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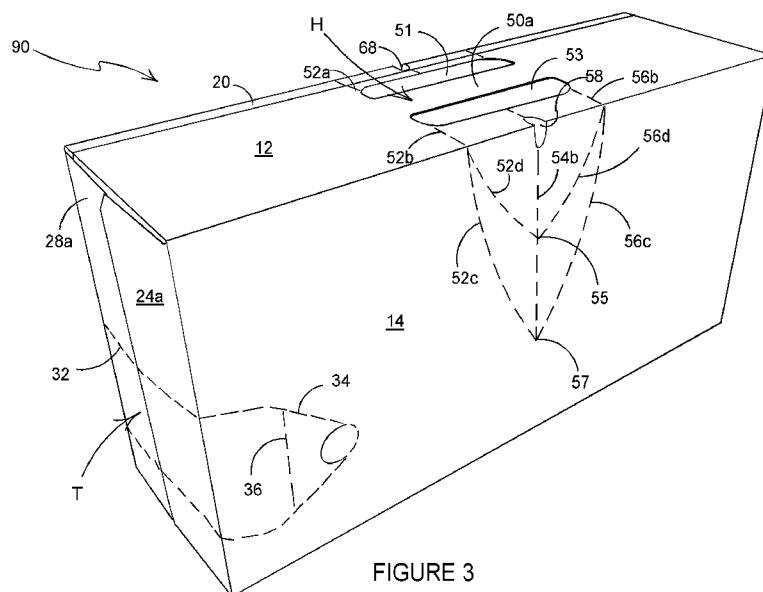


FIGURE 3

(57) Abstract: A carton (90) for one or more articles (A) includes a tubular structure formed from at least a top panel (12/20), a first side wall panel (14), a second side wall panel (18) and a base panel (16). The carton has a handle structure (H) defined at least in the top panel that includes a handle strap (50a/50b). The carton further includes a relief structure (R1/R2) for controlling and directing deformation of the top panel and at least one of the side wall panels. The relief structure includes a fold line (54b) extending from the handle strap across the top panel and into at least one of the side wall panels. A weakening feature interrupts the fold line, and is formed in part in the top panel and in part in at least one of the side wall panels.

CARTON AND CARTON BLANK

FIELD OF THE INVENTION

The present invention relates to a carton for packaging one or more articles and a blank for forming the same, more specifically, but not exclusively to a carton having a carrying handle with a relief structure for controlling the deformation of the carton when the carrying handle is employed.

BACKGROUND OF THE INVENTION

In the field of packaging it is often required to provide consumers with a package comprising multiple primary product containers. Such multi-packs are desirable for shipping and distribution and for display of promotional information. For cost and environmental considerations, such cartons or carriers need to be formed from as little material as possible and cause as little wastage in the materials from which they are formed as possible. Another consideration is the strength of the packaging and its suitability for holding and transporting large weights of articles.

It is desirable to provide a carrying handle such that the consumer can carry the multi-pack; it is desirable to control the deformation of the carton when the carrying handle is employed.

The present invention seeks to overcome or at least mitigate the problems of the prior art.

SUMMARY OF INVENTION

According to a first aspect of the present invention there is provided a carton for packaging one or more articles comprising a plurality of panels for forming a tubular structure including a top panel, a first side wall panel, a second side wall panel and a base panel, the carton comprising a handle structure defined at least in the top panel, the handle structure comprising a handle strap, wherein the carton comprises a relief structure for controlling and directing deformation of the top panel and at least one of the first and second side wall panels, the relief structure comprising a fold line extending from the handle strap across the top panel and into said at least one of the first and second side wall panels, wherein a weakening feature, e.g., one or more apertures or a one or more slits, interrupts the fold line, the weakening feature being formed in part in the top panel and in part in said at least one of the first and second side wall panels.

This is advantageous since it provides a controlled deformation of the panels of the carton. This can improve the appearance of the carton and/or reduce the likelihood of the panels

tearing when under load, since the load forces are directed or controlled by the relief structure.

Preferably, the weakening feature may comprise at least one aperture (which preferably is
5 oval in shape) that has a longitudinal axis collinear with the fold line.

Optionally, the weakening feature may comprise at least one slit that is collinear with the fold line.

10 Optionally, the fold line may be straight and may be disposed substantially perpendicular to the tubular axis of the carton.

In some embodiments the handle strap may extend in the direction substantially parallel to the tubular axis of the carton.

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According to a second aspect of the present invention there is provided a carton for packaging one or more articles comprising a plurality of panels for forming a tubular structure including a top panel, a first side wall panel, a second side wall panel and a base panel, the carton comprising a handle structure defined at least in the top panel, the handle
20 structure comprising a handle strap, wherein the carton comprises a relief structure for controlling and directing deformation of the top panel and at least one of the first and second side wall panels, the relief structure comprising a linear fold line extending from the handle strap across the top panel and into said at least one of the first and second side wall panels, the relief structure comprising a first substantially "V" shaped fold line defined in said at least
25 one of the first and second side wall panels, and a second substantially "V" shaped fold line defined in said at least one of the first and second side wall panels, wherein the first substantially "V" shaped fold line comprises a pair of first arms which meet each other at a first point of intersection, and the second substantially "V" shaped fold line comprises a pair of second arms which meet each other at a second point of intersection, the first and second
30 points of intersection being disposed along the fold line and spaced from each other.

Optionally, the first arms may commence from the hinged connection between the top panel and said at least one of the first and second side wall panels and terminate at the first point of intersection.

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In some embodiments, the second arms may commence from the hinged connection between the top panel and said at least one of the first and second side wall panels and terminates at the second point of intersection.

5 Preferably, one of the first arms and one of the second arms may commence from the same location on the hinged connection between the top panel and said at least one of the first and second side wall panels while the other first arm and the other second arm may commence from the same location on the hinged connection between the top panel and said at least one of the first and second side wall panels.

10

The first arms of the first substantially "V" shaped fold line may be a pair of arcuate fold lines.

The second arms of the second substantially "V" shaped fold line may be a pair of arcuate fold lines.

15

Optionally, the first point of intersection of the first arms may be located at a terminal end of the fold line. The second point of intersection of the second arms may be located substantially equidistant from the terminal end of the fold line as it is from the hinged connection between the top panel and said at least one of the first and second side wall panels.

20

In some embodiments, the first arms of the first substantially "V" shaped fold line may extend into the top panel such that they terminate adjacent the opposed ends of the handle strap respectively.

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The handle strap may be defined at least in part by a pair of elongate apertures struck from the top panel.

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Optionally, a weakening feature such as an aperture or a slit may interrupt the fold line. The weakening feature may be formed in part in the top panel and in part in said at least one of the first and second side wall panels.

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According to a third aspect of the present invention, there is provided a blank for forming a carton, the blank comprising a plurality of panels for forming a tubular structure including a top panel, a first side wall panel, a second side wall panel and a base panel, the blank comprising a handle structure defined at least in the top panel, the handle structure comprising a handle strap, wherein the blank comprises a relief structure for controlling and

directing deformation of the top panel and at least one of the first and second side wall panels in a set-up carton, the relief structure comprising a fold line extending from the handle strap across the top panel and into said at least one of the first and second side wall panels, wherein a weakening feature (e.g., one or more apertures or one or more slits) interrupts the fold line, the weakening feature being formed in part in the top panel and in part in said
5 at least one of the first and second side wall panels.

According to a fourth aspect of the present invention, there is provided a blank for forming a carton, the blank comprising a plurality of panels for forming a tubular structure including a
10 top panel, a first side wall panel, a second side wall panel and a base panel, the blank comprising a handle structure defined at least in the top panel, the handle structure comprising a handle strap, wherein the blank comprises a relief structure for controlling and directing deformation of the top panel and at least one of the first and second side wall panels in a set-up carton, the relief structure comprising a linear fold line extending from the
15 handle strap across the top panel and into said at least one of the first and second side wall panels, the relief structure comprising a first substantially "V" shaped fold line defined in said at least one of the first and second side wall panels and a second substantially "V" shaped fold line defined in said at least one of the first and second side wall panels, wherein the first substantially "V" shaped fold line comprises a pair of first arms meeting at a first intersection,
20 and the second substantially "V" shaped fold line comprises a pair of second arms meeting at a second intersection, the first and second intersections being disposed along the linear fold line and spaced apart from each other.

Within the scope of this application it is envisaged and intended that the various aspects,
25 embodiments, examples, features and alternatives set out in the preceding paragraphs, in the claims and/or in the following description and drawings may be taken independently or in any combination thereof. For example, features described in connection with one embodiment are applicable to all embodiments unless there is incompatibility of features.

30 BRIEF DESCRIPTION OF THE DRAWINGS

Exemplary embodiments of the invention will now be described with reference to the accompanying drawings, in which:

Figure 1 is a plan view from above of a blank for forming a carton according to a first embodiment of the invention;

35 Figure 2 is an enlarged plan view from above of a portion of the blank of Figure 1;

Figure 3 is a perspective view from above of a carton formed from the blank of Figure 1;

Figure 4 is a perspective view from above of a portion of the carton of Figure 3;

Figure 5 is a perspective view from above of the portion of the carton Figure 4 when the carrying handle is being employed; and

Figure 6 is a plan view from above of a blank for forming a carton according to a
5 second embodiment of the invention wherein the blank is provided with weakening features each comprises a weakened line of severance.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

Detailed descriptions of specific embodiments of the package, blanks and cartons are
10 disclosed herein. It will be understood that the disclosed embodiments are merely examples of the way in which certain aspects of the invention can be implemented, and do not represent an exhaustive list of all of the ways the invention may be embodied. As used herein, the word “exemplary” is used expansively to refer to embodiments that serve as illustrations, specimens, models, or patterns. Indeed, it will be understood that the packages,
15 blanks and cartons described herein may be embodied in various and alternative forms. The Figures are not necessarily to scale and some features may be exaggerated or minimised to show details of particular components. Well-known components, materials or methods are not necessarily described in great detail in order to avoid obscuring the present disclosure. Any specific structural and functional details disclosed herein are not to be interpreted as
20 limiting, but merely as a basis for the claims and as a representative basis for teaching one skilled in the art to variously employ the invention.

Referring to Figure 1, there is shown a plan view of a blank 10 capable of forming a carton as shown in Figure 3, which carton can accept an input of primary products such as, but not
25 limited to, bottles or cans, hereinafter referred to as “articles”.

In the embodiments detailed herein, the terms “carton” and “carrier” refer, for the non-limiting purpose of illustrating the various features of the invention, to a container for engaging, carrying, and/or dispensing articles, such as product containers. It is contemplated that the
30 teachings of the invention can be applied to various product containers, which may or may not be tapered and/or cylindrical. Exemplary containers include bottles (for example metallic, glass or plastics bottles), cans (for example aluminium cans), tins, pouches, packets and the like.

35 The blank 10 is formed from a sheet of suitable substrate. It is to be understood that, as used herein, the term “suitable substrate” includes all manner of foldable sheet material such as paperboard, corrugated board, cardboard, plastic, combinations thereof, and the like. It

should be recognized that one or other numbers of blanks may be employed, where suitable, for example, to provide the carrier structure described in more detail below.

In the exemplary embodiment, the blank 10 is configured to form a carton or carrier for packaging an exemplary arrangement of exemplary articles. In a first illustrated exemplary embodiment, the arrangement is a 3 x 6 matrix or array and the eighteen articles are cans. The blank can be alternatively configured to form a carrier for packaging other types, number and size of article and/or for packaging articles in a different arrangement or configuration.

The blank 10 comprises a plurality of main panels 12, 14, 16, 18, 20. A first top panel 12 is hinged to a first side wall panel 14 by a fold line 13. The first side wall panel 14 is hinged to a base panel 16 by a fold line 15. The base panel 16 is hinged to a second side wall panel 18 by a fold line 17. The second side wall panel 18 is hinged to a second top panel 20 by a fold line 19.

The plurality of main panels 12, 14, 16, 18, 20 form a tubular structure in an erected form. The ends of the tubular structure are closed by end closure structures having a plurality of end closure panels 22a, 24a, 26a, 28a, 30a, 22b, 24b, 26b, 28b, 30b. A first end of the tubular structure is closed by a first group of end closure panels 22a, 24a, 26a, 28a, 30a; the second end of the tubular structure is closed by a second group of end closure panels 22b, 24b, 26b, 28b, 30b. A first end closure panel 22a is hinged to the first top panel 12 by a fold line 21a; a second end closure panel 24a is hinged to the first side wall panel 14 by a fold line 23a; a third end closure panel 26a is hinged to the base panel 16 by a fold line 25a; a fourth end closure panel 28a is hinged to the second side wall panel 18 by a fold line 27a and a fifth end closure panel 30a is hinged to the second top panel 20 by a pair of fold lines 29a, 31a.

A sixth end closure panel 22b is hinged to the first top panel 12 by a fold line 21b; a seventh end closure panel 24b is hinged to the first side wall panel 14 by a fold line 23b; an eighth end closure panel 26b is hinged to the base panel 16 by a fold line 25b; a ninth end closure panel 28b is hinged to the second side wall panel 18 by a fold line 27b, and a tenth end closure panel 30b is hinged to the second top panel 20 by a pair of fold lines 29b, 31b.

The blank 10 comprises a first weakened line of severance 34 and a second weakened line of severance 32, which together form an access means T or dispenser in a set-up carton, as shown in Figure 3, for facilitating access to the articles being packaged. The first weakened

line of severance 34 and the second weakened line of severance 32 together form a continuous loop in a set-up carton.

5 The first weakened line of severance 34 is provided in part in the first side panel 14 and in part in the second end closure panel 24a. First weakened line of severance 34 commences from a free end edge of the second end closure panel 24a and extends across the second end closure panel 24a into the first side panel 14. The first weakened line of severance 34 is substantially "V" shaped. The first weakened line of severance 34 returns into the second end closure panel 24a, extends across the second end closure panel 24a, and terminates at the free end edge of the second end closure panel 24a. The first side panel 14 comprises an optional first arcuate fold line 38 which is substantially "C" shaped. Each end of the arcuate fold line 38 intersects or meets with the first weakened line of severance 34. First side panel 14 comprises an optional linear fold line 36 spaced from the "C" shaped fold line 38. Each end of the linear fold line 36 intersects or meets with the first weakened line of severance 34. Each end of the first weakened line of severance 34 comprises a plurality of substantially parallel weakened lines of severance 40a, 40b.

20 The second weakened line of severance 32 is provided in part in the second side panel 18 and in part in the fourth end closure panel 28a. The second weakened line of severance 32 commences from a free end edge of the fourth end closure panel 28a and extends across the fourth end closure panel 28a into the second side panel 18. The second weakened line of severance 32 is substantially "U" shaped in the second side panel 18. The second weakened line of severance 32 returns into the fourth end closure panel 28a, extends across the fourth end closure panel 28a, and terminates at the free end edge of the fourth end closure panel 28a. Each end of the second weakened line of severance 32 comprises a plurality of substantially parallel weakened lines of severance 42a, 42b for facilitating alignment of the first weakened line of severance 34 with the second weakened line of severance 32.

30 The access means T defined by the first and second weakened lines of severance 34, 32, is arranged to be in closer proximity to the bottom panel 16 than to the composite top panel 12/20. In alternative embodiments, the access means T may be arranged to be in closer proximity to the composite top panel 12/20, or evenly spaced. It will be appreciated that the access means T can be arranged to be in closer proximity to the composite top panel 12/20 without affecting the integrity of the handle structure H.

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The blank 10 comprises a handle structure denoted generally by reference signs H1 and H2. The first top panel 12 comprises a first part H1 of the handle structure. The first part H1 of the handle structure comprises a first aperture 51 and a second aperture 53. The first and second apertures 51, 53 are elongate in shape and are disposed in a parallel, spaced-apart relationship. The first and second apertures 51, 53 define a handle strap 50a therebetween. The first and second apertures 51, 53 and the handle strap 50a are orientated so as to extend in parallel to a tubular axis of the carton when in a set-up condition.

The second top panel 20 comprises a second part H2 of the handle structure. The second part H2 of the handle structure comprises a third aperture 63 and a recess 61. The third aperture 63 and the recess 61 are elongate in shape and are disposed in a parallel, spaced-apart relationship. The third aperture 63 and the recess 61 define a reinforcing handle strap 50b therebetween. The third aperture 63 and the recess 61 and the reinforcing handle strap 50b are orientated so as to extend in parallel to a tubular axis of the carton when in a set-up condition. In an alternative embodiment, however, the handle structure may be defined not only in the first and second top panels but also in the adjacent panels such as panels 22a, 22b, 30a, 30b. In such an embodiment the handle straps 50a, 50b may be extended into the respective ones of those panels 22a, 22b, 30a, 30b.

In the set-up carton, the first aperture 51 and the third aperture 63 are disposed in vertical registry to form a first opening in the top wall of the carton. The second aperture 53 and the recess 61 are disposed in vertical registry to form a second opening in the top wall of the carton.

The handle structure comprises a first relief structure R1 and a second relief structure R2.

The first relief structure R1 comprises a plurality of score lines or predefined fold lines. The fold lines are defined in part in the first top panel 12 and in part in the first side wall panel 14.

The first relief structure R1 comprises a first linear or straight fold line 54b, which extends from the second aperture 53 across the first top panel 12 into, and terminating in, the first side wall panel 14. In the illustrated embodiment, the first linear fold line 54b extends at least half way across the first side panel 14. In other embodiments, other arrangements are envisaged. For example, the first linear fold line 54b may extend half way across the first side wall panel 14, or may extend less than half way across the first side wall panel 14. The first linear fold line 54b is interrupted by a weakening feature in the form of a relief aperture 58. The relief aperture 58 is defined by an endless cut line 59 (see Figure 2). The relief

aperture 58 is defined in part in the first top panel 12 and in part in the first side wall panel 14. The first linear fold line 54b is located centrally with respect to the second aperture 53. The relief aperture 58 is oval in shape, although in other embodiments other shapes are envisaged. In some embodiments the relief aperture 58 may be replaced with a different type of weakening feature such as a cut line or weakened line of severance. The relief structure R1 further comprises a pair of first arms in the form of arcuate fold lines 52b/52c and 56b/56c. The first arm 52b/52c is defined in part in the first top panel 12 and in part in the first side panel 14. The first arm 52b/52c extends from a first end of the second aperture 53 across the first top panel 12 and into the first side wall panel 14. The first arm 52b/52c terminates at the end of the first linear fold line 54b.

The other first arm 56b/56c is defined in part in the first top panel 12 and in part in the first side panel 14. The other first arm 56b/56c extends from a second end of the second aperture 53 across the first top panel 12 and into the first side wall panel 14. The other first arm 56b/56c terminates at the end of the first linear fold line 54b.

The first arms 52b/52c and 56b/56c meet at a common vertex 57 disposed on the first linear fold line 54b within the first side wall panel 14. The common vertex 57 in other words is a first point of intersection of the first arms 52b/52c and 56b/56c. The first arms 52b/52c and 56b/56c of the pair together provides a first substantially "V" shaped fold line.

The first relief structure R1 further comprises a pair of second arms in the form of arcuate fold lines 52d, 56d. The second arms 52d, 56d extend respectively from two spaced locations along the fold line 13, hinging the first top panel 12 to the first side wall panel 14. The two spaced locations along the fold line 13 in Figure 1 coincide with the intersections of the fold line 13 and the first arms 52b/52c, 56b/56c. The second arms 52d, 56d extend to and terminate at a second point of intersection 55 disposed on the first linear fold line 54b at a location between the fold line 13 and the terminal end (or the first point of intersection) 57 of the first linear fold line 54b. The second point of intersection 55 between the second arms 52d, 56d is disposed at a substantially equal distance from the fold line 13 to it is from the terminal end 57 of the first linear fold line 54b, although in other embodiments other arrangements are envisaged. The second arms 52d, 56d of the pair together provide a second substantially "V" shaped fold line.

The first and second substantially "V" shaped fold lines each is bisected by the first linear fold line 54b. Each of the first and second "V" shaped fold lines point towards the base panel 16.

The first relief structure R1 further comprises a second linear fold line 54a which is collinear with the first linear fold line 54b. The second linear fold line 54a extends between the free side edge of the first top panel 12 and the first handle aperture 51. A third linear fold line 52a extends between the free side edge of the first top panel 12 and the first handle aperture 51 and is located adjacent to a first end of the first aperture 51, and extends transversely across the first top panel 12. The third linear fold line 52a is collinear with an end portion 52b of the first arm 52b/52c. The end portion 52b is substantially linear or straight and extends transversely across the first top panel 12 between the second handle aperture 53 and the fold line 13. A fourth linear fold line 56a extends between the free side edge of the first top panel 12 and the first handle aperture 51 and is located adjacent to a second end of the first aperture 51 opposite to the first end. The fourth linear fold line 56a extends transversely across the first top panel 12. The fourth linear fold line 56a is collinear with an end portion 56b of the other first arm 56b/56c. The end portion 56b is substantially linear or straight and extends transversely across the first top panel 12 between the second handle aperture 53 and the fold line 13.

Referring now to Figure 2, it can be seen that the first linear fold line 54b, first and second substantially "V" shaped fold lines 52b/52c, 56b/56c, 52d, 56d and the fold line 13 define portions of the first side wall panel 14. A first panel portion 70 is defined by the fold line 13, the second arm 52d and the first linear fold line 54b. A second panel portion 72 is defined by the fold line 13, the other second arm 56d and the first linear fold line 54b. A third panel portion 74 is defined by the second arm 52d, the first arm 52b/52c and the first linear fold line 54b. A fourth panel portion 76 is defined by the second arm 56d, the other first arm 56b/56c and the first linear fold line 54b. The first, second third and fourth panel portions 70, 72, 74, 76 are each substantially triangular in shape.

The second relief structure R2 comprises a plurality of score lines or predefined fold lines. The fold lines are defined in part in the second top panel 20 and in part in the second side wall panel 18.

The second relief structure R2 comprises a fifth linear fold line 64a which extends from the third aperture 63 across the second top panel 20 into, and terminating in, the second side wall panel 18. In the illustrated embodiment, the fifth linear fold line 64a extends at least half way across the second side wall panel 18. In other embodiments, other arrangements are envisaged. For example the fifth linear fold line 64a may extend half way across the second side wall panel 18 or may extend less than half way across the second side wall panel 18.

The fifth linear fold line 64a is interrupted by a second weakening feature in the form of a second relief aperture 68. The second relief aperture 68 is defined in part in the second top panel 20 and in part in the second side wall panel 18. The fifth linear fold line 64a is located centrally with respect to the third aperture 63. The second relief aperture 68 is oval in shape, although in other embodiments other shapes are envisaged. In some embodiments the second relief aperture 68 may be replaced with a different type of weakening feature such as a cut line or weakened line of severance. The second relief structure R2 further comprises a pair of third arms in the form of arcuate fold lines 62b/62a, 66b/66a which are defined in part in the second top panel 20 and in part in the second side wall panel 18. The third arms 62b/62a, 66b/66a extend respectively from the first and second opposed ends of the third aperture 63, across the second top panel 20 and into the second side wall panel 18. The third arms 62b/62a, 66b/66a meet and terminate at a third point of intersection 67 which is located at the end of the fifth linear fold line 64a.

The third arms 62b/62a, 66b/66a and fifth linear fold line 64a terminate at a common vertex which is coincidental with the third point of intersection 67 disposed within the second side wall panel 18. Intersecting with each other at the common vertex, the third arms 62b/62a, 66b/66a provides a third substantially "V" shaped fold line.

The second relief structure R2 further comprises a pair of fourth arms in the form of arcuate fold lines 62c, 66c. The fourth arms 62c, 66c extend respectively from two spaced locations along the fold line 19, hinging the second top panel 20 to the second side wall panel 18. The two spaced locations coincide respectively with the intersections between the fold line 19 and the third arms 62b/62a, 66b/66a. The fourth arms 62c, 66c extend to and terminates at a fourth point of intersection 65 on the fifth linear fold line 64a at a location between the fold line 19 and the terminal end (or third point of intersection) 67 of the fifth linear fold line 64a. The fourth point of intersection 65 between the fourth arms 62c, 66c is disposed at an equal distance from the fold line 19 to it is from the terminal end 67 of the fifth linear fold line 64a, although in other embodiments other arrangements are envisaged. The fourth arms 62c, 66c together provides a fourth substantially "V" shaped fold line.

The third and fourth substantially "V" shaped fold lines 62b/62a, 66b/66a, 62c, 66c each is bisected by the fifth linear fold line 64a. Both the "V" shaped fold lines point towards the base panel 16.

Turning to the construction of the carton 90 as illustrated in Figures 3, 4 and 5, it is envisaged that the carton 90 can be formed by a series of sequential folding operations in a

straight line machine so that the carton is not required to be rotated or inverted to complete its construction. The folding process is not limited to that described below and may be altered according to particular manufacturing requirements.

- 5 The blank 10 can be formed by folding the second top panel 20 about the fold line 19 to place the second top panel 20 in face-contacting relationship with the second side wall panel 18.

10 The first side wall panel 14 and the first top panel 12 are folded about the fold line 15. This places the first top panel 12 in overlying relationship with the second top panel 20. The first top panel 12 is secured with glue or other suitable adhesive treatment to the second top panel 20. The first and fifth end closure panels 22a, 30a are secured to one another by adhesive or other suitable treatment. The sixth and tenth end closure panels 22b, 30b are secured to one another by adhesive or other suitable treatment. In this way a flat collapsed
15 tubular structure is formed. This flat collapsed tubular structure is suitable for shipping or distribution to a convertor plant.

The flat collapsed tubular structure can be erected into a carton by forming a tubular structure, engaging an adjacent pair of the plurality of main panels 12, 14, 16, 18, 20 and
20 orientating an adjacent pair of the plurality of main panels 12, 14, 16, 18, 20 so as to be substantially perpendicular to each other. The tubular structure can then be loaded with articles A by inserting the article through one or both of the open ends of the tubular structure. The ends of the tubular structure are closed by folding the end closure panels 22a, 24a, 26a, 28a, 30a, 22b, 24b, 26b, 28b, 30b to be substantially perpendicular to the one of
25 the plurality of main panels 12, 14, 16, 18, 20 to which they are hinged.

The first and fifth end closure panels 22a, 30a are folded to be substantially perpendicular to the top wall 12/20 formed by the first and second top panel 12, 20. The third end closure panel 26a is folded to be substantially perpendicular to the base panel 16. The fourth end
30 closure panel 28a is folded to be substantially perpendicular to the second side wall panel 18 such that it is in face contacting relationship with the first and third end closure panels 22a, 26a. The fourth end closure panel 28a is secured to the first and third end closure panels 22a, 26a by adhesive or other suitable treatment. The second end closure panel 24a is folded to be substantially perpendicular to the first side wall panel 14 and is secured to the
35 first and third end closure panels 22a, 26a and to the fourth end closure panel 28a by adhesive or other suitable treatment. The second group of end closure panels 22b, 24b, 26b,

28b, 30b is constructed in substantially the same manner to that of the first group of end closure panels 22a, 24a, 26a, 28a, 30a previously described.

Figures 4 and 5 illustrate the handle structure of the carton 90 in use. Figure 4 illustrates the handle structure in a stowed or undeployed position. Figure 5 illustrates the handle structure in a deployed condition.

In the stowed position, it can be seen that the panel portions 70, 72, 74, 76 are coplanar with the rest of the first side wall panel 14. In the deployed condition, the panel portions 70, 72, 74, 76 deform as the handle strap 50a is lifted out of the plane of the top wall 12/20. The panel portions 70, 72, 74, 76 bow inwardly so as to appear concave when viewed from an external position. The portion of the top wall 12/20 disposed between the end portion 52b of the first arcuate fold line 52b/52c and the section of the first linear fold line 54b defined in the top wall 12/20 also bows inwardly. The portion of the top wall 12/20 disposed between the end portion 56b of the second arcuate fold line 56b/56c and the section of the first linear fold line 54b defined in the top wall 12/20 also bows inwardly.

This has the effect of distorting the relief aperture 58. The distortion tends to close or reduce the size of the opening formed by the aperture 58.

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In this way, when the handle is employed by a user U, the side wall panels 14, 18 deform in a controlled and predefined way. This substantially preserves the appearance of the carton when the handle is in use. It may also preserve the appearance of the carton once the handle has been used and released. The panel portions 70, 72, 74, 76 and top wall 12/20 return at least in part to their starting positions when the handle is no longer in use due to the natural or inherent resilience of the material from which the carton 90 is formed. The carton walls 14, 18 tend to buckle when the handle structure is employed. The "V" shaped fold lines control the direction and spread of the buckling of the carton walls 14, 18 when under the load of the articles being packaged when the handle structure is employed. The first and fifth linear fold lines 54b, 64a provide relief to the buckling and allow the carton walls to fold centrally. The relief apertures 58, 68 reduce the resistance of the carton 90 to folding in this manner in the region adjacent the fold lines 13, 19, which couple the top wall 12/20 to the first and second side wall panels 14, 18. This further improves the aesthetic of the carton 90. Controlling and directing the buckling of the first and second side wall panels 14, 18 and top wall 12/20 may also improve the strength of the carton, allowing greater loads to be carried or reducing the likelihood of tearing or other damage as a result of employing the handle structure.

It can be appreciated that various changes may be made within the scope of the present invention. For example, the size and shape of the panels and apertures may be adjusted to accommodate articles of differing size or shape. It will be appreciated that the top wall of the carton 90 may in alternative embodiments be formed by a single top panel which extends between the first and second side wall panels 14, 18 when in a set-up condition. In such embodiments a glue flap may be provided for securing a pair of adjacent main panels to one another. In other embodiments the first top panel 12 and/or the second top panel 20 may extend between the first and second side wall panels 14, 18. In such embodiments the recess 61 may be replaced with an additional handle aperture arranged to be in vertical registry with the first handle aperture 51 when in a set-up condition.

It should be readily understood that although the forgoing embodiment describes the substantially "V" shaped fold lines, all of them or at least one of them may be replaced by a substantially "U" shaped fold line or substantially "U" shaped fold lines.

It should also be readily understood that the term "weakening feature" as used herein refers to an aperture, an opening, multiple apertures or openings arranged in a row, or a weakened line of severance. The weakened line of severance may be a cut or slit, an interrupted cut or slit, a half cut, an interrupted half cut, a combination thereof or the like. Figure 6 illustrates a second embodiment of the present invention wherein the blank 110 of a carton is provided with weakening features each comprising a weakened line of severance 158, 168. The weakened line of severance 158 is disposed to intersect substantially perpendicularly with the fold line 13 while the weakened line of severance 168 is disposed to intersect substantially perpendicularly with fold line 19. The weakened line of severance 158 extends collinear with the linear fold line 54b and thus interrupts the fold line 54b while the weakened line of severance 168 extends collinear with the fold line 64a and thus interrupts the fold line 64a. Those weakened lines of severance 158, 168 function in a similar way as the relief apertures 58, 68. The other parts of the blank 110 are identical to those shown in Figure 1. As such, the same reference numerals as in Figure 1 are used in Figure 6 to denote those identical parts and description thereof are being omitted. It should, however, be understood that in a still another alternative embodiment, the weakened lines of severance 158, 168 may be replaced by fold lines respectively. Stated differently, the weakened features in such an alternative embodiment may be omitted such that the linear fold lines 58, 68, 158, 168 extend from the respective handle apertures 53, 63 continuously into the adjacent side wall panels 14, 18.

It will be recognized that as used herein, directional references such as "top", "bottom", "front", "back", "end", "side", "inner", "outer", "upper" and "lower" do not necessarily limit the respective panels to such orientation, but may merely serve to distinguish these panels from one another.

As used herein, the terms "hinged connection" and "fold line" refer to all manner of lines that define hinge features of the blank, facilitate folding portions of the blank with respect to one another, or otherwise indicate optimal panel folding locations for the blank. A fold line is typically a perforation, a scored line, an embossed line, or a debossed line. Any reference to "hinged connection" or "fold line" should not be construed as necessarily referring to a single fold line only; indeed it is envisaged that a hinged connection can be formed from any one or more of the following: a short slit, a frangible line or a fold line without departing from the scope of the invention.

As used herein, the term "weakened line of severance" refers to all manner of lines that facilitate separating portions of the substrate (e.g., paperboard or any other foldable sheet material) from one another, or that indicate optimal separation locations. Weakened lines of severance may be frangible or tear lines, or otherwise may be weakened lines each formed by perforations, a line of perforations, a line of short slits, a line of half-cuts, a single slit, a single half-cut, a single cut line, an interrupted cut line, a single score line, an interrupted score lines, any combination thereof, and the like.

It should be understood that hinged connection, weakened lines of severance and fold lines can each include elements that are formed in the substrate of the blank including perforations, a line of perforations, a line of short slits, a line of half-cuts, a single half-cut, a cut line, an interrupted cut line, slits, scores, any combination thereof, and the like. The elements can be dimensioned and arranged to provide the desired functionality. For example, a line of perforations can be dimensioned or designed with degrees of weakness to define a fold line and/or a severance line. The line of perforations can be designed to facilitate folding and resist breaking, to facilitate folding and facilitate breaking with more effort, or to facilitate breaking with little effort.

CLAIMS

1. A carton for packaging one or more articles, comprising a plurality of panels for forming a tubular structure including a top panel, a first side wall panel, a second side wall panel and a base panel, the carton comprising a handle structure defined at least in the top panel, the handle structure comprising a handle strap, wherein the carton comprises a relief structure for controlling and directing deformation of the top panel and at least one of the first and second side wall panels, the relief structure comprising a fold line extending from the handle strap across the top panel and into said at least one of the first and second side wall panels, wherein a weakening feature interrupts the fold line, the weakening feature being formed in part in the top panel and in part in said at least one of the first and second side wall panels.
2. The carton according to claim 1 wherein the weakening feature comprises at least one aperture.
3. The carton according to claim 2 wherein the at least one aperture has a longitudinal axis which is collinear with the fold line.
4. The carton according to claim 1 wherein the weakening feature comprises one selected from the group consisting of a slit, an interrupted slit, a half cut, an interrupted half cut, and a combination thereof, the weakening feature extending collinear with the fold line.
5. The carton according to claim 1 wherein the fold line is substantially straight and is orientated substantially perpendicular to a tubular axis of the carton.
6. The carton according to claim 1 wherein the handle strap extends in the direction substantially parallel to a tubular axis of the carton.
- 5
7. A carton for packaging one or more articles comprising a plurality of panels for forming a tubular structure including a top panel, a first side wall panel, a second side wall panel and a base panel, the carton comprising a handle structure defined at least in the top panel, the handle structure comprising a handle strap, wherein the carton comprises a relief structure for controlling and directing deformation of the top panel and at least one of the first and second side wall panels, the relief structure comprising a fold line extending from the handle strap across the top panel and into said at least one of the first and second side wall panels, the relief structure further comprising a first substantially "V" shaped fold line defined in said at least one of the first and second side wall panels and a second substantially "V" shaped fold line defined in said at least one of

the first and second side wall panels, wherein the first substantially "V" shaped fold line comprises a pair of first arms which meet each other at a first point of intersection, and the second substantially "V" shaped fold line comprises a pair of second arms which meet each other at a second point of intersection, the first and second points of intersection being disposed along the fold line and spaced from each other.

8. The carton according to claim 7 wherein the first arms of the first substantially "V" shaped fold line extend from a hinged connection between the top panel and said at least one of the first and second side wall panels and terminate at the first point of intersection.
9. The carton according to claim 8 wherein the second arms of the second substantially "V" shaped fold line extend from a hinged connection between the top panel and said at least one of the first and second side wall panels and terminate at the second point of intersection, the second point of intersection being disposed between the first point of intersection and the hinged connection between the top panel and said at least one of the first and second side wall panels.
10. The carton according to claim 7 wherein one of the first arms and one of the second arms extend from the same location on a hinged connection between the top panel and said at least one of the first and second side wall panels and terminate at the first and second points of intersection respectively, and the other of the first arms and the other of the second arms extend from the same location on the hinged connection and terminate at the first and second points of intersection respectively.
11. The carton according to claim 7 wherein the first arms comprise a pair of arcuate fold lines.
12. The carton according to claim 11 wherein the second arms comprise a pair of arcuate fold lines.
13. The carton according to claim 7 wherein the first point of intersection of the first arms is located at a terminal end of the fold line.
14. The carton according to claim 13 wherein the second point of intersection of the second arms is located substantially equidistant from the terminal end of the fold line as it is from a hinged connection between the top panel and said at least one of the first and second side wall panels.

15. The carton according to claim 7 wherein the first arms of the first substantially "V" shaped fold line extends into the top panel such that the first arms terminate adjacent opposed ends of the handle strap respectively.
16. The carton according to claim 7 wherein the handle strap is defined at least in part by a pair of elongate apertures struck from the top panel.
17. The carton according to claim 7 wherein a weakening feature interrupts the fold line, the weakening feature being formed in part in the top panel and in part in said at least one of the first and second side wall panels.
18. A blank for forming a carton, the blank comprising a plurality of panels for forming a tubular structure including a top panel, a first side wall panel, a second side wall panel and a base panel, the blank comprising a handle structure defined at least in the top panel, the handle structure comprising a handle strap, wherein the blank comprises a relief structure for controlling and directing deformation of the top panel and at least one of the first and second side wall panels in a set-up carton, the relief structure comprising a fold line extending from the handle strap across the top panel and into said at least one of the first and second side wall panels, wherein a weakening feature interrupts the fold line, the weakening feature being formed in part in the top panel and in part in said at least one of the first and second side wall panels.
19. The blank according to claim 18 wherein the weakening feature comprises one selected from the group consisting of a slit, an interrupted slit, a half cut, an interrupted half cut, and a combination thereof, the weakening feature extending collinear with the fold line.
20. A blank for forming a carton, the blank comprising a plurality of panels for forming a tubular structure including a top panel, a first side wall panel, a second side wall panel and a base panel, the blank comprising a handle structure defined at least in the top panel, the handle structure comprising a handle strap, wherein the blank comprises a relief structure for controlling and directing deformation of the top panel and at least one of the first and second side wall panels in a setup carton, the relief structure comprising a fold line extending from the handle strap across the top panel and into said at least one of the first and second side wall panels, the relief structure further comprising a first substantially "V" shaped fold line defined in said at least one of the first and second side wall panels and a second substantially "V" shaped fold line defined in said at least one of

the first and second side wall panels, wherein the first substantially "V" shaped fold line comprises a pair of first arms which meet at a first point of intersection, and the second substantially "V" shaped fold line comprises a pair of second arms which meet at a second point of intersection, the first and second points of intersection being disposed along the fold line and spaced from each other.

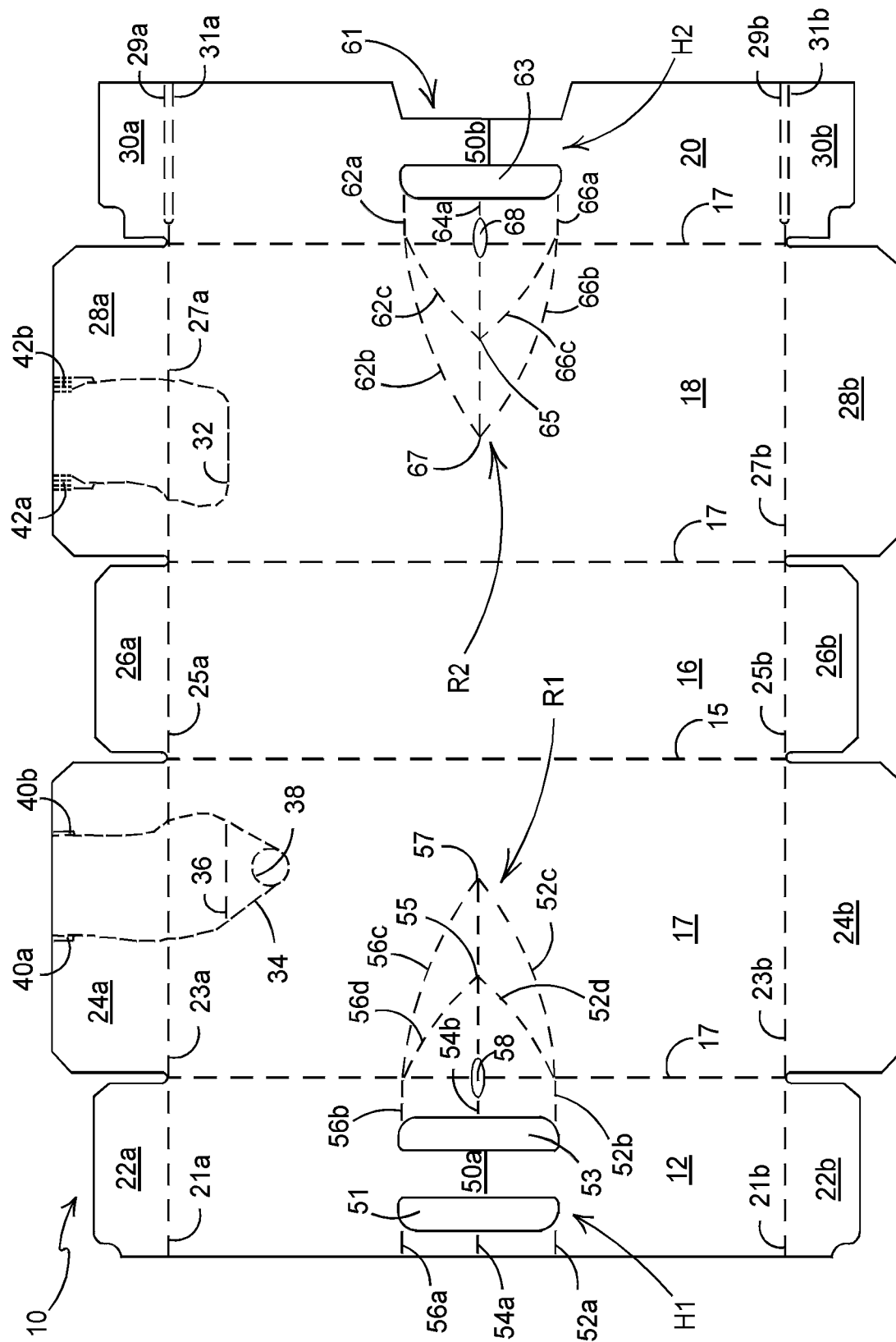


FIGURE 1

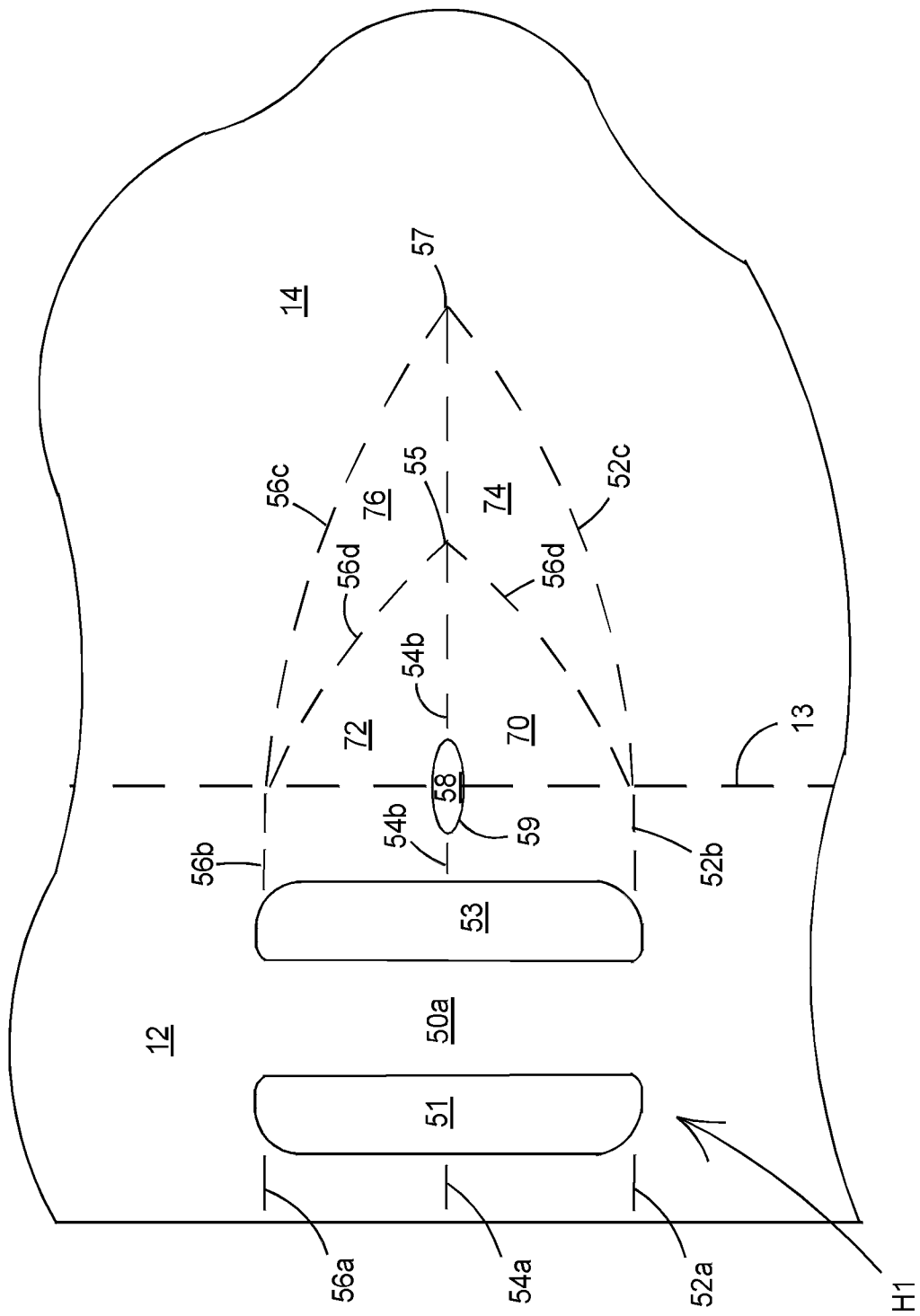


FIGURE 2

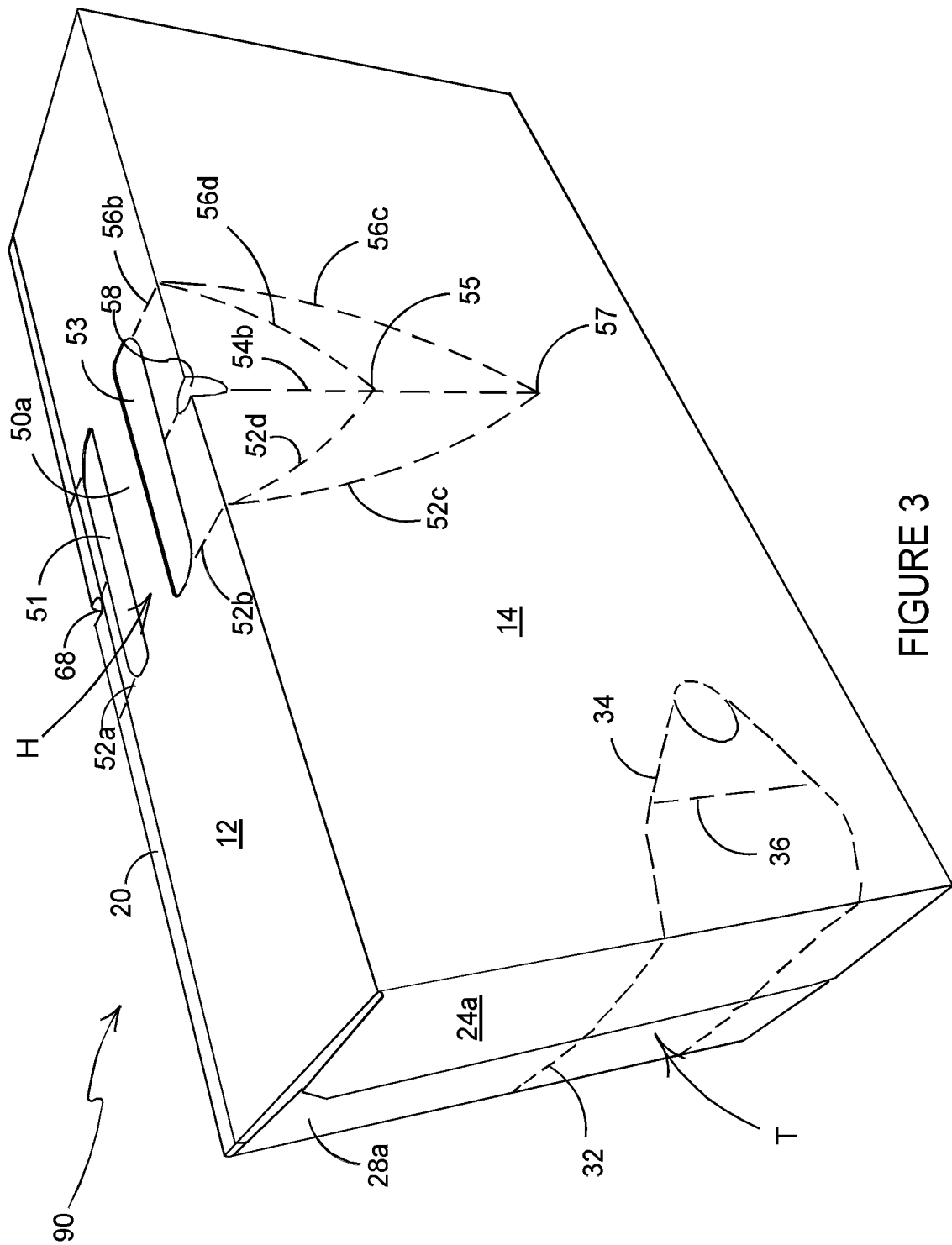


FIGURE 3

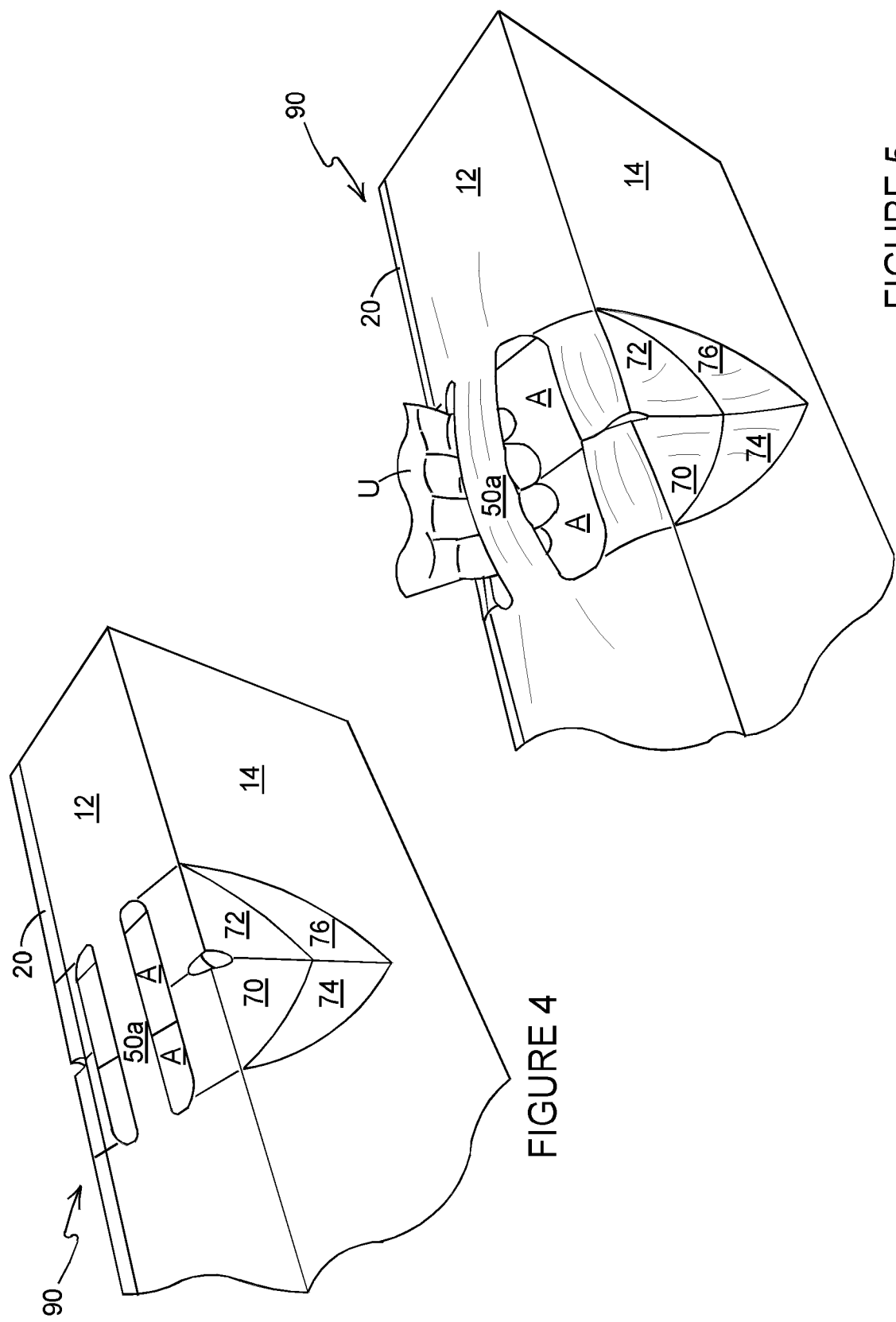


FIGURE 5

FIGURE 4

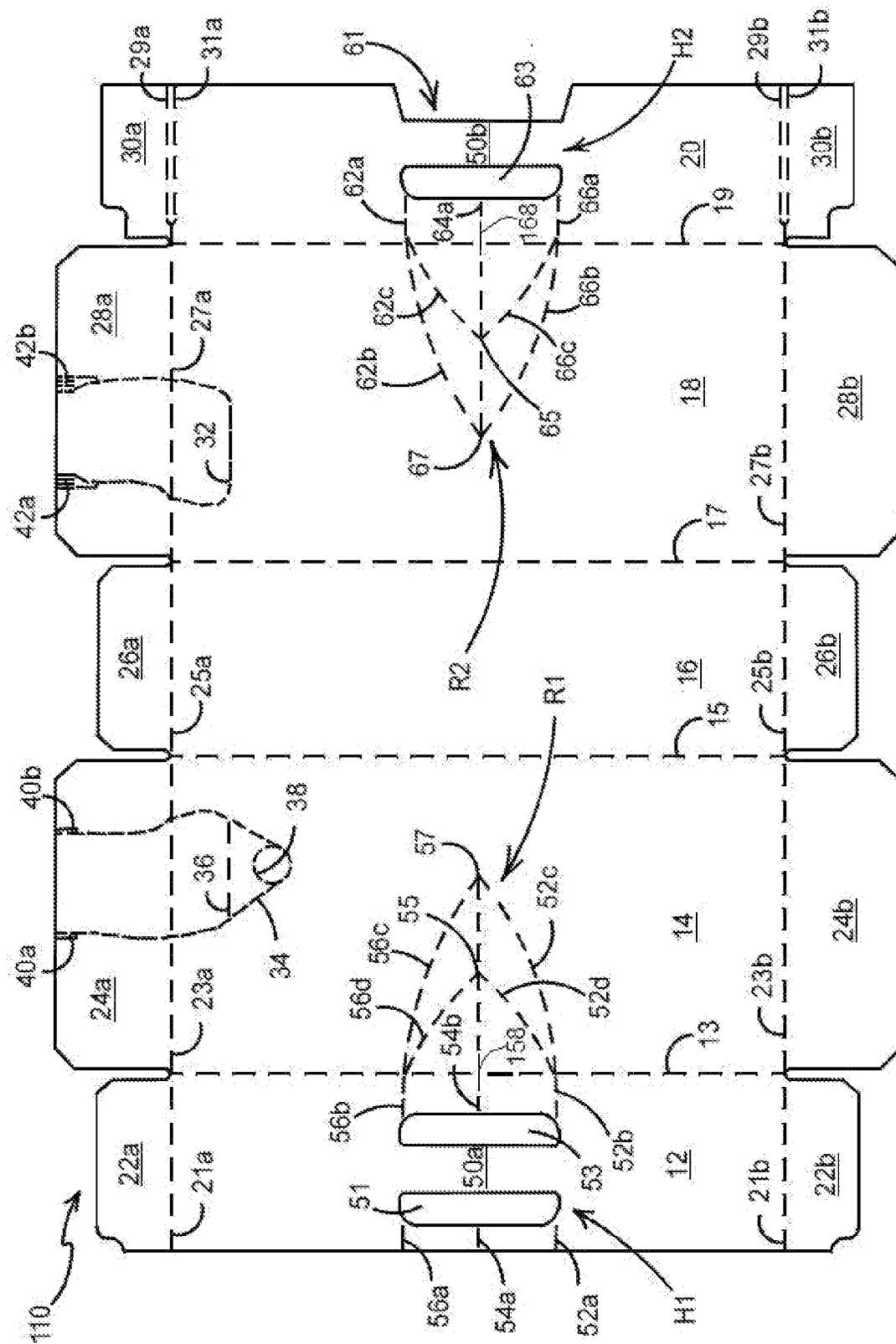


FIGURE 6

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2014/043872

A. CLASSIFICATION OF SUBJECT MATTER

INV. B65D71/36

ADD.

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)

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2002/079245 A1 (AUCLAIR JEAN-MICHEL [FR] ET AL) 27 June 2002 (2002-06-27) paragraph [0040] - paragraph [0042]; figures 1-4	1-6, 18, 19
A	US 2009/236408 A1 (SPIVEY SR RAYMOND R [US] ET AL) 24 September 2009 (2009-09-24) paragraph [0026] - paragraph [0027]; figures 1-9	7-17, 20
A	US 5 379 944 A (STOUT JAMES T [US] ET AL) 10 January 1995 (1995-01-10) column 2, line 45 - line 58; figures 1-4	1, 18
A	EP 0 391 623 A1 (MEAD CORP [US]) 10 October 1990 (1990-10-10) column 4, line 14 - column 5, line 50; figures 1-3	7, 20



Further documents are listed in the continuation of Box C.



See patent family annex.

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"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

21 October 2014

Date of mailing of the international search report

29/10/2014

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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