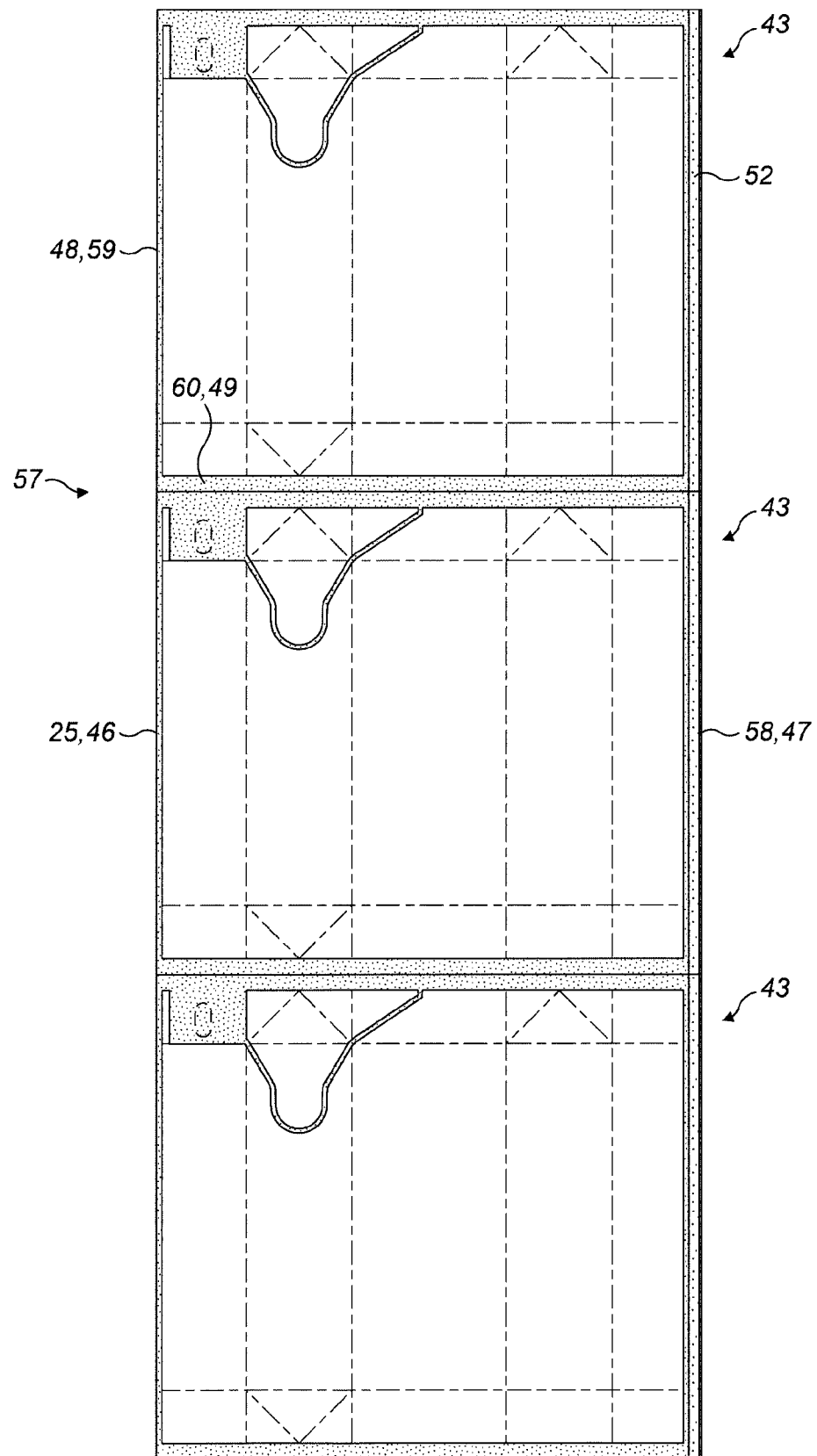
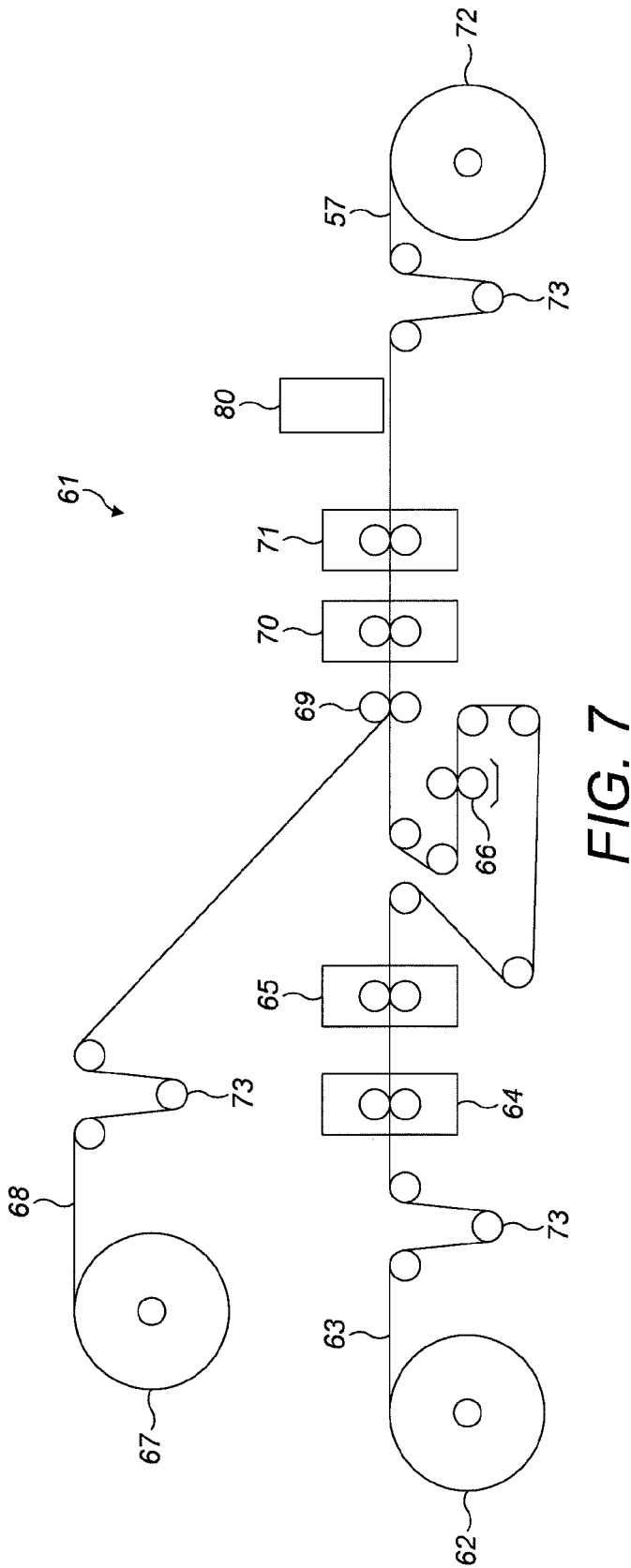


FIG. 6



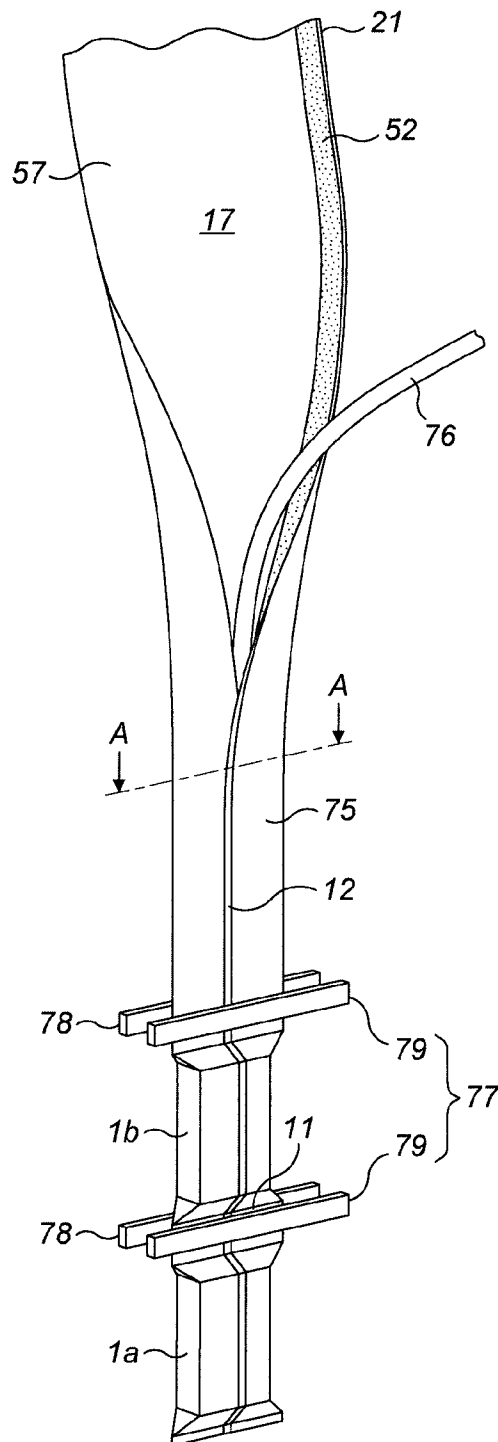
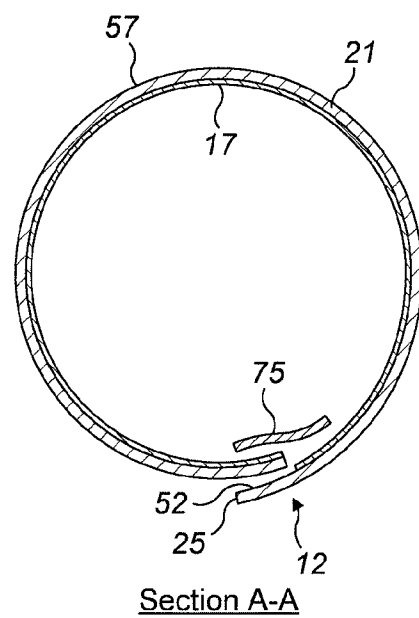
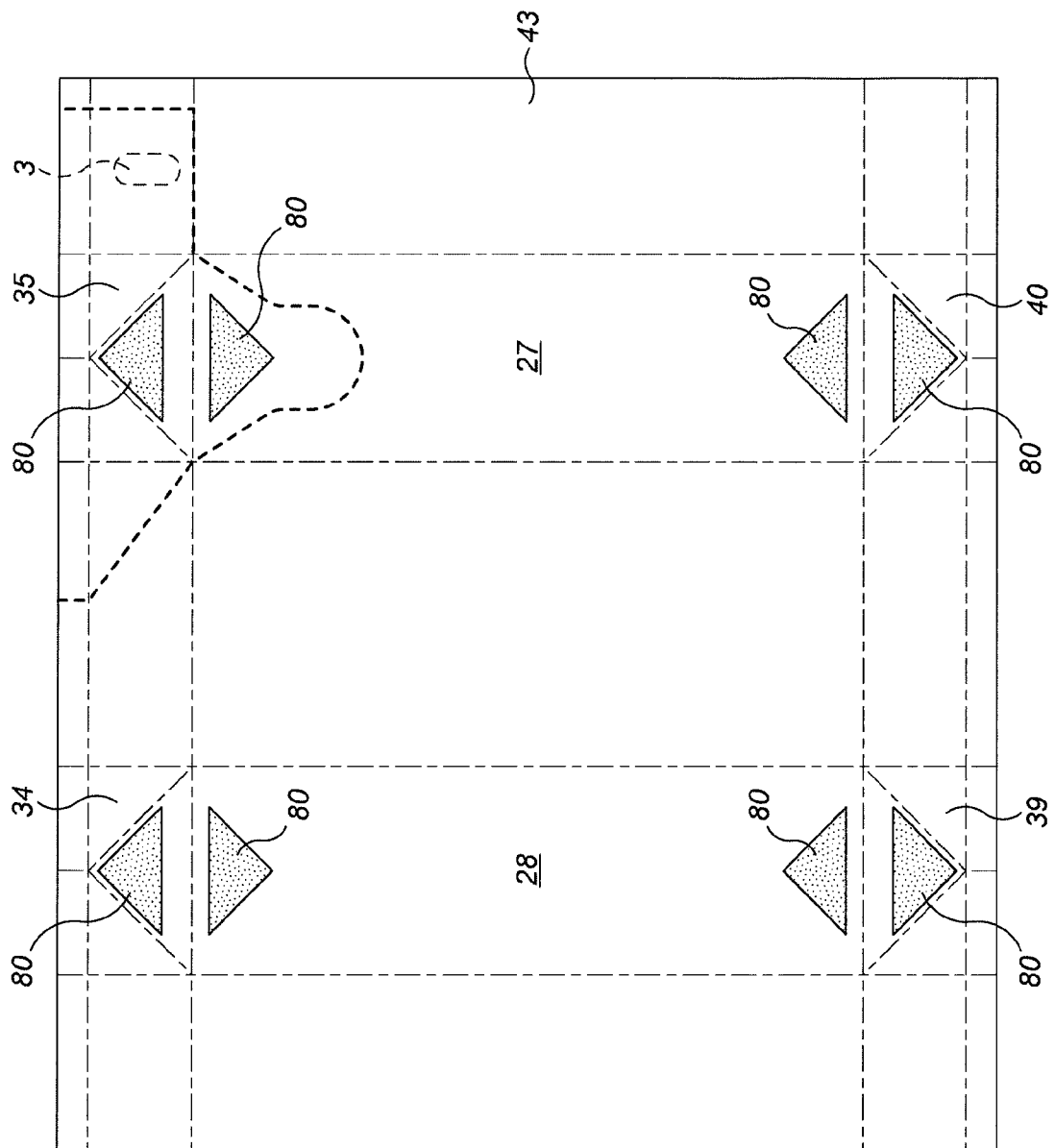


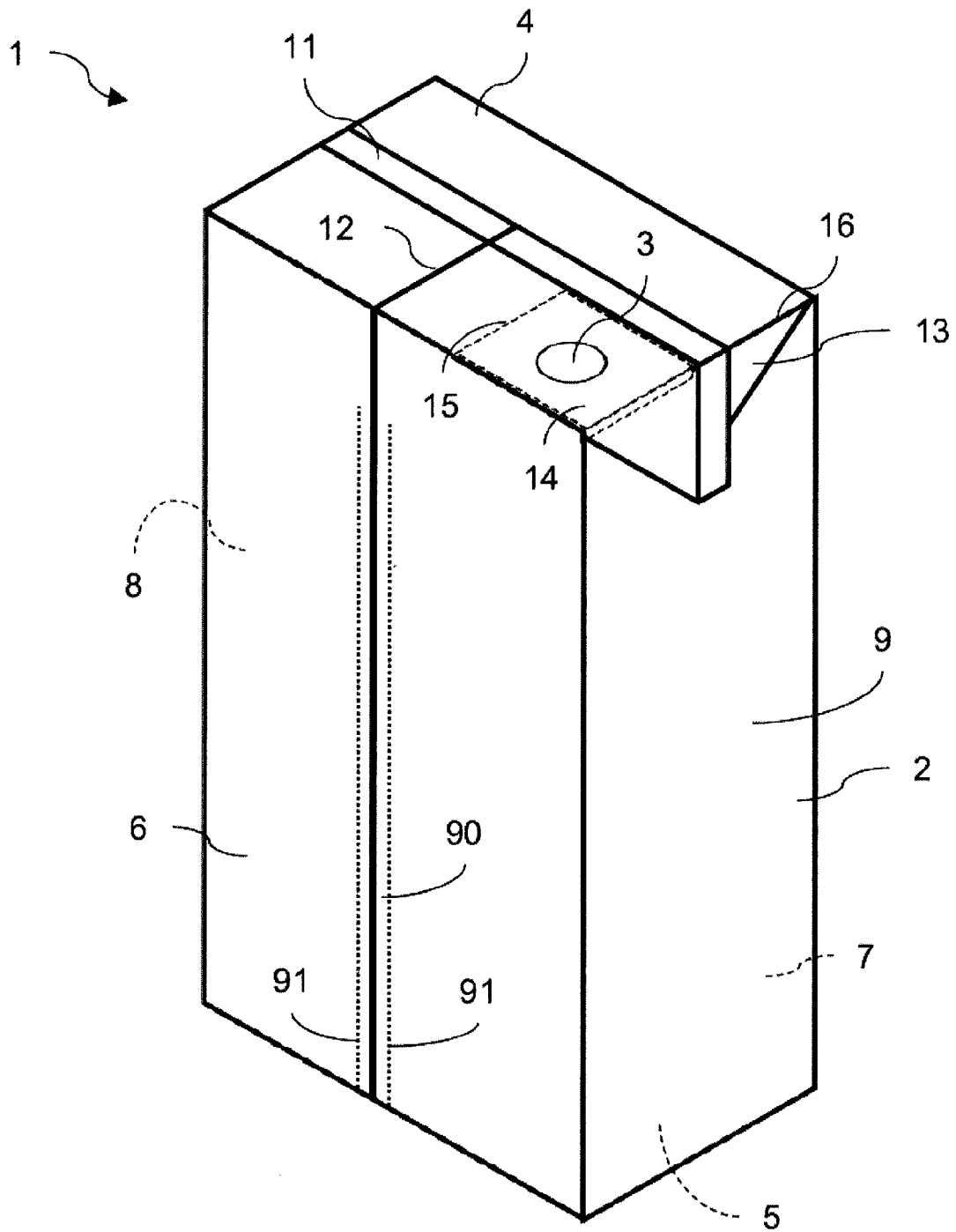
FIG. 8



Section A-A

FIG. 9



**FIG. 11**

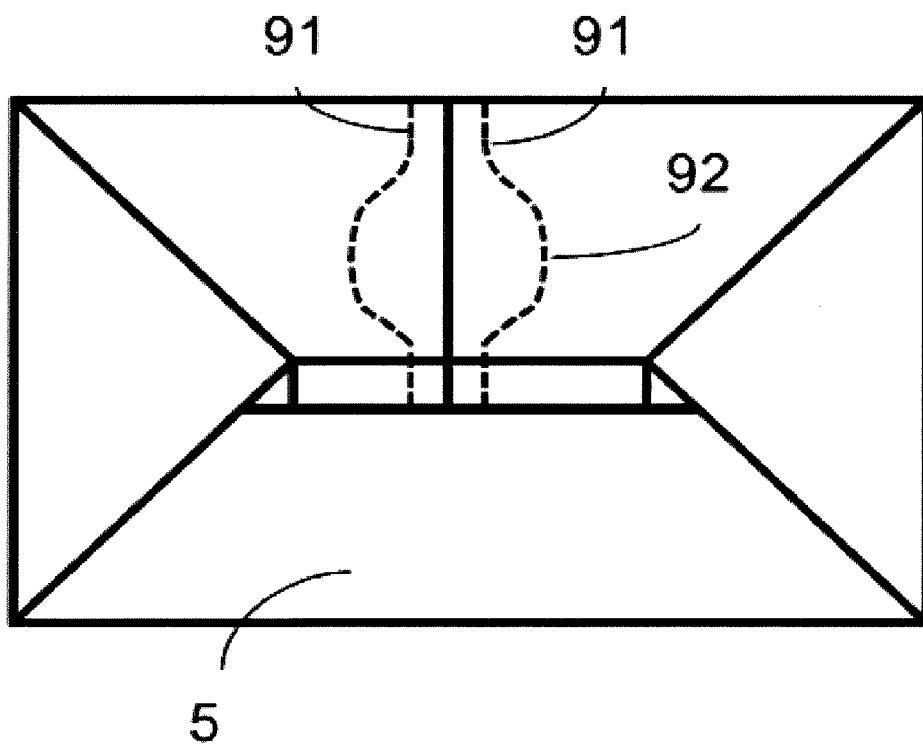


FIG. 12

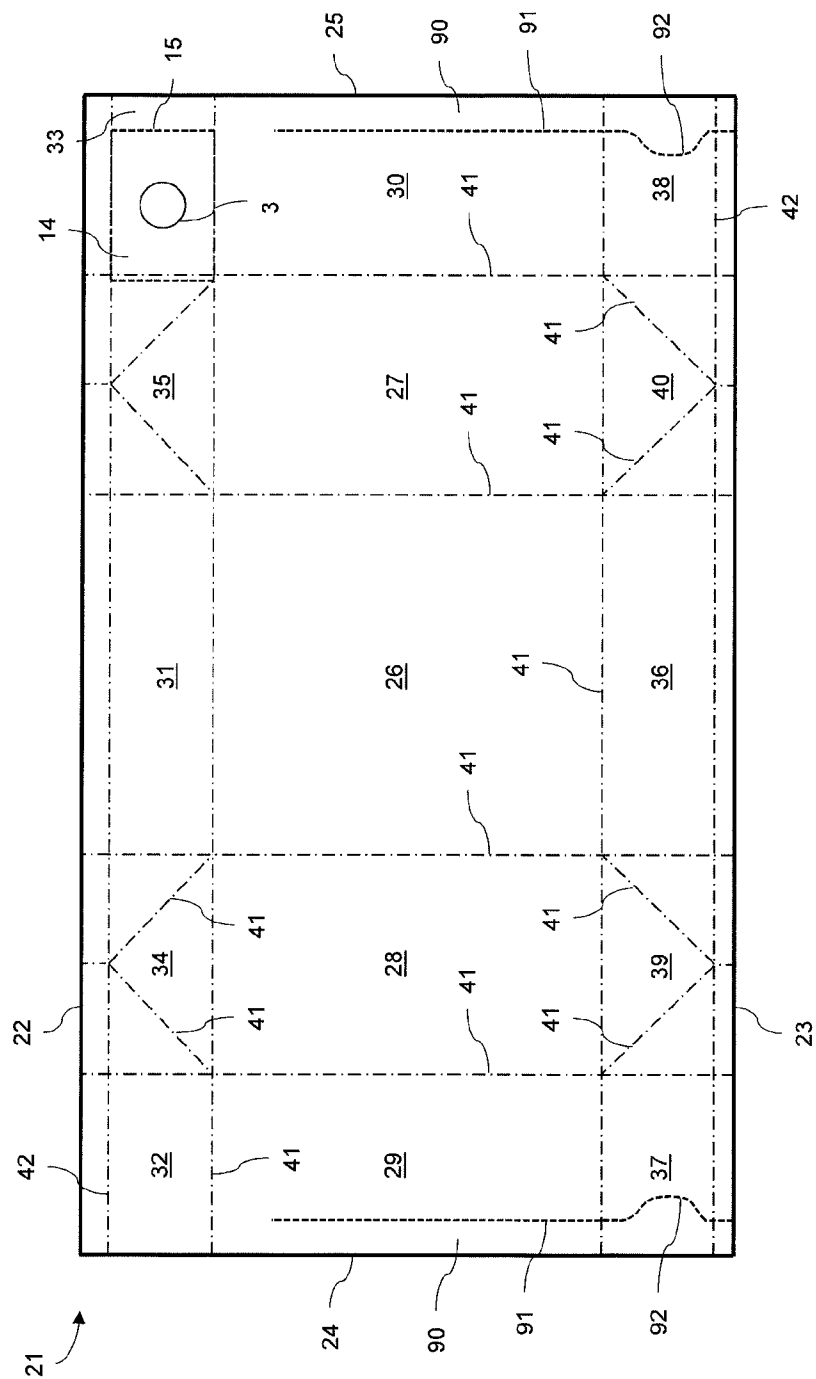


FIG. 13

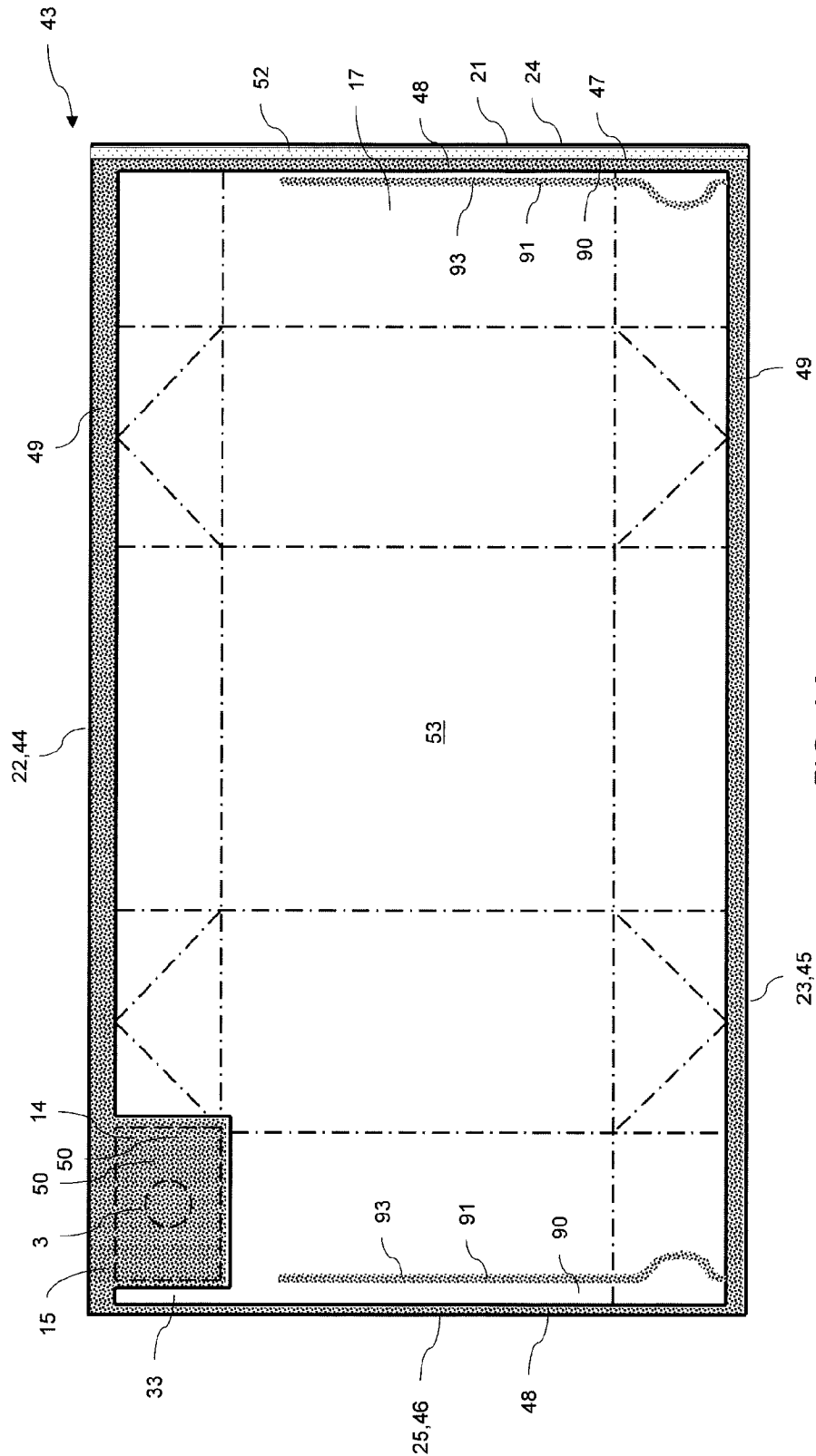


FIG. 14

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2019/052852

A. CLASSIFICATION OF SUBJECT MATTER

INV. B31B50/14 B31B50/62 B31B105/00 B31B110/35 B31B120/40
B32B37/00 B32B37/12 B32B37/20 B32B38/04 B65D5/54
B65D5/60 B65D5/70

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B31B B32B B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 795 513 A (JENSEN JR JAMES W [US]) 3 January 1989 (1989-01-03)	1,2, 8-13,16, 17,21
A	column 1, line 17 - line 23 column 6, line 28 - column 44 column 7, line 7 - line 18 column 8, line 68 - column 9, line 3 column 9, line 42 - line 46 column 15, line 59 - column 16, line 2 column 17, line 36 - line 47 column 19, line 17 - line 25; figures 1, 2, 15, 22	3,4,6,7, 14,15, 19,20, 25-30, 32-37
A	----- US 2017/240334 A1 (MYERSCOUGH MARTIN [GB]) 24 August 2017 (2017-08-24) paragraphs [0061], [0070]; figures 4-7 -----	1-4, 6-17, 19-37



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

20 December 2019

Date of mailing of the international search report

27/03/2020

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
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Authorized officer

Sundqvist, Stefan

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB2019/052852

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-4, 6-17, 19-37

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-4, 6-17, 19-37

A carton blank, reel of carton blanks, and a method for manufacturing the carton blank or reel of carton blanks for improved recyclability.

2. claims: 5, 18

A method for manufacturing a carton blank with means for facilitating joining (claim 5 as dependent on claim 1) and a carton blank with means for facilitating joining (claim 18 as dependent on claims 12 and 16).

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2019/052852

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			JP 2017534534 A	24-11-2017
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			US 2017240334 A1	24-08-2017
			WO 2016055772 A1	14-04-2016
			ZA 201703106 B	25-07-2018
