(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
01 October 2020 (01.10.2020)

WIPO | PCT

(10) International Publication Number
WO 2020/198105 A1

(51) International Patent Classification:
B65D 71/30 (2006.01) *B65D 71/36* (2006.01)

(21) International Application Number:
PCT/US2020/024135

(22) International Filing Date:
23 March 2020 (23.03.2020)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
62/824,842 27 March 2019 (27.03.2019) US

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH,

(54) Title: CARTON AND CARTON BLANK

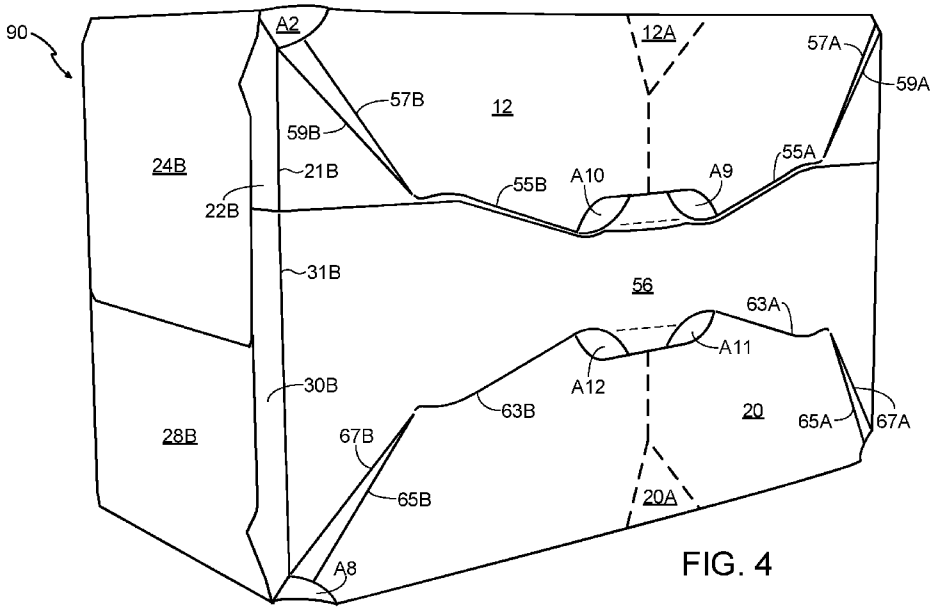


FIG. 4

(57) Abstract: A carton for packaging one or more articles B, the carton comprising a plurality of panels for forming a tubular structure including a top wall 12/20, a first side wall 14 and a second side wall 18. The top wall comprises filleted corners A1-A4 so as to be octagonal in shape. The filleted corners define free corner edges of the top wall. Each of the first and second side walls comprise at least two filleted corners so as to be at least hexagonal in shape. Each filleted corner of the top wall is disposed adjacent to a filleted corner of one of the first and second side walls. The carton comprises a handle structure defined in the top wall. The handle structure comprises a handle strap 54 extending longitudinally between opposed ends of the carton. The handle strap is defined at least in part by first and second severance lines 55A, 55B.

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GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

PATENT APPLICATION

CARTON AND CARTON BLANK

TECHNICAL FIELD

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 structure for controlling the load forces in the carton when the carrying handle is employed.

BACKGROUND

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 load forces in 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

According to a first aspect of the present invention there is provided a carton for packaging one or more articles, the carton comprises a plurality of panels for forming a tubular structure including a top wall, a first side wall and a second side wall. The top wall may comprise filleted corners so as to be octagonal in shape. The filleted corners define free corner edges of the top wall. Each of the first and second side walls comprise at least two filleted corners so as to be at least hexagonal in shape. Each free corner edge of the top wall is disposed adjacent to a filleted corner of one of the first and second side walls. The carton comprises a handle structure defined in the top wall. The handle structure comprises a handle strap extending longitudinally between opposed ends of the carton. The handle strap is defined at least in part by first and second severance lines.

Optionally, the handle structure comprises a pair of divergently arranged fold lines extending from each end of the first and second severance lines to an adjacent one of the free corner edges of the top wall.

Optionally, a first one of the pair of divergently arranged fold lines comprises a lower fold resistance than the other one of the pair of divergently arranged fold lines.

Optionally, each of the pairs of divergently arranged fold lines converge at an end of one of the first and second severance lines.

Optionally, each of the pairs of divergently arranged fold lines terminate at a free corner edge of the top wall so as to define a web, the web being displaceable out of the plane of the top wall when the handle is in use.

Optionally, opposed ends of the tubular structure are closed, at least in part by a top end closure flap hingedly connected to the top wall, the top end closure flap being displaceable inwardly when the handle is in use.

Optionally, the top wall is equal in length to each of the first and second side walls.

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 wall, a first side wall and a second side wall. The top wall may comprise at least two filleted corners so as to be at least hexagonal in shape. The filleted corners define first and second free corner edges of the top wall. Each of the first and second side walls comprise at least one filleted corner. The first free corner edge of the top wall is disposed adjacent to the filleted corner of the first side wall and the second free corner edge of the top wall is disposed adjacent to the filleted corner of the second side wall. The carton comprise a handle structure defined in the top wall, the handle structure comprise a handle strap extending longitudinally between opposed ends of the carton. The handle strap is defined at least in part by first and second severance lines.

Optionally, the handle structure comprises a first pair of divergently arranged fold lines extending from a first end of the first severance line to the first free edge of the top wall and a second pair of divergently arranged fold lines extending from a first end of the second severance line to the second free edge of the top wall.

Optionally, a first end of the tubular structure is closed, at least in part by a top end closure flap hingedly connected to a first end of the top wall, the top end closure flap being displaceable inwardly when the handle is in use.

Optionally, a first one of the first pair of divergently arranged fold lines comprises a lower fold resistance than the other one of the first pair of divergently arranged fold lines.

Optionally, a first one of the second pair of divergently arranged fold lines comprises a lower fold resistance than the other one of the second pair of divergently arranged fold lines.

Optionally, the first and second pairs of divergently arranged fold lines terminate define a web, the web being displaceable out of the plane of the top wall when the handle is in use.

According to a third aspect of the present invention there is provided a blank for forming a carton. The blank comprises a plurality of panels for forming a tubular structure having a top wall, a first side wall and a second side wall. At least one of the plurality of panels forms a handle panel comprising at least two filleted corners. The filleted corners define first and second free corner edges of the handle panel. A further one of the plurality of panels hingedly connected to the handle panel comprises at least two filleted corners. The first free corner edge of the handle panel is disposed adjacent to a first one of the filleted corners of the further one of the plurality of panels and the second free corner edge of the handle panel is disposed adjacent to a second one of the filleted corners of the further one of the plurality of panels. The blank comprises a handle structure defined in the handle panel. The handle structure comprises a handle strap extending longitudinally between opposed ends of the blank. The handle strap is defined at least in part by a severance line.

Optionally, the handle structure comprises a first pair of divergently arranged fold lines extending from a first end of the first severance line to the first free edge of the handle panel and a second pair of divergently arranged fold lines extending from a second end of the first severance line to the second free edge of the handle panel.

Optionally, the blank comprises a second handle panel comprising at least two filleted corners. The filleted corners define first and second free corner edges of the second handle panel. Another one of the plurality of panels is hingedly connected to the second handle panel and comprises at least two filleted corners. The first free corner edge of the second handle panel is disposed adjacent to a first one of the filleted corners of said another one of the plurality of panels and the second free corner edge of the second handle panel is disposed adjacent to a

second one of the filleted corners of said another one of the plurality of panels. The blank comprises a handle structure defined in the second handle panel. The handle structure comprises a handle strap extending longitudinally between opposed ends of the blank. The handle strap is defined at least in part by a second severance line.

Optionally, the handle structure comprises a third pair of divergently arranged fold lines extending from a first end of the second severance line to the first free edge of the second handle panel and a fourth pair of divergently arranged fold lines extending from a second end of the second severance line to the second free edge of the second handle panel.

Within the scope of this application it is envisaged or intended that the various aspects, embodiments, examples, features and alternatives set out in the preceding paragraphs, in the claims and/or in the following description and drawings may be considered or taken independently or in any combination thereof.

Features or elements described in connection with, or relation to, one embodiment are applicable to all embodiments unless there is an incompatibility of features. One or more features or elements from one embodiment may be incorporated into, or combined with, any of the other embodiments disclosed herein, said features or elements extracted from said one embodiment may be included in addition to, or in replacement of one or more features or elements of said other embodiment.

A feature, or combination of features, of an embodiment disclosed herein may be extracted in isolation from other features of that embodiment. Alternatively, a feature, or combination of features, of an embodiment may be omitted from that embodiment.

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;

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

Figure 2 is a plan view from above of a blank for forming an optional insert or divider according to embodiments of the invention;

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

Figure 4 is a perspective view of the carton of Figure 3;

Figure 5 is a perspective view from above of the carton Figure 3 when a carrying handle is being employed; and

Figure 6 is a perspective view of a corner portion of the carton of Figure 5 in which a carrying handle is in a deployed condition.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

Detailed descriptions of specific embodiments of the package, blanks and cartons are 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, 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 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 90 as shown in Figures 3 to 5, which carton can accept an input of primary products such as, but not limited to, bottles or cans, hereinafter referred to as "articles" B.

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

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.

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 embodiment illustrated in Figure 1, the blank 10 is configured to form a carton or carrier 90 for packaging an exemplary arrangement of exemplary articles B. In the illustrated embodiment the arrangement is an m x n x t matrix or array, having three rows (m=3) and six columns (n=6) and two tiers (t=2); in the illustrated embodiment three rows of six articles B are provided in two tiers, and the articles B are 350ml cans; the cans may be formed from a suitable material such as, but not limited to, Aluminium. The blank 10 can be alternatively configured to form a carrier 90 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 for forming a tubular structure or sleeve. A first main or top panel 12 is hinged to a second main panel 14 (also referred to herein as a first side wall panel 14) by a fold line 13. The first side wall panel 14 is hinged to a third main panel 16 (also referred to herein as a base panel 16) by a fold line 15. The base panel 16 is hinged to a fourth main panel 18 (also referred to herein as a second side wall panel 18) by a fold line 17. The second side wall panel 18 is hinged to a fifth main panel 20 (also referred to herein as a second top panel 20) by a fold line 19.

The first and fifth main panels 12, 20 form a composite panel 12/20. The composite panel 12/20 forms the top panel (top wall) 12/20 when a handle structure H is in use as a carrying handle by a user. This top wall 12/20 is disposed optionally adjacent to the sides of the articles B. In this orientation, the top wall 12/20 is not disposed substantially planar to the tops or bottoms of the articles B held within the carton 90. In other words, the cylindrical axis of the articles B is substantially parallel with the plane of the top wall 12/20 of the carton 90.

Either one of the second or fourth main panels 14, 18 may form a base panel when the carton 90 is being loaded with articles B. A group of articles B may be inserted into the tubular

structure by sliding the group over the said one of the second or fourth main panels 14, 18 forming the base.

The third main panel 16 forms the base panel 16 when the handle structure H is in use as a carrying handle by a user. The third main panel 16 may also form the base panel 12 when the articles B are being dispensed from the carton 90 or when the carton 90 is at rest upon a surface such as a shelf.

As such, it will be understood that descriptive terms “top”, “base”, and “side” do not necessarily limit the carton 90 to adopting a particular orientation but serve to distinguish those panels from one another. In other embodiments the cylindrical axis of the articles B may be orientated differently with respect to the top wall 12/20 of the carton 90. For example, but not limited to, the cylindrical axis of the articles B be may orientated substantially perpendicularly to the plane of the top wall 12/20 of the carton 90.

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 27a; a fourth end closure panel 28a is hinged to the second side wall panel 18 by a fold line 29a and a fifth end closure panel 30a is hinged to the second top panel 20 by a fold line 31a.

The first end closure panel 22a and fifth end closure panel 30a form a composite end closure panel 22a/30a. The first end closure panel 22a and fifth end closure panel 30a form a first minor or top end closure flap 22a/30a or dust flap.

The third end closure panel 26a forms a minor or lower end closure flap 26a or dust flap.

The second and fourth enclosure panel 24a, 28a form major end flaps or side end flaps.

The first group of end closure panels 22a, 24a, 26a, 28a, 30a are coupled one to the next by a web panel 32a, 34a, 36a, 40a. A first web panel 32a is hingedly connected to the first end

closure panel 22a by a hinged connection in the form of a fold line 33a. The first web panel 32a is hingedly connected to the second end closure panel 24a by a hinged connection in the form of a fold line 35a. A second web panel 34a is hingedly connected to the second end closure panel 24a by a hinged connection in the form of a fold line 37a. The second web panel 34a is hingedly connected to the third end closure panel 26a by a hinged connection in the form of a fold line 39a. A third web panel 36a is hingedly connected to the third end closure panel 26a by a hinged connection in the form of a fold line 41a. The third web panel 36a is hingedly connected to the fourth end closure panel 28a by a hinged connection in the form of a fold line 43a. A fourth web panel 40a is hingedly connected to the fourth end closure panel 28a by a hinged connection in the form of a fold line 45a. The fourth web panel 40a is hingedly connected to the fifth end closure panel 30a by a hinged connection in the form of a fold line 47a.

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 27b; a ninth end closure panel 28b is hinged to the second side wall panel 18 by a fold line 29b, and a tenth end closure panel 30b is hinged to the second top panel 20 by a fold line 31b.

The sixth end closure panel 22b and tenth end closure panel 30b form a composite end closure panel 22b/30b. The sixth end closure panel 22b and tenth end closure panel 30b form a second minor or top end closure flap 22a/30a or dust flap.

The eighth end closure panel 26b forms a minor or lower end closure flap 26b or dust flap.

The seventh and ninth enclosure panel 24b, 28b form major end flaps or side end flaps.

The fold lines 21a, 23a, 27a, 29a, 31a are collinear with each other, the fold lines 21b, 23b, 27b, 29b, 31b are collinear with each other, such that first top panel 12, first side panel 14, base panel 16, second side panel 18 and second top panel 20 are equal in length.

The second group of end closure panels 22b, 24b, 26b, 28b, 30b are coupled one to the next by a web panel 32b, 34b, 36b, 40b. A fifth web panel 32b is hingedly connected to the sixth end closure panel 22b by a hinged connection in the form of a fold line 33b. The fifth web panel 32b is hingedly connected to the seventh end closure panel 24b by a hinged connection in the form of a fold line 35b. A sixth web panel 34b is hingedly connected to the seventh end closure panel 24b by a hinged connection in the form of a fold line 37b. The sixth web panel

34b is hingedly connected to the eighth end closure panel 26b by a hinged connection in the form of a fold line 39b. A seventh web panel 36b is hingedly connected to the eighth end closure panel 26b by a hinged connection in the form of a fold line 41b. The seventh web panel 36b is hingedly connected to the ninth end closure panel 28b by a hinged connection in the form of a fold line 43b. An eighth web panel 40b is hingedly connected to the ninth end closure panel 28b by a hinged connection in the form of a fold line 45b. The eighth web panel 40b is hingedly connected to the tenth end closure panel 30b by a hinged connection in the form of a fold line 47b.

The blank 10 comprises a first cutaway A1 in the form of an aperture. The first cutaway A1 is struck in part from, or defined in part by, each of the first top panel 12, first side panel 14, first end closure panel 22a, first web panel 32a and second end closure panel 24a.

The blank 10 comprises a second cutaway A2 in the form of an aperture. The second cutaway A2 is struck in part from, or defined in part by, each of the first top panel 12, first side panel 14, sixth end closure panel 22b, fifth web panel 32b and seventh end closure panel 24b.

The blank 10 comprises a third cutaway A3 in the form of an aperture. The third cutaway A3 is struck in part from, or defined in part by, each of the first side panel 14, base panel 16, second end closure panel 24a, second web panel 34a and third end closure panel 26a.

The blank 10 comprises a fourth cutaway A4 in the form of an aperture. The fourth cutaway A4 is struck in part from, or defined in part by, each of the first side panel 14, base panel 16, seventh end closure panel 24b, sixth web panel 34b and eighth end closure panel 26b.

The blank 10 comprises a fifth cutaway A5 in the form of an aperture. The fifth cutaway A5 is struck in part from, or defined in part by, each of the base panel 16, second side panel 18, third end closure panel 26a, third web panel 36a and fourth end closure panel 28a.

The blank 10 comprises a sixth cutaway A6 in the form of an aperture. The sixth cutaway A6 is struck in part from, or defined in part by, each of the base panel 16, second side panel 18, eighth end closure panel 26b, seventh web panel 36b and ninth end closure panel 28b.

The blank 10 comprises a seventh cutaway A7 in the form of an aperture. The seventh cutaway A7 is struck in part from, or defined in part by, each of the second side panel 18, second top panel 20, fourth end closure panel 28a, fourth web panel 40a and fifth end closure panel 30a.

The blank 10 comprises an eighth cutaway A8 in the form of an aperture. The eighth cutaway A8 is struck in part from, or defined in part by, each of the second side panel 18, second top panel 20, ninth end closure panel 28b, eighth web panel 40b and tenth end closure panel 30b.

The first, second, third and fourth cutaways A1, A2, A3, A4 define chamfered, recessed, filleted or rounded corners of the first side panel 14, such that the first side panel 14 is substantially octagonal in shape.

The fifth, sixth, seventh and eighth cutaways A5, A6, A7, A8 define chamfered, recessed, filleted or rounded corners of the second side panel 18, such that the second side panel 18 is substantially octagonal in shape.

The third, fourth, fifth and sixth cutaways A3, A4, A5, A6 define chamfered, recessed, filleted or rounded corners of the base panel 16, such that the base panel 16 is substantially octagonal in shape.

The third, fourth, fifth and sixth cutaways A3, A4, A5, A6 are optional and in some embodiments may be omitted, in such embodiments the base panel 16 may be substantially rectangular and the first and second side panel 14, 18 may be substantially hexagonal in shape

The first and second cutaways A1, A2 define chamfered, recessed, filleted or rounded corners of the first top panel 12. The seventh and eighth cutaways A7, A8 define chamfered, recessed, filleted or rounded corners of the second top panel 20. In this way the composite top panel 12/20 formed from the first and second top panels 12, 20 is substantially octagonal in shape. The filleted corners define free edges of the composite top panel 12/20 herein after referred to as free corner edges.

In the illustrated embodiment the first and second side panels 14, 18 comprise convex filleted corners.

In the illustrated embodiment the base panel 16 and composite top panel 12/20 comprise concave filleted corners.

The blank 10 comprises a handle structure denoted generally by reference signs H1 and H2.

The first top panel 12 comprises a first portion H1 of the handle structure, the first portion H1 comprises a first strap member 54 having a central region and opposed end regions with a tapered region mediate the central region and each of the end regions. First strap member 54 is defined at least part by a pair of severance lines 55a, 55b extending substantially longitudinally (between the first and sixth end closure panels 22a, 22b) of the first top panel 12. The severance lines 55a, 55b take the form of preformed, perforated tear lines defined by a plurality of perforations or cuts.

The pair of severance lines 55a, 55b are spaced apart by a first handle opening, the handle opening is defined in part by a first and second handle aperture A9, A10 and by a first cushioning flap 52. The first cushioning flap 52 is hinged to a first or outer side of the first strap member 54 by a hinged connection in the form of a fold line 53.

The first strap member 54 may comprise a reinforcing member 50 hinged to a second side of the first strap member 54 by a hinged connection in the form of a fold line 51. The second side opposes the first side.

The first portion H1 of the handle structure comprises a first pair of stress diverting score or fold lines 57a, 59a extending from an outer end of a first one 55a of the pair of severance lines 55a, 55b. The first pair of stress diverting score or fold lines 57a, 59a are divergently arranged with respect to each other. The first pair of stress diverting score or fold lines 57a, 59a each terminate at the first cutaway A1. The first pair of stress diverting score or fold lines 57a, 59a each terminate at a first corner edge of the composite top panel 12/20. The first pair of stress diverting score or fold lines 57a, 59a extend from the edge of the first top panel 12 defined by the first cutaway A1 to a terminal end of the first severance line 55a. The first pair of stress diverting score or fold lines 57a, 59a converge at the terminal end of the first severance line 55a. A first web is defined, at least in part between the first pair of stress diverting fold lines 57a, 59a.

A first stress diverting fold line 57a may line upon a notional line extending between the terminal end of the first severance line 55a and a notional point of intersection between the fold line 13 and the fold line 21a.

A second stress diverting fold line 59a may extend between the terminal end of the first severance line 55a and a point of intersection between the fold line 21a and the first cutaway A1.

The first portion H1 of the handle structure comprises a second pair of stress diverting score or fold lines 57b, 59b extending from an outer end of a second one 55b of the pair of severance lines 55a, 55b.

The second pair of stress diverting score or fold lines 57b, 59b are divergently arranged with respect to each other. The second pair of stress diverting score or fold lines 57b, 59b each terminate at the second cutaway A2. The second pair of stress diverting score or fold lines 57b, 59b each terminate at a second corner edge of the composite top panel 12/20. The second pair of stress diverting score or fold lines 57b, 59b extend from the edge of the first top panel 12 defined by the second cutaway A2 to a terminal end of the second severance line 55b. The second pair of stress diverting score or fold lines 57b, 59b converge at the terminal end of the second severance line 55b. A second web is defined, at least in part between the second pair of stress diverting score or fold lines 57b, 59b.

A third stress diverting fold line 57b may line upon a notional line extending between the terminal end of the second severance line 55b and a notional point of intersection between the fold line 13 and the fold line 21b.

A fourth stress diverting fold line 59b may extend between the terminal end of the second severance line 55b and a point of intersection between the fold line 21b and the second cutaway A2.

The first and second webs extend diagonally from the chamfered, filleted or free corner edges of the first top panel 12. The first web is divergently arranged with respect to the second web.

The second top panel 20 comprises a second portion H2 of the handle structure, the second portion H2 comprises a second strap member 56 having a central region and opposed end regions with a tapered region mediate the central region and each of the end regions. Second strap member 56 is defined at least part by a pair of severance lines 63a, 63b extending substantially longitudinally (between the fourth and tenth end closure panels 30a, 30b) of the second top panel 20. The severance lines 63a, 63b take the form of preformed, perforated tear lines defined by a plurality of perforations or cuts.

The pair of severance lines 63a, 63b, comprising a third severance lines 63a and a fourth severance line 63b, are spaced apart by a second handle opening, the handle opening is defined in part by a third and fourth handle aperture A11, A12 and by a second cushioning

flap 58. The second cushioning flap 58 is hinged to a first or outer side of the second strap member 56 by a hinged connection in the form of a fold line 61.

The second portion H2 of the handle structure comprises a third pair of stress diverting score or fold lines 65a, 67a extending from an outer end of a third severance line 63a. The third pair of stress diverting score or fold lines 65a, 67a are divergently arranged with respect to each other. The third pair of stress diverting score or fold lines 65a, 67a each terminate at the seventh cutaway A7. The third pair of stress diverting score or fold lines 65a, 67a each terminate at a third corner edge of the composite top panel 12/20. The third pair of stress diverting score or fold lines 65a, 67a extend from the edge of the second top panel 20 defined by the seventh cutaway A7 to a terminal end of the third severance line 63a. The third pair of stress diverting score or fold lines 65a, 67a converge at the terminal end of the third severance line 63a. A third web is defined, at least in part between the third pair of stress diverting fold lines 65a, 67a.

A fifth stress diverting fold line 65a may line upon a notional line extending between the terminal end of the third severance line 63a and a notional point of intersection between the fold line 19 and the fold line 31a.

A sixth stress diverting fold line 67a may extend between the terminal end of the third severance line 63a and a point of intersection between the fold line 31a and the seventh cutaway A7.

The second portion H2 of the handle structure comprises a fourth pair of stress diverting score or fold lines 65b, 67b extending from an outer end of the fourth severance line 63b.

The fourth pair of stress diverting score or fold lines 65b, 67b are divergently arranged with respect to each other. The fourth pair of stress diverting score or fold lines 65b, 67b each terminate at the eighth cutaway A8. The fourth pair of stress diverting score or fold lines 65b, 67b each terminate at a fourth corner edge of the composite top panel 12/20. The fourth pair of stress diverting score or fold lines 65b, 67b extend from the edge of the second top panel 20 defined by the eighth cutaway A8 to a terminal end of the fourth severance line 63b, the fourth pair of stress diverting score or fold lines 65b, 67b converge at the terminal end of the fourth severance line 63b. A fourth web is defined, at least in part between the fourth pair of stress diverting score or fold lines 65b, 67b.

A seventh stress diverting fold lines 65b may line upon a notional line extending between the terminal end of the fourth severance line 63b and a notional point of intersection between the fold line 19 and the fold line 31b, see Figure 1A.

An eighth stress diverting fold lines 67b may extend between the terminal end of the fourth severance line 63b and a point of intersection between the fold line 31b and the eighth cutaway A8.

The third and fourth webs extend diagonally from the chamfered, filleted or free corner edges of the second top panel 12. The third web is divergently arranged with respect to the fourth web.

The first web is divergently arranged with respect to the third web. The second web is divergently arranged with respect to the fourth web.

Referring now to Figure 1A, an enlarged view of a corner of the second top panel 20 is illustrated. The seventh and eighth stress diverting fold lines 65b, 67b are shown in detail, the first, second, third, fourth, fifth and sixth stress diverting fold lines 57a, 59a, 57b, 59b, 65a, 67a are similarly arranged. The seventh and eighth stress diverting fold lines 65b, 67b each comprise at least one cut line or perforation C3, C4. The seventh stress diverting fold line 65b comprises three cut lines C3 each of the cut lines C3 is disposed collinearly with the preformed fold line 65b. The eighth stress diverting fold line 67b comprises two cut lines C4 each of the cut lines C4 is disposed collinearly with the preformed fold line 67b. The cut lines C3, C4 may be considered to interrupt the respective one of the seventh and eighth stress diverting fold lines 65b, 67b.

The cut lines C3, C4 may weaken or reduce the fold resistance of the seventh and eighth stress diverting fold lines 65b, 67b making the fold lines 65b, 67b easier to fold when the carrying handle is in use. The cut lines C3, C4 can be considered to be fold resistance reduction devices.

The seventh stress diverting fold line 65b comprises a greater number of cut lines than the eighth stress diverting fold line 67b. In this way the fold resistance of the seventh stress diverting fold line 65b may be less than that of the eighth stress diverting fold line 67b.

The reduced fold resistance of the seventh stress diverting fold line 65b compared to the eighth stress diverting fold line 67b may lead the seventh stress diverting fold line 65b to fold prior to or in advance of the eighth stress diverting fold line 67b.

This preferential sequence of folding defines that the first, third, fifth and seventh stress diverting fold line 57a, 57b, 65a, 65b take an elevated position with respect to the second, fourth, sixth or eighth stress diverting fold line 59a, 59b, 67a, 67b, best shown in Figure 6.

In other embodiments, alternative fold resistance control devices may be employed. The first, third, fifth and seventh stress diverting fold line 57a, 57b, 65a, 65b may be employ a fold resistance reduction device or structure such that they are more readily folded than the second, fourth, sixth or eighth stress diverting fold line 59a, 59b, 67a, 67b, for example the cut lines may be replaced with one or more cutaways, apertures, slots or slits, half depth cuts.

Optionally, the blank 10 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 the first top panel 12.

The first relief structure R1 comprises a first linear fold line 70, which extends at a proximal end from the first handle opening transversely across a portion of the first top panel 12 towards the fold line 13. A pair of divergently arranged fold lines 72, 74 extend from a distal end of the first linear fold line 70 to intersect with the fold line 13. The pair of divergently arranged fold lines 72, 74 define, in part, a first top panel portion 12a therebetween.

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

The second relief structure R2 comprises a first linear fold line 70, which extends at a proximal end from the second handle opening transversely across a portion of the second top panel 20 towards the fold line 19. A pair of divergently arranged fold lines 72, 74 extend from a distal end of the first linear fold line 70 to intersect with the fold line 19. The pair of divergently arranged fold lines 72, 74 define, in part, a second top panel portion 20a therebetween.

The first and second relief structures R2 may be located substantially centrally in the respective one of the first and second top panels 12, 20, that is to say, substantially half way between the first and sixth or fifth and tenth end closure panels 22a, 22b; 30a, 30b.

Optionally, a second blank 110 may be provided to serve as an insert or buffer between the first and second tiers of articles B. The second blank 110 may comprise a main panel 112 having a substantially rectangular form. The main panel 112 may comprise chamfered or filleted corners similar to those of the first and second side panel 14, 18. The main panel 112 may comprise a pair of recesses C1, C2 on opposing side edges. One side edges of main panel 112 is disposed adjacent to the composite top panel 12/20.

Turning to the construction of the carton 90 as illustrated in Figures 3, 4 and 5, 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.

Glue G or other adhesive treatment is applied to the reinforcing member 50. In alternative embodiments glue or other adhesive treatment is applied to a portion of the first strap member 54.

The reinforcing member 50 is folded about fold line 51 to be brought into face contacting relationship with the first strap member 54. The reinforcing member 50 is secured to the first strap member 54.

The blank 10 is then folded about the fold line 15 such that the first top panel 12 is brought into face to face relationship with a portion of the second side panel 18 and a portion of the base panel 16. The first side panel 14 is brought into face to face relationship with the base panel 16.

Glue G or other adhesive treatment is applied to the first top panel 12 in particular to the first strap member 54 and regions of the first top panel which overlap with the second top panel 20 when the second top panel 20 is folded about fold line 19 into face to face relationship with the first top panel 12. In alternative embodiments glue or other adhesive treatment is applied to the second top panel 20 in particular the second strap member 56.

Glue G or other adhesive treatment is applied to regions of the first end closure panel 22a and the sixth end closure panel 22b.

The second top panel 20 is folded about fold line 19 into face contacting relationship with the first top panel 12. The second top panel 20 is secured to the first top panel 12.

The fifth end closure panel 30a is brought into overlapping relationship with the first end closure panel 22a, the tenth end closure panel 30b is brought into overlapping relationship with the sixth end closure panel 22b.

The fifth end closure panel 30a is secured to the first end closure panel 22a. The tenth end closure panel 30b is secured to the sixth end closure panel 22b.

In this way a flat collapsed 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 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 B by inserting the articles B through one or both of the open ends of the tubular structure. The insert 110 may be placed between two tiers of articles B. 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 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 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 may be 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 fourth end closure panel 28a, and may be secured to the first and third end closure panels 22a, 26a, 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 5 and 6 illustrate the handle structure of the carton 90 in use. Figure 4 illustrates the handle structure in a stowed or undeployed position. Figure 5 and 6 illustrate the handle structure in a deployed condition.

In the stowed position, it can be seen that the webs defined by the stress diverting fold lines 57a/59a, 57b/59b, 65a/67a, 65b/67b are coplanar with the top wall12/20. A carrying handle 54/56 formed from the first and second strap members 54, 56 is coplanar with the top wall12/20

When the carrying handle 54/56 is in use the top wall 12/20 deforms. The webs are fold about each of the pair of fold lines 57a/59a, 57b/59b, 65a/67a, 65b/67b partially defining them. The fold lines with the lower fold resistance, fold lines 57a, 57b, 65a, 65b adopt a higher elevation than the fold lines 59a, 59b, 67a, 67b with the higher fold resistance, best shown in Figure 6.

The webs and/or the pair of fold lines 57a/59a, 57b/59b, 65a/67a, 65b/67b partially defining them may direct load forces in the top wall 12/20 and carrying handle 54/56 into the corners of the carton 90. The webs and/or the pair of fold lines 57a/59a, 57b/59b, 65a/67a, 65b/67b may also control deformation of the carton 90 so as to tighten the carton 90 onto the group of articles B disposed inside. In this way the articles may serve as a brace, load forces may be transferred onto the brace.

The top end closure flaps 22a/30a, 22b/30b may be displaced inwardly, into a void between the carton 90 and the endmost articles in the upper most row of articles B. This inward displacement may allow the carrying handle to be displaced outwardly to create space or clearance between the carrying handle 54/56 and the top wall 12/20 of the carton 90. The inward displacement of the top end closure flaps 22a/30a, 22b/30b may be facilitated by the displacement of the webs. The fold lines 59a, 59b, 67a, 67b with the higher fold resistance may be considered to move inwardly from each end of the carton 90 towards the respective one of fold lines 57a, 57b, 65a, 65b with the lower fold resistance with which they are convergently arranged. The fold lines 59a, 59b, 67a, 67b may move inwardly so as to be disposed below a respective one of the fold lines 57a, 57b, 65a, 65b.

When the carrying handle 54/56 is in use the first top panel 12 and the second top panel 20 may deform adopting a nonplanar condition. The first and second relief structures R1, R2 may control the deformation. The first and second relief structures R1, R2 may further improve transfer of load forces onto the articles disposed within the carton 90.

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.

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 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 “severance line” refers to all manner of lines that facilitate separating portions of the substrate from one another, or that indicate optimal separation locations. Severance lines may be frangible or otherwise weakened lines, tear lines, cut lines, or slits.

It should be understood that hinged connection, severance lines 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 wall, a first side wall and a second side wall, the top wall comprising filleted corners so as to be octagonal in shape, the filleted corners defining free corner edges of the top wall, the top wall comprising opposed end edges each extending between a respective pair of the free corner edges, each of the first and second side walls comprising at least two filleted corners so as to be at least hexagonal in shape, and wherein each filleted corner of the top wall is disposed adjacent to a filleted corner of one of the first and second side walls, the carton comprising a handle structure defined in the top wall, the handle structure comprising a handle strap extending longitudinally between the opposed end edges of the top wall, wherein the handle strap is defined at least in part by first and second severance lines.

2. A carton according to claim 1 wherein the handle structure further comprises a pair of divergently arranged fold lines extending from each end of the first and second severance lines to an adjacent one of the free corner edges of the top wall.

3. A carton according to claim 2 wherein a first one of the pair of divergently arranged fold lines comprises a lower fold resistance than the other one of the pair of divergently arranged fold lines.

4. A carton according to claim 2 wherein each of the pairs of divergently arranged fold lines converge at an end of one of the first and second severance lines.

5. A carton according to claim 2 wherein each of the pairs of divergently arranged fold lines terminate at a free corner edge of the top wall so as to define a web, the web being displaceable out of the plane of the top wall when the handle is in use.

6. A carton according to claim 1 wherein opposed ends of the tubular structure are closed, at least in part by a top end closure flap hingedly connected to the top wall, the top end closure flap being displaceable inwardly when the handle is in use.

7. A carton according to claim 1 wherein the top wall is equal in length to each of the first and second side walls.

8. A carton for packaging one or more articles comprising a plurality of panels for forming a tubular structure including a top wall, a first side wall and a second side wall, the top wall

comprising at least two filleted corners so as to be at least hexagonal in shape, the filleted corners defining first and second free corner edges of the top wall, each of the first and second side walls comprising at least one filleted corner, and wherein the first free corner edge of the top wall is disposed adjacent to the filleted corner of the first side wall and the second free corner edge of the top wall is disposed adjacent to the filleted corner of the second side wall, the carton comprising a handle structure defined in the top wall, the handle structure comprising a handle strap extending longitudinally between opposed ends of the carton, wherein the handle strap is defined at least in part by first and second severance lines.

9. A carton according to claim 8 wherein the handle structure comprises a first pair of divergently arranged fold lines extending from a first end of the first severance line to the first free edge of the top wall and a second pair of divergently arranged fold lines extending from a first end of the second severance line to the second free edge of the top wall.

10. A carton according to claim 8 wherein a first end of the tubular structure is closed, at least in part by a top end closure flap hingedly connected to a first end of the top wall, the top end closure flap being displaceable inwardly when the handle is in use.

11. A carton according to claim 9 wherein a first one of the first pair of divergently arranged fold lines comprises a lower fold resistance than the other one of the first pair of divergently arranged fold lines.

12. A carton according to claim 9 wherein a first one of the second pair of divergently arranged fold lines comprises a lower fold resistance than the other one of the second pair of divergently arranged fold lines.

13. A carton according to claim 9 wherein the first and second pairs of divergently arranged fold lines terminate define a web, the web being displaceable out of the plane of the top wall when the handle is in use.

14. A blank for forming a carton, the blank comprising a plurality of panels for forming a tubular structure having a top wall, a first side wall and a second side wall, at least one of the plurality of panels forming a handle panel comprising at least two filleted corners, the filleted corners defining first and second free corner edges of the handle panel, a further one of the plurality of panels hingedly connected to the handle panel comprising at least two filleted corners, and wherein the first free corner edge of the handle panel is disposed

adjacent to a first one of the filleted corners of the further one of the plurality of panels and the second free corner edge of the handle panel is disposed adjacent to a second one of the filleted corners of the further one of the plurality of panels, the blank comprising a handle structure defined in the handle panel, the handle structure comprising a handle strap extending longitudinally between opposed ends of the blank, wherein the handle strap is defined at least in part by a severance line.

15. A blank according to claim 14 wherein the handle structure comprising a first pair of divergently arranged fold lines extending from a first end of the first severance line to the first free edge of the handle panel and a second pair of divergently arranged fold lines extending from a second end of the first severance line to the second free edge of the handle panel.

16. A blank according to claim 15 comprising a second handle panel comprising at least two filleted corners, the filleted corners defining first and second free corner edges of the second handle panel, wherein another one of the plurality of panels is hingedly connected to the second handle panel and comprises at least two filleted corners, and wherein the first free corner edge of the second handle panel is disposed adjacent to a first one of the filleted corners of said another one of the plurality of panels and the second free corner edge of the second handle panel is disposed adjacent to a second one of the filleted corners of said another one of the plurality of panels, the blank comprising a handle structure defined in the second handle panel, the handle structure comprising a handle strap extending longitudinally between opposed ends of the blank, wherein the handle strap is defined at least in part by a second severance line, the handle structure comprising a third pair of divergently arranged fold lines extending from a first end of the second severance line to the first free edge of the second handle panel and a fourth pair of divergently arranged fold lines extending from a second end of the second severance line to the second free edge of the second handle panel.

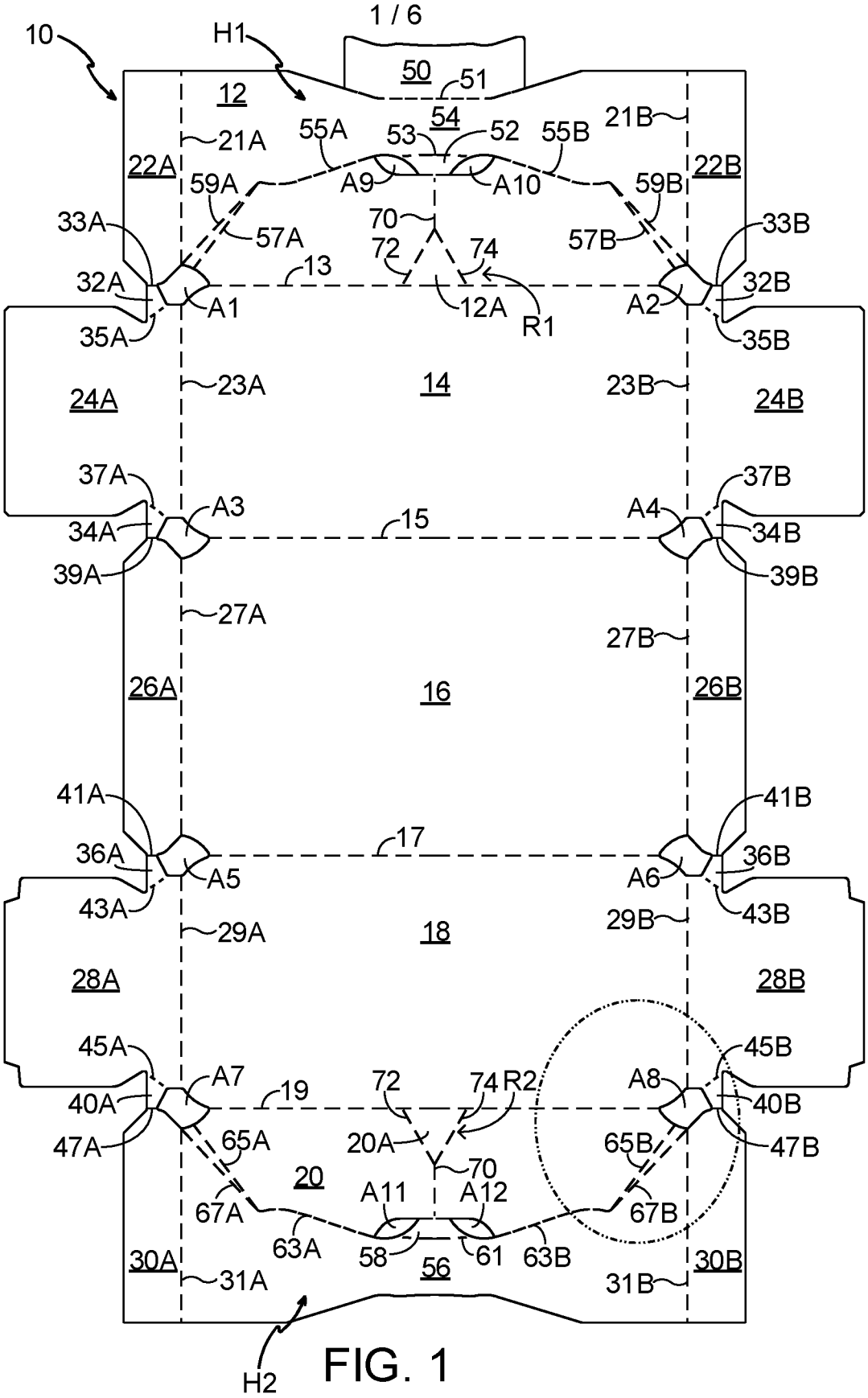

10
H1
50
51
12
54
21A
55A
53
52
55B
21B
22A
59A
A9
A10
59B
22B
33A
57A
70
72
74
57B
33B
32A
13
A1
12A
R1
A2
32B
35A
35B
24A
23A
14
23B
24B
37A
A3
15
A4
37B
34A
34B
39A
39B
27A
27B
26A
16
26B
41A
41B
17
36A
A5
A6
36B
43A
43B
29A
18
29B
28A
28B
45A
A7
19
72
74
R2
A8
45B
40A
40B
47A
65A
20A
Y
70
65B
47B
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31B
30B
H2

FIG. 1

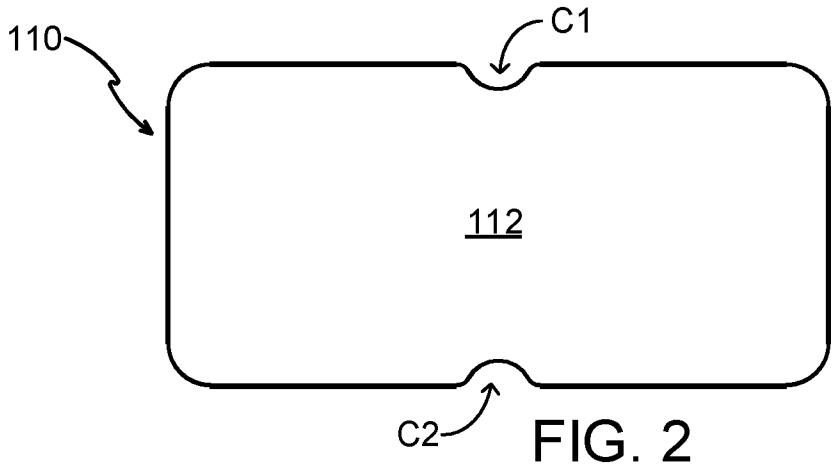

110
C1
112
C2

FIG. 2

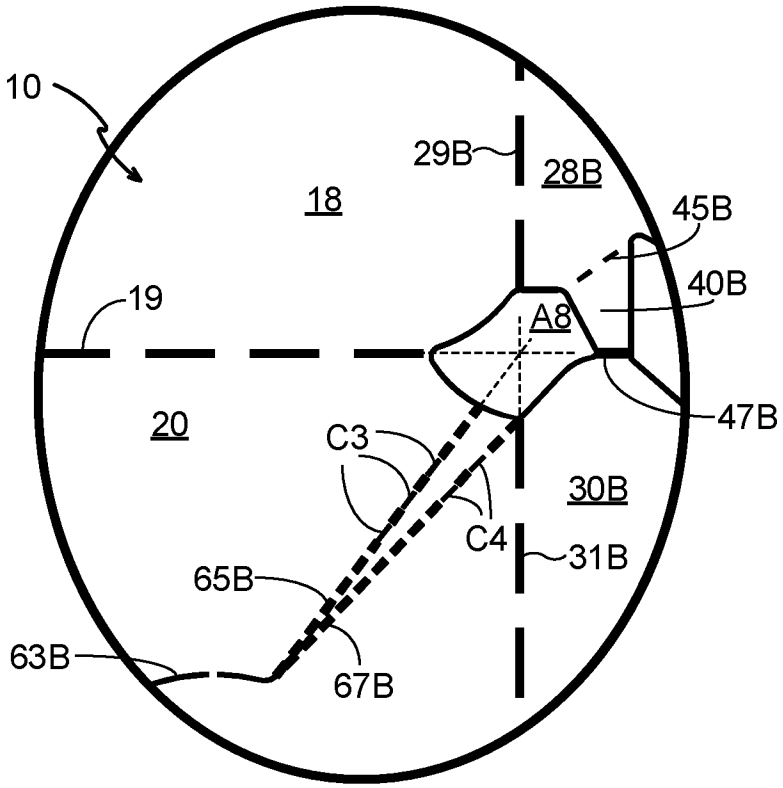

10
29B
28B
18
45B
40B
19
A8
47B
20
C3
30B
C4
31B
65B
63B
67B

FIG. 1A

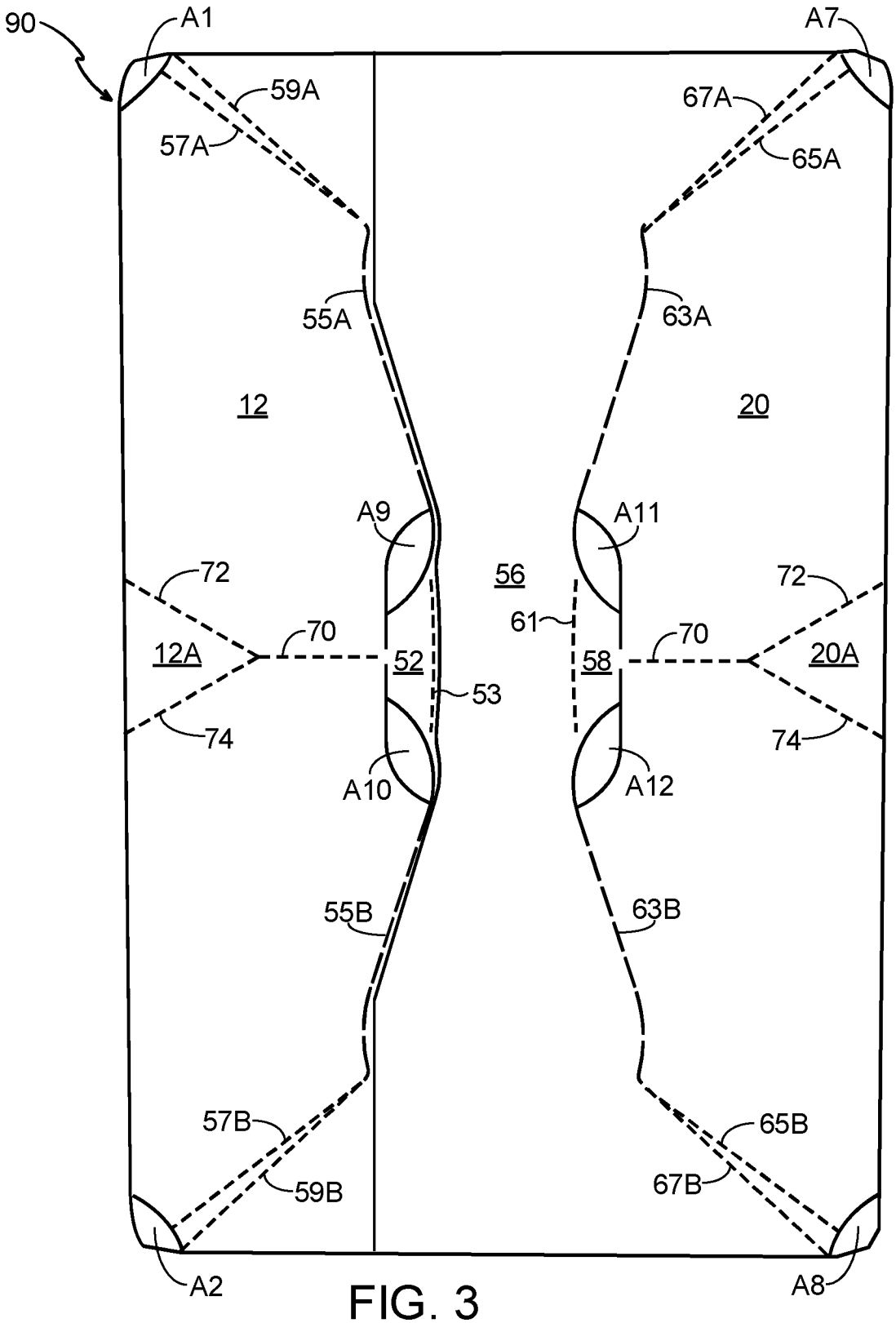

90
A1
A7
59A
57A
67A
65A
55A
63A
12
20
A9
A11
72
56
72
61
70
70
12A
52
58
20A
53
74
74
A10
A12
55B
63B
57B
65B
59B
67B
A2
A8

FIG. 3

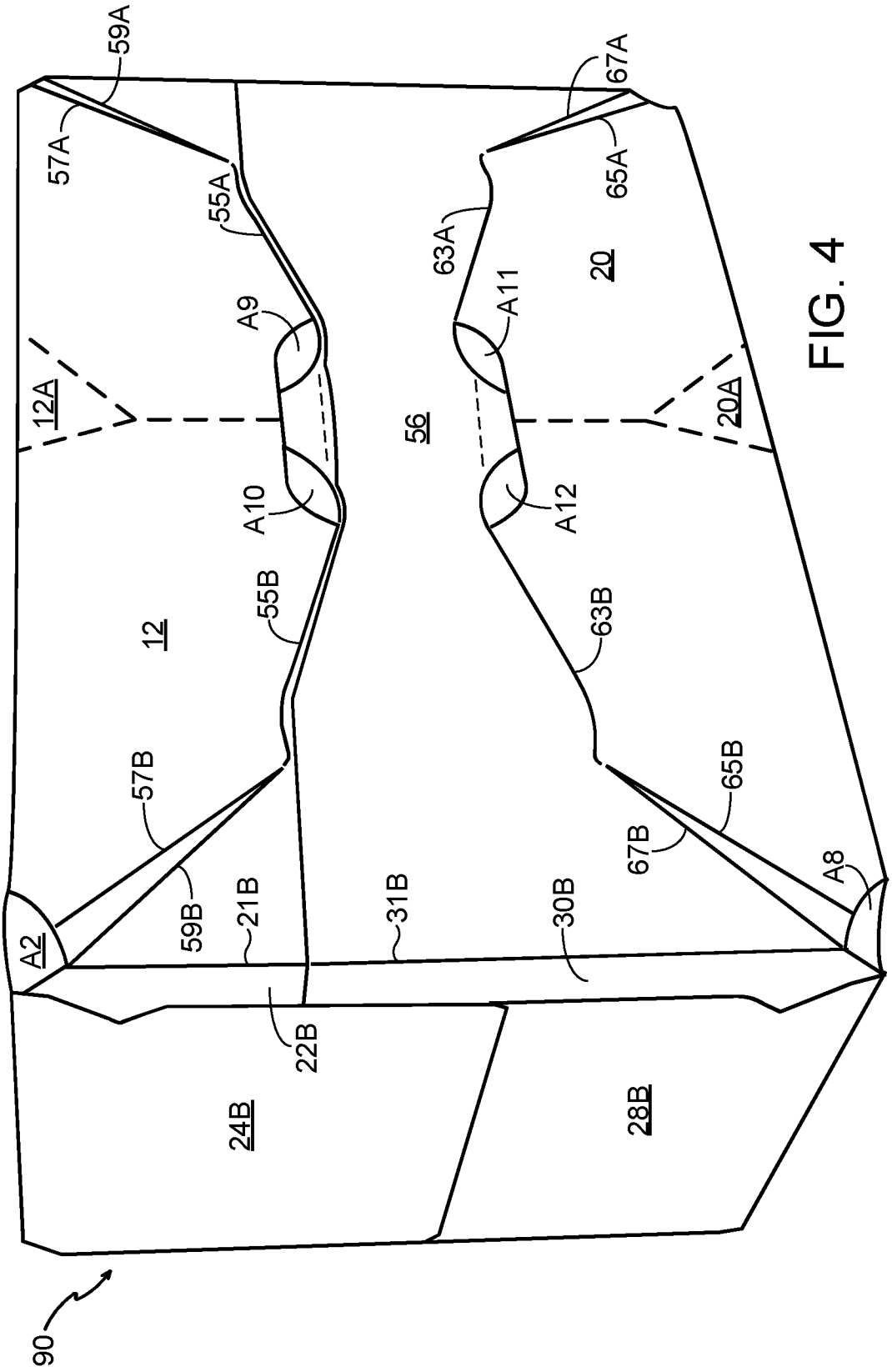

59A
57A
55A
A9
12A
A10
55B
12
57B
59B
21B
A2
22B
24B
90
67A
65A
63A
A11
20
56
A12
20A
63B
65B
67B
A8
31B
30B
28B

FIG. 4

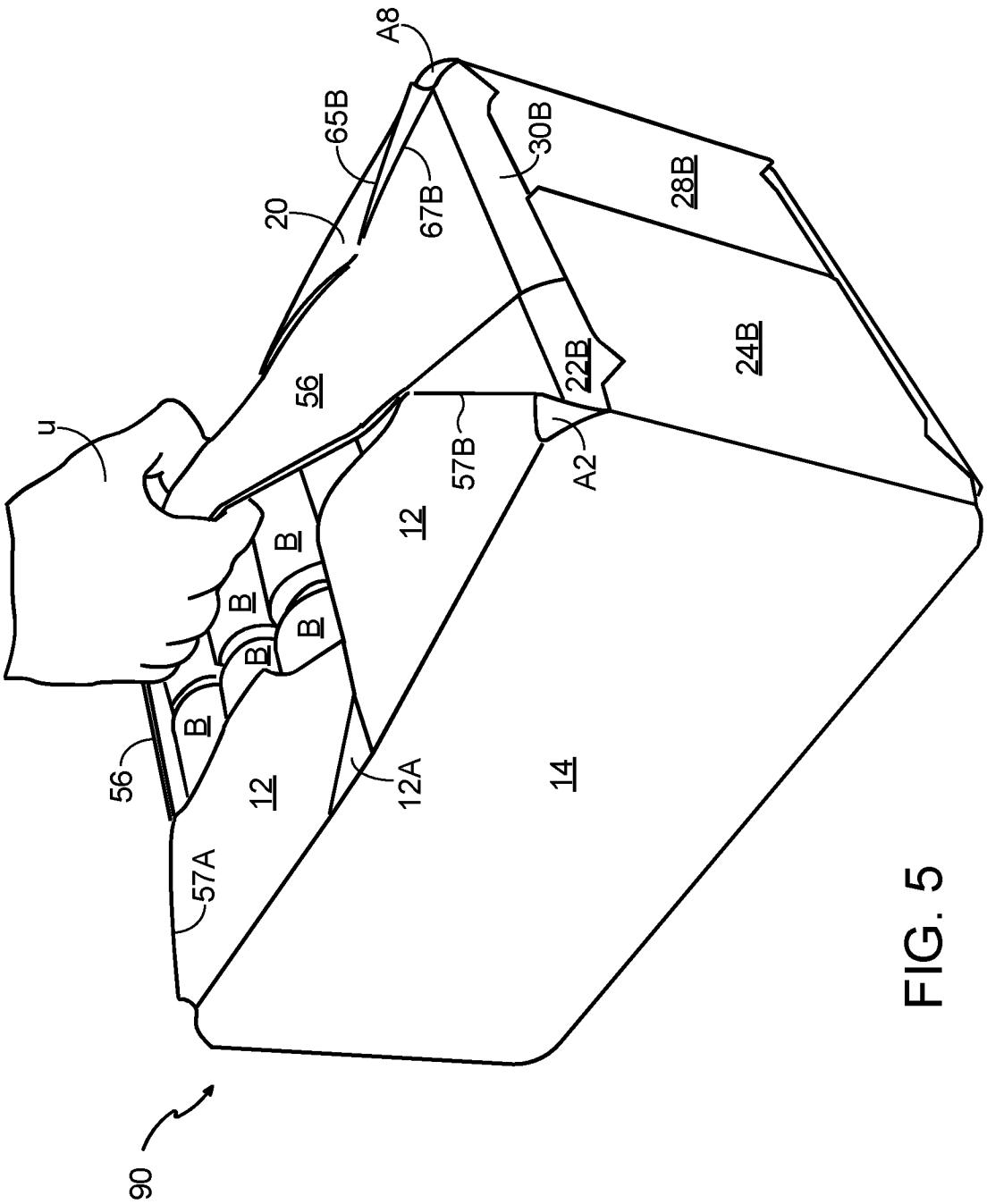

A8
65B
67B
20
30B
28B
24B
22B
56
57B
A2
u
12
B
B
B
B
B
56
12
12A
14
57A
90

FIG. 5

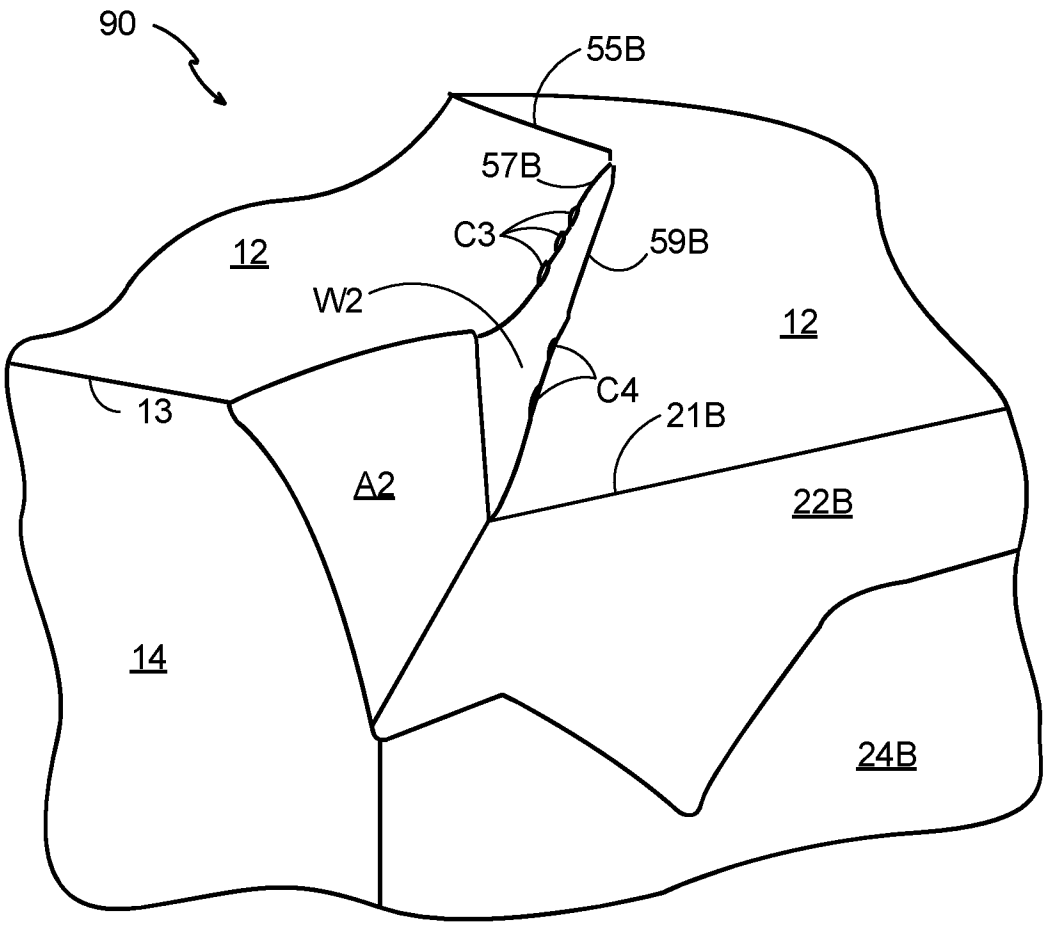


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2020/024135

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65D71/30 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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 480 091 A (STOUT JAMES T [US]) 2 January 1996 (1996-01-02)	1,2, 4-10, 13-16
A	column 4, line 24 - column 5, line 2; figures 4,5	3,11,12

Y	WO 96/38348 A1 (MEAD CORP [US]; LAMAMY MICHEL [FR]) 5 December 1996 (1996-12-05)	1,2, 4-10, 13-16
A	page 3, line 13 - page 5, line 16; figures	3,11,12

Y	WO 2006/127735 A1 (MEADWESTVACO PACKAGING SYSTEMS [US]; LEBRAS PHILIPPE [FR]) 30 November 2006 (2006-11-30)	1,2, 4-10, 13-16
A	page 10, line 26 - page 11, line 14; figure 1	3,11,12

☐ 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	Date of mailing of the international search report
15 June 2020	24/06/2020

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Serrano Galarraga, J

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2020/024135

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		DE 69603847 T2	10-02-2000
		DK 0824476 T3	06-12-1999
		EP 0824476 A1	25-02-1998
		ES 2135901 T3	01-11-1999
		GR 3031587 T3	31-01-2000
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