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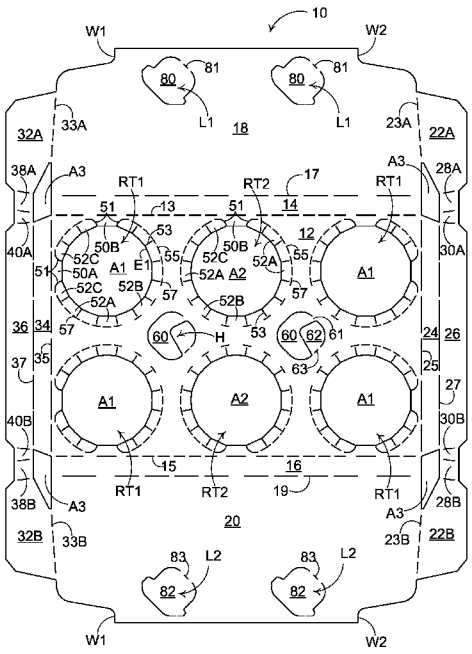


FIG. 1

(57) Abstract: Aspects of the disclosure relate to a packaging system, a package (P), article carriers (90; 1090; 2090; 3090) for packaging one or more articles and a joint member (190; 2190; 3190; 4190; 5190; 6190), and blanks (10; 110; 1010; 1110; 2010; 2110; 3010; 4110; 5110; 6110) for forming the article carriers (90; 1090; 2090; 3090) and joint member (190; 2190; 3190; 4190; 5190; 6190). The package P comprises a pair of sub-packages (90; 1090; 2090; 3090), including a first sub-package (90; 1090; 2090; 3090) and a second sub-package (90; 1090; 2090; 3090) disposed next to each other, or one on top of another, and a joint member (190; 2190; 3190; 4190; 5190; 6190), in the form of a handle strap, connecting the pair of sub-packages (90; 1090; 2090; 3090) together into a unitary tertiary package (P). The joint member (190; 2190; 3190; 4190; 5190; 6190) comprises a tubular structure disposed around the pair of sub-packages (90; 1090; 2090; 3090).

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ARTICLE CARRIER AND BLANK

TECHNICAL FIELD

The present invention relates to packaging, to article carriers and blanks for forming the same. More specifically, but not exclusively, the invention relates to a package comprising a plurality of carriers of the top-gripping type having one or more apertures for receiving and retaining an article therein and a handle strap binding the carriers together.

BACKGROUND

In the field of packaging, it is known to provide cartons for carrying multiple articles. Cartons are well known in the art and are useful for enabling consumers to transport, store and access a group of articles for consumption. 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. Further considerations are the strength of the carton and its suitability for holding and transporting large weights of articles. It is desirable that the contents of the carton are secure within the carton.

It is well known to provide top gripping article carriers in which an aperture is formed in a panel of the carrier, wherein tabs are struck from said panel and are arranged about the aperture. The tabs are displaced out of the plane of said panel when an article is received in the aperture, wherein said tabs engage the article generally about a flange or lip of the article.

It is desirable to provide a carrying handle for transportation of the article carrier. It is a further object of the present disclosure to provide a strap for binding or combining two or more article carrier together during transportation.

The present invention seeks to provide an improvement in the field of packaging, of cartons, typically formed from paperboard or the like, and apparatus for assembly of said cartons.

SUMMARY

A first aspect of the invention provides a package comprising a pair of sub-packages, including a first sub-package and a second sub-package disposed next to each other, and a joint member connecting the pair of sub-packages together into a unitary package. The joint member comprises a tubular structure having opposed open ends and disposed around each of the pair of sub-packages such that part of the first sub-package extends outwards from one of the opposed open ends of the tubular structure and part of the second sub-package extends outwards from the other one of the opposed open ends of the tubular structure. The tubular structure comprises first and second engaging openings or tabs in engagement with respective ones of the first and second sub-packages.

Optionally, the joint member provides a handle strap.

Optionally, the first and second engaging tabs are hinged to a top panel of the tubular structure by respective first and second fold lines, the first and second fold lines are divergently arranged with respect to each other to encourage the first and second sub-packages towards each other.

Optionally, the first and second engaging tabs are hinged to a top panel of the tubular structure by respective first and second fold lines, the first and second fold lines are divergently arranged with respect to each other to encourage the first and second sub-packages towards the middle of the top panel.

Optionally, the first and second engaging tabs are configured to engage a respective article in a first row or column of articles within one of the pair of sub-packages, the first row or column of articles being disposed proximate to the joint member and extending transversely with respect to a tubular axis of the joint member.

Optionally, the first and second engaging tabs are configured to engage an article in a second row or column of articles within one of the pair of sub-packages, the second row or column of articles being disposed distally from the joint member.

Optionally, the second row or column of articles is disposed adjacent to a first row or column of articles within the sub-packages disposed proximate to the joint member and extends transversely with respect to a tubular axis of the joint member.

Optionally, the article carrier comprises a plurality of engaging tabs hinged to a top panel of the tubular structure by respective fold lines, the plurality of engaging tabs configured to engage a respective article in each of a first and second row or column of articles within the sub-packages.

Optionally, the joint member comprises a base panel that is smaller in dimension, in a lateral direction, than the combined footprint of the pair of sub-packages.

Optionally, each of the pair of sub-packages comprise two or more rows of articles, and the joint member engages endmost articles in one row of the articles in the first sub-package and endmost articles in one row of the articles in the second sub-package, said one row of the articles in the second sub-package being disposed adjacent the aforesaid one row of the articles in the first sub-package.

Optionally, each of the pair of sub-packages comprise two or more rows of articles, the joint member engages endmost articles in a single row of the articles in each of the first and second sub-packages.

Optionally, the joint member is reinforced by at least one reinforcement flap disposed in face-to-face relationship with a top panel of the tubular structure.

Optionally, the at least one reinforcement flap may comprise at least one extension disposed in face-to-face relationship with one of a pair of opposing side panels of the tubular structure.

Optionally, the at least one reinforcement flap is hingedly connected to a side edge of the top panel.

Optionally, the at least one extension is hingedly connected to a side edge of said one of a pair of opposing side panels.

Optionally, the at least one extension is hingedly connected to the at least one reinforcement flap.

Optionally, the joint member comprises a handle flap struck from, or hinged to, the top panel.

Optionally, the at least one reinforcement flap may comprise a cutaway defining a recess disposed configured to receive at least a portion of the handle flap therein.

Optionally, the first and second engaging openings engage a heel of a respective article and are struck at least in part from a base panel of the tubular structure.

Optionally, the first and second engaging openings are struck from one of a pair of opposing side panels of the tubular structure.

Optionally, the first and second engaging openings are defined in part by a pair of flaps hingedly connected to the base panel and said one of the pair of opposing side panels of the tubular structure.

Optionally, the base panel comprises at least two handling apertures, one of the at least two handling apertures may be provided by a portion of one of the first and second engaging openings in the base panel, the other one of the at least two handling apertures is provided by an aperture disposed in a spaced apart relationship from the other one of the first and second engaging openings.

A second aspect of the invention provides a package comprising a pair of sub-packages, including a first sub-package and a second sub-package disposed next to each other, and a joint member connecting the pair of sub-packages together into a unitary package. The joint member comprises a tubular structure having opposed open ends and disposed around each of the pair of sub-packages such that part of the first sub-package extends outwards from one of the opposed open ends of the tubular structure and part of the second sub-package extends outwards from the other one of the opposed open ends of the tubular structure. The tubular structure comprises first and second engaging openings in engagement with respective ones of the first and second sub-packages.

A third aspect of the invention provides a package comprising a pair of sub-packages, including a first sub-package and a second sub-package disposed next to each other, and a joint member connecting the pair of sub-packages together into a unitary package. The joint member comprises a tubular structure having opposed open ends and disposed around each of the pair of sub-packages such that part of the first sub-package extends outwards from one of the opposed open ends of the tubular structure and part of the second sub-package extends outwards from the other one of the opposed open ends of the tubular structure. The tubular structure comprises first and second engaging tabs in engagement with respective ones of the first and second sub-packages.

A fourth aspect of the invention provides a package comprising a pair of sub-packages, including a first sub-package and a second sub-package disposed next to each other, and a joint member connecting the pair of sub-packages together into a unitary package. The joint member comprises a tubular structure having opposed open ends and disposed around each of the pair of sub-packages such that part of the first sub-package extends outwards from one of the opposed open ends of the tubular structure and part of the second sub-package extends outwards from the other one of the opposed open ends of the tubular structure. The tubular structure comprises first and second engaging openings and first and second engaging tabs in engagement with respective ones of the first and second sub-packages.

A fifth aspect of the invention provides blanks for forming a package, including at least two first blanks for forming sub-packages each first blank comprising a main panel having a plurality of article retention structures for engaging respective articles, and a second blank for forming a joint member for being disposed around the sub-packages. The

second blank comprises a plurality of panels for forming an open-ended tubular structure. The second blank comprises first and second engaging openings or first and second engaging tabs for engagement with respective ones of the first and second sub-packages. The second blank is dimensioned such that in a set up condition part of a first sub-package extends outward from one of the open ends of the tubular structure and part of a second sub-package extends outward from the other one of the open ends of the tubular structure.

A sixth aspect of the invention provides a blank for forming a joint member for being disposed around at least two sub-packages. The blank comprises a plurality of panels for forming an open-ended tubular structure. The blank comprises first and second engaging openings or first and second engaging tabs for engagement with respective ones of the at least two sub-packages. The blank is dimensioned such that in a set up condition part of a first sub-package extends outward from one of the open ends of the tubular structure and part of a second sub-package extends outward from the other one of the open ends of the tubular structure.

A seventh aspect of the invention provides a package comprising a plurality of sub-packages disposed next to one another, and a joint member connecting the sub-packages together into a unitary package. The joint member comprises a tubular structure having opposed open ends and disposed around each of the sub-packages such that part of a first one of the sub-packages extends outwards from one of the opposed open ends of the tubular structure and part of a second one of the sub-packages extends outwards from the other one of the opposed open ends of the tubular structure. Each of the sub-packages comprises a plurality of articles and a top-engaging carrier in engagement with an upper portion of each of the articles.

An eighth aspect of the invention provides a package comprising a stack of sub-packages disposed one on top of another, and a joint member connecting the sub-packages together into a unitary package. The joint member comprises a tubular structure having opposed open ends and disposed around the stack such that a part of each of the sub-packages of the stack extends outwards from one of the opposed open ends of the tubular structure and another part of each of the sub-packages of the stack extends outwards from the other one of the opposed open ends of the tubular structure, wherein each of the sub-packages comprises a plurality of articles and a top-engaging carrier in engagement with an upper portion of each of the articles.

A ninth aspect of the invention provides a package comprising a stack of sub-packages disposed one on top of another, and a joint member connecting the sub-packages together into a unitary package. The joint member comprising a tubular structure having opposed open ends and disposed around the stack such that a part of each of the sub-packages of the stack extends outwards from one of the opposed open ends of the tubular structure and another part of each of the sub-packages of the stack extends outwards from the other one of the opposed open ends of the tubular structure, wherein the tubular structure comprises at least one engaging opening or tab in engagement with at least one of the sub-packages of the stack.

A tenth aspect of the invention provides a package comprising a plurality of sub-packages disposed next to one another, and a joint member connecting the sub-packages together into a unitary package. The joint member comprises

a plurality of panels connected together to form a tubular structure having opposed open ends. The plurality of panels includes a pair of opposed side panels each having first and second opposed end edges. One of the opposed open ends is defined, in part, by the first end edges of the pair of opposed side panels. The other one of the opposed open ends of the tubular structure is defined, in part, by the second end edges of the pair of opposed side panels. The joint member is disposed around each of the sub-packages such that part of a first one of the sub-packages extends outwardly from said first end edges and part of a second one of the sub-packages extends outwardly from said second end edges. Each of the sub-packages comprises a plurality of articles and a top-engaging carrier in engagement with an upper portion of each of the articles.

Optionally, part of the first one of the sub-packages extends outwardly from a first end edge of a base wall of the joint member and part of the second one of the sub-packages extends outwardly from a second, opposing, end edge of the base wall.

An eleventh aspect of the invention provides a package comprising a plurality of sub-packages disposed next to one another, and a joint member connecting the sub-packages together into a unitary package. The joint member comprises a plurality of panels connected together to form a tubular structure having opposed open ends. The plurality of panels includes a handle panel comprising a gripping portion extending transversely with respect to a tubular axis of the tubular structure. The gripping portion has a first transversely extending edge and a second opposing transversely extending edge. One of the opposed open ends of the tubular structure is defined in part by the first transversely extending edge of the gripping portion. The other one of the opposed open ends is defined in part by the second transversely extending edge of the gripping portion. The joint member is disposed around each of the sub-packages such that part of a first one of the sub-packages extends outwardly from the first transversely extending edge of the gripping portion and part of a second one of the sub-packages extends outwards from the second transversely extending edge of the gripping portion. Each of the sub-packages comprises a plurality of articles and a top-engaging carrier in engagement with an upper portion of each of the articles.

A twelfth aspect of the invention provides a package comprising a plurality of sub-packages disposed next to one another, and a joint member connecting the sub-packages together into a unitary package. The joint member comprises a plurality of panels connected together to form a tubular structure having opposed open ends. The joint member is disposed around each of the sub-packages such that part of a first one of the sub-packages extends outwards from one of the opposed open ends of the tubular structure and part of a second one of the sub-packages extends outwards from the other one of the opposed open ends of the tubular structure. Each of the first and second ones of the sub-packages comprises an engaging projection. The joint member comprises at least one receiving feature in which the engaging projection of each of the first and second ones of the sub-packages is received.

Optionally, each of the at least first and second sub-packages comprises a plurality of articles and a top-engaging carrier in engagement with an upper portion of each of the articles, and wherein the engaging projection is provided by the top-engaging carrier of the each of the first and second ones of the sub-packages.

Optionally, the engaging projection is provided by a cover panel disposed over the upper portions of the articles.

A thirteenth aspect of the invention provides a package comprising a plurality of sub-packages disposed next to one another, and a joint member connecting the sub-packages together into a unitary package. The joint member comprises a plurality of panels connected together to form a tubular structure having opposed open ends and first tubular axis. The joint member is disposed around each of the sub-packages such that part of a first one of the sub-packages extends outwards from one of the opposed open ends of the tubular structure and part of a second one of the sub-packages extends outwards from the other one of the opposed open ends of the tubular structure. Each of the first and second ones of the sub-packages comprises a tubular structure having opposed ends and second tubular axis. The second tubular axis is perpendicular to the first tubular axis. The first and second tubular axes define a plane which is parallel to the plane of a top wall of the joint member and to the plane of a cover panel of the sub-packages.

Optionally, the top wall of the joint member is disposed in face-to-face relationship with the cover panel of the sub-packages.

Optionally, the top wall of the joint member is disposed in face contacting relationship with the cover panel of the sub-packages.

Further features and advantages of the present invention will be apparent from the specific embodiments illustrated in the drawings and discussed below.

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 top-engaging carrier according to a first embodiment of the present disclosure;

Figure 2 is a plan view from above of a blank for forming a binding or handle strap according to the first embodiment of the present disclosure;

Figure 3 is a perspective view from above of a unitary package according to the first embodiment, which comprising a pair of sub-packages formed from the carrier blanks of Figure 1 and the handle strap blank of Figure 2;

Figure 4 is a plan view from above of an alternative blank for forming a binding or handle strap, the blank taking a modified form of the blank of Figure 2;

Figure 5 is a plan view from above of an alternative blank for forming a top-engaging carrier according to a second embodiment of the present disclosure;

Figure 6 is a plan view from above of another alternative blank for forming a binding or handle strap according to the second embodiment of the present disclosure;

Figure 7 is a perspective view from above of a unitary package according to the second embodiment, comprising a pair of sub-packages formed from the carrier blanks of Figure 5 and the handle strap of Figure 6;

Figure 8 is a plan view from above of still another alternative blank for forming a top-engaging carrier according to a third embodiment of the present disclosure;

Figure 9 is a perspective view from above of a unitary package according to the third embodiment, comprising a pair of sub-packages formed from the carrier blanks of Figure 8 and the binding handle strap of Figure 6;

Figure 10 is a perspective view from above of a unitary package according to a fourth embodiment, comprising a pair of sub-packages formed from the carrier blanks of Figure 1 and a binding strap of another modified form;

Figure 11 is a plan view from above of another alternative blank for forming a binding or handle strap according to a fifth embodiment of the present disclosure;

Figure 12 is a perspective view from above of a unitary package according to the fifth embodiment, comprising a pair of sub-packages formed from the carrier blanks of Figure 5 and the handle strap of Figure 11;

Figure 13 is a plan view from above of another alternative blank for forming a binding or handle strap according to a sixth embodiment of the present disclosure;

Figure 14 is a perspective view from above of a unitary package according to the sixth embodiment, comprising a pair of sub-packages formed from the carrier blanks of Figure 5 and the handle strap of Figure 13;

Figure 15 is a plan view from above of another alternative blank for forming a binding or handle strap according to a seventh embodiment of the present disclosure;

Figure 16 is a plan view from above of an alternative blank for forming a top-engaging carrier according to the seventh embodiment of the present disclosure;

Figure 17 is a perspective view from above of a unitary package according to the seventh embodiment, comprising three sub-packages formed from carrier blanks of Figure 16 and the handle strap of Figure 15;

Figure 18 is a plan view from above of a blank for forming a top-engaging carrier according to an eighth embodiment of the present disclosure;

Figure 18B is an enlarged view of a portion of the blank of Figure 18;

Figure 19 is a plan view from above of a blank for forming a binding or handle strap according to the eighth embodiment of the present disclosure;

Figure 20 is a perspective view from above of a unitary package according to the eighth embodiment, which comprising a pair of sub-packages formed from the carrier blanks of Figure 18 and the handle strap blank of Figure 19;

Figure 21 is a plan view from above of a blank for forming a binding or handle strap according to a ninth embodiment of the present disclosure;

Figure 22 is a perspective view from above of a unitary package according to the ninth embodiment, which comprising a pair of sub-packages and the handle strap blank of Figure 19;

Figure 23 is a perspective view from above of a unitary package according to a tenth embodiment, which comprises a pair of sub-packages and the binding strap according to the tenth embodiment;

Figure 24 is a plan view from above of a blank for forming a binding or handle strap according to an eleventh embodiment of the present disclosure; and

Figure 25 is a perspective view from below of a unitary package according to the eleventh embodiment, which comprises a pair of sub-packages and the binding strap of Figure 24.

DETAILED DESCRIPTION OF EMBODIMENTS

Detailed descriptions of specific embodiments of the packaging system, methods, blanks, and carriers 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 packaging system, methods, blanks, and carriers 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 which is capable of forming a top-engaging carton or carrier 90, as shown in Figure 3, for containing and carrying a group of primary products such as, but not limited to, bottles or cans, hereinafter referred to as articles B, as shown in Figure 3. The articles B may be generally cylindrical; the articles B may comprise a circular cross-sectional shape, at least about a region of engagement with the carrier 90. The blank 10 forms a secondary package for packaging at least one primary product container or package. Alternative blanks 1010; 2010; 3010; 10’ are shown in Figures 5, 8, 16, and 18 for forming an alternative cartons or carriers 1090; 2090; 3090; 90’; 90” as shown in Figures 7, 9, 12, 14, 17, 20, 22, 23, and 25.

Figure 2 shows a plan view of a blank 110 which is capable of forming a tertiary package P (see Figure 3) with a pair of carriers 90 formed form a pair of blanks 10 according to Figure 1. Alternative blanks 1110; 2110; 4110; 5110; 6110; 7110; 8110; 10110 are shown in Figures 4, 6, 11, 13, 15, 19, 21, and 24 and for forming alternative tertiary packages P; P' as shown in Figure 7, 9, 12, 14, 17, 20, 22 and 25. Further alternative tertiary packages P are shown in Figures 10 and 23.

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 and carrying articles, such as primary 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 cartons or carriers in the drawings are shown in the form of top engaging carriers as options only. The top engaging carriers, as illustrated throughout the disclosure, each has a main or primary engaging panel provided with a plurality of article retention structures. Each structure typically comprises an aperture for receiving an upper portion of an article and one or more engaging teeth or tabs joined along the perimeter of the aperture.

The blanks 10; 10'; 110; 1010; 1110; 2010; 2110; 3010; 4110; 5110; 6110; 7110; 8110; 10110 are 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 recognised that one or other numbers of blanks may be employed, where suitable, for example, to provide the carrier structure described in more detail below.

The packaging structures or cartons described herein may be formed from a sheet material such as paperboard, which may be made of or coated with materials to increase its strength. An example of such a sheet material is tear-resistant NATRALOCK® paperboard made by WestRock® Company. It should be noted that the tear resistant materials may be provided by more than one layer, to help improve the tear-resistance of the package. Typically, one surface of the sheet material may have different characteristics to the other surface. For example, the surface of the sheet material that faces outwardly from a finished package may be particularly smooth and may have a coating such as a clay coating or other surface treatment to provide good printability. The surface of the sheet material that faces inwardly may, on the other hand, be provided with a coating, a layer, a treatment or be otherwise prepared to provide properties such as one or more of tear-resistance, good glue-ability, heat sealability, or other desired functional properties.

The blanks 10; 10'; 1010; 2010 of Figures 1, 5, 8, and 18 are configured to form a carton or carrier 90; 90'; 1090; 2090 shown in Figures 3, 7, 9, 10, 12, 14 and 20, for packaging an exemplary arrangement of exemplary articles B. In the illustrated embodiments, the arrangement is a 2 × 3 matrix or array -two rows of three articles B are provided- and the articles B are 330ml cans beverage cans. The blank 3010 of Figure 16 is configured to form a carton or carrier 3090 shown in Figure 17, for packaging an exemplary arrangement of articles B arranged in a 2 × 4 matrix or array

configuration -two rows of four articles B are provided- and the articles B are 330ml cans beverage cans. Alternatively, the blanks 10; 1010; 2010; 3010 can be configured to form a carrier for packaging other types, number, and size of articles and/or for packaging articles in a different arrangement or configuration.

In some embodiments, the blanks 10; 1010; 2010; 3010 may be configured to accommodate beverage cans of the sleek or slim design that may be 330ml cans. The sleek or slim articles B are substantially of the same diameter over their entire height. An exemplary article B has a maximum diameter or lateral dimension (the diameter may be about 2.25inches or about 58mm). The article B comprises an upper portion or top closure which has a diameter or lateral dimension (the diameter may be about 2.125inches or 54.8mm). The neck may provide an outwardly projecting flange, that is to say, it may comprise an undercut for engaging with the carrier. A top closure may be attached to the side wall of the article B to form a seam or "chime" which provides the flange. In some embodiments, the variation in diameter between the top closure and the main body of the article B is less than 7mm, may be less than 5mm and optionally is less than 4mm. As used herein the terms "sleek" or "slim" refer to articles B which have little or no variation in their lateral dimension between the top closure which engages with the carrier 90; 1090; 2090; 3090 and the main body of the article B. The articles B are substantially parallel sided or of substantially uniform diameter.

Referring to Figure 1 there is shown a blank 10 comprising a plurality of panels 12, 14, 16, 18, 20, including a main panel 12 for forming a bottom wall or an engaging panel of a carrier 90 (see Figure 3).

A first side panel 14 is hingedly connected to a first side of the main panel 12 by a hinged connection in the form of a fold line 13. A first top or cover panel 18 is hingedly connected to the first side panel 14 by a hinged connection in the form of a fold line 17.

A second side panel 16 is hingedly connected to a second side of the main panel 12 by a hinged connection in the form of a fold line 15. A second top or cover panel 20 is hingedly connected to the second side panel 16 by a hinged connection in the form of a fold line 19.

The main panel 12 of the blank 10 includes at least one article retention structure RT1, RT2. The main panel 12 comprises a plurality of article retention structures RT1, RT2, specifically six article retention structures RT1, RT2 arranged in 2 × 3 matrix or array. Each of the article retention structures RT1, RT2 comprises an opening or aperture A1, A2.

The blank 10 comprises four first article retention structures RT1. The first article retention structures RT1 are located adjacent to ends of the main panel 12. The blank 10 comprises two second article retention structures RT2. The second article retention structures RT2 are located between a first pair of first article retention structures RT1 disposed proximate a first end of the main panel 12 and a second pair of first article retention structures RT1 disposed proximate a second end of the main panel 12. The second article retention structures RT2 are also referred to herein as intermediate article retention structures RT2. The first article retention structures RT1 are also referred to herein as end article retention structures RT1.

Each of the first article retention structures RT1 is substantially similar in construction and will therefore be described in detail with reference to a first one of the first article retention structures RT1 located adjacent to a first end of the blank 10 as shown in Figure 1.

The first article retention structure RT1 comprises an article receiving opening defined in part by an aperture A1.

The first article retention structure RT1 comprises a plurality of engaging teeth or tabs 50A, 50B, 52A, 52B, 52C disposed about the aperture A1.

The plurality of teeth 50A, 50B, 52A, 52B, 52C are hinged to the main panel 12 by a fold line.

A first tab 50A may be hinged to the main panel 12 by a hinged connection provided by a portion of a fold line 25, 35 hinging an end panel 24, 34 to the main panel 12. The first tab 50A comprises a pair of side edges, the side edges are defined by cut lines 51 extending outward from the aperture A1. The cut lines 51 may be nonlinear and may arcuate. The cut lines 51 may be divergently arranged with respect to each other, and may be comprise outer terminal end spaced apart from the fold line 25, 35.

A second tab 50B may be hinged to the main panel 12 by a hinged connection provided by a portion of the fold line 13, 15 hinging a side panel 14, 16 to the main panel 12. The second tab 50B comprises a pair of side edges, the side edges are defined by cut lines 51 extending outward from the aperture A1. The cut lines 51 may be nonlinear and may arcuate. The cut lines 51 may be divergently arranged with respect to each other, and may comprise outer terminal ends spaced apart from the fold line 13, 15.

The plurality of teeth 50A, 50B, 52A, 52B, 52C includes third, fourth, and fifth teeth 52A, 52B, 52C hingedly connected to the main panel 12 by a fold line. The fold line may be defined by a plurality of cut lines 55, 57. The plurality of cut lines 55, 57 may define or approximate a circle.

The plurality of teeth 50A, 50B, 52A, 52B, 52C includes third teeth 52A disposed about a portion of the aperture A1. Each of the plurality of third teeth 52A comprises an engaging edge E1 opposing a hinged edge. The engaging edges E1 are defined by a linear portion of a cut line defining the aperture A1. Each engaging edge E1 defines a part of a polygon. The illustrated embodiment comprises seven third teeth 52A. Each third tooth 52A comprises a pair of side edges, the side edges are defined by cut lines 53 extending radially outward from respective vertices of the polygon. From a respective vertex between a pair of adjacent linear portions of the cut line defining the aperture A1. The cut lines 53 are divergently arranged with respect to each other and define an angle therebetween, the angle may be about 22.5°.

The plurality of teeth 50A, 50B, 52A, 52B, 52C includes fourth teeth 52B disposed about a portion of the aperture A1. The illustrated embodiment comprises three fourth teeth 52B. The fourth teeth 52B are provided about an inner most region of the aperture A1, that is to say, about a region closest to the centre of the main panel 12.

The plurality of teeth 50A, 50B, 52A, 52B, 52C includes fifth teeth 52C disposed about a portion of the aperture A1. The illustrated embodiment comprises four fifth teeth 52C. The fifth teeth 52B are provided on opposing sides of the first or second tab 50A, 50B.

The first article retention structure RT1 may comprise a plurality of first circumferential cut lines 57. Each of the plurality of first circumferential cut lines 57 is aligned with one of the radial cut lines 53 such that said one of the radial cut lines 53 or a notional extension thereof bisects a respective one of the plurality of first circumferential cut lines 57.

Each of the plurality of first circumferential cut lines 57 is spaced apart from said one of the radial cut lines 53 bisecting it so as to define a connecting nick or bridge portion between a pair of adjacently disposed third, fourth, and fifth teeth 52A, 52B, 52C.

Each of the plurality of first circumferential cut lines 57 may be linear in shape.

The first article retention structure RT1 may comprise a plurality of second circumferential cut lines 55. Each of the plurality of second circumferential cut lines 55 is disposed between a pair of the plurality of first circumferential cut lines 57 and is spaced apart therefrom so as to define a pair of connecting nick or bridge portions between each third and fifth tooth 52A, 52C and the main panel 12. The pair of connecting nick or bridge portions provide a hinged or foldable connection between each third and fifth tooth 52A, 52C and the main panel 12. The fourth teeth 52B do not comprise a second circumferential cut line 55, the fourth teeth 52B are hinged to the main panel 12 by a single nick or bridge portions between a pair of first circumferential cut lines 57.

Each of the plurality of second circumferential cut lines 55 may be linear in shape. In alternative embodiments, each of the plurality of first circumferential cut lines 57 may be arcuate or curved. In alternative embodiments, each of the plurality of second circumferential cut lines 55 may be arcuate or curved.

Each of the second article retention structures RT2 is substantially similar in construction and will therefore be described in detail with reference to a first one of the second article retention structures RT2 located adjacent to the first one of the first article retention structures RT1 as shown in Figure 1.

The second article retention structure RT2 comprises an article receiving opening defined in part by an aperture A2. The second article retention structure RT2 comprises a plurality of engaging teeth or tabs 50A, 50B, 52A, 52B, 52C disposed about the aperture A2.

The plurality of teeth 50A, 50B, 52A, 52B, 52C are hinged to the main panel 12 by a fold line.

A second tab 50B may be hinged to the main panel 12 by a hinged connection provided by a portion of the fold line 13, 15 hinging a side panel 14, 16 to the main panel 12. The second tab 50B comprises a pair of side edges, the side edges are defined by cut lines 51 extending outward from the aperture A2. The cut lines 51 may be nonlinear and may arcuate. The cut lines 51 may be divergently arranged with respect to each other, and may be comprise outer terminal end spaced apart from the fold line 13, 15.

The plurality of teeth 50A, 50B, 52A, 52B, 52C includes third, fourth, and fifth teeth 52A, 52B, 52C hingedly connected to the main panel 12 by a fold line. The fold line may be defined by a plurality of cut lines 55, 57. The plurality of cut lines 55, 57 may define or approximate a circle.

The plurality of teeth 50A, 50B, 52A, 52B, 52C includes third teeth 52A disposed about a portion of the aperture A2. Each of the plurality of third teeth 52A comprises an engaging edge opposing a hinged edge. The engaging edges

are defined by a linear portion of a cut line defining the aperture A2. Each engaging edge defines a part of a polygon. The illustrated embodiment comprises sixth third teeth 52A. Each third tooth 52A comprises a pair of side edges, the side edges are defined by cut lines 53 extending radially outward from respective vertices of the polygon. From a respective vertex between a pair of adjacent linear portions of the cut line defining the aperture A2. The cut lines 53 are divergently arranged with respect to each other and define an angle therebetween, the angle may be about 22.5°.

The plurality of teeth 50A, 50B, 52A, 52B, 52C includes fourth teeth 52B disposed about a portion of the aperture A2. The illustrated embodiment comprises seven fourth teeth 52B. The fourth teeth 52B are provided about an inner most region of the aperture A2, that is to say, about a region closest to the centre of the main panel 12.

The plurality of teeth 50A, 50B, 52A, 52B, 52C includes fifth teeth 52C disposed about a portion of the aperture A2. The illustrated embodiment comprises two fifth teeth 52C. The fifth teeth 52B are provided on opposing sides of the second tab 50B.

The second article retention structure RT2 may comprise a plurality of first circumferential cut lines 57. Each of the plurality of first circumferential cut lines 57 is aligned with one of the radial cut lines 53 such that said one of the radial cut lines 53 or a notional extension thereof bisects a respective one of the plurality of first circumferential cut lines 57.

Each of the plurality of first circumferential cut lines 57 is spaced apart from said one of the radial cut lines 53 bisecting it so as to define a connecting nick or bridge portion between a pair of adjacently disposed third, fourth, and fifth teeth 52A, 52B, 52C.

Each of the plurality of first circumferential cut lines 57 may be linear in shape.

The second article retention structures RT2 may comprise a plurality of second circumferential cut lines 55. Each of the plurality of second circumferential cut lines 55 is disposed between a pair of the plurality of first circumferential cut lines 57 and is spaced apart therefrom so as to define a pair of connecting nick or bridge portions between each third and fifth tooth 52A, 52C and the main panel 12. The pair of connecting nick or bridge portions provide a hinged or foldable connection between each third and fifth tooth 52A, 52C and the main panel 12. The fourth teeth 52B do not comprise a second circumferential cut line 55, the fourth teeth 52B are hinged to the main panel 12 by a single nick or bridge portions between a pair of first circumferential cut lines 57.

Each of the plurality of second circumferential cut lines 55 may be linear in shape. In alternative embodiments, each of the plurality of first circumferential cut lines 57 may be arcuate or curved. In alternative embodiments, each of the plurality of second circumferential cut lines 55 may be arcuate or curved.

The main panel 12 comprises a handle structure. The handle structure may comprise at least one handle opening. In the illustrated embodiment, the blank 10 comprises two handle openings. Each handle opening is defined in, or struck from, a region of the main panel 12 disposed centrally between four apertures A1, A2 arranged as two adjacent pairs of apertures A1, A2. The handle openings are defined by a pair of handle tabs 60, 62 hingedly connected to the main panel 12 by a respective hinged connection in the form of a fold line 61, 63. The fold lines may be disposed

adjacent to each other and may be orthogonal to each other. The pair of handle tabs 60, 62 are separated from each other by a cut line or severance line, the cut line or severance line may be non-linear and may be substantially "V" or "U" shaped.

The hinged connection between a first tab 60 and the main panel 12 defines a portion of a first edge of the handle opening. The pair of tabs 60, 62 includes a second tab 62 hinged to the main panel 12. The hinged connection between the second tab 62 and the main panel 12 defines a portion of a second, adjacent, edge of the handle opening. The second tab 62 is defined in part by a substantially "V" shaped cutline extending between the first and second edges of the handle opening. The first tab 60 may define at least a portion of at least three edges of the handle opening, and may define at least a portion of four edges of the handle opening. The handle opening may be substantially square or diamond shaped. The handle opening may provide a receiver element RC for receiving at least one locking tab 80, 82 of a locking mechanism. The "V" shaped cutline defines a recess or cutaway in the first tab 60 capable of receiving a portion of at least one male tab 80, 82.

The first and second top panels 18, 20 are arranged to be disposed in at least partially overlapping relationship with each other. The overlapping portions of the first and second top panels 18, 20 are provided with a locking structure for locking the first and second top panels 18, 20. The locking structure may cooperate with the handle openings in the main panel 12 to secure the first and second top panels 18, 20 to the main panel 12.

The locking structure comprises at least one first locking element L1 for being received in the receiver element RC. The first locking element L1 comprises a tab 80 struck from the first top panel 18, the illustrated embodiment comprises two tabs 80 each arranged to be engageable with one of the handle or receiver openings and pass through an opening in the second top panel 20. Each tab 80 is hinged to the first top panel 18 by a hinged connection in the form of first fold line 81 having a first fold strength or resistance. The first fold line 81 may be defined by a single perforation or weakening element disposed between ends of a cutline defining the tab 80. In some embodiments, the perforation or weakening element may be omitted.

The locking structure comprises at least one second locking element L2 in the form of an opening in the second top panel 20. The second locking element L2 comprises a tab 82 struck from the second top panel 20, the illustrated embodiment comprises two tabs 82 each arranged to be engageable with one of the handle or receiver openings in the main panel 12. Each tab 82 is hinged to the second top panel 20 by a hinged connection in the form of second fold line 83 having a second fold strength or resistance, the second fold resistance may be equal to or lower than the first fold resistance, that is to say, the second tabs 82 may be more easily folded. The second fold line 83 may be defined by one, two or more perforations or weakening elements disposed between ends of a cutline defining the tab 82. The second fold line 83 may comprise at least one more perforation than the first fold line 81, alternatively a greater proportion of the hinged connection between the second top panel 20 and the second tabs 82 may be defined by, or comprise, a cut line, perforation, or other weakening element than the hinged connection between the first top panel 18 and the first tabs 80.

The second tab 82 should be at least equal in size to the first tab 80. The second tab 82 may be larger in dimension, in length and/or in width, than the first tab 80 so as to facilitate the first tab 80 readily passing through the second top panel 20. The first tab 80 comprises first shoulders or hook portions for engaging with the main panel 12. The second tab 82 comprises second shoulders or hook portions for engaging with the main panel 12. The second shoulders or hook portions may be configured and arranged to be substantially aligned with the first shoulders or hook portions when the lock tabs 80, 82 are in an engaged position.

The locking tabs 80, 82 may be asymmetric in shape about a notional line bisecting the locking tabs 80, 82 and extending perpendicularly to a notional line parallel or coincident with the fold line 81, 83.

The first top panel 18, second top panel 20, first and second side panels 14, 16 and main panel 12 form a tubular structure. Each end of the tubular structure is closed by an end closure structure. A first end closure structure comprises a first end panel 24 hingedly connected to a first end of the main panel 12 by a hinged connection in the form of a fold line 25. A first top end flap 26 is hingedly connected to the first end panel 24 by a hinged connection in the form of a fold line 27.

A first anchor flap 22A is hingedly connected to a first end of the first top panel 18 by a hinged connection in the form of a fold line 23A. The first anchor flap 22A is hingedly connected to the first top end flap 26 by a pair of hinged panels 28A, 30A. The pair of hinged panels 28A, 30A form a gusset. A first connecting panel 28A is hingedly connected to the first anchor flap 22A by a hinged connection in the form of a fold line. A second connecting panel 30A is hingedly connected to the first connecting panel 28A by a hinged connection in the form of a fold line. The second connecting panel 30A is hingedly connected to the first top end flap 26 by a hinged connection in the form of a fold line.

A second anchor flap 22B is hingedly connected to a first end of the second top panel 20 by a hinged connection in the form of a fold line 23B. The second anchor flap 22B is hingedly connected to the first top end flap 26 by a pair of hinged panels 28B, 30B forming a second gusset. A third connecting panel 28B is hingedly connected to the second anchor flap 22B by a hinged connection in the form of a fold line. A fourth connecting panel 30B is hingedly connected to the third connecting panel 28B by a hinged connection in the form of a fold line. The fourth connecting panel 30B is hingedly connected to the first top end flap 26 by a hinged connection in the form of a fold line.

The first end panel 24 is separated from each of the first and second anchor flaps 22A, 22B by an aperture A3. The apertures A3 separate each of the pair of hinged panels 28A/30A, 28B/30B from the respective one of the first and second side panels 14, 16.

A second end closure structure comprises a second end panel 34 hingedly connected to a second end of the main panel 12 by a hinged connection in the form of a fold line 35. A second top end flap 36 is hingedly connected to the second end panel 34 by a hinged connection in the form of a fold line 37.

A third anchor flap 32A is hingedly connected to a second end of the first top panel 18 by a hinged connection in the form of a fold line 33A. The third anchor flap 32A is hingedly connected to the second top end flap 36 by a pair of hinged panels 38A, 40A forming a third gusset. A fifth connecting panel 38A is hingedly connected to the third anchor

flap 32A by a hinged connection in the form of a fold line. A sixth connecting panel 340A is hingedly connected to the fifth connecting panel 38A by a hinged connection in the form of a fold line. The sixth connecting panel 40A is hingedly connected to the second top end flap 36 by a hinged connection in the form of a fold line.

A fourth anchor flap 32B is hingedly connected to a second end of the second top panel 20 by a hinged connection in the form of a fold line 33B. The fourth anchor flap 32B is hingedly connected to the second top end flap 36 by a pair of hinged panels 38B, 40B forming a fourth gusset. A seventh connecting panel 38B is hingedly connected to the fourth anchor flap 32B by a hinged connection in the form of a fold line. An eighth connecting panel 40B is hingedly connected to the seventh connecting panel 38B by a hinged connection in the form of a fold line. The eighth connecting panel 40B is hingedly connected to the second top end flap 36 by a hinged connection in the form of a fold line.

The second end panel 34 is separated from each of the third and fourth anchor flaps 32A, 32B by an aperture A3. The apertures A3 separate each of the pair of hinged panels 38A/40A, 38B/40B from the respective one of the first and second side panels 14, 16.

The blank 10 may comprise at least two alignment or registration devices W1, W2. Each of the registration devices W1, W2 takes the form of a cutaway or recess defining a registration edge of the blank 10 for receiving or engaging a reference pin of a packaging machine. The blank 10 comprises a pair of first registration devices W1 each defining a downstream or leading registration edge. The blank 10 may also comprise a second pair of registration devices W2 each defining an upstream or trailing registration edge. Each of the cutaways or recesses defining a registration device W1, W2 is struck from, or defined in, one of the first and second top panels 18, 20.

The blank 10 may comprise at least one stabilisation device. In the illustrated embodiment, the blank 10 comprises two stabilisation devices. Each stabilization device comprises an opening in at least one of the first top panel 18, second top panel 20, and the main panel 12. Each stabilization device may comprise an opening in at least two, or all, of the first top panel 18, second top panel 20, and the main panel 12. Each stabilisation device is configured to receive an abutment peg or dog of a packaging machine.

An opening forming at least part of the stabilisation device may be non-circular in shape, and may be substantially square or diamond shaped. The opening or openings in the panels providing the stabilisation device may be defined by at least one tab struck from the panel in which it is formed and hingedly connected thereto.

In the illustrated embodiment, stabilisation device openings are provided by the handle openings and/or the openings created by folding the locking tabs 80, 82 out of the plane of the panel 18, 120 to which they are hinged.

Turning to the construction of the carrier 90 from the blank 10, the blank 10 may be formed into an assembled carrier 90, as shown in Figure 3.

The blank 10 is applied to a group of articles B. The blank 10 is lowered with respect to a group of articles B. Each of the article retention structures RT1, RT2 of the blank 10 is aligned with a respective article B in the group. Portions of the articles B pass through the main panel 12. The toothed regions of the main panel 12 about each of the article retention structures RT1, RT2 may be folded out of the plane of the main panel 12.

Each toothed region of the main panel 12 may be folded about one of the articles B received in the respective one of the article retention structures RT1, RT2. The main panel 12 may deform about the article B for example but not limited to a shoulder portion of the article B, where the article B is a can, the shoulder portion may be provided by the neck.

The blank 10 may be partially folded about fold lines 13, 15 to bring the first and second side panels 14, 16 into non-coplanar relationship with the main panel 12.

The blank 10 is folded about fold lines 23A, 23B, 33A, 33B to fold the first, second, third and fourth anchor flaps 22A, 22B, 32A, 32B into substantially face to face relationship with the first or second side panels 14, 16 to which they are hinged.

The blank 10 is folded about fold lines 25, 35 to fold the first and second end panels 24, 34 into at least substantially perpendicular relationship with the main panel 12. In some embodiments, the first and second end panels 24, 34 may be folded through an angle greater than 90° so as to be inclined.

The blank 10 is folded about fold lines 27, 37 to fold the first and second top end flaps 26, 36 with respect to the respective one of the first and second end panels 24, 34 to which they are hinged.

The first and second top end flaps 26, 36 may be folded over an upper end of an article B or articles B disposed adjacent to the first and second ends of the main panel 12.

The first and second top end flaps 26, 36 may be folded to be substantially parallel to the main panel 12.

The first and second end panels 24, 34 and first and second top end flaps 26, 36 may be folded automatically in response to folding the first, second, third and fourth anchor flaps 22A, 22B, 332A, 32B into substantially face contacting relationship with the respective one of the first and second side panels 14, 16.

The blank 10 is folded about fold lines 13, 15 to bring the first and second side panels 14, 16 into substantially perpendicular relationship with the main panel 12.

The blank 10 is folded about fold line 19 to fold the second top panel 20 over the tops of the articles B. The blank 10 is folded about fold line 17 to fold the first top panel 18 over the tops of the articles B and into overlapping relationship with the first top panel 18 to form a composite top panel 18/20.

The locking tabs 80 are displaced out of the plane of the first top panel 18, downwardly, in doing so the locking tabs 82 are displaced out of the plane of the second top panel 20. The locking tabs 80 pass through the second top panel 20.

The locking tabs 80, 82 are folded internally of the carrier 90, to displace the handle tabs 60, 62 out of the plane of the main panel 12. The locking tabs 80, 82 pass through the main panel 12.

The locking tabs 80, 82 engage with the main panel 12. Shoulders of the locking tabs 80, 82 may engage not only with the perimeter of the respective handle opening but also with an edge of each of the one or both handle tabs 60, 62.

The handle tabs 60, 62 may prevent or inhibit disengagement of the locking tabs 80, 82 from the locked condition.

The locking tabs 80, 82 may also serve to function as a spacer between the composite top panel 18/20 and the main panel 12. The locking tabs 80, 82 may engage the main panel 12 along the perimeters of the handle openings and/or the lower surface of the main panel 12 and may thereby serve as tension members for maintaining a spacing between the main panel 12 and the composite top panel 18/20 so as to prevent the spacing from increasing.

The locking tab 80, 82 may also provide a cushioning tab improving comfort when the package 90 is carried by inserting one or more fingers into the openings in the composite top panel 18/20 and the main panel 12.

Referring to Figure 2 there is shown a blank 110 comprising a plurality of panels 112, 114, 116, 118, 120, 122, 124 for forming a handle strap and/or binding device for coupling two or more carriers 90 together.

The blank 110 includes a first bottom panel 112 hingedly connected to a first corner or bevel panel 114 by a hinged connection in the form of a fold line 113. A first side panel 116 is hingedly connected to the first bevel panel 114 by a hinged connection in the form of a fold line 115. A top panel 118 is hingedly connected to the first side panel 116 by a hinged connection in the form of a fold line 117. A second side panel 120 is hingedly connected to the top panel 118 by a hinged connection in the form of a fold line 119. A second corner or bevel panel 122 is hingedly connected to the second side panel 120 by a hinged connection in the form of a fold line 121. A first bottom panel 124 is hingedly connected to a second bevel panel 122 by a hinged connection in the form of a fold line 123.

The blank 110 is foldable to form a carrier 190 as illustrated in Figure 3. The first and second base panels 112, 124 are engageable with one another in an overlapping relationship to form a composite base wall 112/124 of the carrier 190. The blank 110 may comprise a complementary locking mechanism for securing the second base panel 124 to the first base panel 112. The first base panel 112 may comprise at least one first part M of the complementary locking mechanism. The second base panel 124 may comprise at least one second part F of the complementary locking mechanism. In the illustrated embodiment, the second base panel 124 comprises a plurality of female tabs F defining openings in the first base panel 112. The first base panel 112 comprises a plurality of male tabs M, the openings in the second base panel 124 being configured to receive a respective one of the male tabs M. The female tabs F are arranged to be displaced out of the second base panel 124 to form the opening and to bear against the male tabs M when received therein. In some embodiments, the complementary locking mechanism M/F may be omitted, the first and second base panels 112, 124 may be secured to each other by other means such as but not limited to adhesive or staples.

Optionally, the first base panel 112 may comprise at least one first handling aperture A4; in alternative embodiments, the first handling aperture A4 may be defined at least in part by a tab foldably or severably connected to the first base panel 112. In the illustrated embodiment, the first base panel 112 comprises two first handling apertures A4. The first handling apertures A4 may be employed to facilitate construction of the carrier 190. A packaging machine component may engage with the first handling apertures A4 to enable the plurality of panels 112, 114, 116, 118, 120, 122, 124 to be tightened about a group of secondary packages or carriers 90. The first handling apertures A4 may also be employed to facilitate alignment of the first and second base panels 112, 124 with respect to each other or to align

the first part of the complementary locking mechanism with the second part of the complementary locking mechanism. The complementary locking mechanism illustrated and described is entirely optional.

The first handling apertures A4 may be substantially triangular in shape.

The first base panel 112 further comprises portions of two first bottom locking arrangements BL1 in the form of openings. The first bottom locking arrangements BL1 extend from the first base panel 112 across the first bevel panel 114 and into the first side panel 116, in-so-doing interrupting the fold lines 113, 115 which hinge the first base panel 112, first bevel panel 114 and first side panel 116 one to the next. Each first bottom locking arrangement BL1 comprises a first aperture A8 defined in the first base panel 112 and a second aperture A6 defined in the first side panel 116. A pair of flaps 170A, 170B extend between the first and second apertures A8, A6. The pair of flaps 170A, 170B are separated from one another by a cut line or severable line. The pair of flaps 170A, 170B are struck, in part, from the first base panel 112, in part from the first bevel panel 114 and in part from the first side panel 116. Each of the pair of flaps 170A, 170B is hinged to the first base panel 112 and to the first side panel 116 by respective hinged connection in the form of fold line 171A, 171B. Each of the pair of flaps 170A, 170B is separated from the first bevel panel 114 by a respective cut line or severance line 173A, 173B.

Each of the pair of flaps 170A, 170B comprises a pair of fold lines 175A/177A, 175B/177B. The fold lines 175A, 177A, 175B, 177B of each pair of fold lines 175A/177A, 175B/177B are divergently arranged with respect to each other.

The second base panel 124 further comprises portions of two second bottom locking arrangements BL2 in the form of openings. The second bottom locking arrangements BL2 substantially similar to the first bottom locking arrangements BL1 albeit first aperture A8 comprises a V shaped recess A7 that extends away from the flaps 170A, 170B into the second base panel 124. This V shaped recess may be engaged by a finger or other machine tool during construction of the carrier 190 and employed in combination with the first handling apertures A4.

The top panel 118 comprises a first reinforcement flap 118A hingedly connected along a first side edge of the top panel 118 by a hinged connection in the form of a fold line 125A. The top panel 118 comprises a second reinforcement flap 118B hingedly connected along a second side edge of the top panel 118, the second side edge opposes the first side edge, by a hinged connection in the form of a fold line 125B.

The first reinforcement flap 118A may extend into the first and/or second side panels 116, 120, a first extension 116A may be hingedly connected to the first side panel 116 by a hinged connection in the form of a fold line 127A. A second extension 120A may be hingedly connected to the second side panel 120 by a hinged connection in the form of a fold line 129A. The first extension 116A may be hingedly connected to the first reinforcement flap 118A by a hinged connection in the form of a fold line 117A. The second extension 120A may be hingedly connected to the first reinforcement flap 118A by a hinged connection in the form of a fold line 119A.

The second reinforcement flap 118B may extend into the first and/or second side panels 116, 120, a first extension 116B may be hingedly connected to the first side panel 116 by a hinged connection in the form of a fold line 127B. A second extension 120B may be hingedly connected to the second side panel 120 by a hinged connection in the form

of a fold line 129B. The first extension 116B may be hingedly connected to the first reinforcement flap 118B by a hinged connection in the form of a fold line 117B. The second extension 120B may be hingedly connected to the first reinforcement flap 118B by a hinged connection in the form of a fold line 119B.

Optionally, the first side panel 116 may comprise a first recess R1 struck from a side edge thereof. The first recess R1 may define an end or lower (in normal use) edge of the first extension 116B of the second reinforcement flap 118B.

Optionally, the second side panel 120 may comprise a second recess R2 struck from a side edge thereof. The second recess R2 may define an end, or lower (in normal use), edge of the second extension 120A of the first reinforcement flap 118A.

The blank 110 may comprise a first handle flap 160 struck from the top panel 118, disposed adjacent to a first side edge of the top panel 118, and hingedly connected thereto by a hinged connection in the form of a fold line 161. An aperture A5 may be struck from the second reinforcement flap 118B adjacent to the first handle flap 160 configured and arranged to accommodate the first handle flap 160 in an operative condition.

The blank 110 may comprise a second handle flap 160 struck from the top panel 118, disposed adjacent to a second, opposing, side edge of the top panel 118, and hingedly connected thereto by a hinged connection in the form of a fold line 161. An aperture A5 may be struck from the first reinforcement flap 118A adjacent to the first handle flap 160 configured and arranged to accommodate the first handle flap 160 in an operative condition.

Figure 3 shows a pair of article carriers 90 coupled together by a strap 190 formed from the blank 110 of Figure 2. The blank 110 is wrapped or folded about the pair of article carriers 90.

The first and second reinforcement flaps 118A, 118B together with the extensions 116A, 116B, 120A, 120B are folded about respective fold lines into substantial face to face relationship with the panel to which they are hinged.

The blank 110 is placed over a pair of article carriers 90, in part over a first article carrier 90 and in part over a second article carrier 90. The first and second reinforcement flaps 118A, 118B are disposed between the top panel 118 and the upper ends of the article carriers 90. The first and second side panels 116, 120 are folded about fold lines 117, 119 respectively to be brought into face-to-face relationship with ends of the article carriers 90.

The flaps 170A, 170B of the bottom locking arrangements BL1, BL2 are folded out of the plane of the bevel panels 114, 122, internally of the strap 190. A lower portion of an article B of the first article carrier 90 is received in a first one of the first bottom locking arrangements BL1. A lower portion of another article B of the first article carrier 90 is received in a first one of the second bottom locking arrangements BL2. A lower portion of an article B of the second article carrier 90 is received in a second one of the first bottom locking arrangements BL1. A lower portion of another article B of the second article carrier 90 is received in a second one of the second bottom locking arrangements BL2. The flaps 170A, 170B are disposed about a lower or heel portion of the articles B and engage generally opposing sides of the articles B to restrict or inhibit movement of the article carriers 90 laterally of the strap 190.

The second base panel 124 is folded about the bases of the groups of articles B in each article carrier 90. The first base panel 112 is folded about the bases of the groups of articles B in each article carrier 90. The first base panel

112 is brought into at least partial overlapping relationship with the second base panel 124. The first base panel 112 is secured to the second base panel 124 by the complementary locking mechanism. In this way the strap 190 combines two carriers 90 into a single tertiary package P, as shown in Figure 3.

In the illustrated embodiment, the first base panel 112 is larger in dimension, length, than the second base panel 124. The male locking tabs M are disposed adjacent an end edge of the first base panel 112 and the female locking tabs F are disposed adjacent an end edge of the second base panel 124. The complementary locking mechanism is arranged to be off-center with respect to the composite base panel 112/124 formed by the first and second base panels 112, 124. The male and female tabs M, F are arranged to be in vertical registry with a void between articles B in an outer row of articles B and the center row of articles B. In other embodiments, having an even number of rows of articles B the arrangement of the first and second base panels 112, 124 may be generally symmetrical, that is to say the first and second base panels 112, 124 may be substantially equal in length.

Referring now to Figure 4, an alternative blank is shown for forming a handle or binding strap which may be used in a packaging system of the present disclosure. The blank of Figure 4 is a modified form of the blank of Figure 2. In Figure 4, like numerals have, where possible, been used to denote like parts, albeit with the addition of the prefix "1000" to indicate that these features belong to the blank of the modified form of the handle strap. Figure 4 shares many common features with the strap of Figure 2, therefore only the differences from the strap of Figure 2 will be described in any greater detail.

Figure 4 shows a blank 1110 comprising a plurality of panels 1112, 1114, 1116, 1118, 1120, 1122, 1124. The blank 1110 comprises a top panel 1118. The reinforcement flaps 118A, 118B of the embodiment of Figure 2 have been omitted. The top panel 1118 comprises a pair of handle flaps 1160 hingedly connected, by hinged connections in the form of fold lines 1161, to opposing sides of the top panel 1118 and extending along a substantial portion -greater than half- of the side edge of the top panel 1118. The handle flaps 1160 may, in addition to providing a comfortable cushioning flap, reinforce the top panel 1118 by providing a two-ply structure over a substantial portion of the top panel 1118.

The blank 1110 may be employed with carriers 90 formed form blanks 10 in accordance with Figure 1.

Referring now to Figure 5 there is shown an alternative blank for forming a top-engaging carton or carrier which may be used in the unitary package or packaging system of the present disclosure. In the illustrated embodiment, like numerals have, where possible, been used to denote like parts, albeit with the addition of the prefix "1000" to indicate that these features belong to the article carrier or secondary package of Figure 5. The embodiment of Figure 5 shares many common features with the embodiment of Figure 1, therefore only the differences from the embodiment of Figure 1 will be described in any greater detail.

Figure 5 shows a blank 1010 comprising a plurality of main panels 1012, 1014, 1016, 1018, 1020. The plurality of main panels 1012, 1014, 1016, 1018, 1020 includes a first main or top panel 1012 for forming an engaging panel of a carrier 1090 (see Figure 7).

The engaging panel 1012 comprises at least one article retention structure RT1, RT2. The engaging panel 1012 comprises a plurality of article retention structures RT1, RT2, specifically six article retention structures RT1, RT2 arranged in 2 × 3 matrix or array. Each of the article retention structures RT1, RT2 comprises an opening or aperture A1, A2.

The first and second article retention structures RT1, RT2 may comprise an annular series of engaging teeth 1052A, 1052B disposed about an aperture A1, A2. The annular series of engaging teeth 1052A, 1052B may comprises sixteen teeth each having an engaging edge and defining a portion of a polygon, a hexadecagon. The engaging teeth 1052A, 1052B may be hinged to the engaging panel 1012 by hinged connections or fold lines. The hinged connection may be defined by at least a first circumferential cut line 1057 aligned with a radial cut line 1053. Some of the engaging teeth, particularly those disposed in marginal regions of the engaging panel 1012, may also comprise a second circumferential cut line 1055 disposed between a pair of first circumferential cut lines 1057.

A first side panel 1018 is hingedly connected to a first side of the engaging panel 1012 by a hinged connection in the form of a fold line 1017.

A second side panel 1020 is hingedly connected to a second, opposing, side of the engaging panel 1012 by a hinged connection in the form of a fold line 1019.

The blank 1010 comprises an end structure at each end of the engaging panel 1012, the end structures are substantially the same in construction and will be described with reference to a first end structure shown in Figure 5. The first end structure comprises a first end panel 1022T hingedly connected to a first end of the engaging panel 1012 by a hinged connection in the form of a fold line 1011.

The first end structure comprises a first corner panel 1022A connected to a first end of the first end panel 1022T and integral therewith. Optionally, a fold line (not shown) may hingedly connect the first corner panel 1022A to the first end panel 1022T.

The first end structure comprises a first securing panel 1024A hingedly connected to the first corner panel 1022A by a hinged connection in the form of a fold line 1023A. The fold line 1023A is optionally and may be omitted, in such embodiments the first securing panel 1024A is integral with the first corner panel 1022A.

The first end structure comprises a second corner panel 1022B connected to a second end of the first end panel 1022T and integral therewith. Optionally, a fold line (not shown) may hingedly connect the second corner panel 1022B to the first end panel 1022T.

A second securing panel 1024B is hingedly connected to the second corner panel 1022B by a hinged connection in the form of a fold line 1023B. The fold line 1023B is optionally and may be omitted, in such embodiments the second securing panel 1024B is integral with the second corner panel 1022B.

A first web panel 1030A is hingedly connected at one end to the first securing panel 1024A by a hinged connection in the form of a fold line 1025A and is hingedly connected at a second end to the first side panel 1018 by a hinged connection in the form of a fold line 1027A.

A second web panel 1030B is hingedly connected at one end to the second securing panel 1024B by a hinged connection in the form of a fold line 1025B and is hingedly connected at a second end to the second side panel 1020 by a hinged connection in the form of a fold line 1027B.

The first web panel 1030A is separated from the first corner panel 1032A by an aperture A9, the aperture A9 separates the first corner panel 1022A from the engaging panel 1012. The second web panel 1030B is separated from the second corner panel 1022B by an aperture A9, the aperture A9 separates the second corner panel 1030B from the engaging panel 1012.

The first end structure comprises a handle panel 1014, the handle panel 1014 is hingedly connected at one end to the first corner panel 1022A by a hinged connection in the form of a fold line 1021A and is hingedly connected at a second end to the second corner panel 1022B by a hinged connection in the form of a fold line 1021B. The fold line 1021A and the fold line 1021B are optional, in embodiments where the fold lines 1021A, 1021B are omitted the handle panel 1014 is integral with the first and second corner panels 1022A, 1022B.

The handle panel 1014 is defined at least in part by a cut line or frangible line 1013. The frangible line 1013 separates the handle panel 1014 from the first end panel 1022T. The frangible line 1013 extends between the first corner panel 1022A and the second corner panel 1022B. The frangible line 1013 may comprise end portions in the form of “J” or “C” shaped cuts, in some embodiments the end portions may extend into each of the first and second corner panels 1022A, 1022B. The frangible line 1013 may be nonlinear in shape, and may comprise a medial portion 1013 and a pair of divergently arranged marginal portions 1013A, 1013B. The medial portion 1013 may be arranged to interrupt the hinged connection between the first end panel 1022T and the engaging panel 1012 and may be collinear with the fold line 1011. In this way the first end panel 1022T may take the form of a pair of substantially triangular shaped panels spaced apart from each other. The handle panel 1014 may be considered to be formed from material which would otherwise form the first end panel 1022T. This may be advantageous in that the strength of the handle panel is increased without requiring additional material to be provided, without increasing the size of the blank 1010.

It will be appreciated that the first end panel 1022T, the first corner panel 1022A, the first securing panel 1024A, the second corner panel 1022B, the second securing panel 1024B, and the handle panel 1014 form a strap 1024A/1022A/1022T/1014/1022B/1024B along a first end of the engaging panel 1012.

The blank 1010 may comprise at least one stabilisation device T. In the illustrated embodiment, the blank 1010 comprises two stabilisation devices T. The stabilization device T takes the form of an opening struck from the blank 1010. A first stabilisation device T is disposed between first group of four article retention structures RT1, RT2 located proximate a first or leading end edge of the blank 1010 and may be disposed centrally between said group of article retention structures RT1, RT2. A second stabilisation device T is disposed between a second group of four article retention structures RT1, RT2 located proximate a second or trailing end edge of the blank 1010 and may be disposed centrally between said group of article retention structures RT1, RT2. The stabilisation devices T are configured to receive an abutment peg or dog of a packaging machine during assembly of the carrier 1090.

The opening of the stabilisation devices T may be non-circular in shape, and may be substantially square or diamond shaped. The opening may be defined by at least one tab 1064 struck from the engaging panel 1012 and hingedly connected thereto. In the illustrated embodiment, the opening is defined by a pair of tabs 1064 each struck from the engaging panel 1012 and hingedly connected to the engaging panel 1012 in opposition to each other. The pair of tabs 1064 may be separated from each other by a cut or severable line.

Turning to the construction of the carrier 1090 from the blank 1010, the blank 1010 may be formed into an assembled carrier 1090, as shown in Figure 7.

The engaging panel 1012 is lowered with respect to a group of articles B. The article retention structures RT1, RT2 engage with respective articles B. The engaging teeth 1052A, 1052B fold out of the plane of the engaging panel 1012 and engage beneath a flange or projection of the articles B.

The first end panel 1022T and the handle panel 1014 are folded about fold line 1011 and frangible line portion 1013. The first and second corner panels 1022A, 1022B are folded about respective corners of the article group and the first and second securing panels 1024A, 1024B are folded about respective sides of the article group.

Second end panel 1026T and second handle panel 1016 are folded, about fold line 1009 and frangible line portion 1015, downwardly about the end of the article group. Corner panels 1026A, 1026B are folded about respective corners of the article group and securing panels 1028A, 1028B are folded about respective sides of the article group.

Glue or other adhesive treatment is applied to an outward facing surface of the securing panels 1024A, 1024B, 1028A, 1028B. Alternatively, glue or other adhesive treatment is applied to an inner surface of the first and second side panels 1018, 1020.

The first side panel 1018 is folded about fold line 1017 to be brought into face-to-face relationship with the securing panels 1024A, 1028A. The first side panel 1018 is secured to the securing panels 1024A, 1028A.

The second side panel 1020 is folded about fold line 1019 to be brought into face-to-face relationship with the securing panels 1024B, 1028B. The second side panel 1020 is secured to the securing panels 1024B, 1028B.

Referring now to Figure 6 there is shown an alternative blank for forming a handle or binding strap which may be used in the unitary package or packaging system of the present disclosure. In the illustrated embodiment, like numerals have, where possible, been used to denote like parts, albeit with the addition of the prefix “2000” to indicate that these features belong to the strap of Figure 6. The alternative embodiment shares many common features with the embodiment of Figures 1 and 4, therefore only the differences from the embodiment illustrated in Figures 1 and 4 will be described in any greater detail.

Figure 6 shows a blank 2110 comprising a plurality of panels 2112, 2114, 2116, 2118, 2120, 2122, 2124. The blank 2110 comprises a top panel 2118. The top panel 2118 comprises a pair of handle flaps 2160 hingedly connected, by hinged connections in the form of fold lines 2161, to opposing sides of the top panel 2118 and extending along a substantial portion -greater than half- of the side edge of the top panel 2118. The handle flaps 2160 may, in addition to

providing a comfortable cushioning flap, reinforce the top panel 2118 by providing a two-ply structure over a substantial portion of the top panel 2118.

The top panel 2118 is generally "I" shaped and comprises a pair of recesses along opposing side edge thereof. The handle flaps 2160 are provided in said recesses and are hingedly connected to opposed side of a medial portion of the top panel 2118.

The blank 2110 comprises a first upper bevel or corner panel 2116A hingedly connected to a first side panel 2116A by a hinged connection in the form of a fold line 2117B and hingedly connected to the top panel 2118 by a hinged connection in the form of a fold line 2117A.

The blank 2110 comprises a second upper bevel or corner panel 2118A hingedly connected to a second side panel 2120B by a hinged connection in the form of a fold line 2119B and hingedly connected to the top panel 2118 by a hinged connection in the form of a fold line 2119A.

The blank 2110 comprises at least one article engaging tab 2166 struck from, or hingedly connected to, the top panel 2118. The illustrated embodiment comprises a plurality of article engaging tab 2166, specifically, but not exclusively, four article engaging tab 2166. Each article engaging tab 2166 is hinged to an end portion of the top panel 2118. The article engaging tabs 2166 are disposed in, or define, a portion of one of the pair of recesses along opposing side edges of the top panel 2118. Each article engaging tab 2166 is hingedly connected to the top panel 2118 by a hinged connection in the form of a fold line 2165, the fold line 2165 may be divergently arranged with respect to a fold line 2117A, 2119A between an upper bevel panel 2118A, 2120A and the top panel 2118, additionally or alternatively, the fold line 2165 may be divergently arranged with respect to the fold line 2161 hinging a respective one of the pair of handle flaps 2160 to the top panel 2118.

The fold line 2165 may be obliquely oriented with respect to the fold line 2161 hinging a respective one of the pair of handle flaps 2160 to the top panel 2118.

Each article engaging tab 2166 may be separated from one of the pair of handle flaps 2160 by a cutline, slot or other cutaway.

A free edge of each article engaging tab 2166 may be defined, at least in part, by a non-linear cutline, optionally an arcuate cutline. In embodiments, where an arcuate cutline is employed the radius of curvature of the cutline may be substantially equal to the radius of curvature of an internal wall of a rim, ridge or recess of an article B being packaged.

The blank 2110 may be employed with carriers 1090 formed form blanks 1010 in accordance with Figure 5 to form a tertiary package as shown in Figure 7. The handle strap 2190 inhibits or prevents access to or use of the handle structure of the article carrier 1090 provided by the handle flaps 1014, 1016.

The article engaging tabs 2166 engage with upper ends of articles B received in the article retention structures RT1 of the article carriers 90, in this way the security of the article carriers 90 within the handle strap is improved.

Referring now to Figure 8 there is shown an alternative blank for use in the packaging system of the present disclosure. In the illustrated embodiment, like numerals have, where possible, been used to denote like parts, albeit with the addition of the prefix “2000” to indicate that these features belong to the article carrier or secondary package of Figure 8. The alternative embodiment shares many common features with the embodiments of Figures 1 and 5, therefore only the differences from the embodiment illustrated in Figures 1 and 5 will be described in any greater detail.

Figure 8 shows a blank 2010 comprising an engaging panel 2012 forming part of a carrier 2090 shown in Figure 9.

The blank 2010 includes a first end panel 2014 hingedly connected to a first end of the main panel 2012 by a hinged connection in the form of a fold line 2013. The fold line 2013 is linear. The blank 2010 includes a second end panel 2016 hingedly connected to a second end of the main panel 2012 by a hinged connection in the form of a fold line 2015. The fold line 2015 is linear.

The blank 2010 includes a first side panel 2018 hingedly connected to a first side of the main panel 2012 by a hinged connection in the form of a fold line 2017. The fold line 2017 is linear. The blank 2010 includes a second side panel 2020 hingedly connected to a second side of the main panel 2012 by a hinged connection in the form of a fold line 2019. The fold line 2019 is linear.

The main panel 2012 comprises four corner regions 2012A each substantially the same in construction. The corner regions 2012A will be described in further detail with reference to a first corner region 2012A. The first corner region 2012A is defined, at least in part, by a divergently arranged pair of fold lines 2013A, 2017A. The pair of fold lines 2013A, 2017A comprises a first fold line 2013A oriented substantially perpendicularly to a second fold line 2017A.

Each of the pair of fold lines 2013A, 2017A is substantially colinear with a respective one of the fold lines 2013, 2017 hinging the first side panel and first end panel 2014, 2016 to the main panel 2012.

The first corner region 2012A may comprise a bevel, chamfered or filleted corner defining a free edge of the main panel 2012 -that is to say, the free edge is not hinged to any other panel.

The blank 2010 comprises four first article retention structures RT1 which are substantially similar in construction to the first article retention structures RT1 of the embodiment shown in Figure 1 albeit the tabs 2050A, 2050B have been widened so as to occupy a larger portion of the circumference of an article receiving opening defined in part by an aperture A1. A partial tab or tooth 2050C is provided on each side of each abutment tab 2050A, 2050B. An abutment tab 2050A, 2050B and the associated pair of partial teeth 2050C occupy an angular width equivalent to three full teeth 2052A, 2050B, said angular width may be 67.5°. The abutment tabs 2050A, 2050B may occupy approximately 39.5°, each partial tooth 2050C may occupy approximately 14°.

Each of the pair of radial cutlines 2051 of the abutment tabs 2050A, 2050B extends to a fold line 2013, 2015, 2017, 2019 hinging a side or end panel 2018, 2020, 2014, 2016 to the engaging panel 2012.

The abutment tab 2050A, 2050B interrupts the respective one of the fold lines 2013, 2015, 2017, 2019 hinging the engaging panel 2012 to the side or end panel 2018, 2020, 2014, 2016 to, or from, which it extends, that is to say, the abutment tab 2050A, 2050B is integral with one of the side or end panels 2018, 2020, 2014, 2016.

The fold lines 2013, 2015, 2017, 2019 hinging the side or end panel 2018, 2020, 2014, 2016 to the engaging panel 2012 may comprise a plurality of spaced apart cutlines arranged collinearly with each other. The plurality of spaced apart cutlines may comprise two, three or more discrete cutlines. The plurality of spaced apart cutlines may comprise two, three or more discrete cutlines each having a different length.

The first article retention structures RT1 comprises a plurality of engaging teeth 2052A, 2052C are hinged to the engaging panel 2012 by a fold line. The fold line may be defined by a plurality of cut lines 2055, 2057. The plurality of cut lines 2055, 2057 may define or approximate a circle.

The hinged connection between the plurality of engaging teeth 2052A, 2052C and the engaging panel 2012 is spaced apart from respective ones of the fold lines 2013, 2015, 2017, 2019 hinging the side or end panels 2018, 2020, 2014, 2016 to the engaging panel 2012. In this way the circumferential fold defining the plurality of engaging teeth 2052A, 2052C is spaced apart from a linear fold hinging a side or end panel 2018, 2020, 2014, 2016 to the engaging panel 2012.

The abutment tabs 2050A, 2050B are defined by a pair of radial cutlines 2051, the radial cutlines 2051 of the abutment tabs 2050A, 2050B are longer in length than at least one of the radial cutlines 2053 defining the first teeth 2052A. The pair of radial cutlines 2051 extend beyond a perimeter of the engaging teeth 2052A, 2052C, that is to say, beyond the circumferential fold defining outer edges of the plurality of engaging teeth 2052A, 2052C, the circumferential fold being defined by the plurality of cut lines 2055, 2057.

The blank 2010 comprises two second article retention structures RT2 which are substantially similar in construction to the first article retention structures RT1 albeit one of the abutment tabs 2050B is omitted along with its two associated partial teeth 2052C, and replaced with three full teeth 2052A.

The blank 2010 forms an article carrier 2090 for use with the handle strap 2190 formed form the blank 2110 of Figure 6, Figure 9 shows a pair of article carriers 2090 forming a tertiary package P with a handle strap 2190.

The abutment tabs 2050A, 2050B fold out of the plane of the main panel 2012 when an article B is received in the article retention structures RT1, RT2, the abutment tabs 2050A, 2050B being integral with one of the side or end panels 2018, 2020, 2014, 2016 may encourage or initiate folding of the side or end panels 2018, 2020, 2014, 2016 with respect to the main panel 2012.

Referring now to Figure 10, an alternative unitary package or packaging system of the present disclosure is shown. In Figure 10, like numerals have, where possible, been used to denote like parts, albeit with the addition of the prefix “3000” to indicate that these features belong to the embodiment of Figure 10. This alternative embodiment shares many common features with the embodiment of Figure 1, therefore only the differences from the embodiment illustrated in Figure 1 will be described in any greater detail.

Figure 10 illustrates a stack of sub-packages each formed from a group of articles B which are clustered together by a top-engaging carrier 90 which is formed from the blank 10 of Figure 1. The sub-packages of Figure 10 are shown as stacked one on top of the other such that the articles B of the upper sub-package are disposed or placed on the carrier 90 of the lower sub-package. The details of the top-engaging carrier 90 and its blank 10 are described earlier and illustrated in Figures 1 and 3.

Figure 10 further illustrates a handle or binding strap 3190 which is wrapped or folded about the stack of sub-packages. The handle strap 3190 comprises a tubular structure having opposed open ends and disposed around the stack such that a part of each of the upper and lower sub-packages extends outwards from one of the opposed open ends of the tubular structure and another part of each of the upper and lower sub-packages extends outwards from the other one of the opposed open ends of the tubular structure Each sub-package is formed from a group of substantially cylindrical articles B and a top-engaging carrier 90 which is in engagement with the upper portion of each of the articles.

The handle or binding strap 3190 comprising a top panel 3118 and a side panel 3120. The other panels of the strap 3190 are not shown in Figure 10; however, the strap 3190 includes another side panel at the position opposing the side panel 3120 and a pair of mutually secured base panels at the position opposing the top panel 3118. The base panels of the strap 3190 each has a single bottom-receiving opening which is defined by a pair of bottom-engaging flaps such as denoted by the numeral “3170B” in Figure 10. The single bottom-receiving opening in Figure 10 is used to receive part of the bottom of an intermediate article B of the lower sub-package. The engaging flaps 3170B are in engagement with the bottom of the respective intermediate article B. The other parts of the strap 3190 may be similar to those shown in Figure 2 if not identical thereto.

Referring now to Figure 11, an alternative blank is shown for forming a handle or binding strap which may be used in a packaging system of the present disclosure. The blank of Figure 11 is a modified form of the blank of Figure 6. In Figure 11, like numerals have, where possible, been used to denote like parts, albeit with the addition of the prefix “4000” to indicate that these features belong to the blank of the modified form of the handle strap. Figure 11 shares many common features with the strap of Figure 6, therefore only the differences from the strap of Figure 6 will be described in any greater detail.

Figure 11 shows a blank 4110 comprising a plurality of panels 4112, 4114, 4116, 4118, 4120, 4122, 4124. The blank 4110 comprises a top panel 4118. The top panel 4118 comprises a pair of handle flaps 4160 hingedly connected, by hinged connections in the form of fold lines 4161, to opposing sides of the top panel 4118 and extending along a substantial portion -greater than half- of the side edge of the top panel 4118. The handle flaps 4160 may, in addition to providing a comfortable cushioning flap, reinforce the top panel 4118 by providing a two-ply structure over a substantial portion of the top panel 4118.

Figure 12 shows a packaging system comprising a pair of sub-packages each formed from a group of articles B which are clustered together by a top-engaging carrier 1090 which is formed from the blank 1010 of Figure 5. The sub-packages are combined together by a binding strap 4190 formed from the blank of Figure 11.

The blank 4110 comprises a pair of base panels 4112, 4124, the pair of base panels 4112, 4124 are configured to form a complete or full base wall 4112/4124, that is to say all of the articles B in the top-engaging carriers 1090, being secured together, rest upon the base wall 4112/4124.

The blank 4110, similar to the blank 2110 of Figure 6, comprises article engaging tabs 4166; the article engaging tabs 4166 are hinged to the top panel 4118 by hinged connections 4165. The article engaging tabs 4166 engage upper ends of articles B in the top-engaging carriers 1090. Each article engaging tab 4166 engages an internal surface of a wall, upstand to recess in the upper end of a respective article B. The article engaging tabs 4166 are configured to engage inner articles B disposed proximate to the handle or binding strap 4190. Upper ends of the outermost or endmost articles B are fully exposed or visible. The lower ends of the outermost or endmost articles B proximate the first and second side walls 4116B, 4120B, are received or engaged by respective bottom locking arrangements BL1, BL2.

Referring now to Figure 13, an alternative blank is shown for forming a handle or binding strap which may be used in a packaging system of the present disclosure. The blank of Figure 13 is a modified form of the blank of Figures 6 and 11. In Figure 13, like numerals have, where possible, been used to denote like parts, albeit with the addition of the prefix “5000” to indicate that these features belong to the blank of the modified form of the handle strap. Figure 13 shares many common features with the strap of Figures 6 and 11, therefore only the differences from the straps of Figures 6 and 11 will be described in any greater detail.

Figure 13 shows a blank 5110 comprising a plurality of panels 5112, 5114, 5116, 5118, 5120, 5122, 5124. The blank 5110 comprises a top panel 5118. The top panel 5118 comprises a pair of handle flaps 5160 hingedly connected, by hinged connections in the form of fold lines 5161, to opposing sides of the top panel 5118 and extending along a substantial portion -greater than half- of the side edge of the top panel 5118. The handle flaps 5160 may, in addition to providing a comfortable cushioning flap, reinforce the top panel 5118 by providing a two-ply structure over a substantial portion of the top panel 5118.

Figure 14 shows a packaging system comprising a pair of sub-packages each formed from a group of articles B which are clustered together by a top-engaging carrier 1090 which is formed from the blank 1010 of Figure 5. The sub-packages are combined together by a binding strap 5190 formed from the blank of Figure 13.

Similarly, to the blank 4110 of Figure 11, the blank 5110 comprises a complete or full base wall 5112/5124, that is to say all of the articles B in the top-engaging carriers 1090, being secured together, rest upon the base wall 5112/5124.

The top panel 5118 comprises marginal portion which extend fully between opposed ends of the package P, that is to say the marginal portions are equal in length to the base panels 5112, 5124.

The first and second sidewalls 5115B, 5120B also extend fully between opposed ends of the package P, they are equal in length to the base panels 5112, 5124 and the marginal portions of the top panel 5118. In this way a side of

the outermost or endmost articles B proximate the first and second side walls 5116B, 5120B is covered or concealed by the first and second sidewalls 5115B, 5120B.

The blank 5110 comprises at least one article engaging tab 5166; the article engaging tabs 5166 are hinged to the top panel 5118 by hinged connections 5165. The article engaging tabs 5166 engage upper ends of articles B in the top-engaging carriers 1090. Each article engaging tab 5166 engages an internal surface of a wall, upstand to recess in the upper end of a respective article B. The article engaging tabs 5166 are configured to engage outer or endmost articles B disposed distally from a handle or grip portion H of the binding strap 5190. Upper ends of the outermost or endmost articles B may be partially exposed or visible. The lower ends of the outermost or endmost articles B proximate the first and second side walls 5116B, 5120B, are received or engaged by respective bottom locking arrangements BL1, BL2.

In alternative embodiments, the inner articles B disposed proximate to the handle of the binding strap 5190 may additionally be secured by means of an additional article engaging tab. The additional article engaging tab may be provided by material which is cut or removed to form the recess in the top panel 5118, or may be struck from within a marginal portion of the top panel 5118 coupling the handle H to one of the side panels 5116B, 5120B.

Referring now to Figure 15, an alternative blank is shown for forming a handle or binding strap which may be used in a packaging system of the present disclosure. The blank of Figure 15 is a modified form of the blank of Figure 13. In Figure 15, like numerals have, where possible, been used to denote like parts, albeit with the addition of the prefix “6000” to indicate that these features belong to the blank of the modified form of the handle strap. Figure 15 shares many common features with the strap of Figure 13, therefore only the differences from the straps of Figure 13 will be described in any greater detail.

Figure 15 shows a blank 6110 comprising a plurality of panels 6112, 6114, 6116, 6118, 1120, 1122, 1124. The blank 6110 comprises a top panel 6118. The top panel 6118 comprises a pair of handle flaps 6160 hingedly connected, by hinged connections in the form of fold lines 6161, to opposing sides of the top panel 6118 and extending along a substantial portion -greater than half- of the side edge of the top panel 6118. The handle flaps 6160 may, in addition to providing a comfortable cushioning flap, reinforce the top panel 6118 by providing a two-ply structure over a substantial portion of the top panel 6118.

Figure 17 shows a packaging system comprising a pair of sub-packages each formed from a group of articles B which are clustered together by a top-engaging carrier 3090 which is formed from the blank 3010 of Figure 16. The sub-packages are combined together by a binding strap 6190 formed from the blank of Figure 15.

The blank 3010 is adapted to accommodate or bind three top-engaging carrier 3090 together. The top-engaging carriers 3090 are substantially similar to that of Figure 8, albeit they are configured and arranged to each accommodate eight articles B in a 2×4 matrix or array configuration.

The blank 6110 is similar in construction to the previous blanks, albeit modified to accommodate three top-engaging carriers 3090 each accommodating eight articles B. A central top-engaging carriers 3090 is disposed entirely

within the binding strap 6190, such that all of its articles B rest upon a base wall 6112/6124. The endmost or outer top-engaging carriers 3090 are each partially disposed within the binding strap 6190. Each outer top-engaging carriers 3090 comprises an inner row or column of articles B disposed upon the base wall 6112/6124 of the binding strap 6190 and an outer row or column of articles B disposed outside of the binding strap 6190. The

The blank 6110 comprises at least one article engaging tab 6166; the article engaging tabs 6166 are hinged to the top panel 6118 by hinged connections 6165. The article engaging tabs 6166 engage upper ends of articles B in the top-engaging carriers 3090. Each article engaging tab 6166 engages an internal surface of a wall, upstand to recess in the upper end of a respective article B. The article engaging tabs 6166 are configured to engage articles B of the outer top-engaging carriers 3090 disposed in the inner row or column of articles B, that is to say those disposed in closest proximity to the handle or grip strap portion H of the binding strap 6190. Upper ends of articles B disposed in the outer row or column of articles B of the outer top-engaging carriers 3090 are fully exposed or visible. The lower ends articles B disposed in the outer row or column of articles B of the outer top-engaging carriers 3090 are free from engagement with the binding strap 6190, and are unsupported by the base wall 6112/6124 of the binding strap 6190.

Referring now to Figure 18 there is shown an alternative blank for use in the packaging system of the present disclosure. In the illustrated embodiment, like numerals have, where possible, been used to denote like parts, albeit with the addition of the suffix '. The alternative embodiment shares many common features with the embodiment of Figure 1, therefore only the differences from the embodiment illustrated in Figure 1 will be described in any greater detail.

Figure 18 shows a blank 10' comprising a plurality of panels 12', 14', 16', 18', 20', including a main panel 12' for forming a bottom wall or an engaging panel of a carrier 90' (see Figure 20).

A first side panel 14' is hingedly connected to a first side of the main panel 12' by a hinged connection in the form of a fold line 13'. A first top or cover panel 18' is hingedly connected to the first side panel 14' by a hinged connection in the form of a fold line 17'.

A second side panel 16' is hingedly connected to a second side of the main panel 12' by a hinged connection in the form of a fold line 15'. A second top or cover panel 20' is hingedly connected to the second side panel 16' by a hinged connection in the form of a fold line 19'.

The main panel 12' of the blank 10' includes at least one article retention structure RT1', RT2'. The main panel 12' comprises a plurality of article retention structures RT1', RT2', specifically six article retention structures RT1', RT2' arranged in 2 × 3 matrix or array. Each of the article retention structures RT1', RT2' comprises an opening or aperture A1', A2'.

The blank 10' comprises four first article retention structures RT1'. The first article retention structures RT1' are located adjacent to ends of the main panel 12'. The blank 10' comprises two second article retention structures RT2'. The second article retention structures RT2' are located between a first pair of first article retention structures RT1' disposed proximate a first end of the main panel 12' and a second pair of first article retention structures RT1' disposed

proximate a second end of the main panel 12'. The second article retention structures RT2' are also referred to herein as intermediate article retention structures RT2'. The first article retention structures RT1' are also referred to herein as end article retention structures RT1'.

Each of the first article retention structures RT1' is substantially similar in construction and will therefore be described in detail with reference to a first one of the first article retention structures RT1' located adjacent to a first end of the blank 10' as shown in Figure 1.

The first article retention structure RT1' comprises an article receiving opening defined in part by an aperture A1.

The first article retention structure RT1' comprises a plurality of engaging teeth 52A', 52B', 52C' disposed about the aperture A1'.

The plurality of teeth 52A', 52B', 52C' is hinged to the main panel 12' by a fold line.

The plurality of teeth 50A, 50B, 52A, 52B, 52C includes first, second, and third teeth 52A', 52B', 52C' hingedly connected to the main panel 12' by a fold line. The fold line may be defined by a plurality of cut lines. The plurality of cut lines may define or approximate a circle.

The plurality of teeth 52A', 52B', 52C' is interrupted by at least one cutaway in the form of a recess C1', C2', C3', C4'. The first article retention structure RT1' of the illustrated embodiment comprises four cutaways or recesses C1', C2', C3', C4'. A first major cutaway C1' is disposed adjacent and proximate to one of the first and second side panels 14', 16'. A second major cutaway C2' is disposed adjacent and proximate to one of a first and second end panel 34', 24'. A first minor cutaway C3' is disposed opposite the first major cutaway C1'. A second minor cutaway C4' is disposed opposite the second major cutaway C2'. The minor cutaways C3', C4' occupy a smaller angular width than the major cutaways C1', C2'.

Groups of engaging teeth 52A', 52B', 52C' are provided between adjacent pairs of the cutaways or recesses C1', C2', C3', C4' about the periphery of the aperture A1'. A first group of teeth 52A', 52C' is provided between the first and second major cutaways C1', C2', and comprises one first engaging tooth 52A' and a pair of third engaging teeth 52C' disposed on opposing side thereof; the third engaging teeth 52C' occupy a smaller angular width than the first tooth 52A'. A second group of teeth 52A', 52B' is provided between the first and second minor cutaways C3', C4', and comprises one first engaging tooth 52A' and a pair of second engaging teeth 52B' disposed on opposing side thereof; the second engaging teeth 52B' may be tapered in shape so as to narrow or reduce in height towards a respective one of the first and second minor cutaways C3', C4'. A third group of teeth 52A', 52B', 52C' is provided between the first major cutaway C1' and the second minor cutaway C4'; a third engaging tooth 52C' is disposed adjacent the first major cutaway C1', a second engaging tooth 52B' is disposed adjacent the second minor cutaway C4' and a first tooth 52A' is disposed therebetween.

A fourth group of teeth 52A', 52B', 52C' is provided between the second major cutaway C2' and the first minor cutaway C3'; a third engaging tooth 52C' is disposed adjacent the second major cutaway C2', a second engaging tooth 52B' is disposed adjacent the first minor cutaway C3' and a first tooth 52A' is disposed therebetween.

In this way a third engaging tooth 52C' is disposed on opposing sides of each of the first and second major cutaways C1', C2' and a second engaging tooth 52B' is disposed on opposing sides of each of the first and second minor cutaways C3', C4'.

Each of the second article retention structures RT2' is substantially similar in construction to each other and is similar to the first article retention structures RT1' and only the differences between the second article retention structures RT2' and the first article retention structures RT1' will be described in further detail.

The second article retention structures RT2' comprise three minor cutaways C3', C4', C5' and a single major cutaway C1'. The major cutaway C1' is disposed adjacent and proximate to one of the first and second side panels 14', 16'. A first minor cutaway C3' is disposed opposite the major cutaway C1'. A pair of minor cutaways C4', C5' are disposed opposite each other, the pair of minor cutaways C4', C5' being oriented orthogonally to the first minor cutaway C3' and. the major cutaway C1'.

The first and second top panels 18', 20' are arranged to be disposed in at least partially overlapping relationship with each other. The overlapping portions of the first and second top panels 18', 20' are provided with a locking structure for locking the first and second top panels 18', 20'. The locking structure may cooperate with the main panel 12' to secure the first and second top panels 18', 20' to the main panel 12'.

The locking structure comprises at least one first locking element L1' for being received in a receiver element RC' in the main panel 12'. The first locking element L1' comprises a tab 80' struck from the first top panel 18', the illustrated embodiment comprises two tabs 80' each arranged to be engageable with one of the receiver elements RC'. The receiver elements RC' each comprising a receiver opening. The first locking element L1' also passes through an opening in the second top panel 20'. The opening in the second top panel 20' may be defined by a second tab 82'. Each tab 80' is hinged to the first top panel 18' by a hinged connection in the form of first fold line 81' having a first fold strength or resistance. The first fold line 81' may be defined by a single perforation or weakening element disposed between ends of a cutline defining the tab 80'. In the illustrated embodiment, the perforation or weakening element is omitted.

The locking structure comprises at least one second locking element L2' in the form of an opening in the second top panel 20'. The second locking element L2' comprises a tab 82' struck from the second top panel 20', the illustrated embodiment comprises two tabs 82' each arranged to be engageable with one of the receiver openings in the main panel 12'. Each tab 82' is hinged to the second top panel 20' by a hinged connection in the form of second fold line 83' having a second fold strength or resistance, the second fold resistance may be equal to or lower than the first fold resistance, that is to say, the second tabs 82' may be more easily folded. The second fold line 83' may be defined by one, two or more perforations or weakening elements disposed between ends of a cutline defining the tab 82', in the illustrated embodiment a single perforation or weakening element is provided. The second fold line 83' may comprise at least one more perforation than the first fold line 81', alternatively a greater proportion of the hinged connection

between the second top panel 20' and the second tabs 82' may be defined by, or comprise, a cut line, perforation, or other weakening element than the hinged connection between the first top panel 18' and the first tabs 80'.

The second tab 82' should be at least equal in size to the first tab 80'. The second tab 82' may be larger in dimension, in length and/or in width, than the first tab 80' so as to facilitate the first tab 80' readily passing through the second top panel 20'. The first tab 80' and the second tab 82' are generally "L" shaped and comprises a lobe or projection for engaging with the main panel 12'.

The first tab 80' and the second tab 82' engage with a receiver element RC' in the main panel 12'. The receiver element RC' comprises a receiver opening, in the illustrated embodiment the receiver opening is defined by a pair of tabs 70', 72' struck from the main panel 12' and hingedly connected thereto by respective fold lines 71', 73'. The receiver opening may be generally rectangular in shape, and the tabs 70'. 72 of the pair of tabs 70', 72' may have an unequal length. A longer one of the pair of tabs 70', 72' may be hinged in opposition to the locking tabs 80', 82' which are received in the receiver opening it defines a portion of.

The first top panel 18' and the second top panel 20' comprise tab T' extending from opposing side edges thereof. The tabs T' are disposed proximate or adjacent to a hinged connection 17', 19' between the first top panel 18' and the first side panel 14' or between the second top panel 20' and the second side panel 16'. The tab T' may be defined in part by a cutline CT' extending from an aperture A3 separating each of a pair of hinged panels 28A'/30A', 28B'/30B', 38A'/40A', 38B'/40B' from a respective one of the first and second side panels 14, 16. The cutline CT' may extend to a fold line 23A', 23B', 33A', 33B' between one of the first and second top panels 18', 20' and an anchor flap 22A', 22B' 32A', 32B'. In this way the tab T' may be considered to extend into the aperture A3. The tab T' provides a portion of a respective one of the first and second top panels 18', 20' which extends beyond an end edge of the main panel 12' defined by a fold line 25', 35'; that is to say the first and second top panels 18', 20' in the region of the tabs T' is longer in dimension than the main panel 12'.

Referring now to Figure 19, an alternative blank 7110 is shown for forming a handle or binding strap which may be used in a packaging system of the present disclosure. The blank 7110 of Figure 19 is a modified form of the blank of Figure 2. In Figure 2, like numerals have, where possible, been used to denote like parts, albeit with the addition of the prefix "7000" to indicate that these features belong to the blank of the modified form of the handle strap. Figure 19 shares many common features with the strap of Figure 2, therefore only the differences from the straps of Figure 2 will be described in any greater detail.

Figure 19 shows a blank 7110 comprising a plurality of panels 7112, 7114, 7116, 7118, 7120, 7122, 7124 for forming a handle strap and/or binding device for coupling two or more carriers 90' together.

The blank 7110 includes a first bottom panel 7112 hingedly connected to a first corner or bevel panel 7114 by a hinged connection in the form of a fold line 7113. A first side panel 7116 is hingedly connected to the first bevel panel 7114 by a hinged connection in the form of a fold line 7115. A top panel 7118 is hingedly connected to the first side panel 7116 by a hinged connection in the form of a fold line 7117. A second side panel 7120 is hingedly connected to

the top panel 7118 by a hinged connection in the form of a fold line 7119. A second corner or bevel panel 7122 is hingedly connected to the second side panel 7120 by a hinged connection in the form of a fold line 7121. A first bottom panel 7124 is hingedly connected to a second bevel panel 7122 by a hinged connection in the form of a fold line 7123.

The blank 7110 is foldable to form a carrier 7190 as illustrated in Figure 20. The first and second base panels 7112, 7124 are engageable with one another in an overlapping relationship to form a composite base wall 7112/7124 of the carrier 7190.

The top panel 7118 comprises a first reinforcement flap 7118A hingedly connected along a first side edge of the top panel 7118 by a hinged connection in the form of a fold line 7125A. The top panel 7118 comprises a second reinforcement flap 7118B hingedly connected along a second side edge of the top panel 7118, the second side edge opposes the first side edge, by a hinged connection in the form of a fold line 7125B.

The first reinforcement flap 7118A may extend into the first and/or second side panels 7116, 7120, a first extension 7116A may be hingedly connected to the first side panel 7116 by a hinged connection in the form of a fold line 7127A. A second extension 7120A may be hingedly connected to the second side panel 7120 by a hinged connection in the form of a fold line 7129A. The first extension 7116A may be hingedly connected to the first reinforcement flap 7118A by a hinged connection in the form of a fold line 7117A. The second extension 7120A may be hingedly connected to the first reinforcement flap 7118A by a hinged connection in the form of a fold line 7119A.

The second reinforcement flap 7118B may extend into the first and/or second side panels 7116, 7120, a first extension 7116B may be hingedly connected to the first side panel 7116 by a hinged connection in the form of a fold line 7127B. A second extension 7120B may be hingedly connected to the second side panel 7120 by a hinged connection in the form of a fold line 7129B. The first extension 7116B may be hingedly connected to the first reinforcement flap 7118B by a hinged connection in the form of a fold line 7117B. The second extension 7120B may be hingedly connected to the first reinforcement flap 7118B by a hinged connection in the form of a fold line 7119B.

Each of the reinforcement flap extensions 7116A, 7116B, 7120A, 7120B may comprise an optional fold line extending thereacross. The fold line may extend from the hinged connection 7127A, 7127B, 7129A, 7129B to an opposing free edge of the reinforcement flap extension 7116A, 7116B, 7120A, 7120B. The fold line may be parallel to the hinged connection 7117A, 7117B, 7119A, 7119B between the reinforcement flap extension 7116A, 7116B, 7120A, 7120B and the respective one of the first and second reinforcement flaps 7118A, 7118B from which it depends.

Optionally, the first side panel 7116 may comprise a first recess R1 struck from a first side edge thereof. The first recess R1 may define an end or lower (in normal use) edge of the first extension 7116B of the second reinforcement flap 7118B. Optionally, the first side panel 7116 may comprise a second recess R2 struck from a second, opposing, side edge thereof. The second recess R2 may define an end or lower (in normal use) edge of the first extension 7116A of the first reinforcement flap 7118A.

Optionally, the second side panel 7120 may comprise a first recess R1 struck from a first side edge thereof. The first recess R1 may define an end, or lower (in normal use), edge of the second extension 7120B of the second

reinforcement flap 7118B. Optionally, the second side panel 7120 may comprise a second recess R2 struck from a second, opposing, side edge thereof. The second recess R2 may define an end, or lower (in normal use), edge of the second extension 7120A of the first reinforcement flap 7118A.

The blank 7110 may comprise a first handle flap 7160 struck from the top panel 7118, disposed adjacent to a first side edge of the top panel 7118, and hingedly connected thereto by a hinged connection in the form of a fold line 7161. An aperture A5 may be struck in part from the second reinforcement flap 7118B adjacent to the first handle flap 7160 and in part from the top panel 7118 and is configured and arranged to accommodate the first handle flap 7160 in an operative condition.

The blank 7110 may comprise a second handle flap 7160 struck from the top panel 7118, disposed adjacent to a second, opposing, side edge of the top panel 7118, and hingedly connected thereto by a hinged connection in the form of a fold line 7161. An aperture A5 may be struck in part from the first reinforcement flap 7118A adjacent to the first handle flap 7160 and in part from the top panel 7118 and is configured and arranged to accommodate the first handle flap 7160 in an operative condition.

The blank 7110 may comprises a carrier tab receiver TR, see Figure 20, which may take the form, for example, of one or more selected from the group of an opening, a slot, a slit, a cutline, an aperture, an indentation, a debossment, a rib, and an embossment, formed at least in part in/on one of the first and second side panels 7116, 7120. Any of the indentation, debossment and embossment may be provided on the inside surface of the blank 7110 in the form of a score line or two or more parallel score lines. Figure 19 shows a tab receiver in the form of a cutline TC; the cutline TC may interrupt the hinged connection 7117, 7119 between said one of the first and second side panels 7116, 7120 and the top panel 7118. The cutline TC may be substantially “U” or “C” shaped so as to define a tongue or projection extending from the top panel 7118 and integral therewith. Optionally, a tab receiver may be one or more indentations or debossments provided, for example, by one or more score lines formed along the inside surface of the blank 7110 such that each score line extends alongside, if not colinearly with, the hinged connection 7117, 7119. Optionally, a tab receiver may be one or more ribs or embossments provided, for example, by one or more score lines formed along the inside surface of the blank 7110 such that each score line extends transversely, if not perpendicularly, across the hinged connection 7117, 7119. Such ribs or embossments will be described later in more details.

Figure 20 shows a pair of article carriers 90’ coupled together by a strap 7190 formed from the blank 7110 of Figure 19. The blank 7110 is wrapped or folded about the pair of article carriers 90’.

The first and second reinforcement flaps 7118A, 7118B together with the extensions 7116A, 7116B, 7120A, 7120B are folded about respective fold lines into substantial face to face relationship with the panel to which they are hinged.

The blank 7110 is placed over a pair of article carriers 90’, in part over a first article carrier 90’ and in part over a second article carrier 90’. The first and second reinforcement flaps 7118A, 7118B are disposed between the top panel 7118 and the upper ends of the article carriers 90’. The first and second side panels 7116, 7120 are folded about fold lines 7117, 7119 respectively to be brought into face-to-face relationship with ends of the article carriers 90’.

The flaps 7170A, 7170B of the bottom locking arrangements BL1, BL2 are folded out of the plane of the bevel panels 7114, 7122, internally of the strap 7190. A lower portion of an article B of the first article carrier 90' is received in a first one of the first bottom locking arrangements BL1. A lower portion of another article B of the first article carrier 90' is received in a first one of the second bottom locking arrangements BL2. A lower portion of an article B of the second article carrier 90' is received in a second one of the first bottom locking arrangements BL1. A lower portion of another article B of the second article carrier 90' is received in a second one of the second bottom locking arrangements BL2. The flaps 7170A, 7170B are disposed about a lower or heel portion of the articles B and engage generally opposing sides of the articles B to restrict or inhibit movement of the article carriers 90' laterally of the strap 7190.

The second base panel 7124 is folded about the bases of the groups of articles B in each article carrier 90'. The first base panel 7112 is folded about the bases of the groups of articles B in each article carrier 90'. The first base panel 7112 is brought into at least partial overlapping relationship with the second base panel 7124. The first base panel 7112 is secured to the second base panel 7124 by the complementary locking mechanism. In this way the strap 7190 combines two carriers 90' into a single tertiary package P, as shown in Figure 20.

Each tab T' of an opposed pair of tabs T' of each article carrier 90' is received in a respective carrier tab receiver TR. Each carrier tab receiver TR receives a tab T' from each of the pair of article carriers 90' being packaged. In this way the article carriers 90' are locked or secured to the strap 7190 at upper ends thereof.

Referring now to Figure 21 and 22, an alternative blank 8110 is shown for forming a handle or binding strap which may be used in a packaging system P of the present disclosure. The packaging system P combines a pair of alternative packages 90" of the top-engaging style wherein a lower panel has article retention devices and an upper panel or pair of upper panels provide a cover panel CP" above the lower engaging panel. The top-engaging carrier 90" may comprises a keel or divider structure K extending downwardly from the lower panel between pairs of adjacently disposed articles B. The blank of Figure 21 is a modified form of the blank of Figure 19. In Figure 21, like numerals have, where possible, been used to denote like parts, albeit with the addition of the prefix "8000" to indicate that these features belong to the blank of the modified form of the handle strap. Figure 21 shares many common features with the strap of Figure 19, therefore only the differences from the straps of Figure 19 will be described in any greater detail.

The blank 8110 differs from the blank 7110 of Figure 19 in that the carrier tab receiver TR has been omitted; the packages 90" do not comprise tabs T' extending from the cover panel CP". In alternative embodiments, the packages 90" may comprise tabs T' and the packages 90" may be combined into a single tertiary package P using the blank 7110 of Figure 19.

Figure 23 illustrates a further alternative packaging system P, in the embodiment of Figure 23 a pair of article carriers 90" similar to those of the embodiment of Figure 22 are combined by a strap 9190. The strap 9190 comprises a top wall, opposed side walls and a base wall. One of the top wall, opposed side walls, and the base wall may be formed by a pair of panels in at least partial overlapping relationship to form a composite panel.

In some embodiments, the strap 9190 may have a width dimension sufficient to extend between the centre or middle of the articles B in a row of articles B in a first one of the pair of article carriers 90" and an adjacent row of articles in a second one of the pair of article carriers 90".

In some embodiments, the strap 9190 may have a width dimension sufficient to extend between the keel or divider structure K in the first one of the pair of article carriers 90" and an adjacent row of articles in the second one of the pair of article carriers 90". Interaction between the keel structures K and the strap 9190 may stabilise the article carriers 90" therein; end edges of the keel structures K may engage or contact inner surface of the opposed end walls. In some such embodiments the strap 9190 may comprise a tab receiver in one or both of the opposed side walls and the keel structures K of each of the pair of article carriers 90" may comprise tab extend outwardly therefrom to engage or be received in the tab receiver.

The article carriers 90" comprise a tubular structure having a first tubular axis T_a1, as shown in Figure 23, the strap 8190; 9190 comprises a tubular structure having a second tubular axis T_a2, see Figure 23, The first tubular axis T_a1 is perpendicular to the second tubular axis T_a2 and define a plane parallel to the top wall of the strap 8190, 9190 and the cover panel CP" of the article carriers 90".

The top wall of the strap 8190; 9190 may overlie or cover half, or less than half, of the width of the cover panel CP" of each of the article carriers 90", and may cover a quarter, or less, of the width of the cover panel CP" of each of the article carriers 90".

Referring now to Figure 24, an alternative blank 10110 is shown for forming a handle or binding strap which may be used in a packaging system of the present disclosure. In Figure 24, like numerals have, where possible, been used to denote like parts, albeit with the addition of the prefix "10000" to indicate that these features belong to the blank of the modified form of the handle strap. Figure 24 shares many common features with the strap of previous embodiments, therefore only the differences will be described in any greater detail.

The blank 10110 comprising a plurality of panels 10112, 10114, 10116, 10118, 10120, 10122, 10124 for forming a handle strap and/or binding device 10190 for coupling two or more carriers 90" together.

The blank 10110 includes a first bottom panel 10112 hingedly connected to a first corner or bevel panel 10114 by a hinged connection in the form of a fold line 10113. A first side panel 10116 is hingedly connected to the first bevel panel 10114 by a hinged connection in the form of a fold line 10115. A top panel 10118 is hingedly connected to the first side panel 10116 by a hinged connection in the form of a fold line 10117. A second side panel 10120 is hingedly connected to the top panel 10118 by a hinged connection in the form of a fold line 10119. A second corner or bevel panel 10122 is hingedly connected to the second side panel 10120 by a hinged connection in the form of a fold line 10121. A first bottom panel 10124 is hingedly connected to a second bevel panel 10122 by a hinged connection in the form of a fold line 10123.

The blank 10110 is foldable to form a carrier 10190 as illustrated in Figure 25. The first and second base panels 10112, 10124 are engageable with one another in an overlapping relationship to form a composite base wall

10112/10124 of the carrier 190. The blank 10110 may comprise a complementary locking mechanism for securing the second base panel 10124 to the first base panel 10112. The first base panel 10112 may comprise at least one first part M of the complementary locking mechanism. The second base panel 10124 may comprise at least one second part F of the complementary locking mechanism. In the illustrated embodiment, the second base panel 10124 comprises a plurality of female tabs F defining openings in the first base panel 10112. The first base panel 10112 comprises a plurality of male tabs M, the openings in the second base panel 10124 being configured to receive a respective one of the male tabs M. The female tabs F are arranged to be displaced out of the second base panel 10124 to form the opening and to bear against the male tabs M when received therein. In some embodiments, the complementary locking mechanism M/F may be omitted, the first and second base panels 10112, 10124 may be secured to each other by other means such as but not limited to adhesive or staples.

Optionally, the first base panel 10112 may comprise at least one first handling aperture A4; in alternative embodiments, the first handling aperture A4 may be defined at least in part by a tab foldably or severably connected to the first base panel 10112. In the illustrated embodiment, the first base panel 10112 comprises two first handling apertures A4. The first handling apertures A4 may be employed to facilitate construction of the carrier 190. A packaging machine component may engage with the first handling apertures A4 to enable the plurality of panels 10112, 10114, 10116, 10118, 10120, 10122, 10124 to be tightened about a group of secondary packages or carriers 90". The first handling apertures A4 may also be employed to facilitate alignment of the first and second base panels 10112, 10124 with respect to each other or to align the first part of the complementary locking mechanism with the second part of the complementary locking mechanism. The complementary locking mechanism illustrated and described is entirely optional.

The first handling apertures A4 may be substantially triangular in shape.

In some embodiments, the binding device 10190 is secured to the secondary packages or carriers 90", the binding device 10190 may be adhered to the secondary packages or carriers 90" or to the articles B therein. Figure 24 shows a pair of glue locations G on each of the first and second side panels 10116, 10120. A glue, such as but not limited to a fugitive glue may be applied to the first and second side panels 10116, 10120, for securing each of the first and second side panels 10116, 10120 to an article B in each of the secondary packages or carriers 90" it is binding together.

Figure 25 shows the handle strap or binding device 10190 comprising a mechanical locking feature M/F which secures the opposed ends of the handle strap or binding device 10190 together to form a tubular structure. In the illustrated embodiment, the locking feature M/F is located at, or in, the bottom of the package P formed from the strap10190 and the other components 90", B of the package P. The locking feature M/F may comprise one or more pairs of male and female locking tabs M, F.

The present disclosure provides a package P comprising at least a pair of sub-packages 90; 90'; 90"; 1090; 2090; 3090, including a first sub-package or secondary package and a second sub-package or secondary package disposed next to each other, and a joint member 190; 2190; 3190; 4190; 5190; 6190; 7190; 8190; 9190; 10190 in the form of a

handle strap, connecting the pair of sub-packages 90; 90'; 90"; 1090; 2090; 3090 together into a unitary tertiary package P. The joint member 190; 2190; 3190; 4190; 5190; 6190; 7190; 8190; 9190; 10190 comprises a tubular structure disposed around each of the pair of sub-packages 90; 90'; 90"; 1090; 2090; 3090 such that part of the first sub-package extends outwards from one of the opposite ends of the tubular structure and part of the second sub-package extends outwards from the other end of the tubular structure. The tubular structure comprises first and second engaging openings BL1, BL2 or first and second engaging tabs 2166 or both first and second engaging openings BL1, BL2 and first and second engaging tabs 2166 in engagement with respective ones of the first and second sub-packages 90; 90'; 90"; 1090; 2090; 3090.

In embodiments having first and second engaging tabs 2166, the first and second engaging tabs 2166 may be hinged to the top panel 2118 along respective first and second fold lines 2165. The first and second fold lines 2165 may be divergently arranged with respect to each other to encourage the first and second sub-packages 90; 90'; 90"; 1090; 2090; 3090 towards each other. The first and second fold lines 2165 may encourage the first and second sub-packages 90; 90'; 90"; 1090; 2090; 3090 towards the middle of the top panel 2118.

The engaging tabs 2166 may be configured to engage an article B in a first row or column of articles B within the sub-packages 90; 90'; 90"; 1090; 2090; 3090 which is disposed proximate to the joint member 190; 2190; 3190; 4190; 5190; 6190. The first row or column of articles B extending transversely with respect to a tubular axis of the joint member 190; 2190; 3190; 4190; 5190; 6190; 7190; 8190; 9190; 10190.

The engaging tabs 2166 may be configured to an engage article B in a second row or column of articles B within the sub-packages 90; 90'; 90"; 1090; 2090; 3090 which is disposed distally or remotely the from the joint member 190; 2190; 3190. The second row or column of articles B may be disposed adjacent to first row or column of articles B within the sub-packages 90; 90'; 90"; 1090; 2090; 3090.

The engaging tabs 2166 may be configured to engage an article B in each of a first and second row or column of articles B within the sub-packages 90; 90'; 90"; 1090; 2090; 3090.

The joint member 190; 2190; 3190; 4190; 5190; 6190; 7190; 8190; 9190; 10190 comprises a base panel 112/124; 1112/1124; 2112/2124 which may be smaller in dimension, in a lateral direction, to the combined footprint of the pair of sub-packages 90; 90'; 90"; 1090; 2090; 3090 or to the footprint of a single sub-package 90; 90'; 90"; 1090; 2090; 3090.

Each of the pair or stack of sub-packages 90; 90'; 90"; 1090; 2090; 3090 may comprise two or more rows of articles or primary product containers B, the joint member 190; 2190; 3190; 4190; 5190; 6190; 7190; 8190; 9190; 10190 may engage endmost articles B in one row of the articles B in each of the first and second sub-packages 90; 90'; 90"; 1090; 2090; 3090 or may otherwise engage intermediate articles B in rows of the articles B in each of the sub-packages 90; 90'; 90"; 1090; 2090; 3090.

Each of the pair of sub-packages 90; 90'; 90"; 1090; 2090; 3090 may comprise two or more rows of articles or primary product containers B, the joint member 190; 2190; 3190; 4190; 5190; 6190; 7190; 8190; 9190; 10190 may

engage endmost articles B in a single row of the articles B in each of the first and second sub-packages 90; 90'; 90"; 1090; 2090; 3090 -that is to say, only one or two of the two or more rows of articles B.

The joint member 190; 2190; 3190; 4190; 5190; 6190; 7190; 8190; 9190; 10190 may form a handle strap and may be reinforced by at least one reinforcement flap 118A, 118B; 1160 disposed in face-to-face relationship with a top panel 118, 1118. The at least one reinforcement flap 118A, 118B may comprise at least one extension 116A, 116B, 120A, 120B disposed in face-to-face relationship with one of a pair of opposing side panels 116, 120; 1116, 1120. The at least one reinforcement flap 118A, 118B; 1160 may be hingedly connected to a side edge of the top panel 118; 1118. The at least one extension 116A, 116B, 120A, 120B may be hingedly connected to a side edge of said one of a pair of opposing side panels 116, 120. The at least one extension 116A, 116B, 120A, 120B may be hingedly connected to the at least one reinforcement flap 118A, 118B.

The joint member 190; 2190; 3190; 4190; 5190; 6190; 7190; 8190; 9190 may comprise a handle flap 160 struck from the top panel 118, the at least one reinforcement flap 118A, 118B may comprise a cutaway in the form of an aperture A5. The cutaway defining a recess disposed in registry with the handle flap 160 and configured to receive at least a portion of the handle flap 160 therein.

The base panel 112/124; 1112/1124; 2112/2124 may comprise at least two handling apertures A4, A7, one of the at least two handling apertures A4, A7 may be provided by a portion or extension of one of the first and second engaging openings BL1, BL2. The other one of the at least two handling apertures A4, A7 may be provided by an aperture A4 disposed in a spaced apart relationship from the other one of the first and second engaging openings BL1, BL2.

The present disclosure provides a package P comprising a plurality of sub-packages 90; 90'; 90"; 1090; 2090; 3090 disposed next to one another, and a joint member 190; 2190; 3190; 4190; 5190; 6190; 7190; 8190; 9190; 10190 connecting the sub-packages 90; 90'; 90"; 1090; 2090; 3090 together into a unitary package P. The joint member 190; 2190; 3190; 4190; 5190; 6190; 7190; 8190; 9190; 10190 comprises a plurality of panels connected together to form a tubular structure. The plurality of panels includes a pair of opposed side panels 116, 120; 1116, 1120; 2116B, 2120B; 3120; 4116B, 4120B; 5116B, 5120B; 6116B, 6120B each having a pair of first and second opposed end edges ED1, ED2 (see Figure 12). One of opposed open ends of the tubular structure is defined in part by the first end edges ED1 of the side panels 116, 120; 1116, 1120; 2116B, 2120B; 3120; 4116B, 4120B; 5116B, 5120B; 6116B, 6120B. The other of the opposed open ends of the tubular structure is defined in part by the second end edges ED2 of the side panels 116, 120; 1116, 1120; 2116B, 2120B; 3120; 4116B, 4120B; 5116B, 5120B; 6116B, 6120B. The joint member 190; 2190; 3190; 4190; 5190; 6190 is disposed around each of the sub-packages 90; 90'; 90"; 1090; 2090; 3090 such that part of a first one of the sub-packages 90; 90'; 90"; 1090; 2090; 3090 extends outwards from said first end edges ED1 and part of a second one of the sub-packages 90; 90'; 90"; 1090; 2090; 3090 extends outwards from said second end edges ED2. Each of the sub-packages 90; 90'; 90"; 1090; 2090; 3090 comprises a plurality of articles B and a top-engaging carrier 90; 90'; 90"; 1090; 2090; 3090 in engagement with an upper portion of each of the articles B. In some embodiments, part of the first one of the sub-packages 90; 90'; 90"; 1090; 2090; 3090 extends outwards from a first

end edge of a base wall 112/124; 1112/1124; 2112/2124; 4112/41224; 5112/5124; 6112/6124 and part of the second one of the sub-packages 90; 90'; 90"; 1090; 2090; 3090 extends outwards from a second end edge of the base wall 112/124; 1112/1124; 2112/2124; 4112/41224; 5112/5124; 6112/6124.

The present disclosure also provides a package P comprising a plurality of sub-packages 90; 90'; 90"; 1090; 2090; 3090 disposed next to one another, and a joint member 190; 2190; 3190; 4190; 5190; 6190; 7190; 8190; 9190; 10190 connecting the sub-packages 90; 1090; 2090; 3090 together into a unitary package. The joint member 190; 2190; 3190; 4190; 5190; 6190; 7190; 8190; 9190; 10190 comprising a plurality of panels connected together to form a tubular structure. The plurality of panels including a handle panel 118; 1118; 2118, 3118; 4118, 5118; 6118 comprising a gripping strap or handle H extending transversely with respect to a tubular axis of the tubular structure. The gripping strap H having a pair of first and second opposed transversely extending edges ED3, ED4. One of opposed open ends of the tubular structure is defined in part by the first transversely extending edge ED3 of the gripping strap H. The other of the opposed open ends is defined in part by the second transversely extending edge ED4 of the gripping strap H. The joint member 190; 2190; 3190; 4190; 5190; 6190; 7190; 8190; 9190 is disposed around each of the sub-packages 90; 1090; 2090; 3090 such that part of a first one of the sub-packages 90; 90'; 90"; 1090; 2090; 3090 extends outwards from the first transversely extending edge ED3 of the gripping strap H and part of a second one of the sub-packages 90; 90'; 90"; 1090; 2090; 3090 extends outwards from the second transversely extending edge ED4 of the gripping strap H. Each of the sub-packages 90; 90'; 90"; 1090; 2090; 3090 comprises a plurality of articles B and a top-engaging carrier 90; 90'; 90"; 1090; 2090; 3090 in engagement with an upper portion of each of the articles B.

The present disclosure also provides a package P' comprising a plurality of sub-packages 90' disposed next to one another, and a joint member 7190 connecting the sub-packages 90' together into a unitary package P'. The joint member 7190 comprises a plurality of panels 7112, 7114, 7116, 7118, 7120, 7122, 7124 connected together to form a tubular structure having opposed open ends. The joint member 7190 is disposed around each of the sub-packages 90' such that part of a first one of the sub-packages 90' extends outwards from one of the opposed open ends of the tubular structure and part of a second one of the sub-packages 90' extends outwards from the other one of the opposed open ends of the tubular structure. Each of at least the first and second ones of the sub-packages 90' comprises an engaging projection T'. The joint member 7190 comprises at least one receiving feature or tab receiver TR in which the engaging projection T' of each of the at least first and second sub-packages 90' is received.

Each of the at least first and second sub-packages 90' may comprise a plurality of articles B and a top-engaging carrier 90' in engagement with an upper portion of each of the articles B. The engaging projection T' is provided by the top-engaging carrier 90' of the each of the at least first and second sub-packages 90'. The engaging projection T' may be provided by top or cover panel 18'/20' disposed over the upper portions of the articles B. In Figure 18, each of the cover panels 18", 20" comprises two engaging projections T' at the opposing side edges thereof. Each engaging tab T' projects into the adjacent aperture A3' when the carrier is in the blank form as illustrated in Figures 18 and 18B. Figure 20 shows a package formed from two sub-packages 90', 90' and a joint member 7190 which has two tab

receivers TR at (or adjacent to) the opposite ends of the top wall 7118. Each tab receiver TR is shared by the two sub-packages 90', 90' such that each tab receiver TR receives one of the engaging projections T' of one of the sub-packages 90', 90' and one of the engaging projections T' of the other sub-package 90'. Optionally, two separate tab receivers TR may be provided adjacent to each end of the top wall 7118 such that each tab receiver TR receives only one engaging projection. In the embodiment where the tab receiver takes the form of a rib or embossment, such a tab-receiver may be positioned next to one of the opposed longitudinal edges of the blank 7110 or joint member 7190 in such a manner that the rib or embossment interrupts the hinged connection 7117, 7119. Such a rib or embossment provides an engaging bump with which part of a respective engaging projection T' such that the respective sub-package 90" is prevented from slipping out of the joint member 7190. Optionally, a joint member may be free of any tab receiver. In such an embodiment, an engaging projection of each sub-package may be pressed against the inside surface of the joint member to achieve frictional engagement. Optionally, such frictional engagement may be gained without engaging projection. Such an embodiment is illustrated in Figure 22.

The present disclosure also provides a package P; P' comprising a plurality of sub-packages 90; 90'; 90" disposed next to one another, and a joint member 190; 2190; 3190; 4190; 5190; 6190; 7190; 8190; 9190 connecting the sub-packages 90; 90'; 90" together into a unitary package P; P'. The joint member 190; 2190; 3190; 4190; 5190; 6190; 7190; 8190; 9190; 10190 comprises a plurality of panels 112, 114, 116, 118, 120, 122, 124; 1112, 1114, 1116, 1118, 1120, 1122, 1124; 2112, 2114, 2116, 2118, 2120, 2122, 2124; 3118, 3120; 7112, 7114, 7116, 7118, 7120, 7122, 7124; 8112, 8114, 8116, 8118, 8120, 8122, 8124 connected together to form a tubular structure having opposed open ends and tubular axis T_a1. The joint member 190; 2190; 3190; 4190; 5190; 6190; 7190; 8190; 9190 is disposed around each of the sub-packages 90; 90'; 90" such that part of a first one of the sub-packages 90; 90'; 90" extends outwards from one of the opposed open ends of the tubular structure and part of a second one of the sub-packages 90; 90'; 90" extends outwards from the other one of the opposed open ends of the tubular structure. Each of at least the first and second ones of the sub-packages 90; 90'; 90" comprises a tubular structure having opposed ends and tubular axis T_a2. The tubular axis T_a2 of the sub-packages 90; 90'; 90" is perpendicular to the tubular axis T_a1 of the joint member 190; 2190; 3190; 4190; 5190; 6190; 7190; 8190; 9190; 10190. The tubular axis T_a2 of the sub-packages 90; 90'; 90" and the tubular axis T_a1 of the joint member 190; 2190; 3190; 4190; 5190; 6190; 7190; 8190; 9190; 10190 define a plane which is parallel to the plane of a top wall 118; 1118; 2118; 3118; 7118; 8118 of the joint member 190; 2190; 3190; 4190; 5190; 6190; 7190; 8190; 9190; 10190 and to a top or cover panel 18/20; 18'/20'; CP" of the sub-packages 90; 90'; 90". The top wall 118; 1118; 2118; 3118; 7118; 8118 of the joint member 190; 2190; 3190; 4190; 5190; 6190; 7190; 8190; 9190; 10190 is disposed in face-to-face relationship, and may be in contacting relationship, with the top or cover panel 18/20; 18'/20'; CP" of the sub-packages 90; 90'; 90".

The blanks 10; 10'; 110; 1010; 1110; 2010; 2110; 3010; 4110; 5110; 6110; 7110; 8110; 10110 include at least a paperboard substrate. The material of the paperboard substrate may be selected from any conventional paperboard, for example, ranging in weight upwardly from about 10pt., preferably from about 16pt. to about 28pt. (0.028"/~0.7mm).

An example of such a substrate is a 27 point (pt.) SBS board (solid bleached sulphate paperboard coated on one side, trade name PrintKote®) or CNK® board (Coated Natural Kraft® -an unbleached kraft paperboard having a clay coating on one side, trade name CarrierKote™) manufactured by WestRock® Company. The paperboard substrate may be a bleached or unbleached board. The board may be coated on at least one side, optionally the side opposite the lamination, with a conventional coating selected for compatibility with the printing method and board composition. The blanks 10; 10'; 1010; 2010; 3010 forming the secondary packages 90; 90'; 90"; 1090; 2090; 3090 may be formed from a paperboard substrate having a different, heavier or lighter, weight than the blanks 110; 1110; 2110; 4110; 5110; 6110; 7110; 8110; 10110 forming the joint member 190; 2190; 3190, 4190; 5190; 6190; 7190; 8190; 9190; 10190 for example the first blanks 10; 10'; 1010; 2010; 3010 may be formed from paperboard having a weight or caliper of 20pt. (0.020"/~0.5mm) whereas the second blanks 110; 1110; 2110; 4110; 5110; 6110; 7110; 8110; 10110 may be formed from paperboard having a weight or caliper of 27pt. (0.027"/~0.69mm).

The blanks 10; 10'; 110; 1010; 1110; 2010; 2110; 3010; 4110; 5110; 6110; 7110; 8110; 10110 may include a tear resistant layer laminated to the paperboard layer. It optionally includes an adhesive layer between the paperboard substrate and the tear resistant layer. The tear resistant layer may be disposed over the uncoated side of the paperboard substrate and may be formed of polymeric material and secured to the substrate. The tear resistant layer imparts toughness to the laminate structure. Suitable tear resistant materials may include, but not be limited to, tear resistant laminated sheet material, e.g., NATRALOCK®, which may include a layer of an n-axially oriented film, e.g., MYLAR®, which is a bi-axially oriented polyester, oriented nylon, cross-laminated polyolefin or high-density polyolefin. The orientation and cross-laminated structure of these materials contribute to the tear resistant characteristic. Also, tear resistance may be attributed to the chemical nature of the tear resistant material such as extruded metallocene-catalysed polyethylene (mPE).

Alternatively, the tear resistant layer may be a layer of linear low-density polyethylene (LLDPE). In embodiments where linear low-density polyethylene (LLDPE) or mPE is used, it is not necessary to incorporate an adhesive layer. Other suitable materials having a high level of tear resistance may also be used.

The adhesive layer may be formed of polyolefin material such as a low-density polyethylene (LDPE). The adhesive layer may be placed between the substrate and the tear resistant layer to secure the tear resistant layer to the substrate.

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. The shoulder panels may be omitted. The present invention is not limited to cartons of the top-engaging type, the invention may be employed with other carton styles such as, but not limited to, open top crates, lidded or closed top crates.

It will be recognised that as used herein, directional references such as "top", "bottom", “base”, "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. Any reference to “hinged connection” should not be construed as necessarily referring to a single fold line only; indeed, a hinged connection can be formed from two or more fold lines wherein each of the two or more fold lines may be either straight/linear or curved/curvilinear in shape. When linear fold lines form a hinged connection, they may be disposed parallel with each other or be slightly angled with respect to each other. When curvilinear fold lines form a hinged connection, they may intersect each other to define a shaped panel within the area surrounded by the curvilinear fold lines. A typical example of such a hinged connection may comprise a pair of arched or arcuate fold lines intersecting at two points such that they define an elliptical panel therebetween. A hinged connection may be formed from one or more linear fold lines and one or more curvilinear fold lines. A typical example of such a hinged connection may comprise a combination of a linear fold line and an arched or arcuate fold line which intersect at two points such that they define a half moon-shaped panel therebetween.

As used herein, the term “fold line” may refer to one of the following: a scored line, an embossed line, a debossed line, a line of perforations, a line of short slits, a line of half-cuts, a single half-cut, an interrupted cutline, a line of aligned slits, a line of scores and any combination of the aforesaid options.

It should be understood that hinged connections 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 cutline, an interrupted cutline, slits, scores, embossed lines, debossed lines, 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.

The phrase “in registry with” as used herein refers to the alignment of two or more elements in an erected carton, such as an aperture formed in a first of two overlapping panels and a second aperture formed in a second of two overlapping panels. Those elements in registry with each other may be aligned with each other in the direction of the thickness of the overlapping panels. For example, when an aperture in a first panel is “in registry with” a second aperture in a second panel that is placed in an overlapping arrangement with the first panel, an edge of the aperture may extend along at least a portion of an edge of the second aperture and may be aligned, in the direction of the thickness of the first and second panels, with the second aperture.

CLAIMS

1. A package comprising a plurality of sub-packages disposed next to one another, and a joint member connecting the sub-packages together into a unitary package, the joint member comprising a tubular structure having opposed open ends and disposed around each of the sub-packages such that part of a first one of the sub-packages extends outwards from one of the opposed open ends of the tubular structure and part of a second one of the sub-packages extends outwards from the other one of the opposed open ends of the tubular structure, wherein the tubular structure comprises first and second engaging openings or tabs in engagement with the first and second sub-packages respectively.
2. An article carrier according to claim 1, wherein the joint member provides a handle strap.
3. An article carrier according to claim 2, wherein the first and second engaging tabs are hinged to a top panel of the tubular structure by first and second fold lines, respectively.
4. An article carrier according to claim 3, wherein the first and second fold lines are divergently arranged with respect to each other to encourage the first and second sub-packages towards a middle of the top panel.
5. An article carrier according to claim 3, wherein the first and second engaging tabs each is configured to engage an article in a first row or column of articles within a respective one of the first and second sub-packages, the first row or column of articles being disposed proximate to a middle of the top panel and extending transversely with respect to a tubular axis of the joint member.
6. An article carrier according to claim 3, wherein the first and second engaging tabs each is configured to engage an article in a second row or column of articles within a respective one of the first and second sub-packages, the second row or column of articles being disposed distally from a middle of the top panel.
7. An article carrier according to claim 6, wherein the second row or column of articles is disposed adjacent to a first row or column of articles within the respective one of the first and second sub-packages disposed proximate to the middle of the top panel and extending transversely with respect to a tubular axis of the joint member.
8. An article carrier according to claim 3, wherein the tubular structure further comprises third and fourth engaging tabs hinged to the top panel of the tubular structure by third and fourth fold lines, respectively.
9. An article carrier according to claim 1, wherein the joint member comprises a base panel that is smaller in dimension, in a lateral direction, than the combined footprint of the plurality of sub-packages.
10. An article carrier according to claim 1, wherein each of the plurality of sub-packages comprise two or more rows of articles, and the joint member engages endmost articles in one row of the articles in the first sub-package and endmost articles in one row of the articles in the second sub-package, said one row of the articles in the second sub-package being disposed adjacent the one row of the articles in the first sub-package.

11. An article carrier according to claim 1, wherein each of the first and second sub-packages comprise two or more rows of articles, the joint member engages endmost articles in a single row of the articles in each of the first and second sub-packages.
12. An article carrier according to claim 2, wherein the joint member is reinforced by at least one reinforcement flap.
13. An article carrier according to claim 12, wherein the at least one reinforcement flap comprises at least one extension hingedly connected to one of a pair of opposing side panels of the tubular structure.
14. An article carrier according to claim 13, wherein the at least one reinforcement flap is hingedly connected to a side edge of a top panel of the tubular structure.
15. An article carrier according to claim 13, wherein the at least one extension is hingedly connected to the at least one reinforcement flap.
16. An article carrier according to claim 12, wherein the joint member comprises a handle flap struck from a top panel of the tubular structure.
17. An article carrier according to claim 1, wherein the first and second engaging openings each engages a heel of an article in a respective one of the first and second sub-packages and is struck at least in part from a base panel of the tubular structure.
18. An article carrier according to claim 17, wherein the first and second engaging openings each is struck in part from one of a pair of opposing side panels of the tubular structure.
19. An article carrier according to claim 17, wherein the first and second engaging openings each is defined in part by a pair of flaps hingedly connected to the tubular structure.
20. An article carrier according to claim 17, wherein the base panel of the tubular structure comprises at least two handling apertures, one of the at least two handling apertures is provided by a portion of one of the first and second engaging openings in the base panel, the other one of the at least two handling apertures is provided by an aperture disposed in a spaced apart relationship from the other one of the first and second engaging openings.
21. A package comprising a pair of sub-packages, including a first sub-package and a second sub-package disposed next to each other, and a joint member connecting the pair of sub-packages together into a unitary package, the joint member comprising a tubular structure having opposed open ends and disposed around each of the pair of sub-packages such that part of the first sub-package extends outwards from one of the opposed open ends of the tubular structure and part of the second sub-package extends outwards from the other one of the opposed open ends of the tubular structure, wherein the tubular structure comprises first and second engaging openings in engagement with respective ones of the first and second sub-packages.
22. A package comprising a pair of sub-packages, including a first sub-package and a second sub-package disposed next to each other, and a joint member connecting the pair of sub-packages together into a unitary package, the

joint member comprising a tubular structure having opposed open ends and disposed around each of the pair of sub-packages such that part of the first sub-package extends outwards from one of the opposed open ends of the tubular structure and part of the second sub-package extends outwards from the other one of the opposed open ends of the tubular structure, wherein the tubular structure comprises first and second engaging tabs in engagement with respective ones of the first and second sub-packages.

23. A package comprising a pair of sub-packages, including a first sub-package and a second sub-package disposed next to each other, and a joint member connecting the pair of sub-packages together into a unitary package, the joint member comprising a tubular structure having opposed open ends and disposed around each of the pair of sub-packages such that part of the first sub-package extends outwards from one of the opposed open ends of the tubular structure and part of the second sub-package extends outwards from the other one of the opposed open ends of the tubular structure, wherein the tubular structure comprises first and second engaging openings and first and second engaging tabs in engagement with respective ones of the first and second sub-packages.

24. Blanks for forming a package, including at least two first blanks for forming sub-packages each first blank comprising a main panel having a plurality of article retention structures for engaging respective articles, and a second blank for forming a joint member for being disposed around the sub-packages, the second blank comprising a plurality of panels for forming an open ended tubular structure, wherein the second blank comprises first and second engaging openings or first and second engaging tabs for engagement with respective ones of the first and second sub-packages, the second blank being dimensioned such that in a set up condition part of a first sub-package extends outward from one of the open ends of the tubular structure and part of a second sub-package extends outward from the other one of the open ends of the tubular structure.

25. A blank for forming a joint member for being disposed around at least two sub-packages, the blank comprising a plurality of panels for forming an open ended tubular structure, wherein the blank comprises first and second engaging openings or first and second engaging tabs for engagement with respective ones of the at least two sub-packages, the blank being dimensioned such that in a set up condition part of a first sub-package extends outward from one of the open ends of the tubular structure and part of a second sub-package extends outward from the other one of the open ends of the tubular structure.

26. A package comprising a plurality of sub-packages disposed next to one another, and a joint member connecting the sub-packages together into a unitary package, the joint member comprising a tubular structure having opposed open ends and disposed around each of the sub-packages such that part of a first one of the sub-packages extends outwards from one of the opposed open ends of the tubular structure and part of a second one of the sub-packages extends outwards from the other one of the opposed open ends of the tubular structure, wherein each of the sub-packages comprises a plurality of articles and a top-engaging carrier in engagement with an upper portion of each of the articles.

27. A package comprising a stack of sub-packages disposed one on top of another, and a joint member connecting the sub-packages together into a unitary package, the joint member comprising a tubular structure having opposed open ends and disposed around the stack such that a part of each of the sub-packages of the stack extends outwards from one of the opposed open ends of the tubular structure and another part of each of the sub-packages of the stack extends outwards from the other one of the opposed open ends of the tubular structure, wherein each of the sub-packages comprises a plurality of articles and a top-engaging carrier in engagement with an upper portion of each of the articles.

28. A package comprising a stack of sub-packages disposed one on top of another, and a joint member connecting the sub-packages together into a unitary package, the joint member comprising a tubular structure having opposed open ends and disposed around the stack such that a part of each of the sub-packages of the stack extends outwards from one of the opposed open ends of the tubular structure and another part of each of the sub-packages of the stack extends outwards from the other one of the opposed open ends of the tubular structure, wherein the tubular structure comprises at least one engaging opening or tab in engagement with at least one of the sub-packages of the stack.

29. A package comprising a plurality of sub-packages disposed next to one another, and a joint member connecting the sub-packages together into a unitary package, the joint member comprising a plurality of panels connected together to form a tubular structure having opposed open ends, the plurality of panels including a pair of opposed side panels each having first and second opposed end edges, wherein one of the opposed open ends is defined, in part, by the first end edges of the pair of opposed side panels, the other one of the opposed open ends of the tubular structure is defined, in part, by the second end edges of the pair of opposed side panels, the joint member is disposed around each of the sub-packages such that part of a first one of the sub-packages extends outwardly from said first end edges and part of a second one of the sub-packages extends outwardly from said second end edges, and wherein each of the sub-packages comprises a plurality of articles and a top-engaging carrier in engagement with an upper portion of each of the articles.

30. A package according to claim 31, wherein part of the first one of the sub-packages extends outwardly from a first end edge of a base wall of the joint member and part of the second one of the sub-packages extends outwardly from a second, opposing, end edge of the base wall.

31. A package comprising a plurality of sub-packages disposed next to one another, and a joint member connecting the sub-packages together into a unitary package, the joint member comprising a plurality of panels connected together to form a tubular structure having opposed open ends, the plurality of panels including a handle panel comprising a gripping portion extending transversely with respect to a tubular axis of the tubular structure, the gripping portion having a first transversely extending edge and a second opposing transversely extending edge, wherein one of the opposed open ends of the tubular structure is defined in part by the first transversely extending

edge of the gripping portion, the other one of the opposed open ends is defined in part by the second transversely extending edge of the gripping portion, the joint member is disposed around each of the sub-packages such that part of a first one of the sub-packages extends outwardly from the first transversely extending edge of the gripping portion and part of a second one of the sub-packages extends outwards from the second transversely extending edge of the gripping portion, and wherein each of the sub-packages comprises a plurality of articles and a top-engaging carrier in engagement with an upper portion of each of the articles.

32. A package comprising a plurality of sub-packages disposed next to one another, and a joint member connecting the sub-packages together into a unitary package, the joint member comprising a plurality of panels connected together to form a tubular structure having opposed open ends, the joint member being disposed around each of the sub-packages such that part of a first one of the sub-packages extends outwards from one of the opposed open ends of the tubular structure and part of a second one of the sub-packages extends outwards from the other one of the opposed open ends of the tubular structure, wherein each of the first and second ones of the sub-packages comprises an engaging projection, and wherein the joint member comprises at least one receiving feature in which the engaging projection of each of the first and second ones of the sub-packages is received.

33. A package according to claim 32, wherein each of the at least first and second sub-packages comprises a plurality of articles and a top-engaging carrier in engagement with an upper portion of each of the articles, and wherein the engaging projection is provided by the top-engaging carrier of the each of the first and second ones of the sub-packages.

34. A package according to claim 33, wherein the engaging projection is provided by a cover panel disposed over the upper portions of the articles.

35. A package comprising a plurality of sub-packages disposed next to one another, and a joint member connecting the sub-packages together into a unitary package, the joint member comprising a plurality of panels connected together to form a tubular structure having opposed open ends and first tubular axis, the joint member being disposed around each of the sub-packages such that part of a first one of the sub-packages extends outwards from one of the opposed open ends of the tubular structure and part of a second one of the sub-packages extends outwards from the other one of the opposed open ends of the tubular structure, each of the first and second ones of the sub-packages comprising a tubular structure having opposed ends and second tubular axis, wherein the second tubular axis is perpendicular to the first tubular axis and wherein the first and second tubular axis define a plane which is parallel to the plane of a top wall of the joint member and to the plane of a cover panel of the sub-packages.

36. A package according to claim 35, wherein the top wall of the joint member is disposed in face-to-face relationship with the cover panel of the sub-packages.

37. A package according to claim 35, wherein the top wall of the joint member is disposed in face contacting relationship with the cover panel of the sub-packages.

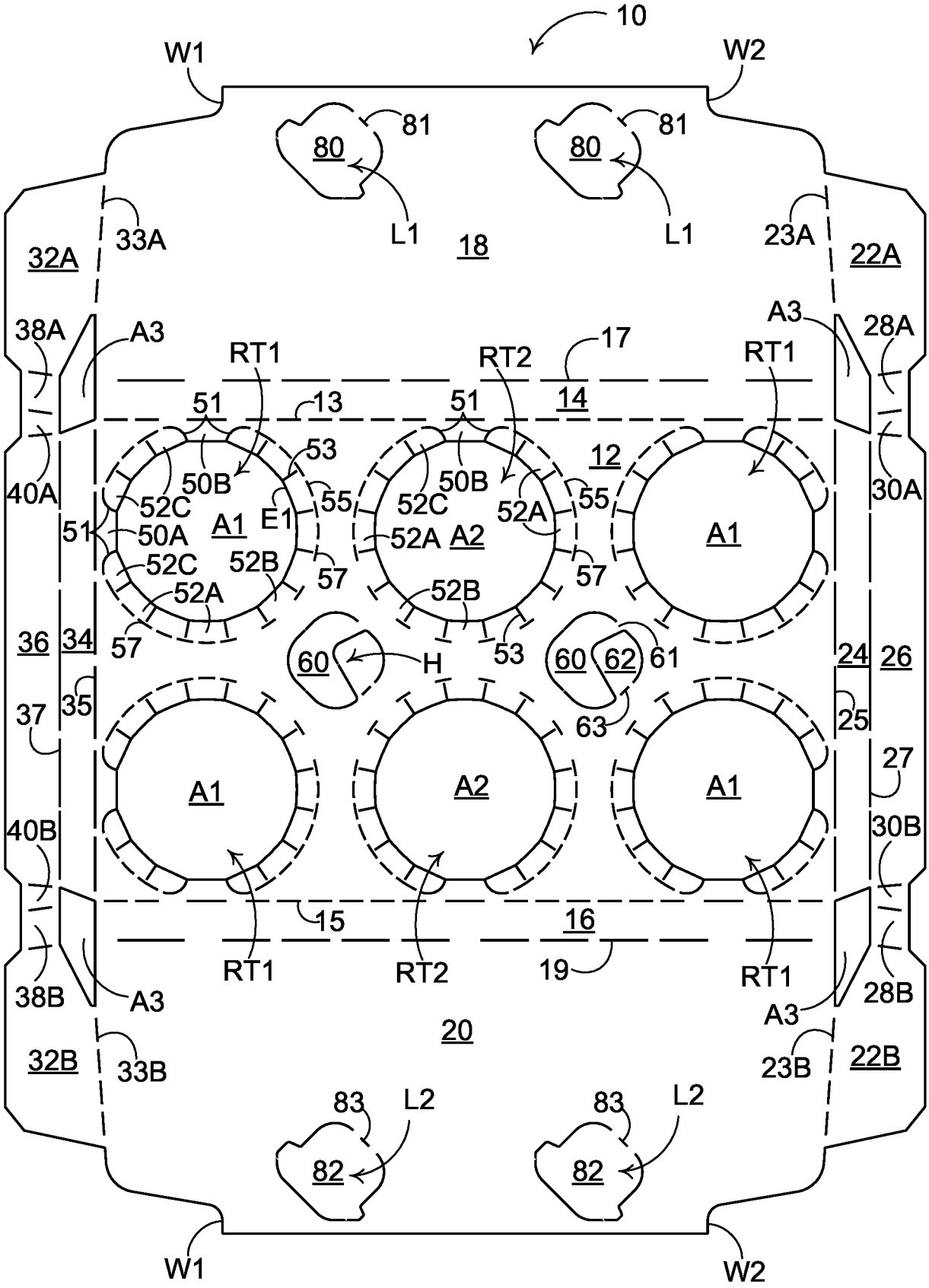

10
W1
W2
80
81
L1
18
32A
33A
23A
22A
38A
A3
28A
RT1
RT2
17
14
13
51
53
50B
52C
50A
A1
E1
55
A2
52A
52B
57
12
40A
30A
36
34
60
H
62
61
24
26
37
35
63
25
27
40B
30B
15
16
19
38B
28B
20
32B
33B
23B
22B
83
L2
82

FIG. 1

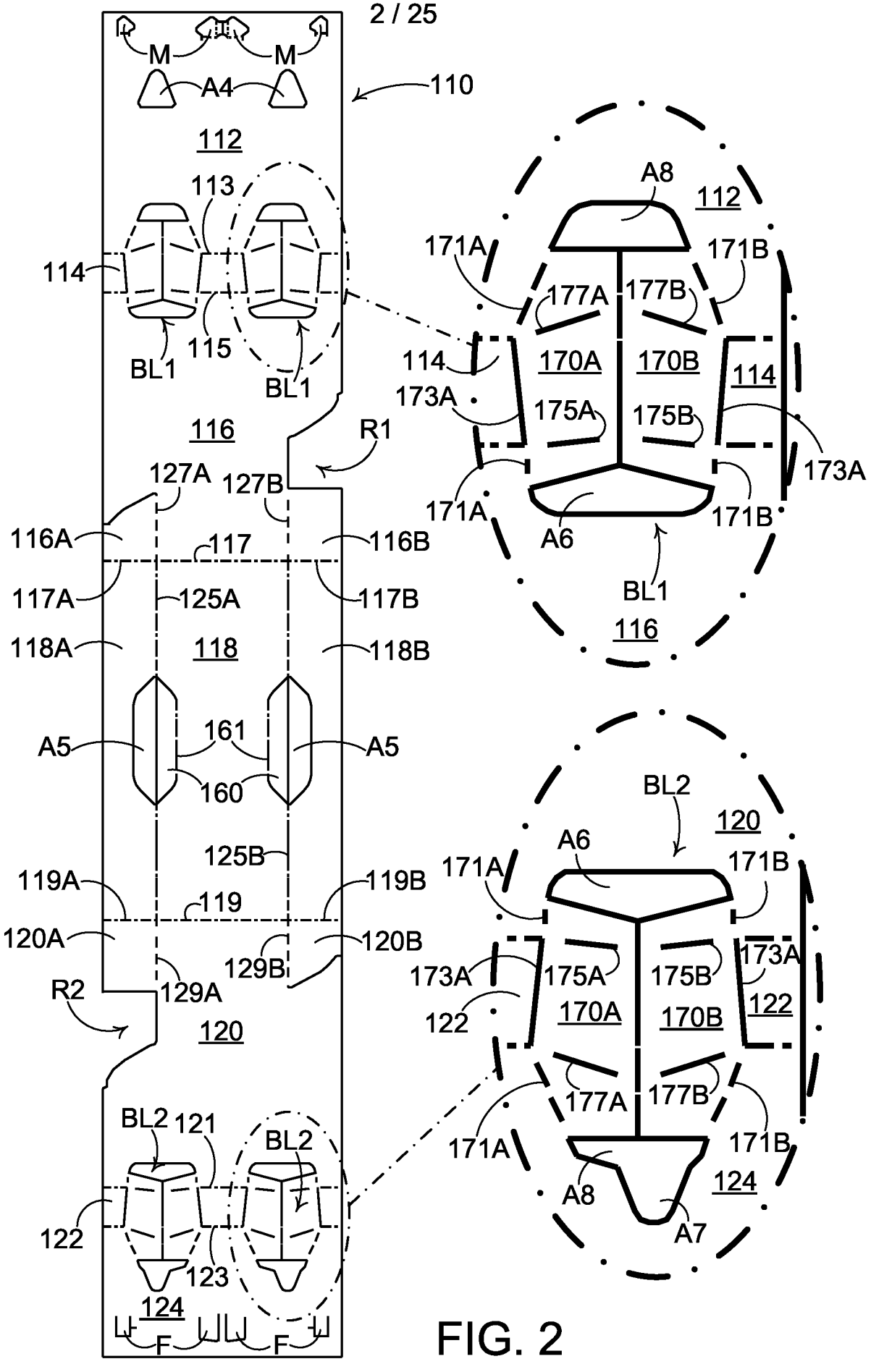

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M
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112
113
114
115
BL1
BL1
116
R1
127A
127B
116A
117
116B
117A
125A
117B
118A
118
118B
A5
161
A5
160
125B
119A
119
119B
120A
120B
129B
R2
129A
120
BL2
121
BL2
122
123
124
F
F
A8
112
171A
171B
177A
177B
114
170A
170B
114
173A
175A
175B
173A
171A
171B
A6
BL1
116
BL2
120
A6
171A
171B
173A
175A
175B
173A
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170A
170B
122
177A
177B
171A
171B
A8
124
A7

FIG. 2

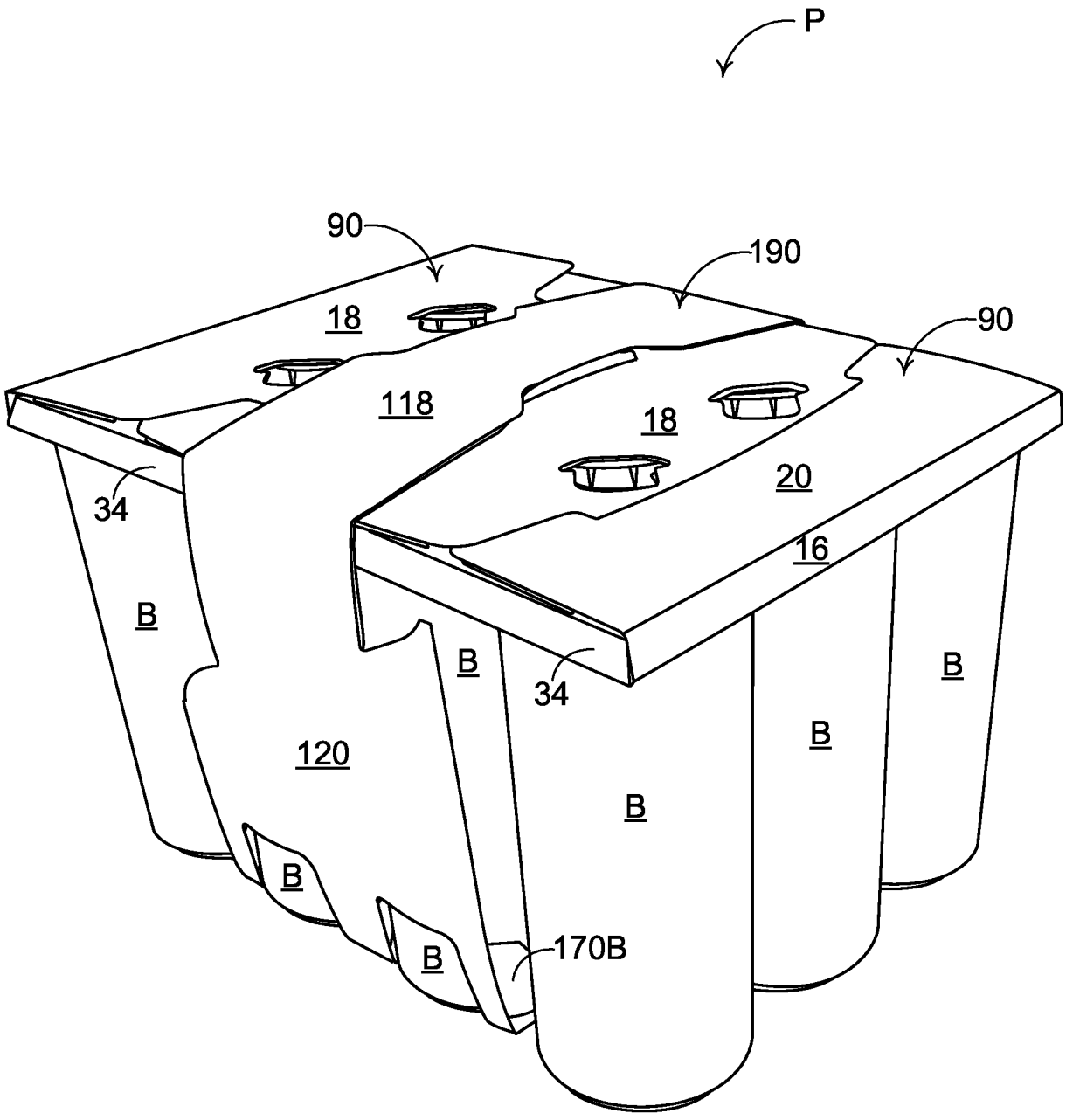


FIG. 3

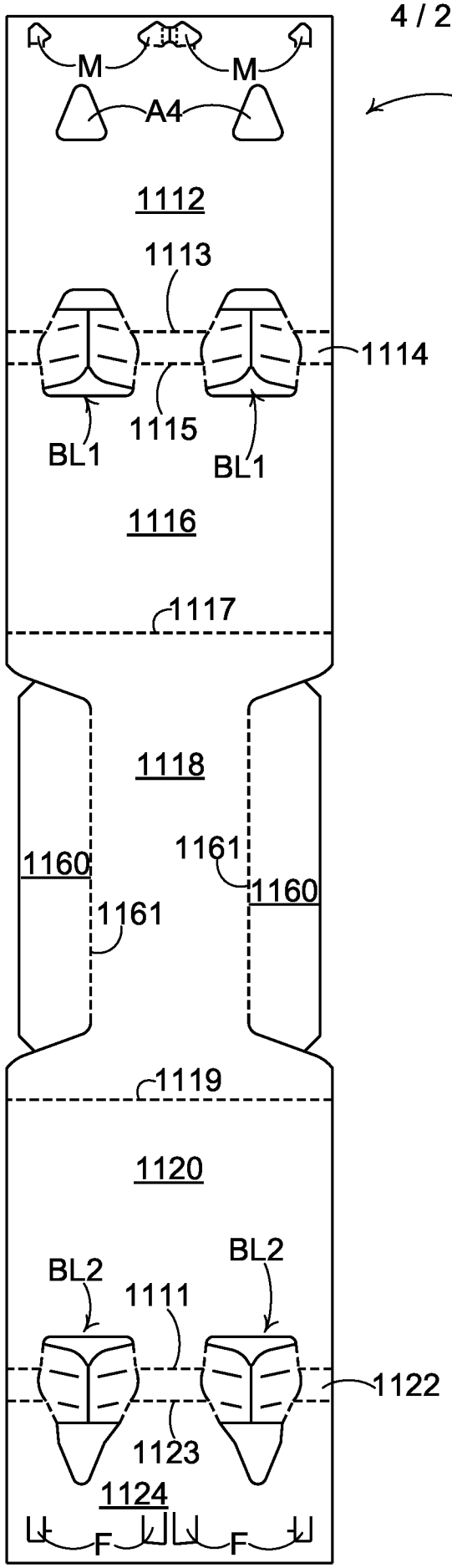

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M
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1112
1113
1114
1115
BL1
BL1
1116
1117
1118
1160
1161
1161
1160
1119
1120
BL2
BL2
1111
1122
1123
1124
F
F

FIG. 4

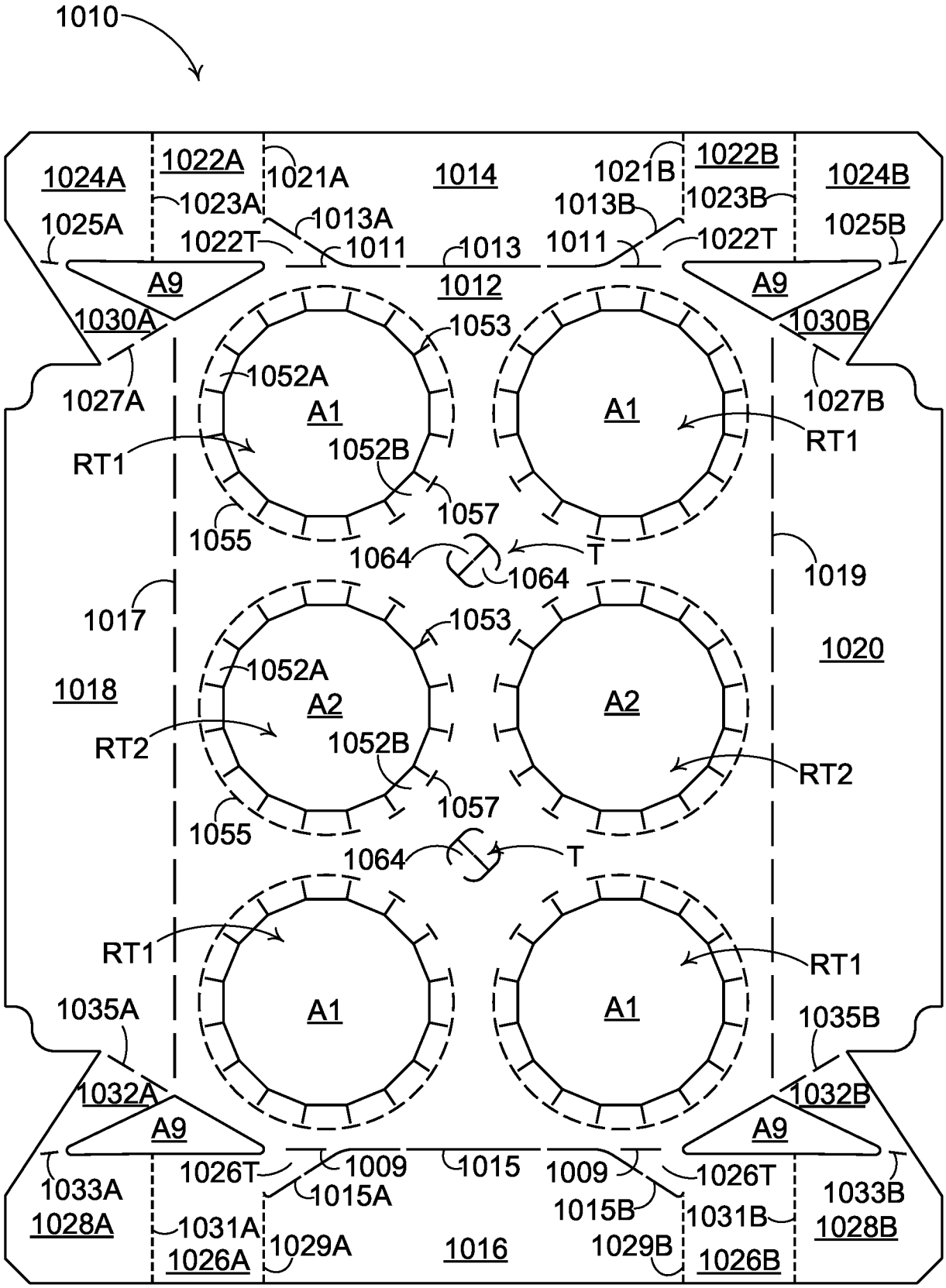

1010
1024A
1022A
1021A
1014
1021B
1022B
1024B
1023A
1013A
1013B
1023B
1025A
1022T
1011
1013
1011
1022T
1025B
A9
1012
A9
1030A
1053
1030B
1052A
1027A
A1
A1
1027B
RT1
1052B
RT1
1057
1055
1064
T
1064
1019
1017
1053
1020
1052A
1018
A2
A2
RT2
1052B
RT2
1057
1055
1064
T
RT1
RT1
1035A
A1
A1
1035B
1032A
1032B
A9
A9
1033A
1026T
1009
1015
1009
1026T
1033B
1015A
1015B
1028A
1031A
1031B
1028B
1029A
1029B
1026A
1016
1026B

FIG. 5

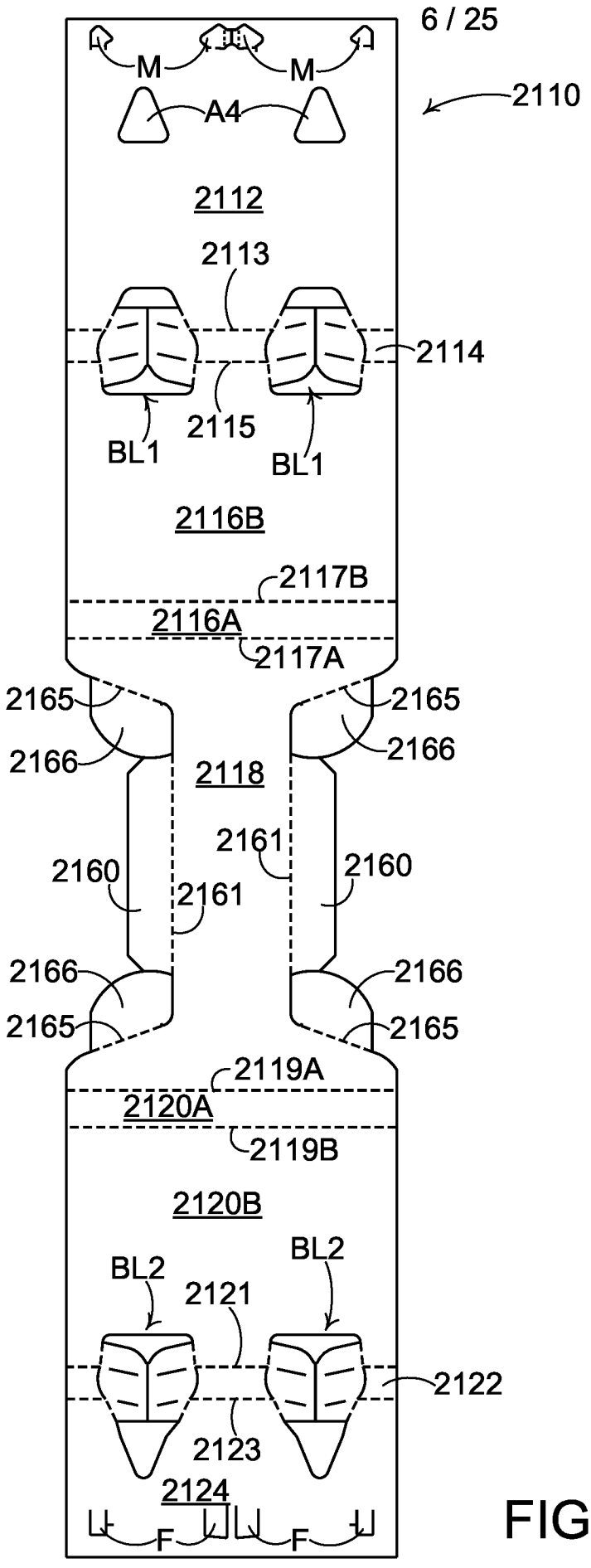

M
M
A4
2110
2112
2113
2114
2115
BL1
BL1
2116B
2117B
2116A
2117A
2165
2165
2166
2166
2118
2161
2160
2160
2161
2166
2166
2165
2165
2119A
2120A
2119B
2120B
BL2
BL2
2121
2122
2123
2124
F
F

FIG. 6

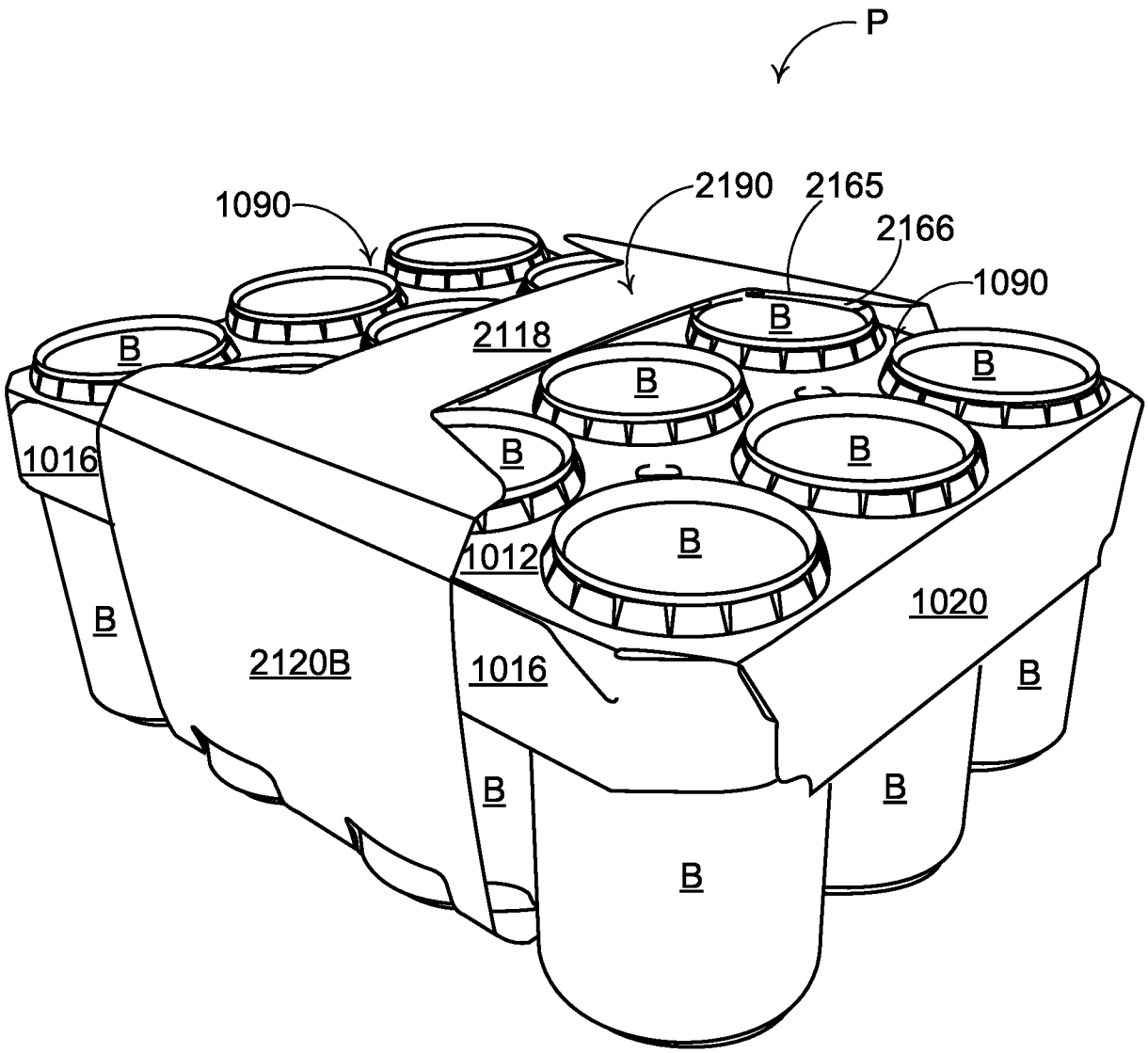


FIG. 7

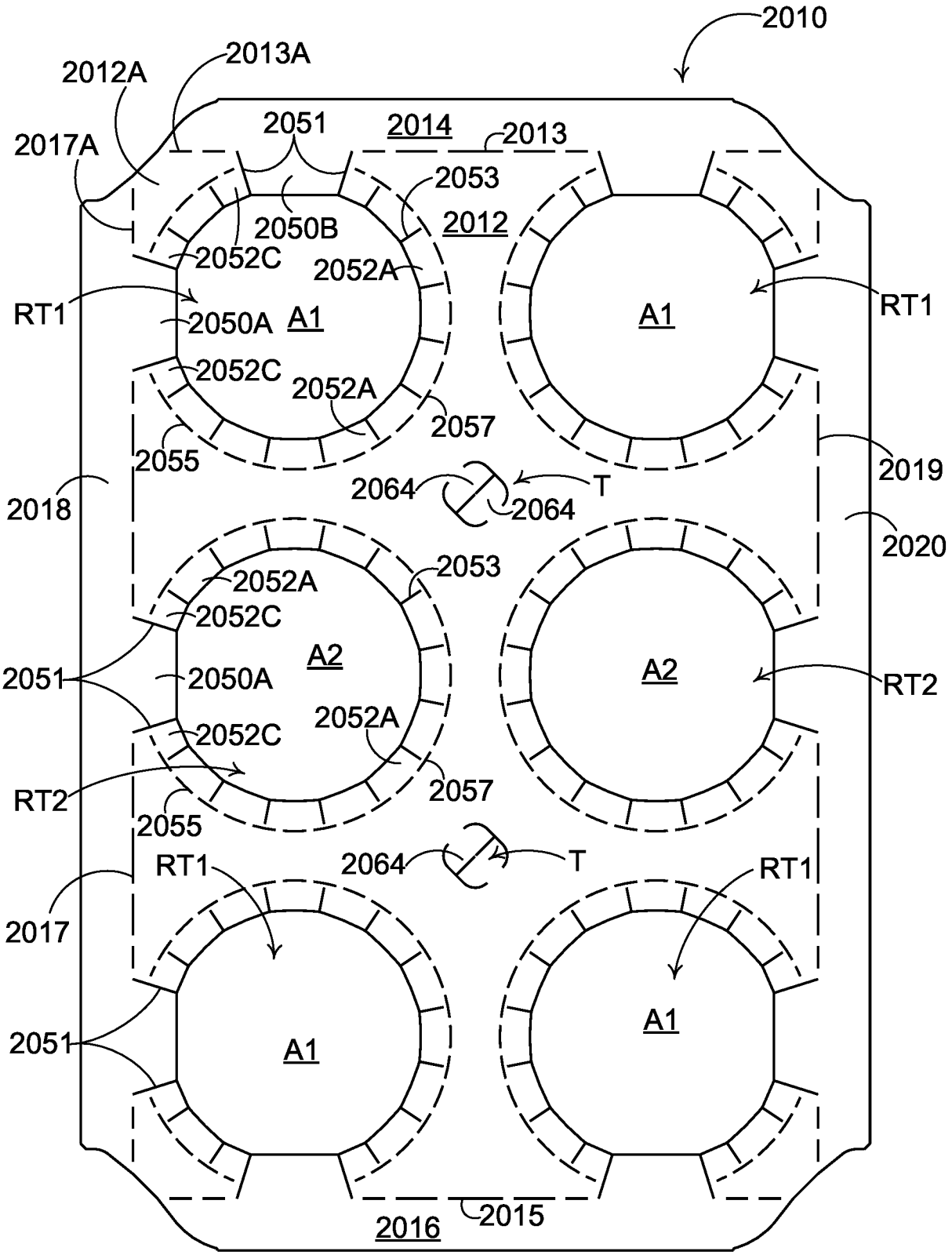

2010
2012A
2013A
2017A
2051
2014
2013
2053
2050B
2012
2052C
2052A
RT1
2050A
A1
A1
RT1
2052C
2052A
2057
2055
2019
2064
T
2064
2018
2020
2053
2052A
2052C
A2
A2
2051
2050A
RT2
2052A
2052C
RT2
2057
2055
RT1
2064
T
RT1
2017
A1
A1
2051
2016
2015

FIG. 8

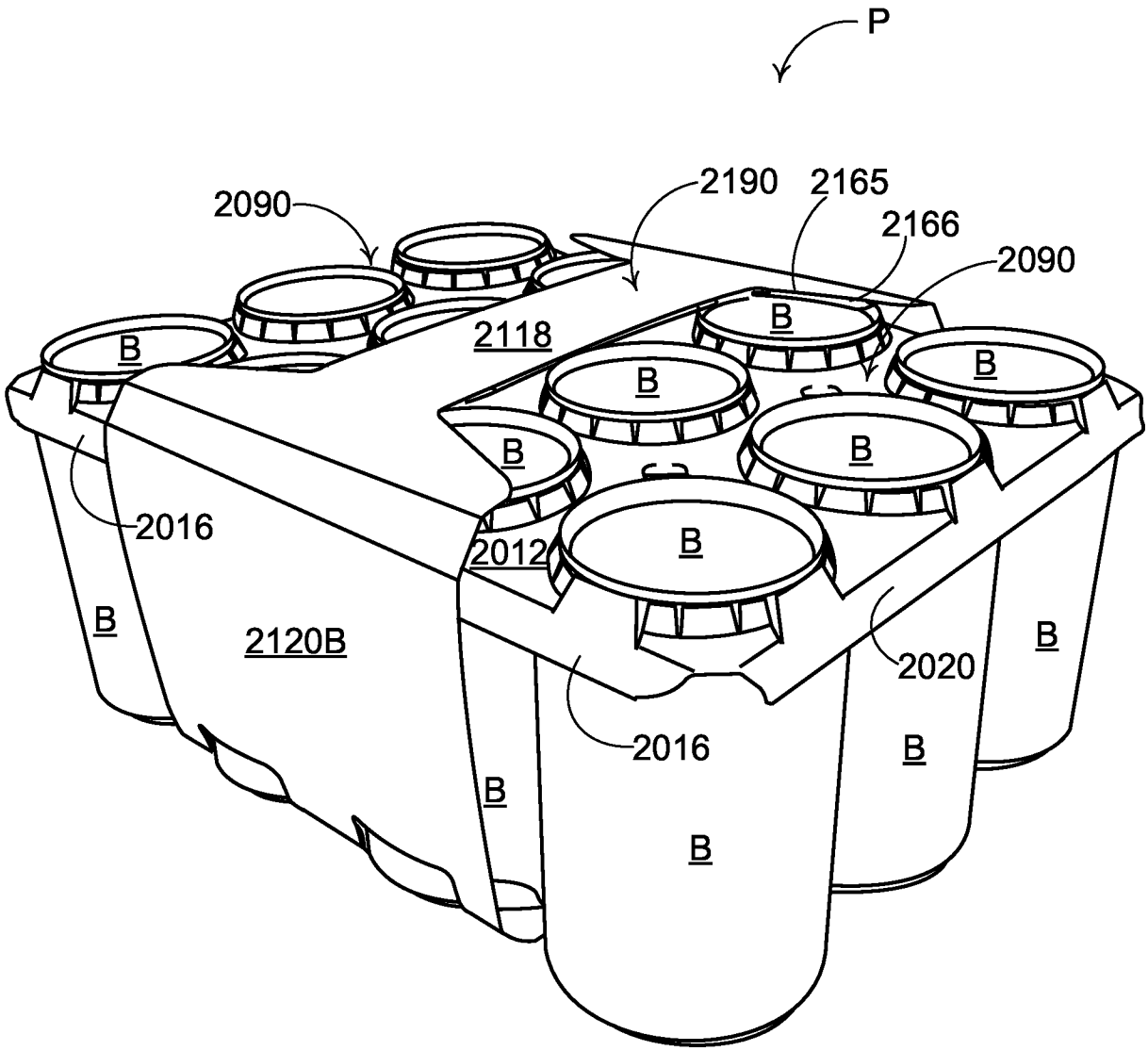


FIG. 9

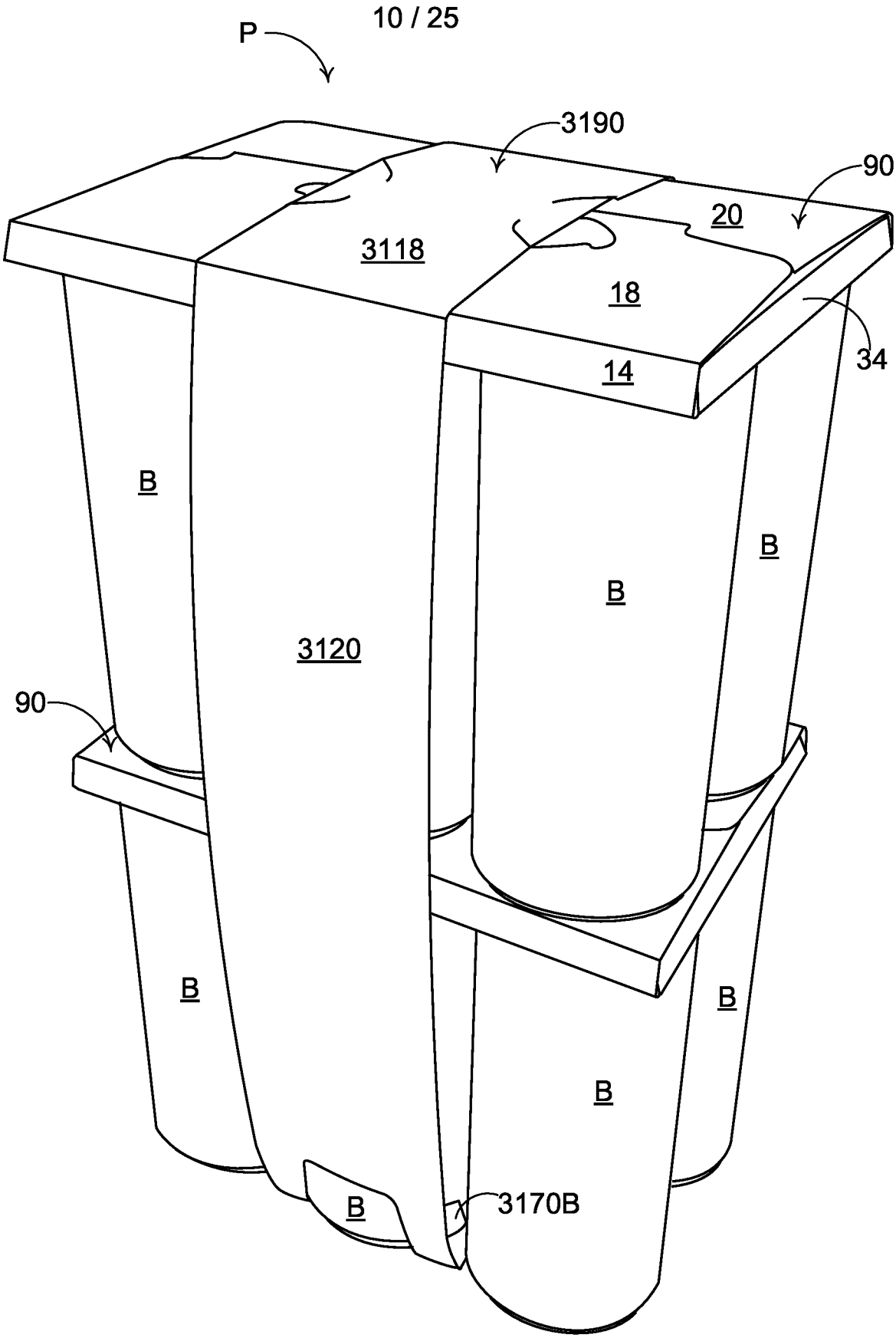


FIG. 10

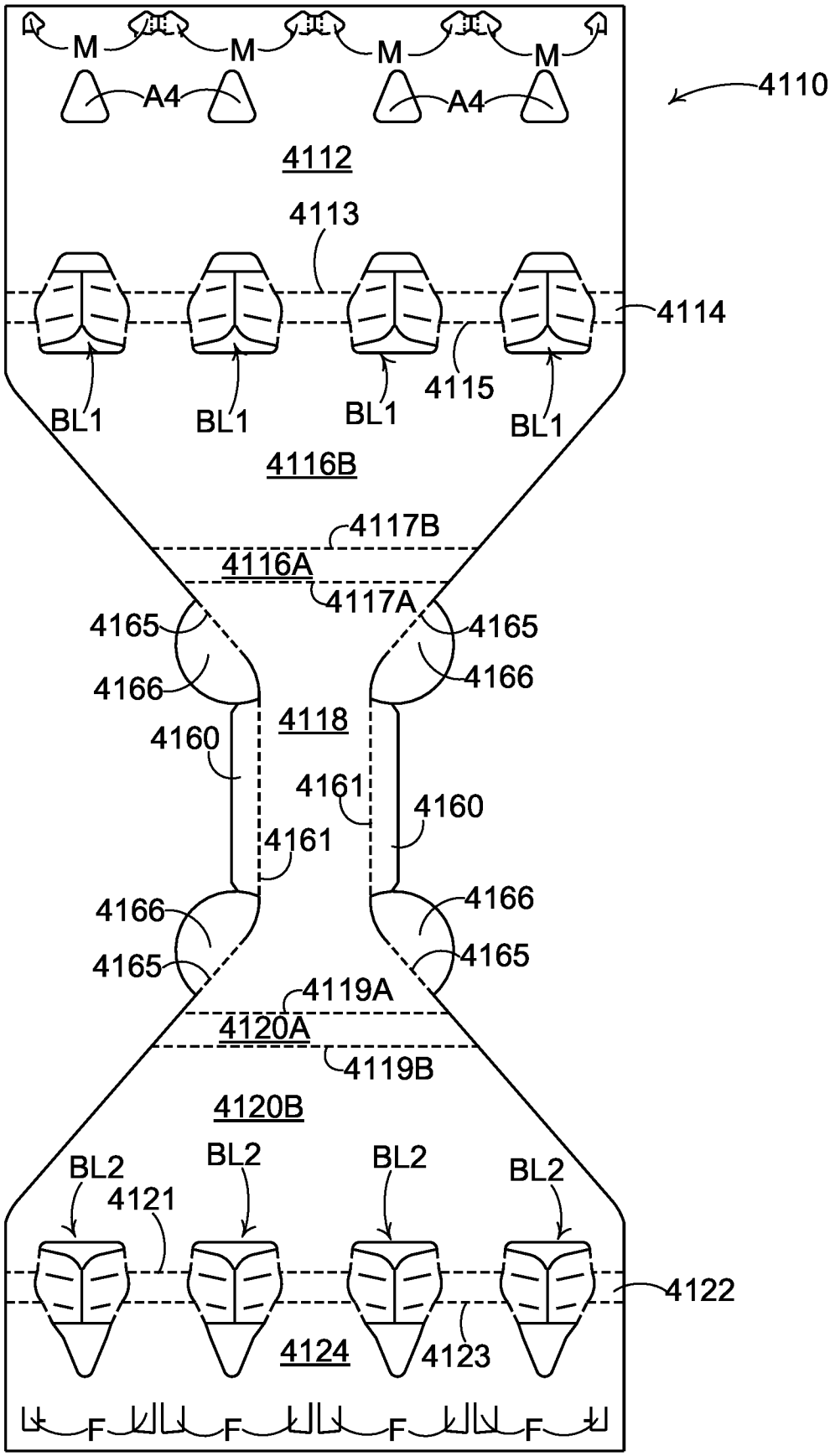

M
M
M
M
A4
A4
4110
4112
4113
4114
4115
BL1
BL1
BL1
BL1
4116B
4117B
4116A
4117A
4165
4165
4166
4166
4118
4160
4161
4161
4160
4166
4166
4165
4165
4119A
4120A
4119B
4120B
BL2
BL2
BL2
BL2
4121
4122
4124
4123
F
F
F
F

FIG. 11

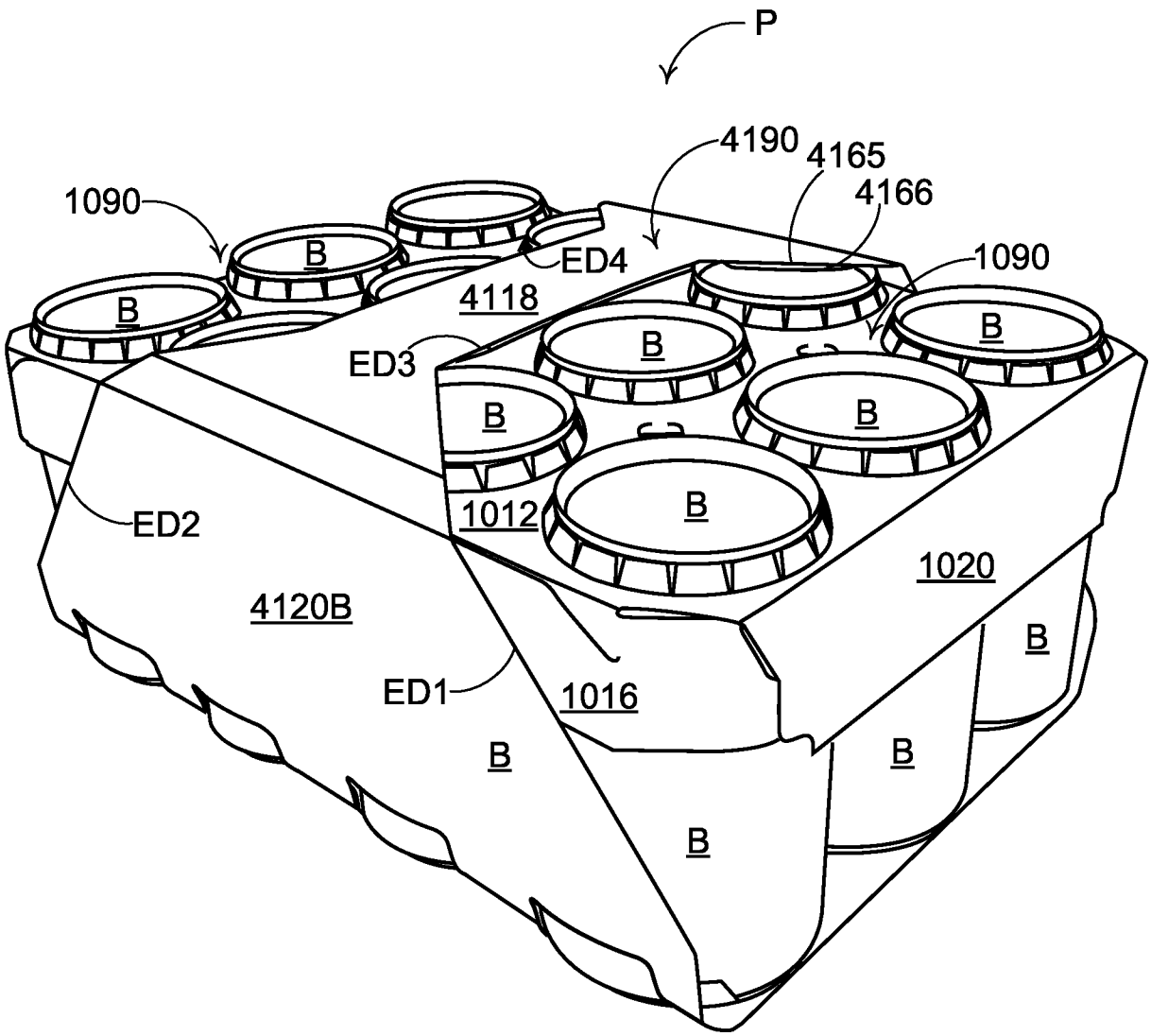

P
4190
4165
4166
1090
1090
B
ED4
4118
ED3
ED2
1012
1020
4120B
ED1
1016

FIG. 12

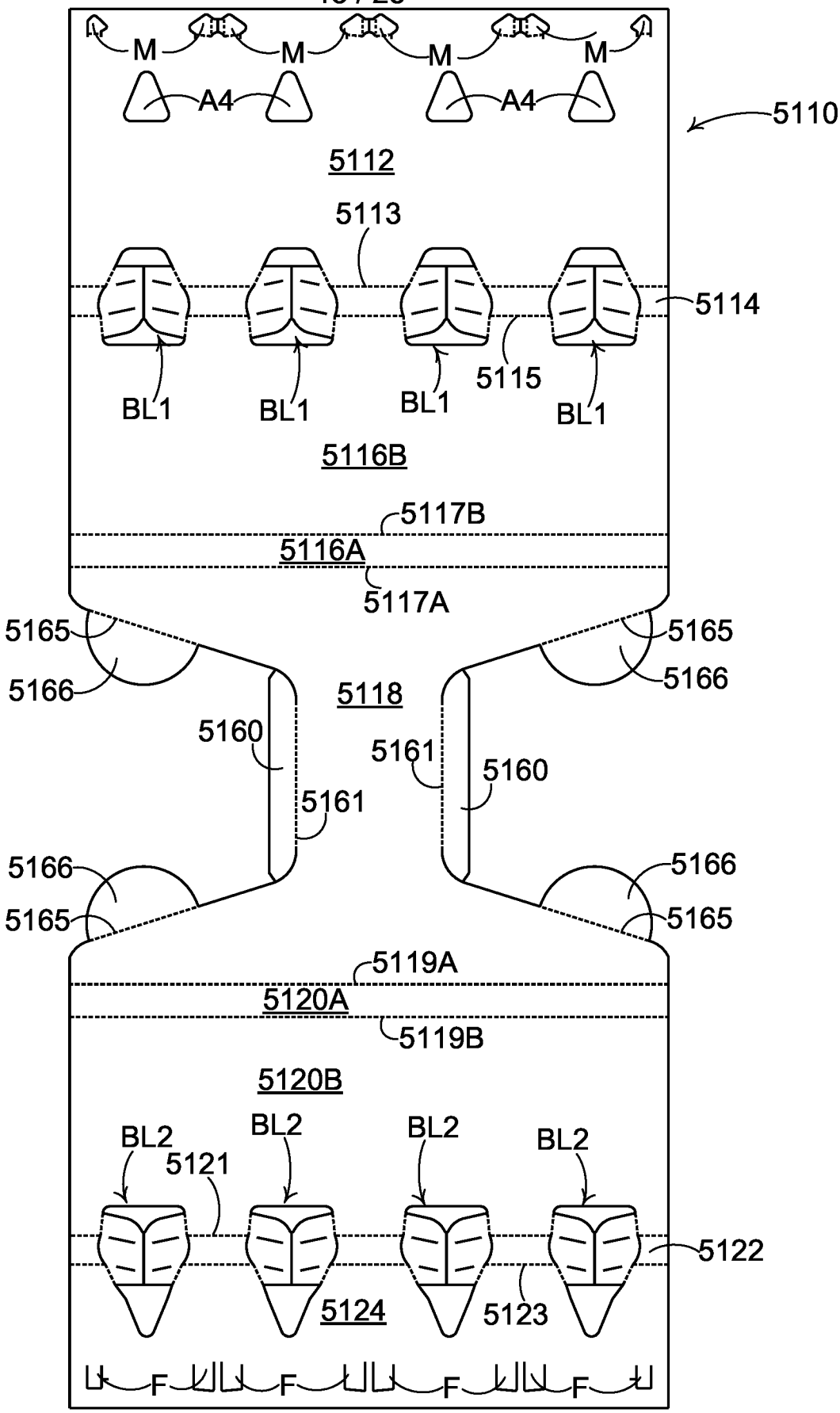

M
M
M
M
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A4
5110
5112
5113
5114
5115
BL1
BL1
BL1
BL1
5116B
5117B
5116A
5117A
5165
5166
5165
5166
5118
5160
5161
5161
5160
5166
5165
5166
5165
5119A
5120A
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BL2
BL2
BL2
BL2
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5122
5124
5123
F
F
F
F

FIG. 13

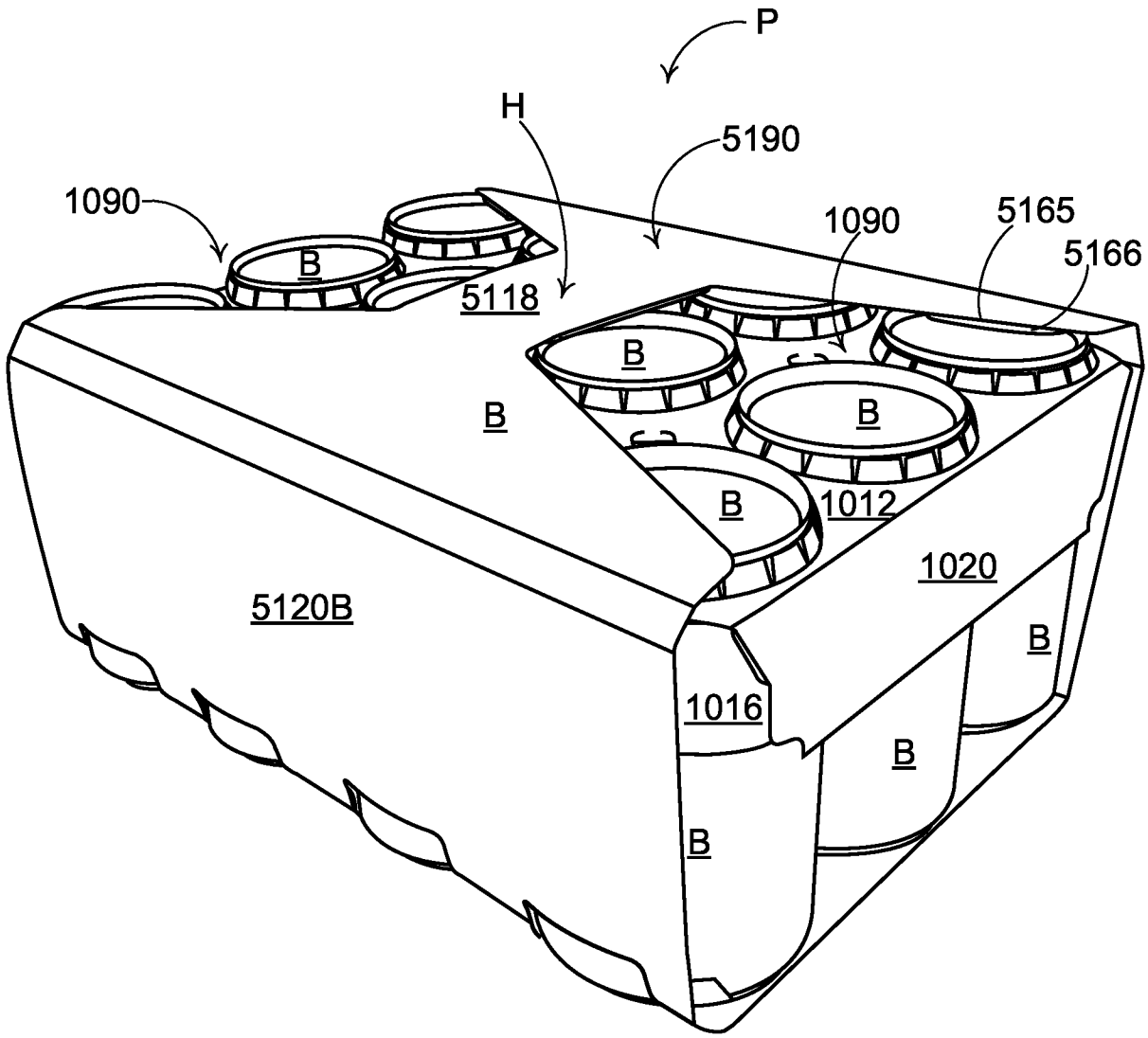

P
H
5190
1090
1090
5165
5166
B
5118
B
B
B
B
1012
1020
5120B
B
1016
B
B

FIG. 14

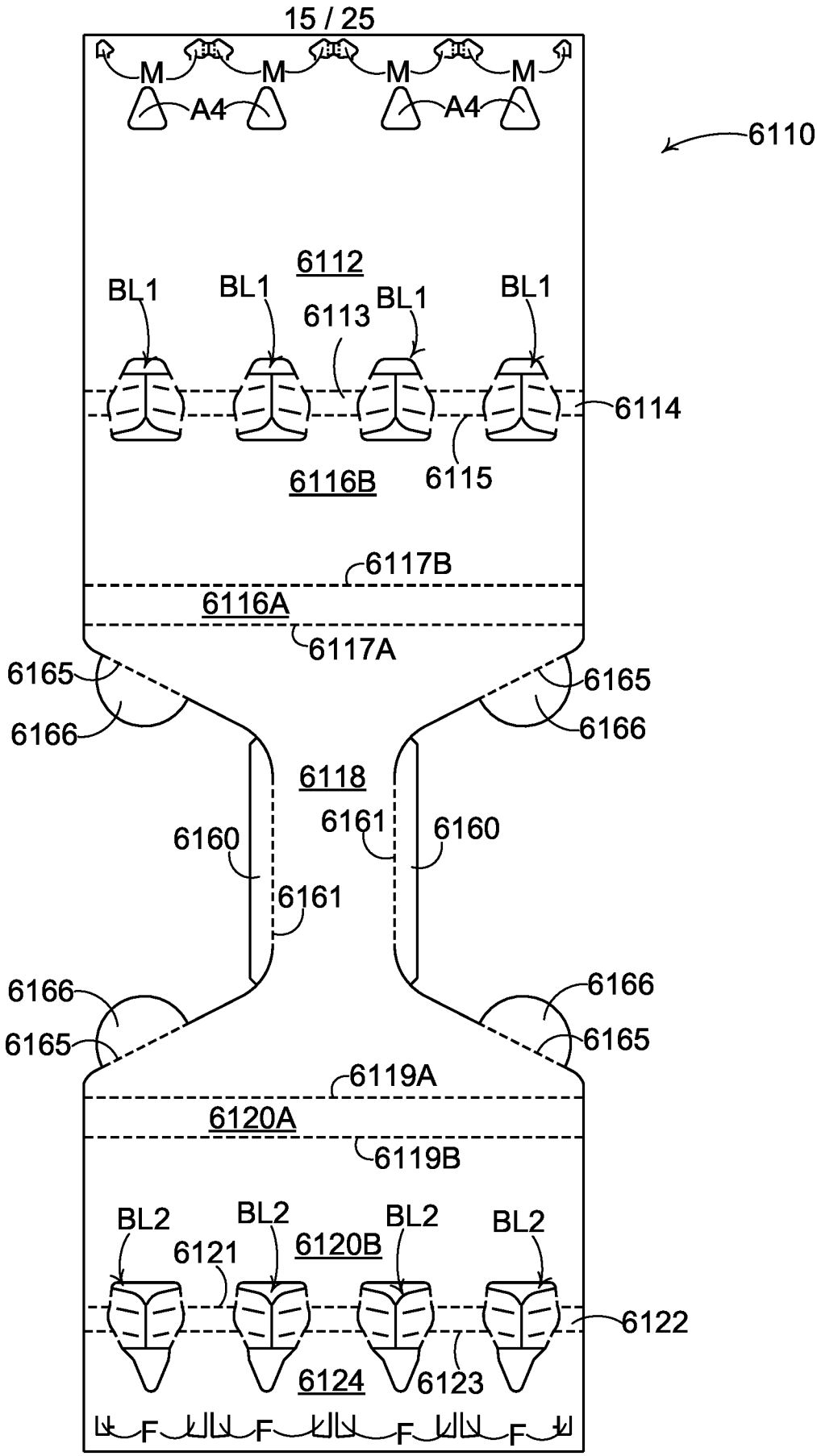

M
M
M
M
A4
A4
6110
6112
BL1
BL1
6113
BL1
BL1
6114
6116B
6115
6117B
6116A
6117A
6165
6166
6165
6166
6118
6161
6160
6160
6161
6166
6165
6166
6165
6119A
6120A
6119B
BL2
BL2
BL2
BL2
6121
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6124
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F
F
F
F

FIG. 15

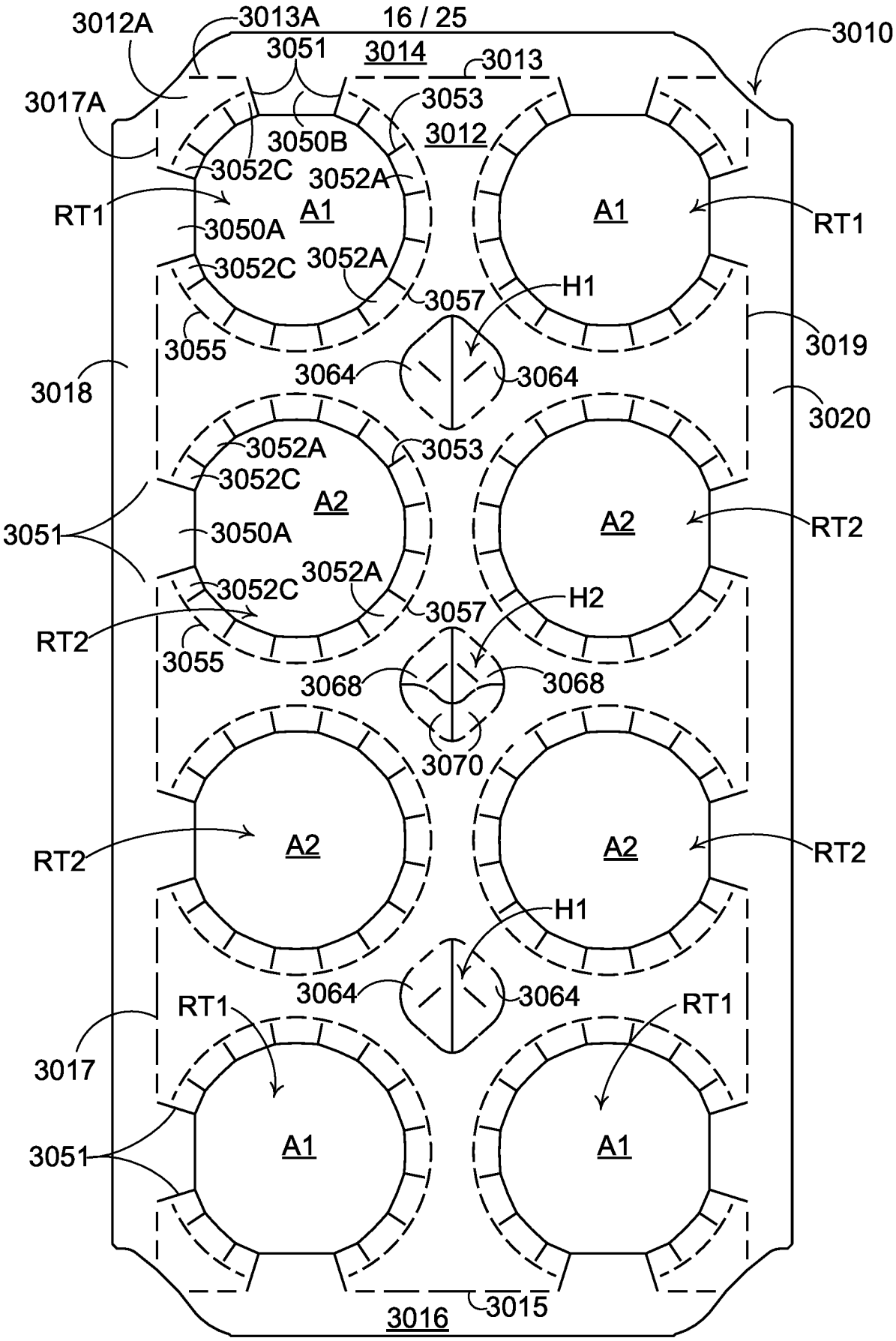

3012A
3013A
3051
3014
3013
3010
3017A
3053
3012
3050B
3052C
3052A
RT1
A1
3050A
3052C
3052A
H1
3057
3055
3019
3064
3064
3018
3020
3052A
3053
3052C
A2
3051
3050A
RT2
3052A
3052C
H2
3057
RT2
3055
3068
3068
3070
A2
A2
RT2
RT2
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RT1
RT1
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A1
A1
3051
3016
3015

FIG. 16

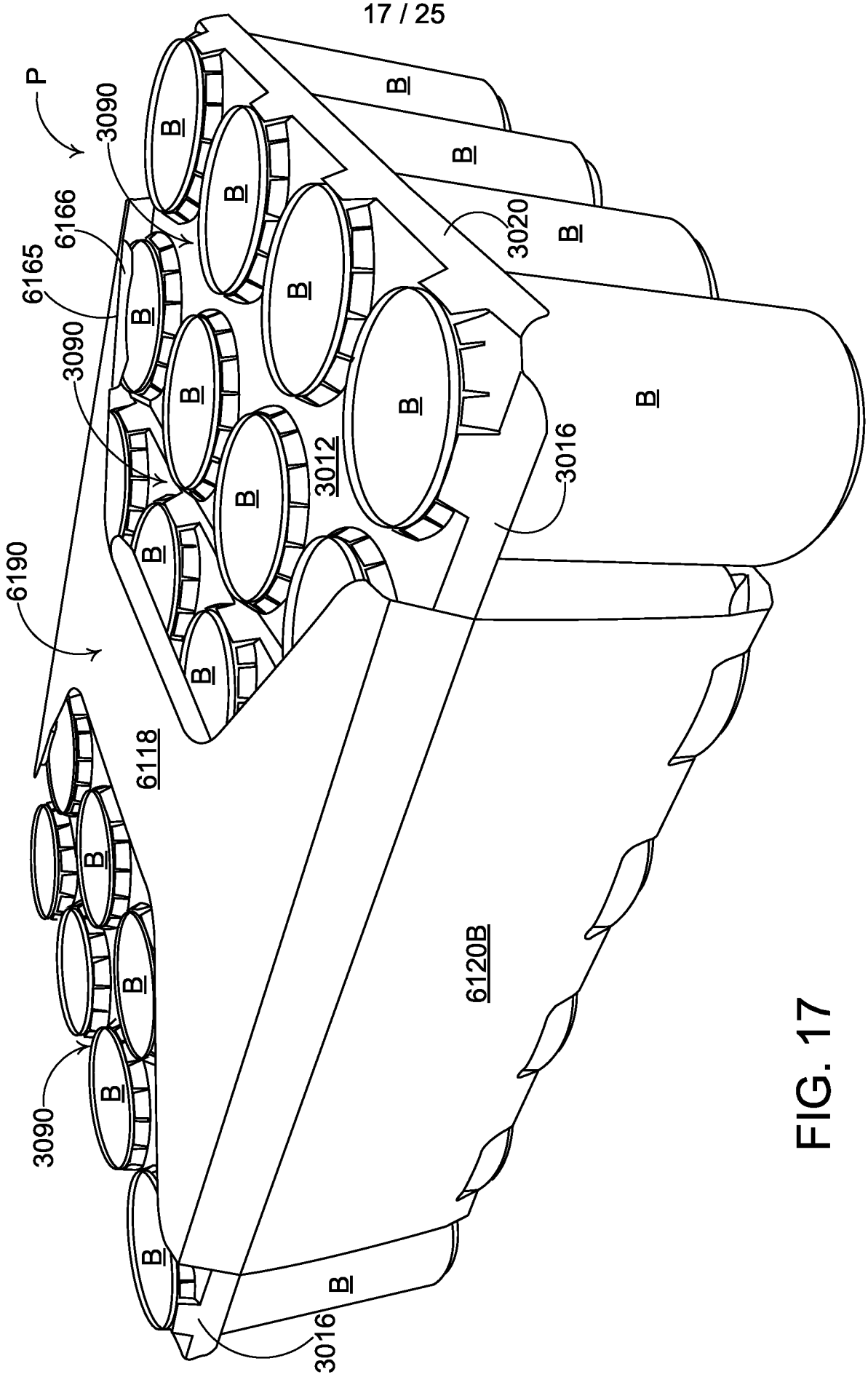

P
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6165
3090
6190
6118
3090
3016
6120B
3012
3020
3016
B

FIG. 17

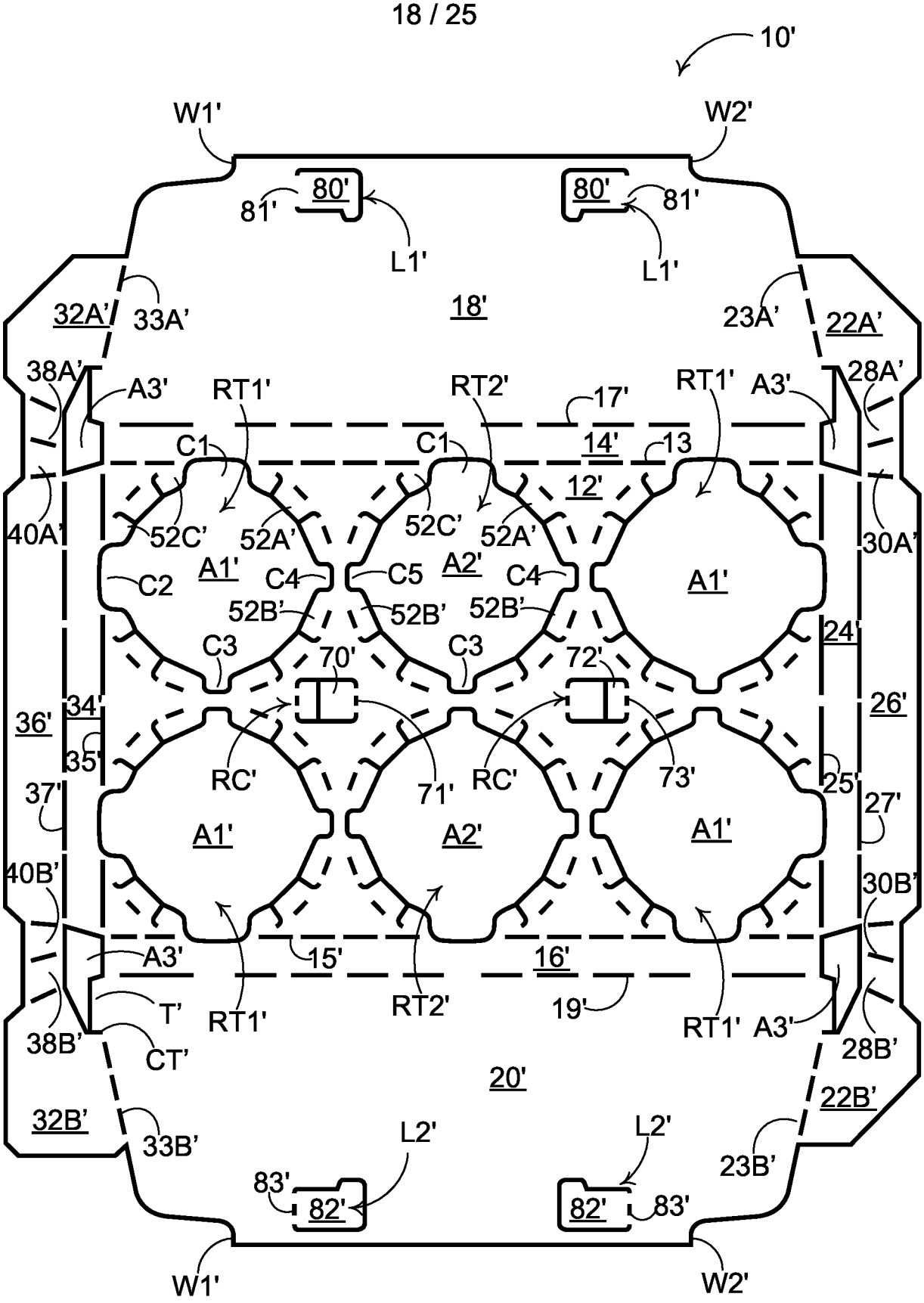

10'
W1'
W2'
80'
81'
L1'
18'
32A'
33A'
23A'
22A'
38A'
A3'
RT1'
RT2'
17'
28A'
C1
14'
13
12'
40A'
52C'
52A'
30A'
A1'
C2
C4
C5
A2'
52B'
C3
70'
72'
24'
34'
26'
36'
35'
RC'
71'
73'
25'
37'
27'
40B'
30B'
15'
16'
T'
19'
38B'
CT'
28B'
20'
32B'
33B'
L2'
23B'
83'
82'
W1'
W2'

FIG. 18

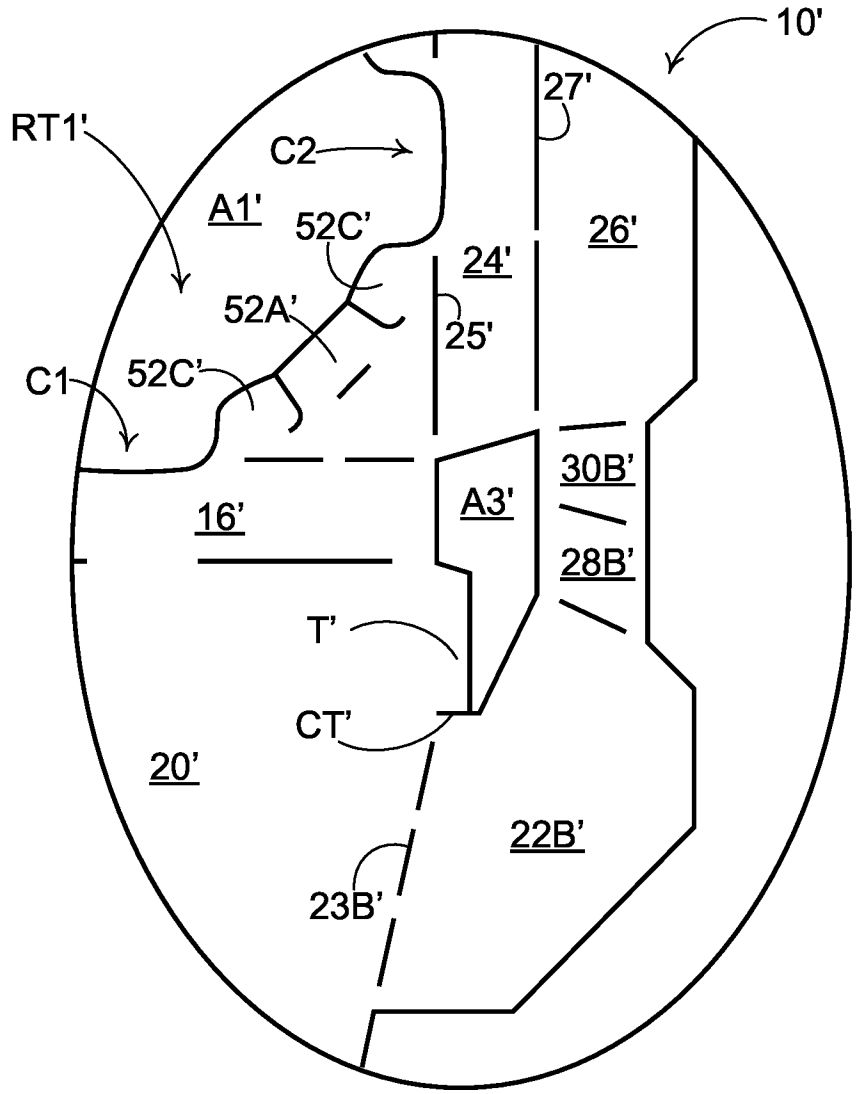


FIG. 18B

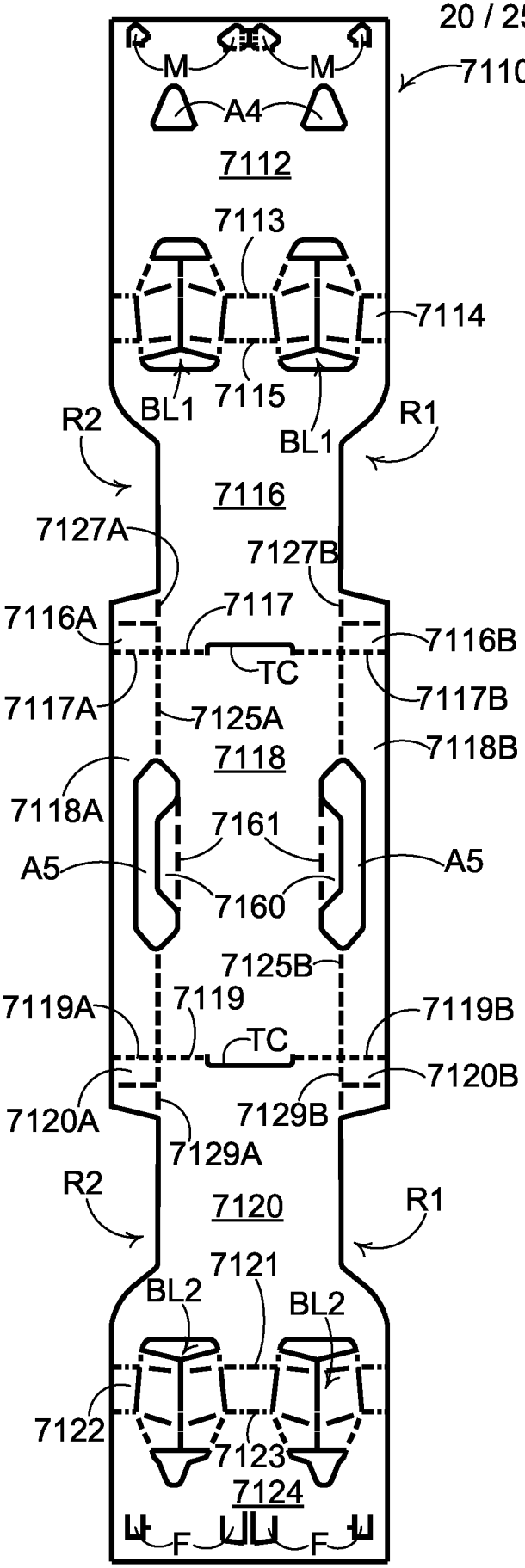

M
M
A4
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7112
7113
7114
7115
BL1
BL1
R2
R1
7116
7127A
7127B
7116A
7117
7116B
TC
7117A
7125A
7117B
7118
7118B
7118A
7161
A5
A5
7160
7125B
7119A
7119
7119B
TC
7120B
7120A
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R2
R1
7120
7121
BL2
BL2
7122
7123
7124
F
F

FIG. 19

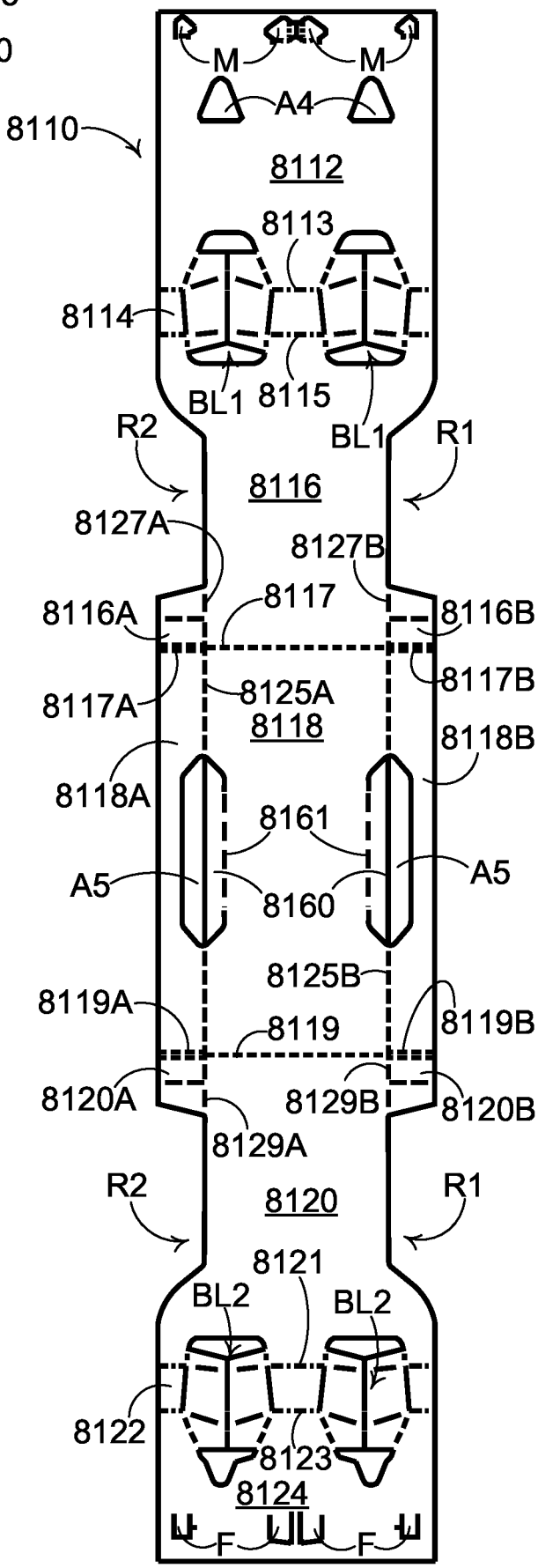

M
M
A4
8110
8112
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8115
BL1
BL1
R2
R1
8116
8127A
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8116A
8117
8116B
8117A
8125A
8117B
8118
8118B
8118A
8161
A5
A5
8160
8125B
8119A
8119
8119B
8120A
8129B
8120B
8129A
R2
R1
8120
8121
BL2
BL2
8122
8123
8124
F
F

FIG. 21

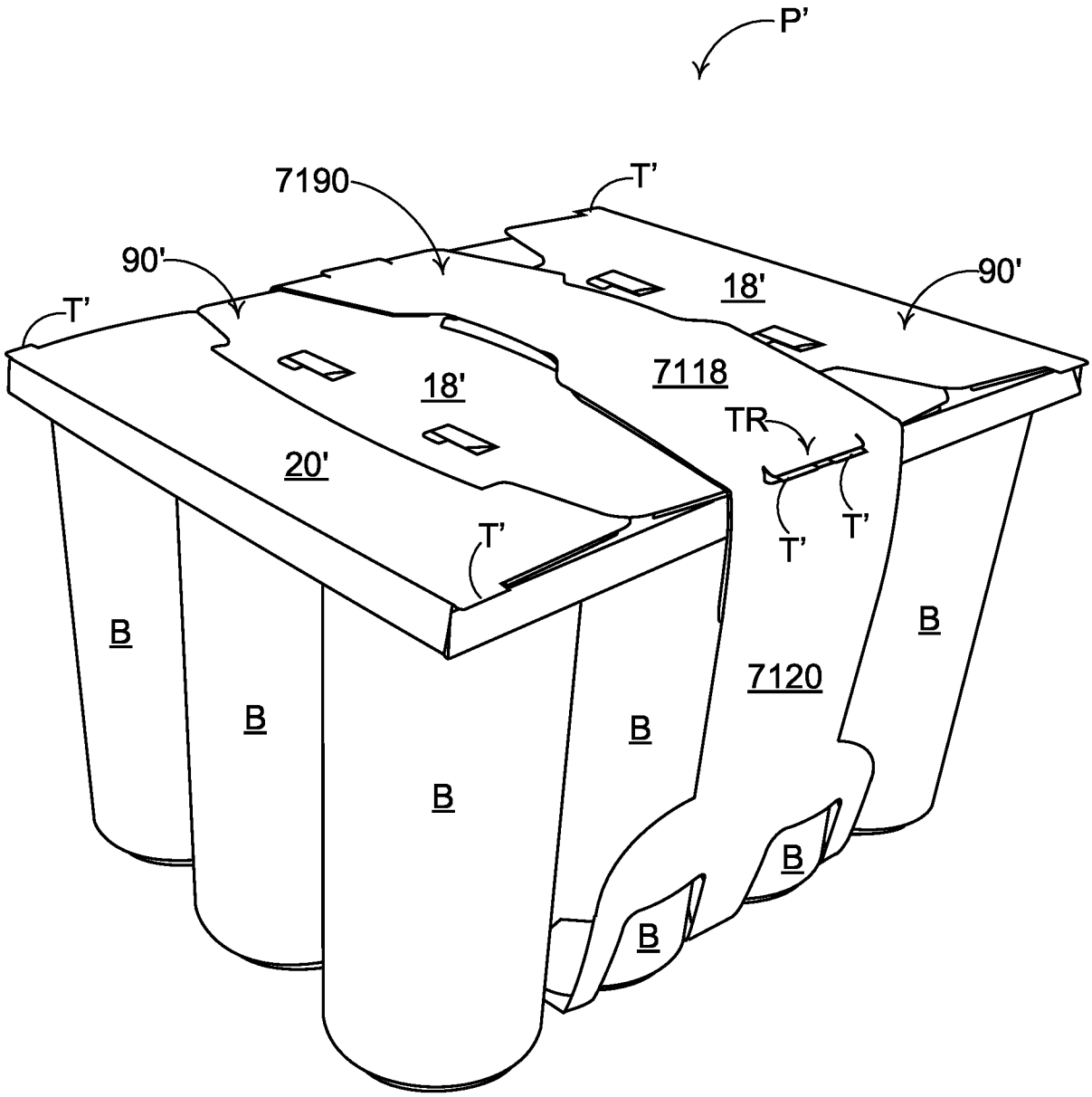


FIG. 20

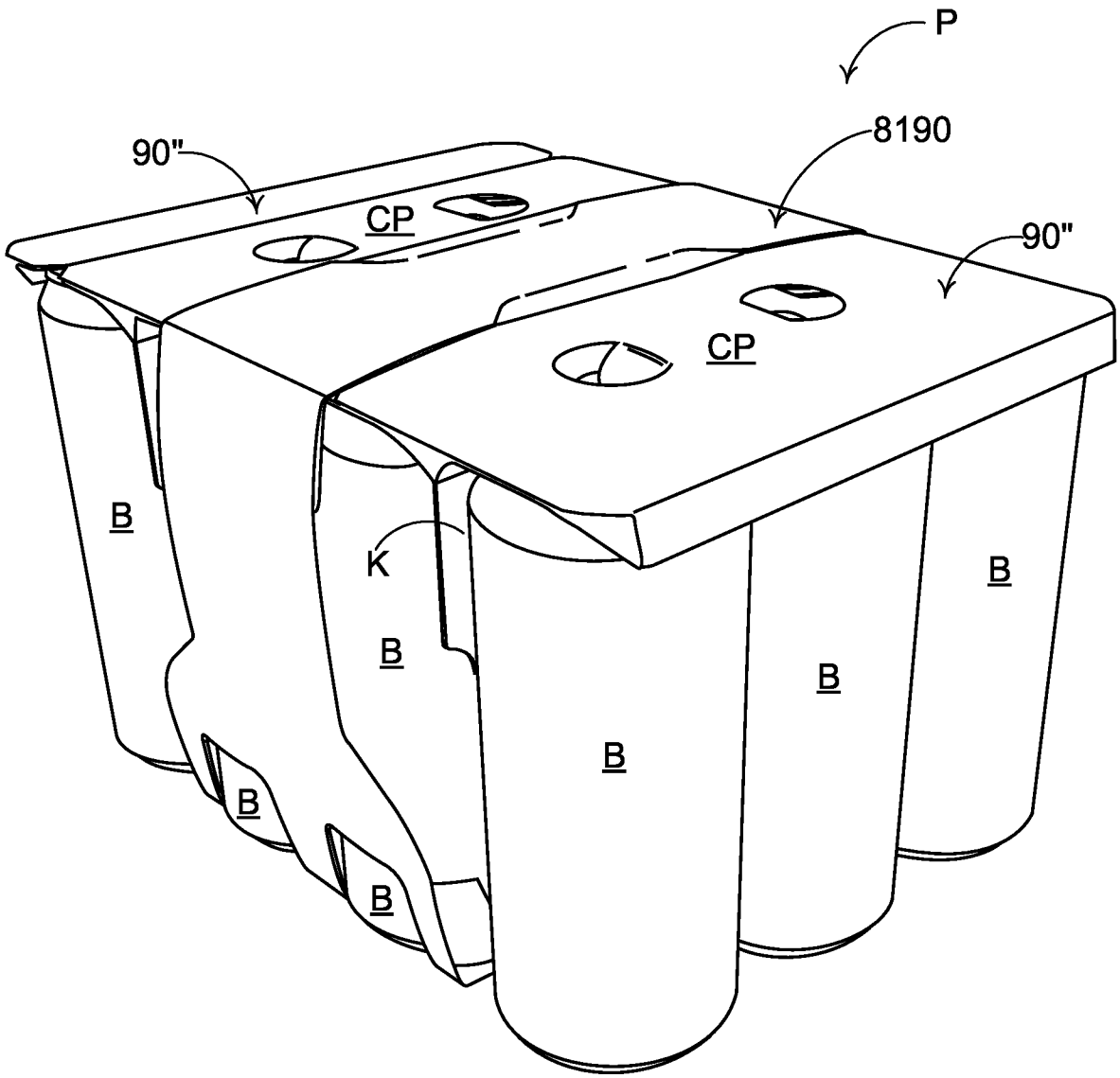


FIG. 22

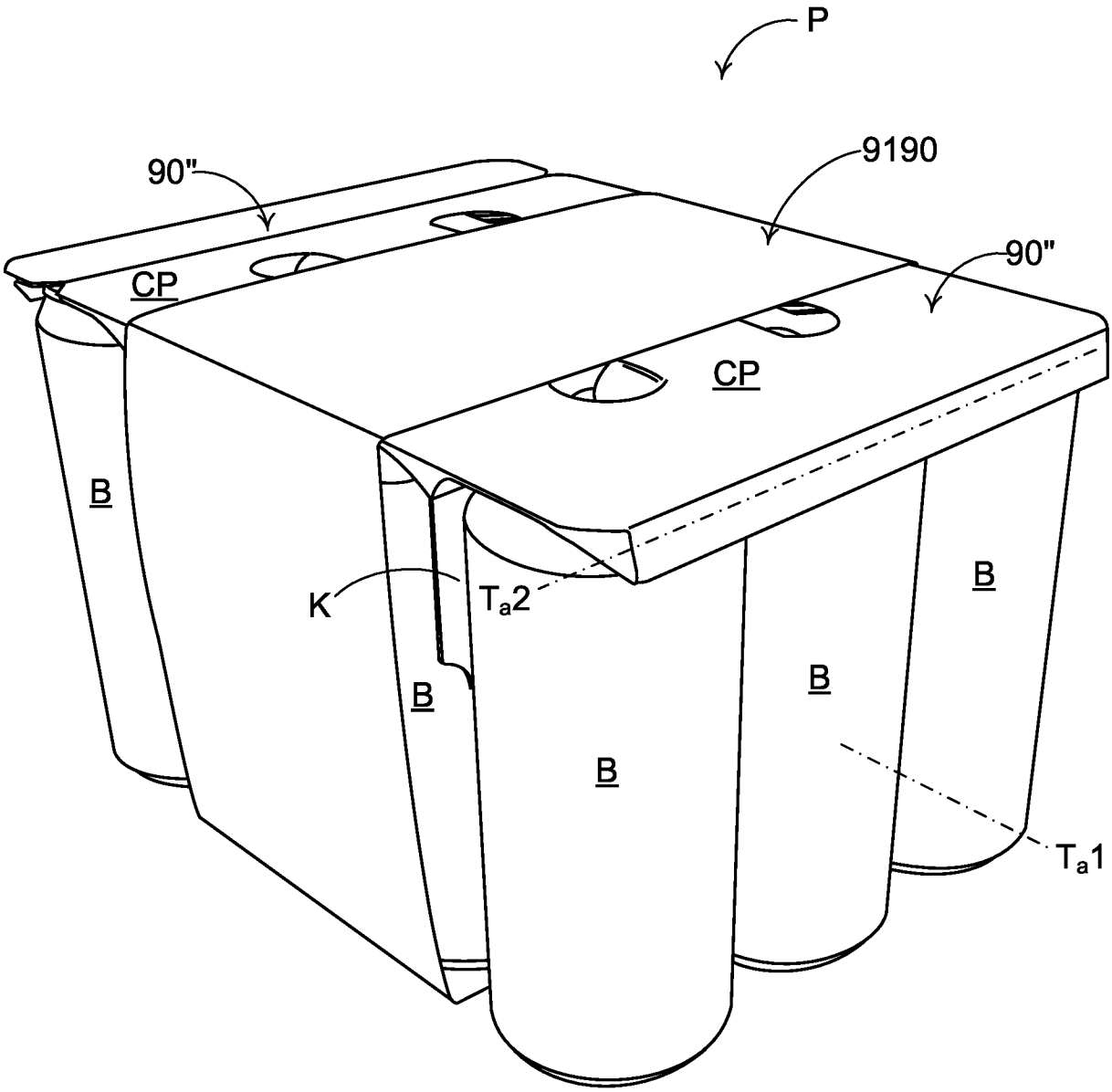


FIG. 23

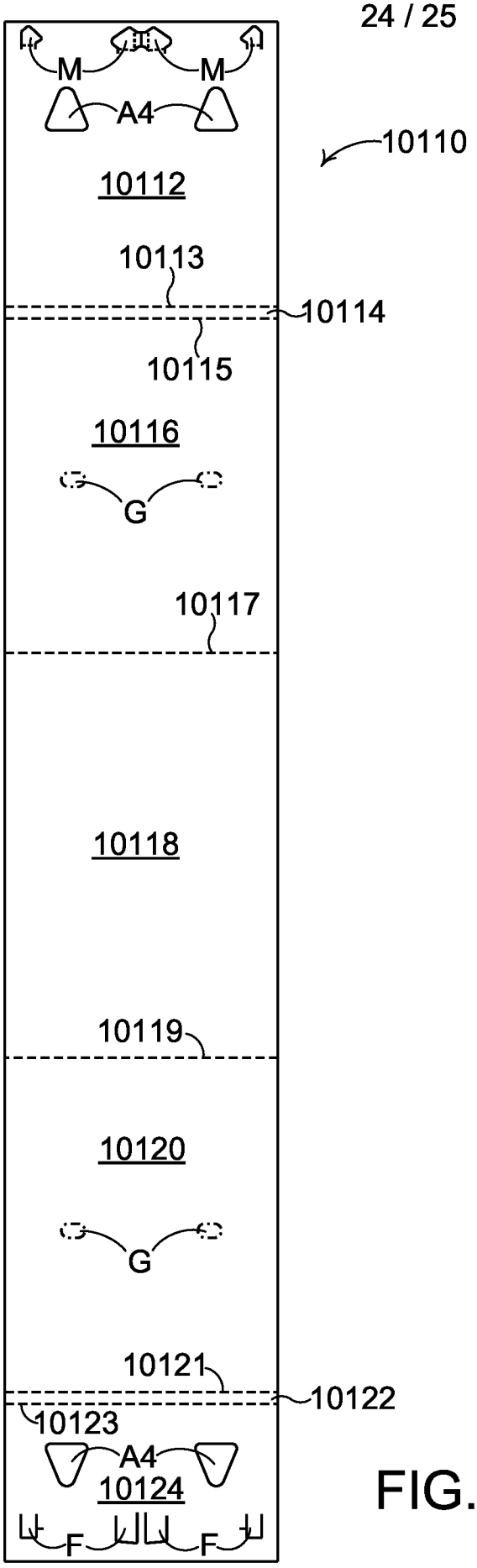

M
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G
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10122
10123
A4
10124
F
F

FIG. 24

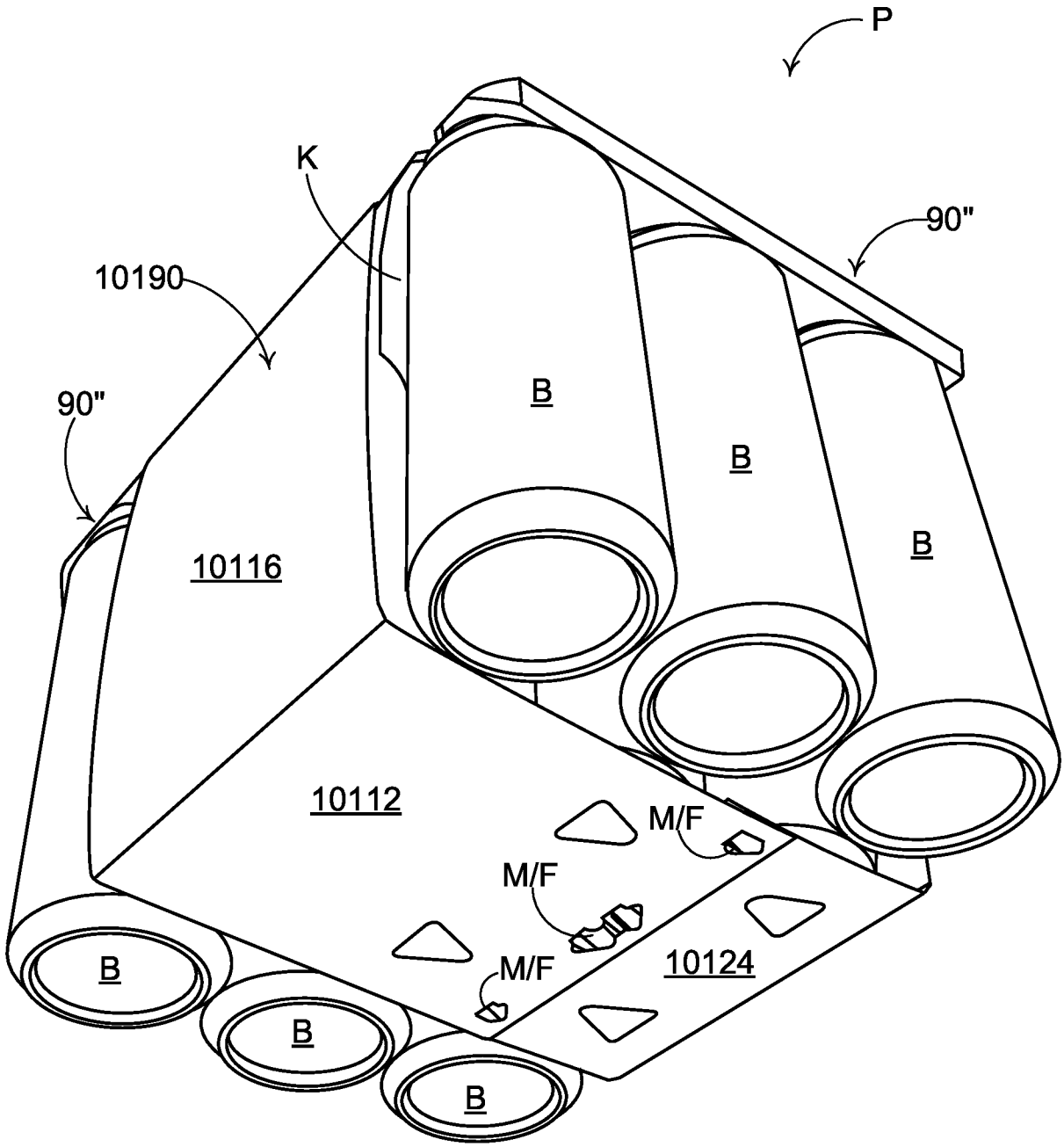


FIG. 25

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2023/062585

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65D71/14 B65D71/42 B65D71/44
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.
X	WO 2014/074659 A1 (MEADWESTVACO PACKAGING SYSTEMS [US]) 15 May 2014 (2014-05-15)	1-3, 5-23,25, 27,28, 30,31, 35-37
A	figures 1-12	4,24,26, 29,32-34

X	EP 0 298 780 A1 (MEAD CORP [US]) 11 January 1989 (1989-01-11)	1,9-11, 17,18, 20-23,25
A	figure 2	2-8, 12-16, 19,24, 26-37

	-/--	

[X] Further documents are listed in the continuation of Box C.

[X] 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 2023	23/06/2023

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	Sacepe, Nicolas

1

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2023/062585

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 394 272 B1 (DOMANSKY PHILIPPE [FR]) 28 May 2002 (2002-05-28)	32
A	figures 1-14	1-31, 33-37

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2023/062585

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2014074659 A1	15-05-2014	EP 2917130 A1	16-09-2015
		HK 1214802 A1	05-08-2016
		TW 201429832 A	01-08-2014
		US 2015291328 A1	15-10-2015
		WO 2014074659 A1	15-05-2014
EP 0298780 A1	11-01-1989	AT 70018 T	15-12-1991
		EP 0298780 A1	11-01-1989
		ES 2028281 T3	01-07-1992
		JP 2635697 B2	30-07-1997
		JP S6484865 A	30-03-1989
		KR 890001843 A	06-04-1989
		NZ 225305 A	26-09-1990
		US 4880115 A	14-11-1989
US 6394272 B1	28-05-2002	NONE	