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(54) **PACKAGING**

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Description

Technical Field of the Invention

[0001] The present invention relates to packaging.

Background to the Invention

[0002] A wide variety of different types of packaging are used to package products including food products such as confectionery product pieces including chocolates, pralines, candies, toffees, and the like, and bakery or other snack type food products including biscuits, cakes and the like. The type of packaging used may be dependent on the nature of the product but can also be dependent on the way in which the product is to be marketed. For example, packaging for products that are intended to be given as gifts will tend to be more substantial and aesthetically pleasing than packaging of similar types products intended for everyday consumption.

[0003] One type of packaging used to package confectionery products that may be given as a gift or which are intended for sharing are cartons made from carton-board or similar materials. The cartons are typically formed by assembly of corresponding carton blanks through a series of folds to provide the required carton shape defining an interior void for the containment of the item or items to be packaged. In one known arrangement, the product pieces are individually wrapped and packed together loosely within a carton. Once the carton is opened, product pieces can be removed individually from the carton and the carton reclosed. Where the carton contains a range of different product pieces, for example a selection of different chocolates or candies, it is necessary to search through the container to find any particular type of product piece. In particular for higher end products, it is often desirable that each product piece is individually held and presented within a container for ease of selection. For example, it is well known to package pieces of confectionery such as chocolates and snack products including biscuits in a box containing at least one tray having open topped recesses to accommodate individual or, in the case of biscuits for example, a small stack of product pieces. Whilst this known arrangement presents each product piece individually in a particular location for selection when the box is opened, the product pieces are not securely held within the tray and may become dislodged or damaged during transit, especially if the box is not retained in an upright orientation.

[0004] DE 202 12 076 U1 discloses packaging comprising a number of detachably interconnected containers. The containers are hingedly connected so that they can be moved into several different configurations relative to one another and have display apertures at least in a front wall which can be used for filling and extraction. In one embodiment there are four containers which can be aligned side-by-side in a first configuration. The in-

nermost containers in the first configuration are hingedly attach along adjacent front edges whilst each of the outermost containers is hingedly attached to one of the innermost containers along adjacent rear edges. The containers can be moved from the first configuration to a second, open square configuration in which the display apertures are exposed by folding each of the outermost containers about the rear hinges to overlie their adjacent innermost containers. Alternatively, the containers can be moved from the first configuration to a third, closed square configuration in which most of the display apertures are hidden by folding the innermost containers about their front hinge so that the innermost containers overlie one another front face to front face and the outermost containers overlie one another front face to front face. In all configurations at least one display aperture is exposed.

[0005] There is a need therefore for an alternative packaging arrangement in which a plurality of product pieces are held which overcomes, or at least mitigates, some or all of the drawbacks of the prior art packaging arrangements.

[0006] There is a need in particular for a packaging assembly in which a plurality of product pieces are individually located and held so as to be securely retained in position regardless of the orientation of the packaging assembly.

[0007] There is a need therefore for an alternative methods of manufacturing, assembling and using a packaging arrangement in which a plurality of product pieces are held which overcomes, or at least mitigates, some or all of the drawbacks of the prior art methods.

Summary of the Invention

[0008] In accordance with a first aspect of the invention, there is provided a packaging assembly comprising a package having a plurality of interconnected containers each for holding at least one product piece, at least some of the containers being movable relative to one another between a closed configuration of the package and an open configuration of the package; each container having a plurality of walls defining an interior volume in which said at least one product piece can be held, with a product display and dispensing aperture in at least one of the walls; characterized in that a product piece holding fitment is located within each container, each product piece holding fitment having a product retention region in which is defined at least one product piece retention seat configured to individually hold and retain a product piece and a resilient biasing arrangement on either side of the product retention region, which resilient biasing arrangements engage with opposed side walls of the respective container to hold the product retention region substantially centrally such that, in use, a product piece mounted in said at least one product retention seat can be seen and removed through the product display and dispensing aperture when the package is in an open configuration.

[0009] The packaging assembly may be configured so that in the closed configuration at least one of the containers overlies at least one other of the containers and in the open configuration the at least one of the containers is arranged side by side with said at least one other of the containers. The arrangement may be such that the product display and dispensing apertures are located in walls of the overlying containers which oppose one another when in the closed configuration so that the apertures are not exposed.

[0010] The packaging assembly may be configured so that in the open configuration, the containers are all aligned in a side-by-side array.

[0011] The package may comprise two containers hingedly attached to one another for movement between an open and a closed configuration.

[0012] The package may comprise at least one innermost container and a pair of outermost containers, the outermost containers being pivotally attached to opposing sides of the at least one innermost container so as to be movable between a closed configuration in which they overlie the at least one innermost container and an open configuration in which they are positioned alongside the at least one innermost container. The package may have two innermost containers non-movably attached to one another in side-by-side relation, the outermost containers each being hingedly attached to a respective one of the innermost containers, the outermost containers each being movable from a closed configuration in which they overlie their respective innermost container and an open configuration in which they are positioned alongside their respective innermost container.

[0013] The package may comprise a main body defining the containers, the main body being formed in two parts, each part comprising one of the innermost containers and one of the outermost containers hingedly connected together. Each part of the main body may be formed from a single blank of foldable material.

[0014] The innermost containers may be connected together at each longitudinal end by a locking insert which engages with the adjacent end regions of the innermost containers. In an alternative embodiment, the innermost containers are bonded together using an adhesive or welded connection

[0015] In an embodiment, each container has a front wall in which the display and dispensing aperture is located, each pair of movably connected containers being configured to overlie each other front wall to front wall in the closed configuration.

[0016] The package may be an inner package and the packaging assembly may include an outer sleeve into which the inner package is insertable when in the closed configuration.

[0017] Each product piece holding fitment may have a plurality of product retention seats aligned in a row. Each product piece holding fitment may have only a single row of product retention seats.

[0018] The resilient biasing arrangement may include

at least one resilient flap along either side of the product retention region.

[0019] In an embodiment, the product retention region comprises a channel shaped member extending in a longitudinal direction of the fitment, the channel shaped member having an outer end wall and a pair of opposed side walls depending inwardly from the end wall, a plurality of product retention seats being spaced along the channel shaped member, each seat being formed in the channel shaped member by a pair of opposed recesses in regions of the side walls proximal to the outer end wall and which merge with an opening extending laterally across the outer end wall to define a cavity in which a product piece can be inserted so as to rest on and be supported by outwardly directed edges of the side walls within the recesses, the opening being shaped so as to define a pair of opposed flaps on laterally extending edges of the outer end wall either side of the opening, the flaps being angled inwardly from the plane of the end wall, the flaps being resiliently biased to an initial rest position at which they are inclined at a first angle relative to the plane of the end wall.

[0020] The packaging assembly may further comprise a plurality of product pieces, each product piece being held and retained in a respective one of the seats, each product piece contacting and being supported by the outwardly directed edges of the side walls in the opposed recesses, the flaps resiliently engaging opposed sides of the product piece. The outer end edges of the flaps may be resiliently biased into contact with oppositely directed faces of the product piece to hold the product piece in contact with the outwardly directed edges of the side walls in the opposed recesses. The oppositely directed faces of the product pieces engaged by the flaps may be inclined towards each other in a direction from the bottom of the recesses to the outer end wall other such that a portion of the product piece inboard of (below) the point at which the edges of flaps engage the faces is wider than the spacing between the outer edges of the opening.

[0021] The resilient biasing arrangement in this embodiment may comprise a pair of flaps connected to the channel shaped member along either side, each pair of flaps including a first flap pivotally connected with a side wall of the channel shaped member and a second flap pivotally connected with the first flap, the second flaps being biased into engagement with opposed sides of the respective container.

[0022] In an alternative embodiment, the product retention region of each product piece holding fitment comprises a plurality of spaced apart product supports defining a product retention seat between each adjacent pair of supports, each support having an outer end wall and a pair of opposed side walls depending inwardly from the end wall, a cavity being defined between each pair of adjacent supports in which a product piece can be inserted, a pair of opposed flaps on laterally extending edges of the outer end walls of the supports either side of each cavity, the flaps being angled inwardly from the plane of

the end wall and resiliently biased to an initial rest position at which they are inclined at a first angle relative to the plane of the end wall of the product supports.

[0023] The packaging assembly may further comprise a plurality of product pieces, each product piece being held and retained in a respective one of the seats, the opposed flaps in each seat resiliently engaging oppositely directed faces of the respective product piece. The outer end edges of the flaps in each seat may be resiliently biased into contact with the oppositely directed faces of the respective product piece, the oppositely directed faces of the product pieces being inclined towards each other in a direction from the inner end of the side walls to the outer end walls of the product supports such that a portion of the product piece inboard of (below) the point at which the edges of flaps engage the product piece is wider than the spacing between the outer edges of the flaps.

[0024] The resilient biasing arrangement in this embodiment may comprise a pair of flaps connected to the product retention region along either side, each pair of flaps including a first flap pivotally connected with the inner ends of the side walls of the product supports on its respective side and a second flap pivotally connected with the first flap, the second flaps being biased into engagement with opposed sides of the respective container.

[0025] In a yet further embodiment, the product retention region of each product piece holding fitment comprises a pair of elongate spaced, angled walls having an inner edge which locates adjacent the rear wall of its respective container and an outer edge which locates proximal to the front face of the container, the angled walls being angled towards each other in a direction from their inner edges to their outer edges, the outer edges the angled walls being spaced apart; a product support panel located in the gap between the outer edges of the angled walls and recessed inwardly from the outer edges, the product support panel being connected to the outer edges of the angled walls by a pair of opposed, generally upright side walls; a plurality of product retention seats being spaced along the central product retention region, each seat being defined by a pair of opposed recesses in the side walls and corresponding recesses in the overlapping regions of the angled walls.

[0026] The recesses may be generally rectangular in shape, the recesses being dimensioned so that a respective product piece can be inserted in the recess with its lower surface resting on and supported by the product support panel, side edges opposed of the recesses engaging with oppositely directed side faces of the product piece.

[0027] The packaging assembly may further comprise a plurality of product pieces, each product piece being held and retained in a respective one of the seats, a lower surface of each product piece resting on and being supported by the product support panel, side edges of the opposed recesses in the side walls and angled walls en-

gaging with oppositely directed faces of the product piece to hold the product piece in the seat. The oppositely directed faces of each of the product pieces that are engaged by side edges of the recesses may be angled towards each other in a direction from product support panel to the outer edges of the angled walls and the side edges of the recesses may be profiled to engage with the inclined oppositely directed faces of the product piece so that there is a portion of the product piece inboard of the point of contact between the side edges and the product piece that is wider than the spacing between the side edges at the point of contact. The side edges of the recess may be convex.

[0028] The resilient biasing arrangement in this embodiment may comprise a single flap resiliently attached to either side of the central product retention region.

[0029] Where the packaging assembly comprises a product piece holding fitment, the fitment may be made from a single blank of foldable material.

Detailed Description of the Invention

[0030] In order that the invention may be more clearly understood an embodiments thereof will now be described, by way of example only, with reference to the accompanying drawings, of which:

Figure 1 is a perspective view of a packaging assembly in accordance with an embodiment of the invention;

Figure 2 is a plan view of a blank for a sleeve forming part of the packaging assembly of Figure 1;

Figure 3 is a perspective view illustrating how the blank of Figure 2 is folded to form an upper end closure of the sleeve;

Figure 4 is a perspective view of an inner package forming part of the packaging assembly of Figure 1, showing the inner package in a closed configuration;

Figure 5 is a perspective view of the inner package of Figure 4, showing the inner package in an open configuration;

Figure 6 is a plan view of the inner package of Figure 5 also showing product pieces located in the inner package;

Figure 7 is a plan view of a blank for forming part of a main body of the inner package of Figures 4 to 6;

Figures 8 to 10 are a series of perspective views illustrating a method of assembling the inner package of Figures 4 to 6;

Figure 11 is a plan view of a blank for forming a lock-

ing insert for interconnecting two parts of a main body of the inner package of Figures 4 to 6;

Figure 12 is a perspective view of a first embodiment of a product retention fitment forming part of the inner package of Figures 4 to 6;

Figure 13 is a partial view of one of the containers of the inner package of Figures 4 to 6 incorporating the fitment of Figure 12 illustrating how product pieces are retained in the fitment;

Figure 14 is a cross sectional view taken on line X-X of Figure 13;

Figure 15 is a plan view of a blank for forming the product retention fitment of Figure 12;

Figure 16 is a perspective view of a second embodiment of a product retention fitment forming part of the inner package of Figures 4 to 6;

Figure 17 is a plan view of the fitment of Figure 16 showing a number of product pieces held in product retention seats;

Figure 18 is a plan view of a blank for forming the product retention fitment of Figure 16;

Figure 19 is a perspective view of a third embodiment of a product retention fitment forming part of the inner package of Figures 4 to 6;

Figure 20 is a plan view of the fitment of Figure 19 showing a number of product pieces held in product retention seats;

Figure 21 is a cross sectional view taken on line Y-Y of Figure 20; and

Figure 22 is a plan view of a blank for forming the product retention fitment of Figure 19.

[0031] A non-limiting embodiment of a packaging assembly 10 in accordance with an aspect of the invention is illustrated in the accompanying Figures and comprises an outer sleeve 12 and an inner package 14 which is received within the outer sleeve when it is in a closed configuration.

[0032] The sleeve 12 is a hollow rectangular prism in shape having a front wall 16 and a rear wall 18 interconnected by opposed side walls 20, 22. The upper end of the sleeve 12 is closed by an end closure which forms an upper wall 24. The lower end 26 of the sleeve is open so that the inner package 14 can be inserted into and removed from the sleeve 12 through the open lower end. Whilst the sleeve 12 is rectangular in the present embodiment with the front and rear walls 16, 18 having a greater

width than the side walls 20, 22, the sleeve 12 could be any suitable shape to receive the inner package 14 in its closed configuration. The outer sleeve 12 could for example be any parallelepiped shape such as a hollow square prism or curved shapes such as a cylinder.

[0033] The outer sleeve 12 can be made from any suitable material but in an embodiment is made from a single blank 30 of foldable material such as cartonboard, cardboard or the like. The material of the blank 30 may be printed on its outer surface and the blank 30 is advantageously configured so that in the completed sleeve 12, there are a minimum, (e.g. one or none) of exposed cut or raw edges of the material showing. The blank 30 is shown in Figure 2 and comprises from right to left, a first side wall panel 32, a front wall panel 34, a second side wall panel 36, a rear wall panel 38 and a glue tab 40, the panels and tab being separated by respective longitudinal fold lines 42, 44, 46 and 48. Adhesive 50 is applied to the outer surface of the glue tab 40. A respective fold over flap 52, 54, 56, 58 is attached by means of a respective transverse fold line 60, 62, 64, 66 to the lower end of each of the front, rear and side wall panels. Adhesive 68 is applied to the inner surface of each of the fold over flaps 50, 52, 54, 56.

[0034] A closure 70 for the upper end of the sleeve 12 is defined in the blank by means of an end closure panel 72 connected to an upper edge of the front wall panel 34 by means of a fold line 74. The end closure panel 72 is shaped and dimensioned so as to cover substantially the whole of the upper end of the sleeve when the blank is erected. In the centre of the end closure panel 72 is a slit 76 through which a looped ribbon 77 for the sleeve can be inserted so as to project upwardly in the completed sleeve. The ribbon 77 has flaps that are secured to the inner surface of end closure panel 72 so as to form generally a T shape. A cover panel 78 is connected with the freed edge of the end closure panel 72 opposite from the front wall panel 34 by means of a further fold line 80. The cover panel is substantially the same size as the end closure panel 72 and may be printed on its outer surface. The cover panel 78 is adapted to be folded inwardly about fold line 80 so as to overlie the inner surface of the end closure panel 72 after the ribbon has been secured in place so as to cover the inner surface of the end closure panel 72 and hide the inner attachment of the ribbon. A pair of side closure panels 82, 84 are foldably connected to opposite side edges of the end closure panel 72 by respective fold lines 86, 88 and to the upper edges of respective ones of the side wall panels 32, 36 by means of further respective fold lines 90, 92. The side closure panels 82, 84 are substantially square in shape and each is divided into a first triangular portion 94 and a second triangular portion 96 by means of a fold line 98 extending substantially diagonally upwardly and outwardly from the intersection of its respective side wall panel 32, 36 and the front wall panel 34. The first portion 94 is adjacent and connected with the end closure panel 72 and the second section 96 is adjacent and foldably connected

with the respective side panel 34, 36. A top end closure tab 100 is foldably connected with an upper edge of the rear wall panel 38 by means of transverse fold line 102.

[0035] Directional terms such as "upper" and "lower", "top" and "bottom" are used herein to refer to the packaging assembly 10 in general, the outer sleeve 12, and the blank 30 from which the sleeve is made in relation to the package and sleeve oriented in a generally upright configuration as illustrated in Figure 1. It will be appreciated however that the packaging assembly 10 can be used or held in different orientations and that in particular that blank 30 for the sleeve 12 can be assembled in any suitable orientation. It will also be appreciated that the designation "front" and "rear" in relation to the major panels of the sleeve is not intended to be limiting and that the panel designated as the front panel could be used to form the rear of the sleeve and vice versa.

[0036] In order to erect the blank 30 into the sleeve 12, the fold over flaps 52, 54, 56, 58 are folded inwardly about their respective fold lines 60, 62, 64, 66 and secured to the inner surface of their respective panel using the adhesive 68. This ensures there are no cut or exposed raw edges at the base of the sleeve.

[0037] A ribbon is inserted through the slot 76 and secured in position and the cover panel 78 folded over so as to cover the inner surface of the end closure panel 76 and the ribbon attachment. The blank is folded about longitudinal fold lines 42, 44, 46 and 48 so that the wall panels 32, 34, 36, 38 assume the position of the front, rear, and side walls defining a rectangular tube and the glue tab 40 is secured to the inner surface of the first side wall panel 32.

[0038] To form the upper end closure 70, the side closure panels 82, 84 are pressed inwardly along the diagonal fold lines 98 and the end closure panel 72 is folded downwardly about fold line 74 causing the first part 94 of each side closure panel to fold down on top of its respective second part 96. To secure the upper closure, the tab 100 is inserted between the folded side closure panels 82, 84 and the cover panel 78. It will be noted that there are no exposed cut or raw edges on the upper closure.

[0039] The inner package 14 has a main body 108 defining a number of containers 110, 112, 114, 116, at least some of the containers are movable relative to each other between a closed configuration in which the inner package can be received in the outer sleeve 12 and an open configuration in which the product pieces can be seen and/or dispensed from their respective containers.

[0040] In an embodiment, the inner package has four containers 110, 112, 114, 116, each container having a front wall 120, a rear wall 122, opposed side walls 124, 126 interconnecting the front and rear walls, and end closures 128, 130 to define an interior volume. Located inside each container is a product piece holding fitment 132 have a mounting arrangement including number of seats 134 for receiving individual product pieces 118. The seats 134 are spaced apart and aligned in a longitudinal row approximately centrally of the container. The

front wall 120 of each container has an aperture 136 through which all the product pieces 118 held in the fitment 132 can be seen and through which the product pieces may be individually removed.

[0041] Two of the containers 112, 114, which will be referred to as "innermost containers", are non-movably attached to one another side by side so that their front walls 120 are substantially aligned in a common plane. The other containers 110, 116, referred to as "outermost containers", are each pivotally connected with the outer side of a respective one of the innermost containers 112, 114 by means of a hinge 137. The outermost containers can each be moved from an open configuration in which they are aligned side-by-side with their respective innermost containers 112, 114 with their front walls 120 exposed and positionable substantially in the common plane with the front walls 120 of the innermost containers, and a closed position in which they overlie their respective innermost containers front face to front face.

[0042] When the two outermost containers 110, 116 are both in the open configuration, all four containers are aligned in a side-by-side array with their front faces exposed as illustrated in Figures 5 and 6. In this configuration all the product pieces 118 can be seen and product pieces can be individually removed from any of the containers through their respective apertures 136. The front walls 120 of all the containers can be substantially aligned in a common plane, though the outermost containers 110, 116 may tend to naturally adopt a position slightly inclined to the inner package containers 112, 114 depending on the nature of the pivotal connection.

[0043] When the two outermost containers 110, 116 are both in the closed configuration as shown in Figure 4, the front walls 120 of all the containers are hidden so that none of the product pieces can be seen or removed. In the present embodiment, the containers 110, 112, 114, 116 are rectangular prisms and are all the same size and shape, each having a cross sectional area corresponding generally to one quarter of the internal cross sectional area of the outer sleeve 12. Accordingly, when the inner package 14 is in its closed configuration, it forms a rectangular block which is a snug fit inside the outer sleeve 12. In the embodiment as shown, the inner package 14 is slightly longer than the outer sleeve 12 so that a portion 138 of the outer container projects out of the lower end of the sleeve 12. This enables the container to be easily removed from the sleeve by grasping the exposed lower end 138 and pulling the sleeve 12 off using the ribbon 77.

[0044] The main body 108 of the inner package can be formed from any suitable materials and by any suitable means. However, in an advantageous embodiment the main body 108 is formed in two identical parts 108A, 108B which are connected together. The two parts 108A, 108B are identical to one another and each includes one of the innermost containers 112, 114 and one of the outermost containers 110, 116 pivotally connected to the each other by hinge 137. Each part 108A, 108B is formed from a single blank 140 of foldable material as shown in Figure

7. The two parts 108A, 108B may be fixed together by any suitable arrangements and could be bonded together using an adhesive, for example. However, in an embodiment the two parts 108A, 108b are fixed together using a mechanical interconnection without any adhesive.

[0045] The blank 140 is made of a cartonboard, cardboard, or a similar relatively stiff but foldable material. The blank 140 comprises two portions, a first portion 140A for producing an innermost container 112, 114 and a second portion 140B for producing the outermost container 110, 116. The two portions 140A, 140B are foldably interconnected along a fold line 142 which forms a pivotal hinge connection 137 between the two containers when the blank is erected.

[0046] The first blank portion 140A includes, from right to left as shown, a glue tab 144, a front wall panel 146 with aperture 136, a first side wall panel 148, a rear wall panel 150 and a second side wall panel 152 separated by respective longitudinal fold lines 154, 156, 158, 160 to form the front, rear and side walls of the innermost container when erected. End closures flaps 162 are connected with the ends of the front wall panel 146 by fold lines 164. Each flap 162 has a main closure portion 162A which closes the end of the container when erected and an insert tab portion 162B separate from the main closure portion 162A by a fold line 165. A pair of end closure tabs 166 are connected with the opposed ends of the second side wall panel 152 by respective lateral fold lines 168. A locking tab 170 is connected to one end of the first side wall panel 148 by means of a lateral fold line 172.

[0047] The second blank portion 140B is substantially a mirror image of the first blank portion 140A and the corresponding parts will be designated using the same reference numbers but with the addition of a dash ('). Thus the front wall panel in the second blank portion 140B will be designated 146' for example. The second blank portion 140B differs from the first in that it is not provided with a locking tab 170 but rather has a second pair of end closure tabs 174' connected to respective ends of the second side wall panel 152' by fold lines 176'.

[0048] To erect the blank 140, it is folded along fold lines 154, 156, 158 and 160 to place the front, rear and side wall panels 146, 150, 148, 152 of the first blank portion 140A into the correct positions to form the front, rear and side walls of the innermost container portion and the glue tab 144 is adhered to an inner surface of the second side wall panel 152. The second blank portion 140B is similarly folded along longitudinal fold lines 154', 156', 158' and 160' and the glue tab 144' adhered to the inner surface of the second side wall panel 152' to form the walls of the outermost container.

[0049] The erected blank forms one part 108A, 108B of the body 108 of the inner package 14. A further blank 140 is erected in the same manner to form the other part 108A, 108B of the body 108 of the inner package 14. Fitments 132 are inserted into each of the containers 110, 112, 114, 116 and the innermost containers 112, 114 of the two parts 108A 108B are mechanically con-

nected together at both ends. The end closures for the containers are formed in the usual manner by folding over the end closure tabs 168, 168', 174', then folding over the end closure flaps 162, 162' and inserting the tab portions 162B, 162B' in to the end of the container. Once the inner package 14 has been formed, products can be inserted into the seats 134 in the fitment 132 through the apertures 136 in the front wall 120 of the containers. The inner package 14 is then placed in its closed configuration and can be inserted into the outer sleeve 12. The inner package 14 may be enclosed in a wrapper prior to insertion in the sleeve 12 for further protection of the product pieces.

[0050] In an advantageous method of assembly, blanks 140 for forming the inner package 14 are partly erected so that the glue tabs 144, 144' are bonded to their respective second side wall panels 152, 152' and are then flattened for transport in a flattened condition for packaging. When required for packaging, two of the blanks 140 are taken and manipulated or popped into shape so that the front, rear and side walls of the containers adopt their desired positions. The two semi-erected parts 108A, 108B are then positioned next to each other with the containers arranged in the closed configuration with the two innermost containers positioned side by side and the assembly is inserted into a rectangular jig 180 which holds the containers vertically upright as illustrated in figures 8 to 10. The jig 180 comprises a rectangular sleeve which is open at either end and can be stably supported on a surface in the upright position. As previously noted, one of the parts 108A, 108B is inverted relative to the other so that there is a locking tab 170 at either end.

[0051] Whilst held in the jig, a fitment 132 is inserted into each container and the exposed upper ends of the innermost containers are mechanically linked together using a locking insert 182 into which the tab 170 is inserted as shown in Figures 9 and 10. The end closures for the innermost containers 112, 114 at the exposed end are formed by folding over the tabs 168 and then folding the end closure flaps 162 and inserting the tab portion 162B. The closure flap 162 covers the locking insert 182 and the locking tab 170 to secure them in position. The end closures for the outermost containers 110, 116 at the exposed upper end are similarly formed by folding over the tabs 168', 174', then folding over the end closure flaps 162' and inserting the tab portions 162B'.

[0052] The jig 180 is then inverted so that the other ends of the containers 110, 112, 114, 116 are exposed. The steps of locking together the innermost containers 112, 114 using the locking insert 182 and forming the end closures as described above is then repeated at the second end. The inner package 14 is removed from the jig 180 and opened out so that the product pieces 118 can be inserted into the seats 134 in the fitments 132. The inner package is then placed in its closed configuration for insertion into the outer sleeve 12 and may be wrapped. If desired, the fitments 132 can be inserted into

the compartments after the first end closures have been formed and the jig has been inverted.

[0053] The locking insert 182 is a channel or U-shaped component having a planar end face 184 and a pair of inwardly directed edge walls 186. The width X end face 184 is substantially the same as the depth of the innermost containers 112, 114 and the edge walls 183 have a recess 188 at their centre into which the adjacent side walls 124 of the two innermost containers 112, 114 can locate so that the edge walls 186 can be inserted into the open ends of the adjacent innermost containers to lock them together. The end face has a lateral slot 190 at its centre through which the locking tab 170 on one of the innermost containers is inserted. In use as illustrated in Figures 9 and 10, the locking tab 170 is inserted through the lateral slot 190 and the edge walls inserted between the front and rear faces of the innermost containers with the adjacent side walls 124 of the innermost containers locate in the recesses 188 and the tab 170 is folded over to one side. This locks the two innermost containers together. The locking insert extends over approximately half the width of each of the innermost containers and is held in place by the end closure flaps 162, when the end closures for the innermost containers are formed.

[0054] The locking insert 182 can be formed from any suitable material but is advantageously formed from a blank 192 of a relatively stiff but foldable material such as cartonboard or cardboard of the like.

[0055] Whilst in the present embodiment the parts 108A, 108B of the inner package body each only have one locking tab 170 at one end of the first side wall panel 148. Locking tabs 170 could be provided at both ends of the first side wall panel 148 so that the parts can be used either way up. In this case, the two locking tabs 170 at each end will both be inserted through the slot 190 in the locking insert and folded in opposite directions.

[0056] It will be appreciated that not all of the various steps in assembling and loading the inner package 14 need be carried out in the precise order described above. For example, the product pieces 118 could be inserted into the fitments 132 before they are placed in the containers. Similarly, the fitments 132 could be inserted into the containers before the end closures are formed at the first end of the containers.

[0057] Aspects of the method of manufacturing/assembling the inner package may be claimed independently from the packaging assembly.

[0058] A first embodiment of a fitment 132 for use in the inner package containers is illustrated in Figure 12. The fitment 132 is made from a single blank of foldable material such as cartonboard or cardboard. The material is selected so that it has an inherent resilience or shape memory when folded about a fold line, at least where the fold line is not formed with a very sharp crease.

[0059] The fitment 132 is elongate having a length approximately the same as the internal length of the containers and has a central, product retention region in the form of an inverted U shaped upstand or channel portion

196 extending in a longitudinal direction. The channel portion 196 includes an outer (upper as shown) end wall 198 and a pair of opposed side walls 200 depending inwardly (downwardly as shown) from the end wall. A number of seats 134 for receiving and holding individual product pieces 118 are spaced along the length of the channel portion 196 so that the product pieces are held in a row.

[0060] On either side of the channel portion 196 are a pair of resilient side flaps 202, 204. A first side flap is connected along one edge to an inner (lower) end of one of the side walls 200 of the channel portion by a first fold line 206 which is formed into a valley fold when the fitment is viewed from in plan from above. The second side flap 204 is attached to the other edge of the first side flap 202 by a further fold line 208 which produces a mountain fold when the erected fitment is viewed in plan from above. The two resilient side flaps 202, 204 form an inverted V shape on either side of the central channel portion and due to the resilience of the material will tend to open out. When the fitment 132 is inserted into a container 110, 112, 114, 116, the second side flaps 204 are resiliently biased into engagement with the side walls of the container by the first side flaps 202 and the arrangement positions the central channel portion 196 substantially centrally of the container and prevents the fitment 132 from moving about within the container. The inner ends of the side walls 200 of the channel portion 196 where they are connected with the first flap 202 at fold line 206 and the free ends of the second flaps 204 engage with the rear wall 122 of the container in use, as can be seen in Figure 8.

[0061] Each seat 134 in the central channel portion is defined by a pair of opposed rectangular recesses 210 formed in outer (upper) regions of the side walls 200 proximal to the end wall 198. The opposed recesses 210 merge into an "hourglass" shaped opening 212 in the end wall 198 which defines a pair of opposed flaps 214 having a semi-circular outer edge 214A on the lateral edges of the end wall 198 either side of the opening 210. The flaps 214 are bent inwardly about a fold line 216 from the plane of the end wall 198. The fitment is configured so that the flaps 214 are resiliently biased to an initial rest position at which they are inclined inwardly (downwardly) at a first angle α to the plane of the end wall. The product pieces 118 have a length which is greater than the width of the channel portion 196 and the seats 134 are configured so that when a product piece 118 is inserted into a seat 134, the flaps 214 are deflected inwardly (downwardly) beyond their initial rest position to allow the product piece 118 to be fully inserted until a lower surface 118A of the product piece 118 engages with and is supported by the outer ends 218 of the side walls 200 at the bottom of the recesses 210. The resilience of material (shape memory) biases the flaps 214 back towards the initial rest position so that they resiliently engage with the oppositely directed side faces 118B, 118C of the product piece 118. The product piece is held firmly in place be-

tween the flaps 214 and the edges 218 of the side walls at the bottom of the recesses 210 regardless of the orientation of the package assembly 10. This is particularly important as when the inner package 14 is in a closed configuration, the outermost containers 110, 116 and their products will be inverted relative to the innermost containers 112, 114 and during transit when the package assembly may be held in any orientation. The product pieces are spaced apart by the remaining sections of the end wall 198 between the openings 212.

[0062] In an advantageous embodiment, the oppositely directed side faces 118B, 118C of the product pieces that are engaged by the flaps 214 are angled towards each other in a direction from the bottom to the top of the product piece 118 as illustrated in Figure 14. With this arrangement, the ends 214A of the flaps 214 are biased into contact with the angled side faces when the product is fully inserted into a seat 134. This results in the product piece being wedged between the ends of the flaps 214A and the edges 218 of the side walls at the bottom of the recesses 210 to ensure that the product pieces are firmly retained but yet easily released when desired by a user to remove a product piece. The fold line 216 about which each flap 214 is bent is advantageously curved so as to be concave relative to the product piece 118. This produces additional room between end wall 198 and the product piece on either side in which a user can insert their fingers to grasp a product piece 118 piece. The flaps 214 thus have a generally ovoid shape in plan.

[0063] The product pieces 118 may be unwrapped or they may be individually wrapped as illustrated. In an embodiment, each product piece 118 individually wrapped in a flow wrapped wrapper having transverse end seals 219 at each end which locate on either side of the central channel portion 196. The product pieces 118 may be chocolates such as chocolate pralines for example. However, the packaging assembly can be adapted to package a range of products, especially food products.

[0064] A blank 220 for forming the fitment 132 is illustrated in Figure 15. The blank has first and second side flap panels 222, 224 on either side of a central channel portion panel 226. The fold lines 206 between the first side flap panel 222 and the central channel portion panel 226 and 208 between the first and second side flaps in this embodiment are perforated fold lines with a series of spaced cuts 227 extending partially through the material. A plurality of apertures 228 are spaced along the length of the central channel portion panel to define the seats 134 and the flaps 214. The apertures 228 form the rectangular recesses 210 in the side walls 200 and the opening 212 in the end wall when the blank is erected. Longitudinal fold lines 230, 232 divided the central channel portion panel into an end wall panel 234 and a pair of side wall panels 236.

[0065] A second embodiment of a fitment 132' for use in the containers of the package assembly 10 is illustrated in Figures 16 to 18. The fitment 132' is similar to the fitment of the first embodiment 132 and the same refer-

ence numerals but with the addition of a dash (' ') will be used to indicate the same features or features which perform the same functions. The fitment 132' may be made from the same materials as the first fitment 132 but differs from the first embodiment in that the product retention region takes a different form and in that it has panels at either end which provide for addition structural integrity.

[0066] In the fitment 132', the product retention region takes the form of a plurality of spaced inverted U or channel shaped supports 196'. Each support 196' has an outer (upper) end wall 198' and a pair of opposed side walls 200' depending inwardly (downwardly) from the end wall. The inner ends of the side walls are 200' are connected to the inner edge of the first flap 202' on their respective side along a fold line 206'. A product retention seat 134' is defined in the cavity between each adjacent pair of the supports 196' and the end walls 198' are shaped so as to define a pair of flaps 214' projecting inwardly on opposing sides of each cavity so as to contact opposed walls of a product piece when inserted in a seat 134'. As in the first embodiment, the fitment 132' is configured so that the flaps 214' are resiliently biased to an initial rest position at which they are inclined at a first angle α to the plane of the end wall about a fold line 216'. The fitment 132' is configured so that when a product piece 118 is inserted into a seat 134', the flaps 214' are deflected inwardly (downwardly) beyond their initial rest position to allow the product piece 118 to be fully inserted. The resilience of material (shape memory) biases the flaps 214' back towards the initial rest position so that they resiliently engage with the oppositely directed side faces 118B, 118C of the product piece 118. The flaps 214' have a semi-circular shaped outer edge 214A' which engages with the product and they are bent about a curved fold line 216' which is advantageously curved so as to be concave relative to the product piece 118. This produces additional room between the supports 196' and the product pieces 118. As with the first embodiment, the flaps 214' are generally ovoid in shape.

[0067] In the second embodiment 132', the product supports 196' are wider and shorter than the channel member 196 in the first embodiment so that the product piece 118 itself is able to sit in the seat 134' with its lower surface 118A passing through the gap between the inner edges 202A of the first side flaps 202'. In the embodiment as illustrated where the product pieces are packaged in a wrapper having transverse end seams 219' at either end, the seams 219' project on either side of the product supports 196' and sit on the upper surfaces of the first flaps 202' but the product is otherwise mainly supported by the flaps 214'.

[0068] In an advantageous embodiment, the oppositely directed side faces 118B, 118C of the product pieces that are engaged by the flaps 214' are angled towards each other in a direction from the bottom to the top of the product piece 118 (that is in a direction from inside to outside of the fitment) in a similar manner to that as discussed in relation to the first embodiment and illustrated

in Figure 14. With this arrangement, the ends 214A' of the flaps 214' are biased into contact with the angled side faces when the product is fully inserted into a seat 134'. Since a portion of the product below the edges of the flaps 214A' is wider than the gap between the end edges 214A, the product piece is firmly held in the seat 134'.

[0069] In this embodiment, the first flaps 202' are shorter than in the first embodiment and the second flaps 204' and the inner edges 202A' of the first flaps 202' where they meet the inner ends of the side walls 200' at the fold line 206' do not contact the rear wall 122 of the container in use. To help support the product retention region, an end support panel 240 is pivotally connected to an outer transverse edge of the end wall 198' of each of the supports 196' at either longitudinal end along a fold line 242. The end support panels 240 are bent down about the fold line 242 and engage with the back wall of the container to provide additional structural integrity for the product retention region. The end support panel 240 is suitably shaped for inclusion in the container

[0070] The fitment 132' can be made from a blank 244 of foldable material such as cartonboard, cardboard or the like as illustrated in Figure 18. The blank 244 has first and second side flap panels 222', 224' on either side of a central product support region panel 226'. The fold line 208' between the first and second side flap panels in this embodiment are perforated fold lines with a series of spaced cuts 227' extending partially through the material. A plurality of apertures 228' are spaced along the length of the central product support region to define the seats 134' and the flaps 214'. The apertures 228' separate the product supports 196' from each other when the blank is erected. Longitudinal fold lines 230', 232' divide the central product support region panel into an end wall panel 234' and a pair of side wall panels 236' for each product support 196'.

[0071] A third embodiment of a fitment 132" for use in the package assembly 10 is illustrated in Figures 19 to 22. The fitment 132" is similar to the fitment of the first and second embodiments 132, 132' and the same reference numerals but with the addition of a double dash ("") will be used to indicate the same features or features which perform the same functions. The fitment 132" can be made from the same materials as the first embodiment 132.

[0072] In the fitment 132" in accordance with the third embodiment, the central product retention region 250 comprises a pair of elongate spaced, angled walls 252 which slope towards each other in a direction from their inner (lower as shown) edges 254 to their outer (upper as shown) edges 256. The inner edges 254 of the walls 252 engage the rear wall 122 of the container in use whilst the outer edges 256 face the front wall 120 of the container. The outer edges 256 of the walls 252 are spaced apart and a product support panel 258 is located in the gap between the outer edges but recessed inwardly (downwardly as shown) from the outer edges 256. The product support panel 256 is connected to the outer edge-

es 256 of the angled walls 252 by means of a pair of opposed, generally upright side walls 260. The side walls 260 are connected with the product support panel 258 by means of respective fold lines 262 and to the outer edge 256 of their respective outer wall 252 by means of further fold lines 264. The product support panel 158 and the side walls 260 form a generally U-shaped channel member located within the angled walls 252.

[0073] A plurality of opposing pairs of recesses 266 are formed through the side walls 260 and the overlapping regions of the angled walls 252 to form product piece retention seats 134". The pairs of opposed recess 266 are spaced along the length of the central product retention region. The recesses 266 are generally rectangular in shape when viewed from the side and are dimensioned so that a product piece 118 can be inserted in the recess so that its lower surface 118A rests on and is supported by the product support panel 258. The side edges 268 of the recesses are shaped and configured to snugly engage with oppositely directed side faces 118B, 118C of the product piece 118 to firmly retain the product piece in position whilst still enabling easy removal. Because the angled walls 252 and the side walls 260 are spaced apart slightly towards the bottom of the recess and the edges of both walls are profiled, there is additional support for the product piece. In an advantageous embodiment, the oppositely directed side faces 118B, 118C of the product pieces that are engaged by side edges 268 are angled towards each other in a direction from the bottom to the top of the product piece 118 (that is to say in a direction from the product support panel 258 to the outer edges 256 of the angled walls 252) and the edges 268 of the recesses in the side walls and the angled walls 252 which define the sides of the recesses 266 are profiled to engage with the inclined faces 118B, 118C. In an embodiment, the side edges 268 curve outwardly in a convex fashion toward the product and are configured to engage with the side walls at a position between its bottom surface and top so that there is a portion of the product piece below the point of contact with the side edges 266 that is wider than the spacing between the side edges 266 at the point of contact. This ensures that the product pieces 118 are firmly retained in the seats 134".

[0074] The fitment 132" in accordance with the third embodiment has a single flap 204" resiliently attached to either side of the central product retention region by means of a fold line 206". The flaps 204" are configured to engage with the side walls of the container to hold the product retention region in position.

[0075] At either end, the fitment 132" has a pair of end panels 270, 272 each being connected with a respective one of the angled outer walls 252 by a fold line 274, 276. One of the end panels 270 has a slot 278 and the other a tab 280. The end panels are folded so as to close the ends of the product retention region and are locked together by inserting the tab 280 in the slot 278. This helps to provide additional structural integrity for the product support region 250.

[0076] The fitment 132" can be made from a blank 282 foldable material such as cartonboard, cardboard or the like as illustrated in Figure 22. The blank 282 has flap panels 224" on either side of a central product support region panel 226". The fold lines 208" between the side flap panel 224" and the central product support region panel 226" are perforated fold lines with a series of spaced cuts 227" extending partially through the material. A plurality of apertures 228" arranged in pairs on opposite sides of the central product support panel 158 are spaced along the length of the central product support region to define the product piece retention seats 134". Two pairs of longitudinal fold lines 230", 232" divide the central product support region panel 226" into outer angled wall panels 284, side wall panels 286 and the product support panel 258. The blank 282 has panels 270, 272 for forming the end panels of the fitment attached at either end of the angled wall panels 284t.

[0077] Whilst several embodiments of a fitment 132, 132', 132" for holding product pieces 118 have been described, it will be appreciated that other embodiments could be used. For example, whilst it is advantageous to form the fitments 132, 132', 132" from a blank of material such as cartonboard, which is both cost effective and easy to manufacture and assemble, the fitments could be made for other materials. The fitments 132, 132', 132" could for example be made from a polymeric material and may be moulded or otherwise formed to define seats 134 for retaining product pieces.

[0078] In the packaging assembly 10 as illustrated in the accompanying Figures, each fitment 132, 132', 132" has six product retention seats 134, 134', 134" for accommodating six individual product pieces so that a packaging assembly with four containers 110, 112, 114, 116 accommodates twenty four product pieces 118 in total. It should be appreciated however that the number of product retention seats in each fitment can be varied and could be more or less than six. It is envisaged that packaging assemblies in accordance with the invention will be made in a range of different sizes for holding different numbers of product pieces. In one possible embodiment each fitment may be provided with four product retention seats so that a packaging assembly with four containers will hold sixteen product pieces altogether. It is also within the scope of the invention that each fitment be provided with only a single product retention seat so that each container holds only a single product piece.

[0079] The above embodiments are described by way of example only. Many variations are possible without departing from the scope of the invention. For example, the inner package may have more or fewer than four containers. In one possible embodiment, the inner package has three containers, a central container to which two outer containers are pivotally attached. The central container is twice as wide as the outer containers so that the outer containers can be moved to overlie the central container side by side with their front faces in contact with the front face of the central container in a closed

configuration. Alternatively, a packaging assembly in accordance with the invention might have only two inner package containers hingedly attached. Such a packaging assembly could be formed substantially as described above in relation one of the parts 108A, 108B of the inner package 14 but without the need for the locking tabs 170.

[0080] Furthermore, it should be noted that whilst the embodiments described herein are particularly suited to packaging confectionery product pieces, the invention is not limited to such application and the teachings herein can be applied to packaging for a wide range of products including other types of food products and non-food products. Accordingly, those skilled in the art will understand that the packaging assemblies, containers and fitments in accordance with the various aspects of the invention as described herein can be adapted to package a wide range of product pieces including, but not limited to, food and other consumable products such as: confectionery, including chocolate, candies, pralines, gum and the like; snack and bakery products including biscuits and biscuit-like products, cakes, cheese and the like; other consumable products including coffee; and non-food or consumable products.

Claims

1. A packaging assembly (10) comprising a package (14) having a plurality of interconnected containers (110, 112, 114, 116) each for holding at least one product piece (118), at least some of the containers being movable relative to one another between a closed configuration of the package and an open configuration of the package; each container having a plurality of walls (120, 122, 124, 126) defining an interior volume in which said at least one product piece can be held, with a product display and dispensing aperture (136) in at least one of the walls (120); **characterized in that** a product piece holding fitment (132; 132'; 132") is located within each container, each product piece holding fitment having a product retention region (196; 196'; 250) in which is defined at least one product piece retention seat (134) configured to individually hold and retain a product piece (118) and a resilient biasing arrangement (202, 204; 202', 204'; 204") on either side of the product retention region, which resilient biasing arrangements engage with opposed walls (124, 126) of the respective container to hold the product retention region substantially centrally such that, in use, a product piece (118) mounted in said at least one product retention seat (134; 134'; 134") can be seen and removed through the product display and dispensing aperture (136) when the package is in an open configuration.
2. A packaging assembly (10) as claimed in claim 1, wherein the package comprises two containers

hingedly attached to one another for movement between an open and a closed configuration.

3. A packaging assembly (10) as claimed in claim 1, wherein the package comprises at least one innermost container and a pair of outermost containers, the outermost containers being pivotally attached to opposing sides of the at least one innermost container so as to be movable between a closed configuration in which they overlie the at least one innermost container and an open configuration in which they are positioned alongside the at least one innermost container. 5
4. A packaging assembly (10) as claimed in claim 1, wherein the package has two innermost containers (112, 114) non-movably attached to one another in side-by-side relation, and two outermost containers (110, 116), each outermost container being hingedly attached (137) to a respective one of the innermost containers, the outermost containers each being movable from a closed configuration in which they overlie their respective innermost container and an open configuration in which they are positioned alongside their respective innermost container. 10 15 20 25
5. A packaging assembly (10) as claimed in claim 4, wherein the package comprises a main body (108) defining the containers, the main body being formed in two parts (108A, 108B), each part comprising one of the innermost containers (112, 114) and one of the outermost containers (110, 116) hingedly connected together (137); and wherein the innermost containers (112, 114) are connected together at each longitudinal end by a locking insert (182) which engages with the adjacent end regions of the innermost containers. 30 35
6. A packaging assembly (10) as claimed in any one of the preceding claims, wherein each container (110, 112, 114, 116) has a front wall (120) in which the display and dispensing aperture (136) is located, each pair of movably connected containers being configured to overlie each other front wall to front wall in the closed configuration, such that none of the display and dispensing apertures are exposed when the package is in the closed configuration. 40 45
7. A packaging assembly (10) as claimed in any one of claims 1 to 6, wherein the resilient biasing arrangement comprises at least one resilient flap (202, 204; 202', 204': 204'') along either side of the product retention region (134; 134'; 134''). 50
8. A packaging assembly (10) as claimed in any one of the preceding claims, wherein the product retention region (196) comprises a channel shaped member extending in a longitudinal direction of the fit-

ment, the channel shaped member having an outer end wall (198) and a pair of opposed side walls (200) depending inwardly from the end wall, a plurality of product retention seats (134) being spaced along the channel shaped member, each seat being formed in the channel shaped member by a pair of opposed recesses (210) in regions of the side walls proximal to the outer end wall and which merge with an opening (212) extending laterally across the outer end wall (198) to define a cavity in which a product piece can be inserted so as to rest on and be supported by outwardly directed edges of the side walls within the recesses, the opening (212) being shaped so as to define a pair of opposed flaps (214) on laterally extending edges of the outer end wall (198) either side of the opening, the flaps (214) being angled inwardly from the plane of the end wall, the flaps being resiliently biased to an initial rest position at which they are inclined at a first angle (α) relative to the plane of the end wall.

9. A packaging assembly (10) as claimed in claim 8, further comprising a plurality of product pieces (118), each product piece being held and retained in a respective one of the seats (134), each product piece contacting and being supported by the outwardly directed edges (218) of the side walls (200) in the opposed recesses, the flaps (214) resiliently engaging opposed sides of the product piece; and wherein outer end edges (214A) of the flaps are resiliently biased into contact with oppositely directed faces (118B, 118C) of the product piece to hold the product piece in contact with the outwardly directed edges (218) of the side walls in the opposed recesses.
10. A packaging assembly (10) as claimed in claim 8 or claim 9, wherein the resilient biasing arrangement comprises a pair of flaps (202, 204) connected to the channel shaped member along either side, each pair of flaps including a first flap (202) pivotally connected with a side wall (200) of the channel shaped member and a second flap (204) pivotally connected with the first flap (202), the second flaps (204) being biased into engagement with opposed sides (124, 126) of the respective container.
11. A packaging assembly (10) as claimed in anyone of claims 1 to 7, wherein the product retention region (196') of each product piece holding fitment comprises a plurality of spaced apart product supports (196'') defining a product retention seat (134') between each adjacent pair of supports, each support having an outer end wall (198') and a pair of opposed side walls (200') depending inwardly from the end wall, a cavity being defined between each pair of adjacent supports in which a product piece (118) can be inserted, a pair of opposed flaps (214') on laterally extending edges of the outer end walls (198') of the

supports either side of each cavity, the flaps (214') being angled inwardly from the plane of the end wall and resiliently biased to an initial rest position at which they are inclined at a first angle relative to the plane of the end wall of the product supports.

12. A packaging assembly (10) as claimed in claim 11, wherein the resilient biasing arrangement comprises a pair of flaps (202', 204') connected to the product retention region (196') along either side, each pair of flaps including a first flap (202') pivotally connected with the inner ends of the side walls (200') of the product supports on its respective side and a second flap (204') pivotally connected with the first flap, the second flaps (204') being biased into engagement with opposed sides (124, 126) of the respective container.
13. A packaging assembly (10) as claimed in claim 11 or claim 12, further comprising a plurality of product pieces (118), each product piece being held and retained in a respective one of the seats (134'), the opposed flaps (214') in each seat resiliently engaging oppositely directed faces (118B, 118C) of the respective product piece.
14. A packaging assembly (10) as claimed in anyone of claims 1 to 7, wherein the product retention region (250) of each product piece holding fitment comprises a pair of elongate spaced, angled walls (252) having an inner edge (254) which locates adjacent the rear wall (122) of its respective container (110, 112, 114, 116) and an outer edge (256) which locates proximal to the front wall (120) of the container, the angled walls (252) being angled towards each other in a direction from their inner edges (254) to their outer edges (256), the outer edges (256) of the angled walls being spaced apart; a product support panel (258) located in the gap between the outer edges (256) of the angled walls and recessed inwardly from the outer edges, the product support panel (258) being connected to the outer edges (256) of the angled walls by a pair of opposed, generally upright side walls (260); a plurality of product retention seats (134'') being spaced along the central product retention region, each seat being defined by a pair of opposed recesses (266) in the side walls (260) and corresponding recesses in the overlapping regions of the angled walls (252).
15. A packaging assembly (10) as claimed in claim 14, further comprising a plurality of product pieces (118), each product piece being held and retained in a respective one of the seats (134''), a lower surface (118A) of each product piece resting on and being supported by the product support panel (258), side edges (268) of the opposed recesses (266) in the side walls and angled walls engaging with oppositely

directed faces (118B, 118C) of the product piece to hold the product piece in the seat.

5 Patentansprüche

1. Verpackungsanordnung (10), umfassend eine Verpackung (14) mit einer Vielzahl von miteinander verbundenen Behältern (110, 112, 114, 116) jeweils zum Halten von mindestens einem Produktstück (118), wobei mindestens einige der Behälter relativ zueinander zwischen einer geschlossenen Konfiguration der Verpackung und einer offenen Konfiguration der Verpackung beweglich sind; wobei jeder Behälter eine Vielzahl von Wänden (120, 122, 124, 126) aufweist, die ein Innenvolumen definieren, in dem das mindestens eine Produktstück gehalten werden kann, wobei eine Produktanzeige und Abgabeöffnung (136) in mindestens einer der Wände (120) ist; **dadurch gekennzeichnet, dass** eine Produktstückhaltevorrichtung (132; 132'; 132'') innerhalb jedes Behälters angeordnet ist, wobei jede Produktstückhaltevorrichtung einen Produktretentionsbereich (196; 196'; 250) aufweist, in dem mindestens ein Produktstückretentionssitz (134) definiert ist, der zum einzelnen Halten und Zurückhalten eines Produktstücks (118) konfiguriert ist, und eine elastische Vorspannanordnung (202, 204; 202', 204': 204'') auf jeder Seite des Produktretentionsbereichs, wobei die elastischen Vorspannanordnungen mit gegenüberliegenden Wänden (124, 126) des jeweiligen Behälters zusammenwirken, um den Produktretentionsbereich im Wesentlichen mittig zu halten, sodass bei Gebrauch ein Produktstück (118), das in dem mindestens einen Produktretentionssitz (134; 134'; 134'') angebracht ist, durch die Produktanzeige und die Abgabeöffnung (136) gesehen und entfernt werden kann, wenn die Verpackung in einer offenen Konfiguration ist.
2. Verpackungsanordnung (10) nach Anspruch 1, wobei die Verpackung zwei Behälter umfasst, die mittels Gelenk für Bewegung zwischen einer offenen und einer geschlossenen Konfiguration aneinander befestigt sind.
3. Verpackungsanordnung (10) nach Anspruch 1, wobei die Verpackung mindestens einen innersten Behälter und ein Paar äußerster Behälter umfasst, wobei die äußersten Behälter schwenkbar an gegenüberliegenden Seiten des mindestens einen innersten Behälters befestigt sind, sodass sie zwischen einer geschlossenen Konfiguration, in der sie den mindestens einen innersten Behälter überlagern, und einer offenen Konfiguration, in der sie neben dem mindestens einen innersten Behälter angeordnet sind, beweglich sind.

4. Verpackungsanordnung (10) nach Anspruch 1, wobei die Verpackung zwei innerste Behälter (112, 114), die nebeneinander nichtbeweglich aneinander befestigt sind, und zwei äußerste Behälter (110, 116) aufweist, wobei jeder äußerste Behälter mittels Gelenk (137) an einem jeweiligen der innersten Behälter befestigt ist, wobei die äußersten Behälter jeweils von einer geschlossenen Konfiguration, in der sie ihren jeweiligen innersten Behälter überlagern, und einer offenen Konfiguration, in der sie neben ihrem jeweiligen innersten Behälter angeordnet sind, beweglich sind. 5
5. Verpackungsanordnung (10) nach Anspruch 4, wobei die Verpackung einen Hauptkörper (108) umfasst, der die Behälter definiert, wobei der Hauptkörper in zwei Teilen (108A, 108B) ausgebildet ist, wobei jeder Teil einen der innersten Behälter (112, 114) und einen der äußersten Behälter (110, 116) umfasst, die mittels Gelenk (137) miteinander verbunden sind; und wobei die innersten Behälter (112, 114) an jedem Längsende durch einen Verriegelungseinsatz (182), der mit den benachbarten Endbereichen der innersten Behälter in Eingriff kommt, miteinander verbunden sind. 10 15
6. Verpackungsanordnung (10) nach einem der vorstehenden Ansprüche, wobei jeder Behälter (110, 112, 114, 116) eine vordere Wand (120) aufweist, in der die Anzeige und die Abgabeöffnung (136) angeordnet sind, wobei jedes Paar beweglich verbundener Behälter so konfiguriert ist, dass sie in der geschlossenen Konfiguration einander von vorderer Wand zu vorderer Wand überlagern, sodass keine von der Anzeige und den Abgabeöffnungen freiliegt, wenn die Verpackung in der geschlossenen Konfiguration ist. 20 25 30
7. Verpackungsanordnung (10) nach einem der Ansprüche 1 bis 6, wobei die elastische Vorspannanordnung mindestens eine elastische Klappe (202, 204; 202', 204': 204'') entlang jeder Seite des Produktretentionsbereichs (134; 134'; 134'') umfasst. 35 40
8. Verpackungsanordnung (10) nach einem der vorstehenden Ansprüche, wobei der Produktretentionsbereich (196) ein kanalförmiges Element umfasst, das in Längsrichtung der Haltevorrichtung verläuft, wobei das kanalförmige Element eine äußere Endwand (198) und ein Paar einander gegenüberliegender Seitenwände (200), die innen von der Endwand abhängig sind, umfasst, wobei eine Vielzahl von Produktretentionssitzen (134) entlang des kanalförmigen Elements voneinander beabstandet angeordnet sind, wobei jeder Sitz in dem kanalförmigen Element durch ein Paar einander gegenüberliegender Vertiefungen (210) in Bereichen der Seitenwände proximal zur äußeren Endwand gebildet ist und mit einer Öffnung (212) verschmilzt, die in Seitenrichtung über 45 50
- die äußere Endwand (198) verläuft, um einen Hohlraum zu definieren, in den ein Produktstück so eingeführt werden kann, dass es auf nach außen gerichteten Rändern der Seitenwände innerhalb der Vertiefungen ruht und davon gestützt wird, wobei die Öffnung (212) so geformt ist, dass sie ein Paar einander gegenüberliegende Klappen (214) an Querrändern der äußeren Endwand (198) an jeder Seite der Öffnung definiert, wobei die Klappen (214) von der Ebene der Endwand nach innen abgewinkelt sind, wobei die Klappen elastisch in eine anfängliche Ruheposition vorgespannt sind, bei der sie in einem ersten Winkel (α) bezogen auf die Ebene der Endwand geneigt sind. 55
9. Verpackungsanordnung (10) nach Anspruch 8, ferner umfassend eine Vielzahl von Produktstücken (118), wobei jedes Produktstück in einem jeweiligen der Sitze (134) gehalten und zurückgehalten wird, wobei jedes Produktstück die nach außen gerichteten Ränder (218) der Seitenwände (200) in den einander gegenüberliegenden Vertiefungen berührt und davon gestützt wird, wobei die Klappen (214) elastisch in gegenüberliegende Seiten des Produktstücks eingreifen; und wobei äußere Endränder (214A) der Klappen elastisch in Kontakt mit entgegengesetzt gerichteten Flächen (118B, 118C) des Produktstücks vorgespannt sind, um das Produktstück in Kontakt mit den nach außen gerichteten Rändern (218) der Seitenwände in den gegenüberliegenden Vertiefungen zu halten.
10. Verpackungsanordnung (10) nach Anspruch 8 oder Anspruch 9, wobei die elastische Vorspannanordnung ein Paar Klappen (202, 204) umfasst, die entlang jeder Seite mit dem kanalförmigen Element verbunden sind, wobei jedes Paar von Klappen eine erste Klappe (202), die schwenkbar mit einer Seitenwand (200) des kanalförmigen Elements verbunden ist, und eine zweite Klappe (204), die schwenkbar mit der ersten Klappe (202) verbunden ist, einschließt, wobei die zweiten Klappen (204) in Eingriff mit gegenüberliegenden Seiten (124, 126) des jeweiligen Behälters vorgespannt sind.
11. Verpackungsanordnung (10) nach einem der Ansprüche 1 bis 7, wobei der Produktretentionsbereich (196') jeder Produktstückhaltevorrichtung eine Vielzahl von beabstandeten Produktstützen (196'') umfasst, die einen Produktretentionssitz (134') zwischen jedem benachbarten Paar von Stützen definieren, wobei jede Stütze eine äußere Endwand (198') und ein Paar einander gegenüberliegender Seitenwände (200'), die nach innen von der Endwand abhängig sind, aufweist, wobei zwischen jedem Paar benachbarter Stützen ein Hohlraum definiert ist, in den ein Produktstück (118) eingeführt werden kann, ein Paar einander gegenüberliegen-

der Klappen (214') an Querrändern der äußeren Endwände (198') der Stützen auf jeder Seite des Hohlraums, wobei die Klappen (214') von der Ebene der Endwand nach innen abgewinkelt sind und elastisch zu einer anfänglichen Ruheposition vorgespannt sind, bei der sie in einem ersten Winkel bezogen auf die Ebene der Endwand der Produktstützen geneigt sind.

12. Verpackungsanordnung (10) nach Anspruch 11, wobei die elastische Vorspannanordnung ein Paar Klappen (202', 204') umfasst, die entlang jeder Seite mit dem Produktretentionsbereich (196') verbunden sind, wobei jedes Paar von Klappen eine erste Klappe (202'), die schwenkbar mit den inneren Enden der Seitenwände (200') der Produktstützen auf ihrer jeweiligen Seite verbunden ist, und eine zweite Klappe (204'), die schwenkbar mit der ersten Klappe verbunden ist, einschließt, wobei die zweiten Klappen (204') in Eingriff mit gegenüberliegenden Seiten (124, 126) der jeweiligen Behälter vorgespannt sind.
13. Verpackungsanordnung (10) nach Anspruch 11 oder Anspruch 12, ferner umfassend eine Vielzahl von Produktstücken (118), wobei jedes Produktstück in einem jeweiligen der Sitze (134') gehalten und zurückgehalten wird, wobei die einander gegenüberliegenden Klappen (214') in jedem Sitz elastisch in entgegengesetzt gerichtete Flächen (118B, 118C) des jeweiligen Produktstücks eingreifen.
14. Verpackungsanordnung (10) nach einem der Ansprüche 1 bis 7, wobei der Produktretentionsbereich (250) jeder Produktstückhaltevorrichtung ein Paar verlängerte, beabstandete, abgewinkelte Wände (252) umfasst, die einen Innenrand (254), der angrenzend an die Rückwand (122) seines jeweiligen Behälters (110, 112, 114, 116) angeordnet ist, und einen Außenrand (256), der proximal zur vorderen Wand (120) des Behälters angeordnet ist, aufweisen, wobei die abgewinkelten Wände (252) in einer Richtung von ihren Innenrändern (254) zu ihren Außenrändern (256) zueinander abgewinkelt sind, wobei die Außenränder (256) der abgewinkelten Wände voneinander beabstandet sind; wobei ein Produktstützfeld (258) in dem Spalt zwischen den Außenrändern (256) der abgewinkelten Wände angeordnet ist und von den Außenrändern nach innen vertieft ist, wobei das Produktstützfeld (258) durch ein Paar einander gegenüberliegender, im Allgemeinen aufrechter Seitenwände (260) mit den Außenrändern (256) der abgewinkelten Wände verbunden ist; wobei eine Vielzahl von Produktretentionssitzen (134'') entlang des mittigen Produktretentionsbereichs voneinander beabstandet sind, wobei jeder Sitz durch ein Paar einander gegenüberliegender Vertiefungen (266) in den Seitenwänden (260) und entsprechende Vertiefungen in den überlappenden

Bereichen der abgewinkelten Wände (252) definiert ist.

15. Verpackungsanordnung (10) nach Anspruch 14, ferner umfassend eine Vielzahl von Produktstücken (118), wobei jedes Produktstück in einem jeweiligen der Sitze (134'') gehalten und zurückgehalten wird, wobei eine untere Oberfläche (118A) jedes Produktstücks auf dem Produktstützfeld (258) ruht und davon gestützt wird, wobei Seitenränder (268) der einander gegenüberliegenden Vertiefungen (266) in den Seitenwänden und abgewinkelte Wände mit entgegengesetzt gerichteten Flächen (118B, 118C) des Produktstücks in Eingriff kommen, um das Produktstück in dem Sitz zu halten.

Revendications

1. Ensemble d'emballage (10) comprenant un emballage (14) ayant une pluralité de contenants interconnectés (110, 112, 114, 116) chacun destiné à maintenir au moins une pièce de produit (118), au moins certains des contenants étant mobiles l'un par rapport à l'autre entre une configuration fermée de l'emballage et une configuration ouverte de l'emballage ; chaque contenant ayant une pluralité de parois (120, 122, 124, 126) définissant un volume intérieur dans lequel ladite au moins une pièce de produit peut être maintenue, avec une ouverture de présentation et de distribution de produit (136) dans au moins une des parois (120) ; **caractérisé en ce qu'un** accessoire de maintien de pièce de produit (132 ; 132' ; 132'') est situé à l'intérieur de chaque contenant, chaque accessoire de maintien de pièce de produit ayant une région de rétention de produit (196 ; 196' ; 250) dans laquelle est défini au moins un siège de rétention de pièce de produit (134) configuré pour maintenir et retenir individuellement une pièce de produit (118) et un agencement de sollicitation élastique (202, 204 ; 202', 204' ; 204'') de part et d'autre de la région de rétention de produit, lesquels agencements de sollicitation élastiques viennent en prise avec des parois opposées (124, 126) du contenant respectif pour maintenir la région de rétention de produit sensiblement centralement de sorte que, lors de l'utilisation, une pièce de produit (118) montée dans ledit au moins un siège de rétention de produit (134 ; 134' ; 134'') peut être observée et retirée à travers l'ouverture de présentation et de distribution de produit (136) lorsque l'emballage est dans une configuration ouverte.
2. Ensemble d'emballage (10) selon la revendication 1, dans lequel l'emballage comprend deux contenants fixés de manière articulée l'un à l'autre pour un mouvement entre une configuration ouverte et une configuration fermée.

3. Ensemble d'emballage (10) selon la revendication 1, dans lequel l'emballage comprend au moins un contenant le plus à l'intérieur et une paire de contenants les plus à l'extérieur, les contenants les plus à l'extérieur étant fixés de manière pivotante à des côtés opposés de l'au moins un contenant le plus à l'intérieur de manière à être mobiles entre une configuration fermée dans laquelle ils reposent sur l'au moins un contenant le plus à l'intérieur et une configuration ouverte dans laquelle ils sont positionnés le long du au moins un contenant le plus à l'intérieur. 5 10
4. Ensemble d'emballage (10) selon la revendication 1, dans lequel l'emballage a deux contenants les plus à l'intérieur (112, 114) fixés de manière non mobile l'un à l'autre côte à côte et deux contenants les plus à l'extérieur (110, 116), chaque contenant le plus à l'extérieur étant fixé de manière articulée (137) à un respectif des contenants les plus à l'intérieur, les contenants les plus à l'extérieur étant mobiles à partir d'une configuration fermée dans laquelle ils reposent sur leur contenant le plus à l'intérieur respectif et une configuration ouverte dans laquelle ils sont positionnés le long de leur contenant le plus à l'intérieur respectif. 15 20 25
5. Ensemble d'emballage (10) selon la revendication 4, dans lequel l'emballage comprend un corps principal (108) définissant les contenants, le corps principal étant formé en deux parties (108A, 108B), chaque partie comprenant l'un des contenants les plus à l'intérieur (112, 114) et l'un des contenants les plus à l'extérieur (110, 116) reliés de manière articulée ensemble (137) ; et dans lequel les contenants les plus à l'intérieur (112, 114) sont reliés ensemble à chaque extrémité longitudinale par un insert de verrouillage (182) qui vient en prise avec les régions d'extrémité adjacentes des contenants les plus à l'intérieur. 30 35
6. Ensemble d'emballage (10) selon l'une quelconque des revendications précédentes, dans lequel chaque contenant (110, 112, 114, 116) a une paroi avant (120) dans laquelle se trouve l'ouverture de présentation et de distribution (136), chaque paire de contenants connectés de manière mobile étant configurée pour reposer sur chaque autre paroi avant vers la paroi avant dans la configuration fermée, de sorte qu'aucune des ouvertures de présentation et de distribution n'est exposée lorsque l'emballage est en configuration fermée. 40 45 50
7. Ensemble d'emballage (10) selon l'une quelconque des revendications 1 à 6, dans lequel l'agencement de sollicitation élastique comprend au moins un rabat élastique (202, 204 ; 202' , 204' ; 204") le long de chaque côté de la région de rétention de produit (134 ; 134' ; 134"). 55
8. Ensemble d'emballage (10) selon l'une quelconque des revendications précédentes, dans lequel la région de rétention de produit (196) comprend un élément en forme de canal s'étendant dans une direction longitudinale de l'accessoire, l'élément en forme de canal ayant une paroi d'extrémité externe (198) et une paire de parois latérales opposées (200) pendant vers l'intérieur depuis la paroi d'extrémité, une pluralité de sièges de rétention de produit (134) étant espacés le long de l'élément en forme de canal, chaque siège étant formé dans l'élément en forme de canal par une paire d'évidements opposés (210) dans des régions des parois latérales à proximité de la paroi d'extrémité externe et qui rejoignent une ouverture (212) s'étendant latéralement à travers la paroi d'extrémité externe (198) pour définir une cavité dans laquelle une pièce de produit peut être insérée de façon à reposer sur et être soutenue par des bords dirigés vers l'extérieur des parois latérales au sein des évidements, l'ouverture (212) étant formée de façon à définir une paire de rabats opposés (214) sur les bords s'étendant latéralement de la paroi d'extrémité externe (198) chaque côté de l'ouverture, les rabats (214) étant inclinés vers l'intérieur depuis le plan de la paroi d'extrémité, les rabats étant élastiquement sollicités vers une position de repos initiale dans laquelle ils sont inclinés selon un premier angle (α) par rapport au plan de la paroi d'extrémité. 5
9. Ensemble d'emballage (10) selon la revendication 8, comprenant en outre une pluralité de pièces de produit (118), chaque pièce de produit étant maintenue et retenue dans l'un respectif des sièges (134), chaque pièce de produit étant en contact et étant supportée par les bords dirigés vers l'extérieur (218) des parois latérales (200) dans les évidements opposés, les rabats (214) venant en prise de manière élastique avec les côtés opposés de la pièce de produit ; et dans lequel les bords d'extrémité externes (214A) des rabats sont sollicités de manière élastique en contact avec des faces orientées de manière opposée (118B, 118C) de la pièce de produit pour maintenir la pièce de produit en contact avec les bords dirigés vers l'extérieur (218) des parois latérales dans les évidements opposés. 35 40 45
10. Ensemble d'emballage (10) selon la revendication 8 ou la revendication 9, dans lequel l'agencement de sollicitation élastique comprend une paire de rabats (202, 204) reliés à l'élément en forme de canal le long de chaque côté, chaque paire de rabats incluant un premier rabat (202) relié de manière pivotante à une paroi latérale (200) de l'élément en forme de canal et un second rabat (204) relié de manière pivotante au premier rabat (202), les deuxièmes rabats (204) étant sollicités pour venir en prise avec les côtés opposés (124, 126) du contenant respectif. 50 55

11. Ensemble d'emballage (10) selon l'une quelconque des revendications 1 à 7, dans lequel la région de rétention de produit (196') de chaque accessoire de maintien de pièce de produit comprend une pluralité de supports de produit espacés (196') définissant un siège de rétention de produit (134') entre chaque paire adjacente de supports, chaque support possédant une paroi d'extrémité externe (198') et une paire de parois latérales opposées (200') pendant vers l'intérieur de la paroi d'extrémité, une cavité étant définie entre chaque paire de supports adjacents dans laquelle une pièce de produit (118) peut être insérée, une paire de rabats opposés (214') sur les bords s'étendant latéralement des parois d'extrémité externes (198') de supports chaque côté de chaque cavité, les rabats (214') étant inclinés vers l'intérieur depuis le plan de la paroi d'extrémité et élastiquement sollicités vers une position de repos initiale dans laquelle ils sont inclinés selon un premier angle par rapport au plan de la paroi d'extrémité des supports de produit.
12. Ensemble d'emballage (10) selon la revendication 11, dans lequel l'agencement de sollicitation élastique comprend une paire de rabats (202', 204') reliés à la région de rétention de produit (196') le long de chaque côté, chaque paire de rabats incluant un premier rabat (202') relié de manière pivotante aux extrémités internes des parois latérales (200') des supports de produit sur son côté respectif et un second rabat (204') relié de manière pivotante au premier rabat, les deuxièmes rabats (204') étant sollicités pour venir en prise avec les côtés opposés (124, 126) du contenant respectif.
13. Ensemble d'emballage (10) selon la revendication 11 ou la revendication 12, comprenant en outre une pluralité de pièces de produit (118), chaque pièce de produit étant maintenue et retenue dans l'un respectif des sièges (134'), les rabats opposés (214') dans chaque siège venant en prise de manière élastique avec les faces orientées de manière opposée (118B, 118C) de la pièce de produit respective.
14. Ensemble d'emballage (10) selon l'une quelconque des revendications 1 à 7, dans lequel la région de rétention de produit (250) de chaque accessoire de maintien de pièce de produit comprend une paire de parois inclinées espacées allongées (252) ayant un bord interne (254) situé de manière adjacente à la paroi arrière (122) de son contenant respectif (110, 112, 114, 116) et un bord externe (256) situé à proximité de la paroi avant (120) du contenant, les parois inclinées (252) étant inclinées l'une vers l'autre dans une direction depuis leurs bords internes (254) vers leurs bords externes (256), les bords externes (256) des parois inclinées étant espacés l'un de l'autre ; un panneau de support de produit (258) situé dans l'espace entre les bords externes (256) des parois inclinées et évidé vers l'intérieur depuis les bords externes, le panneau de support de produit (258) étant relié aux bords externes (256) des parois inclinées par une paire de parois latérales généralement verticales opposées (260) ; une pluralité de sièges de rétention de produit (134") espacés le long de la région centrale de rétention de produit, chaque siège étant défini par une paire d'évidements opposés (266) dans les parois latérales (260) et des évidements correspondants dans les régions en chevauchement des parois inclinées (252).
15. Ensemble d'emballage (10) selon la revendication 14, comprenant en outre une pluralité de pièces de produit (118), chaque pièce de produit étant maintenue et retenue dans un respectif des sièges (134"), une surface inférieure (118A) de chaque pièce de produit reposant sur et étant supportée par le panneau de support de produit (258), des bords latéraux (268) des évidements opposés (266) dans les parois latérales et les parois inclinées venant en prise avec les faces orientées de manière opposée (118B, 118C) de la pièce de produit pour maintenir la pièce de produit dans le siège.

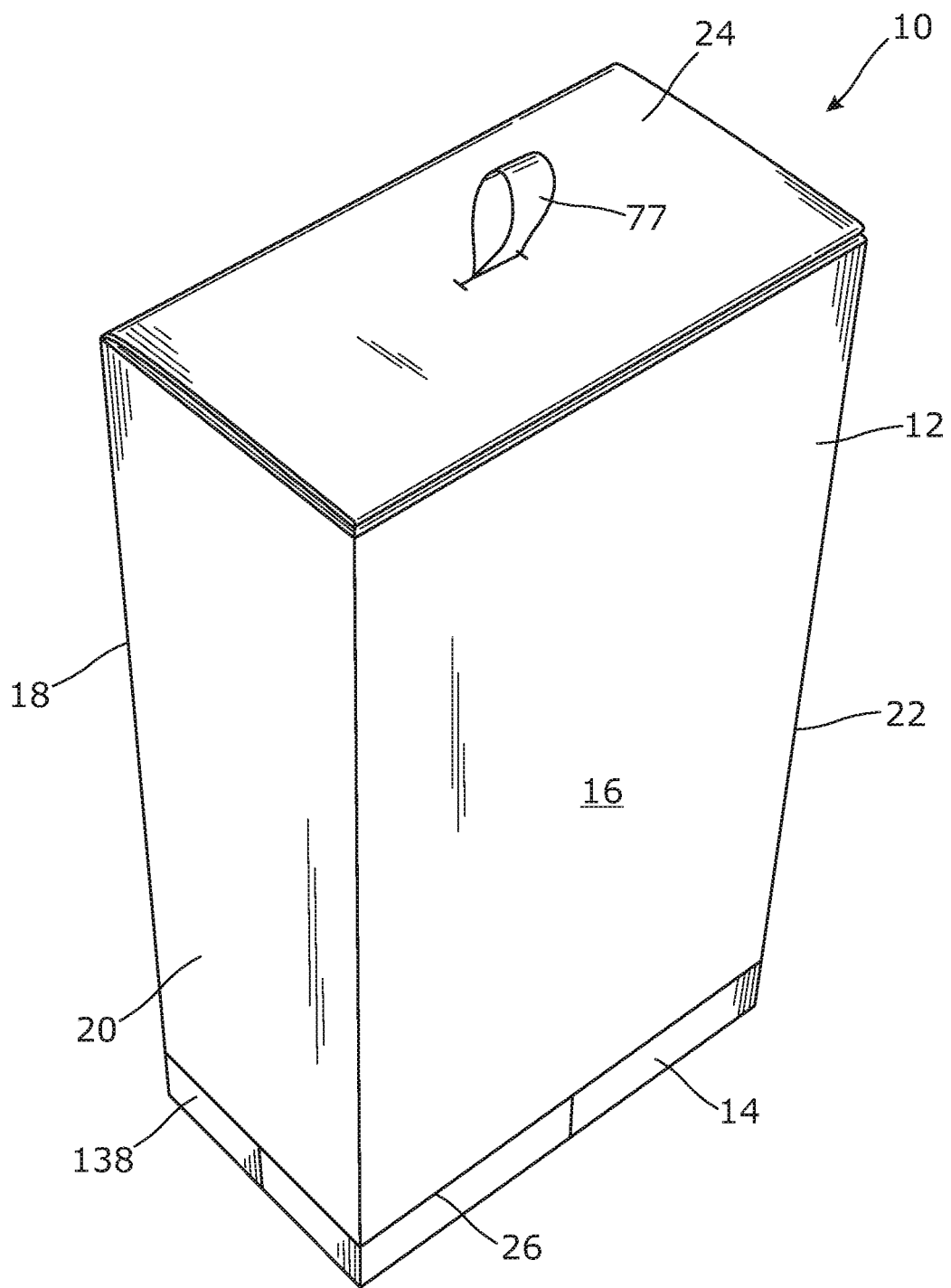
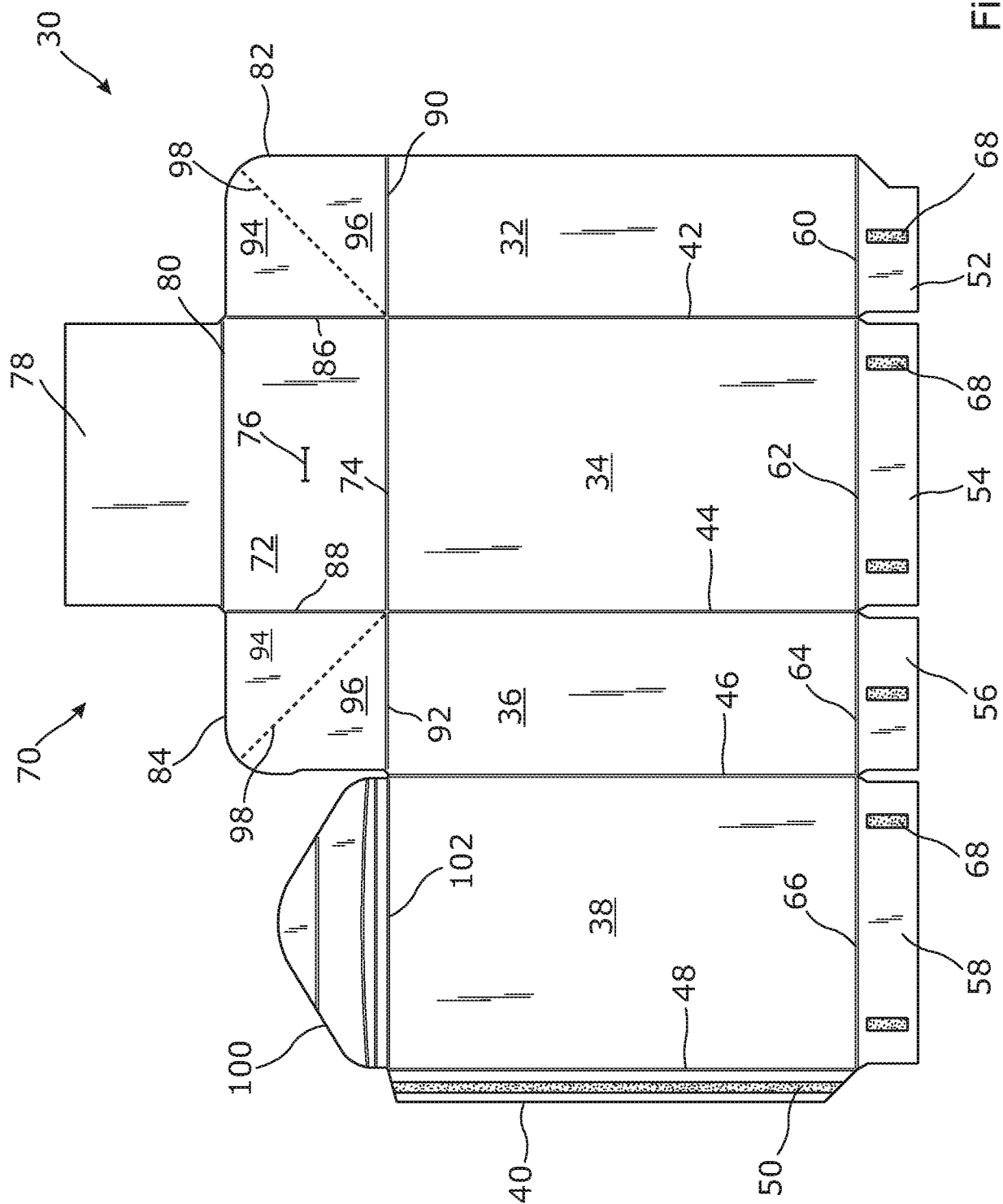


Fig. 1



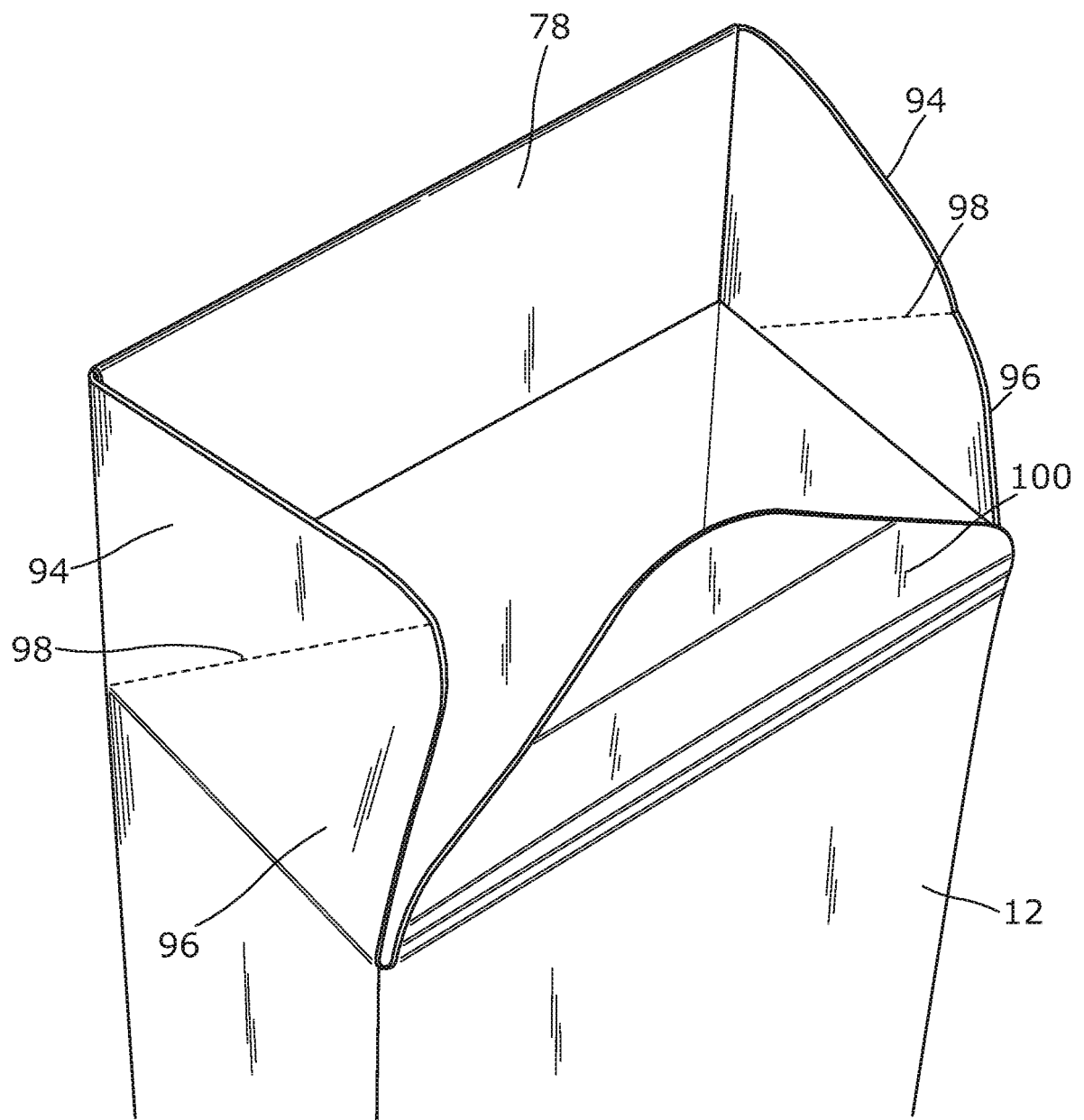


Fig. 3

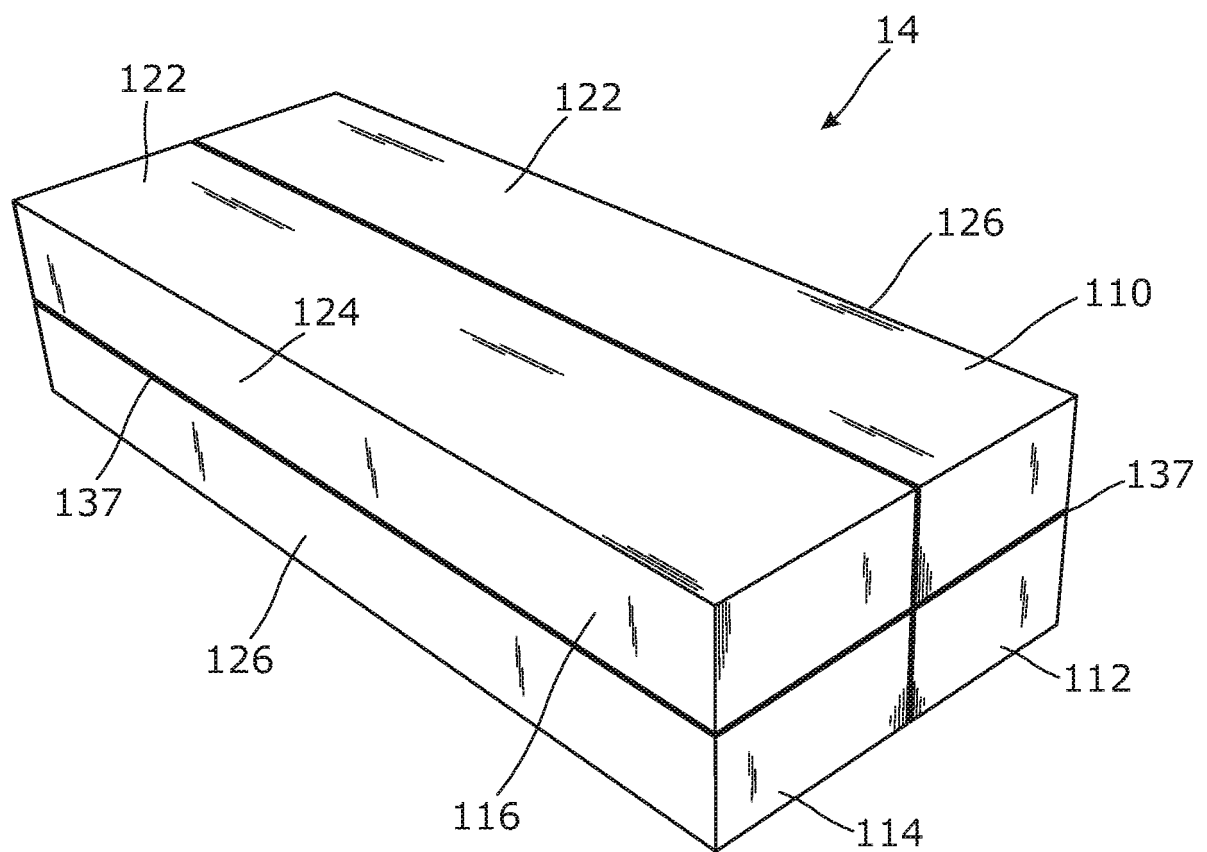


Fig. 4

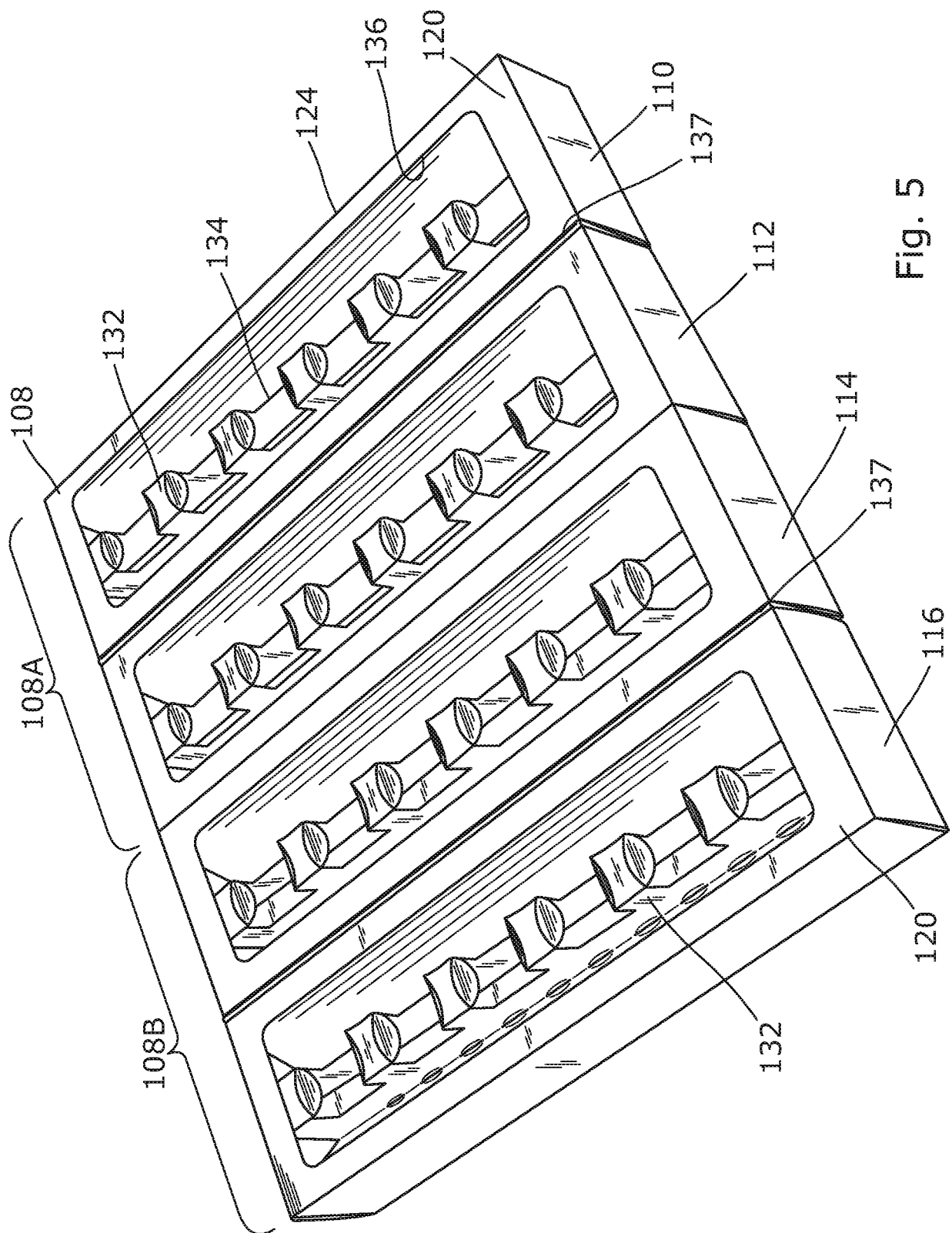


Fig. 5

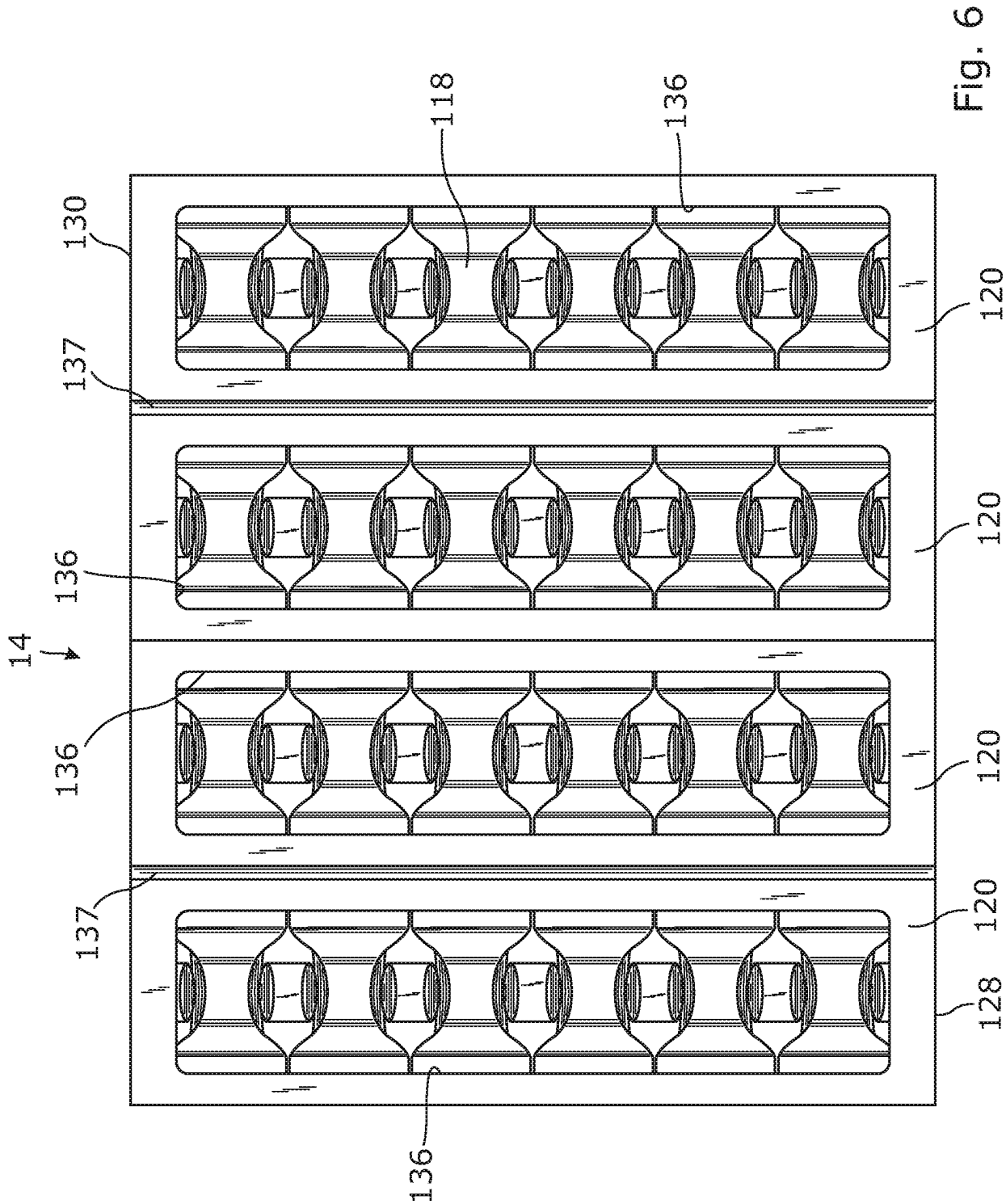
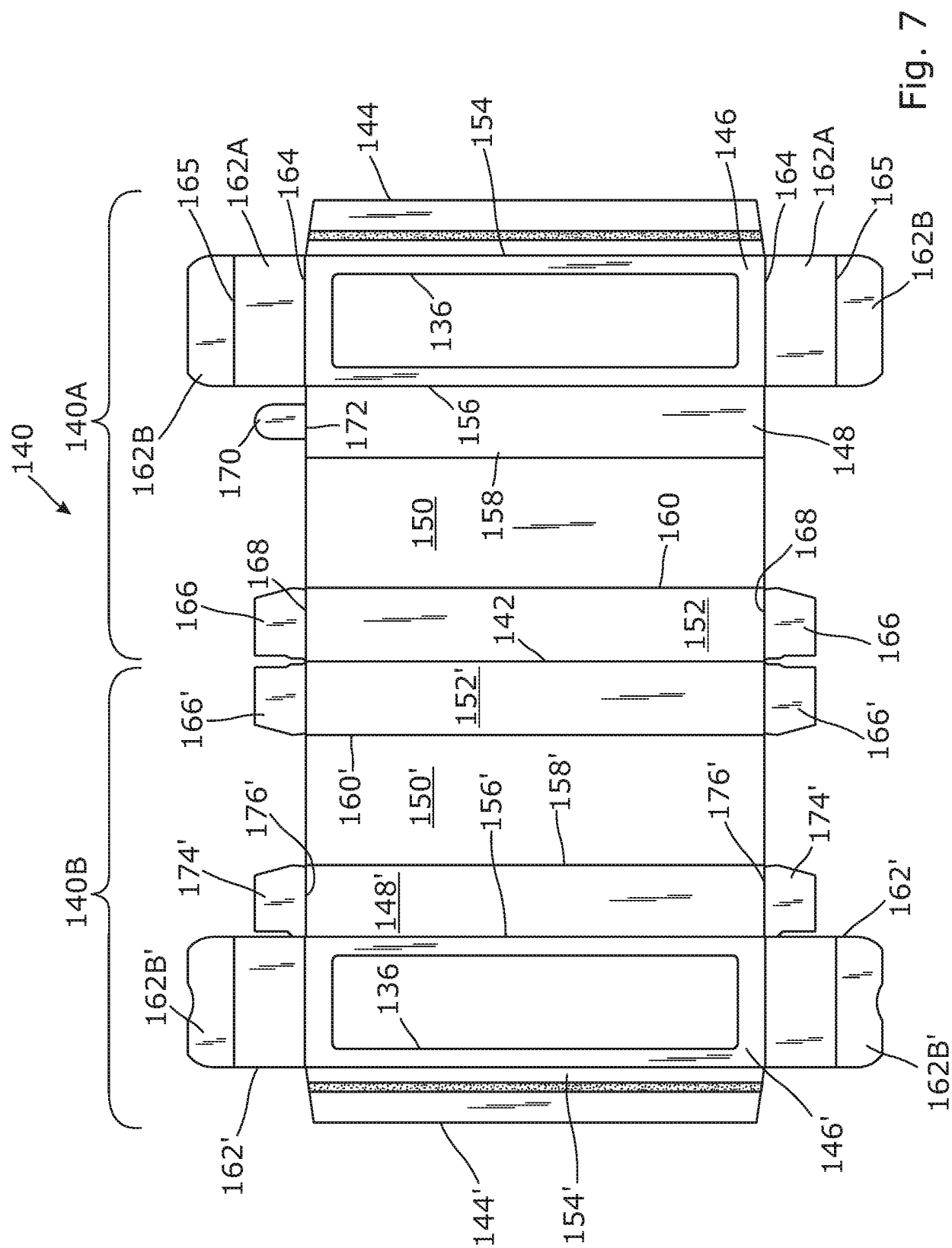


Fig. 6



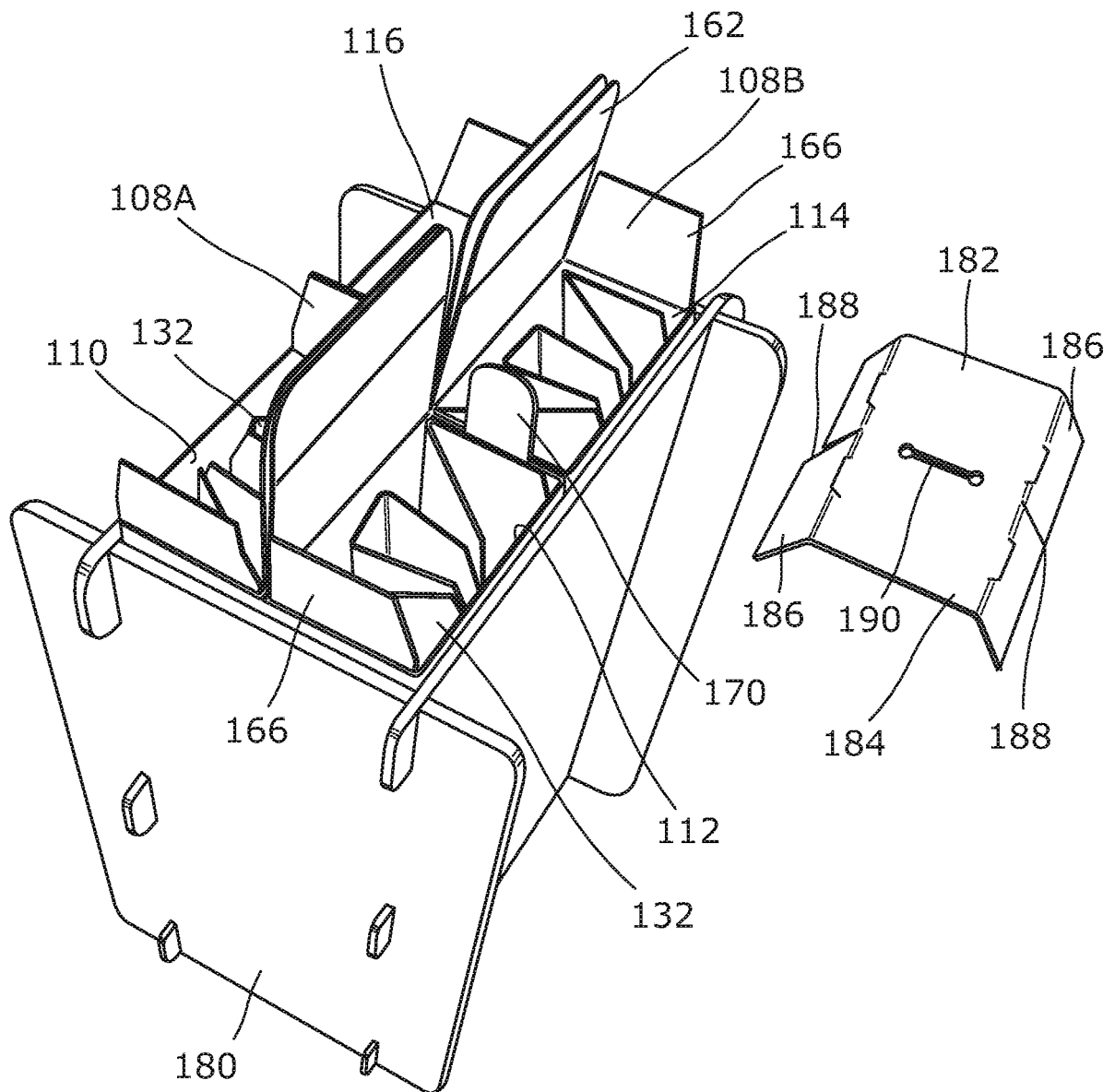


Fig. 8

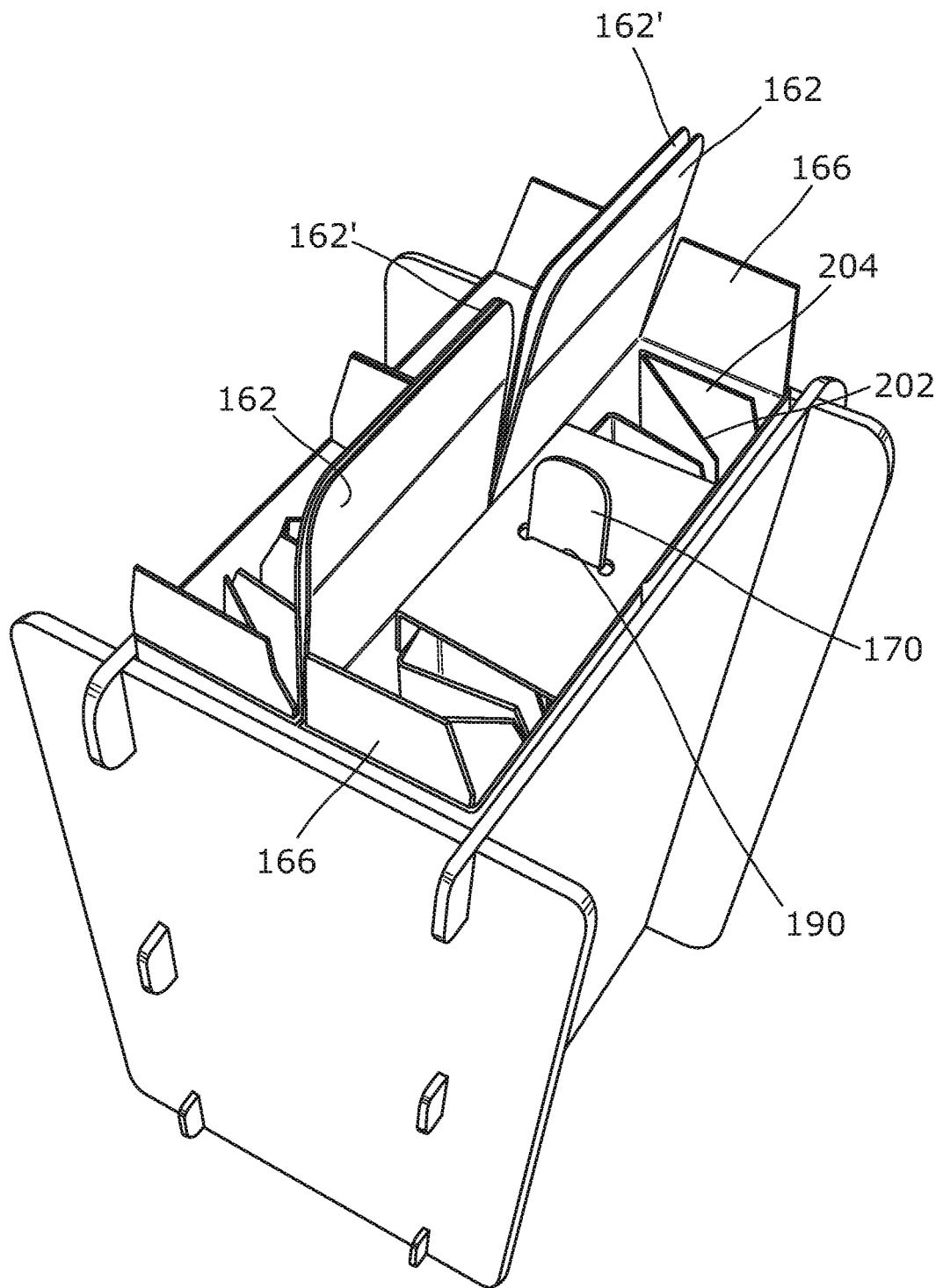


Fig. 9

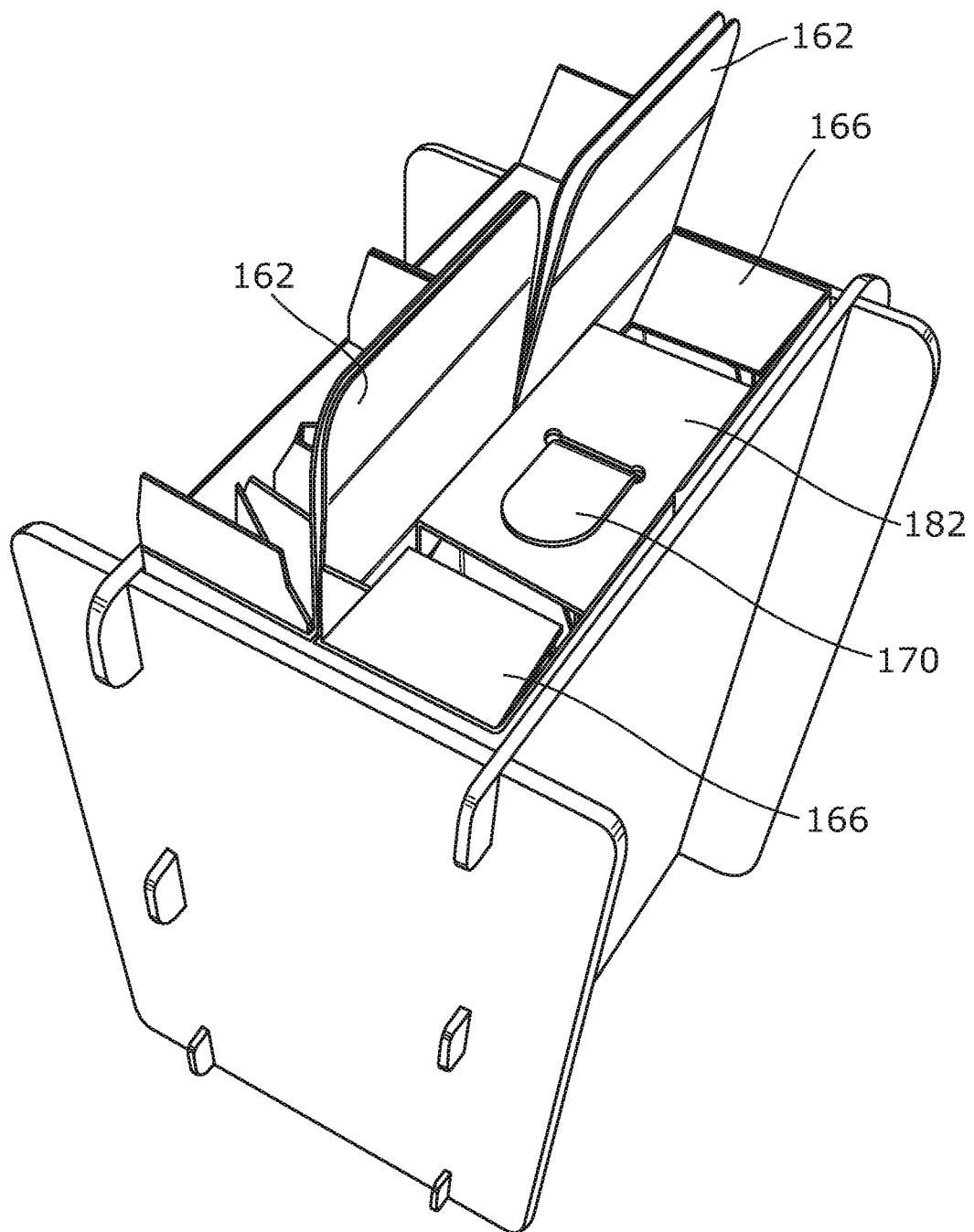


Fig. 10

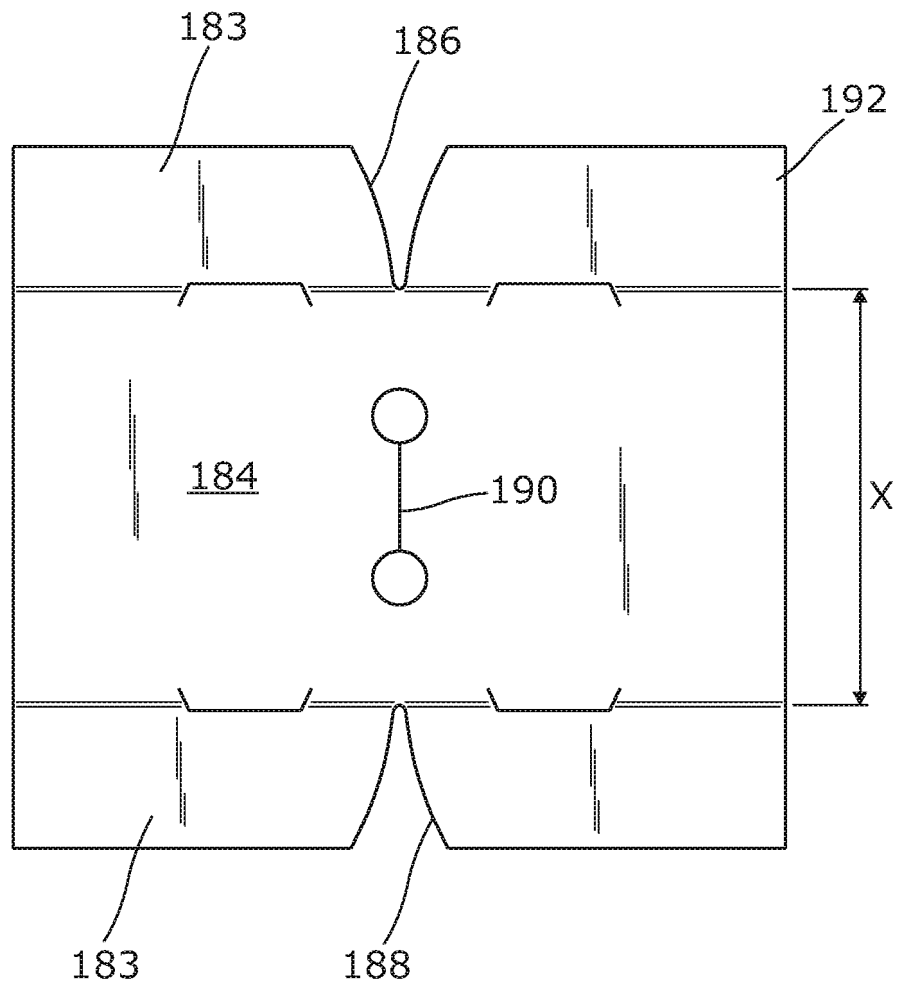


Fig. 11

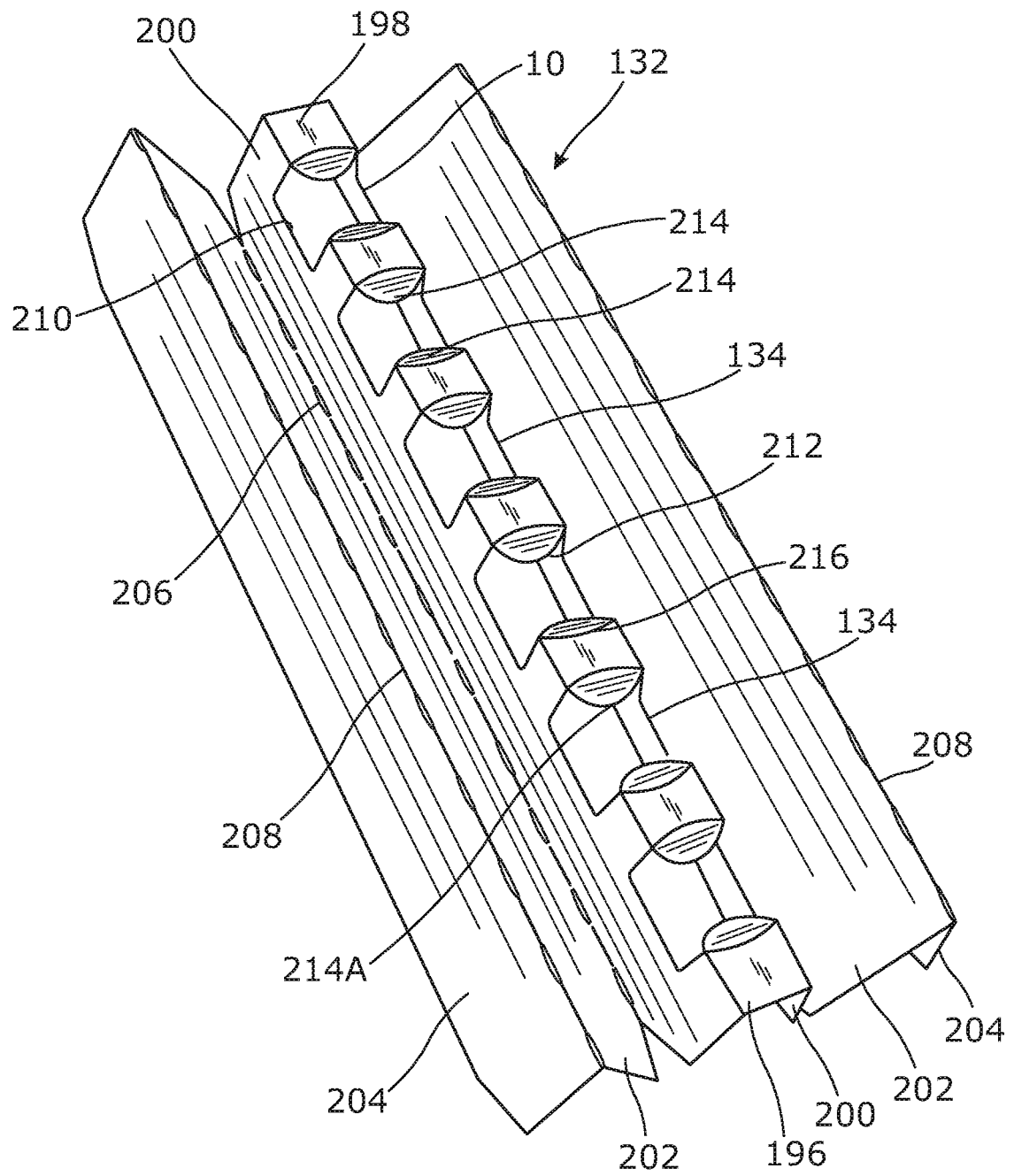


Fig. 12

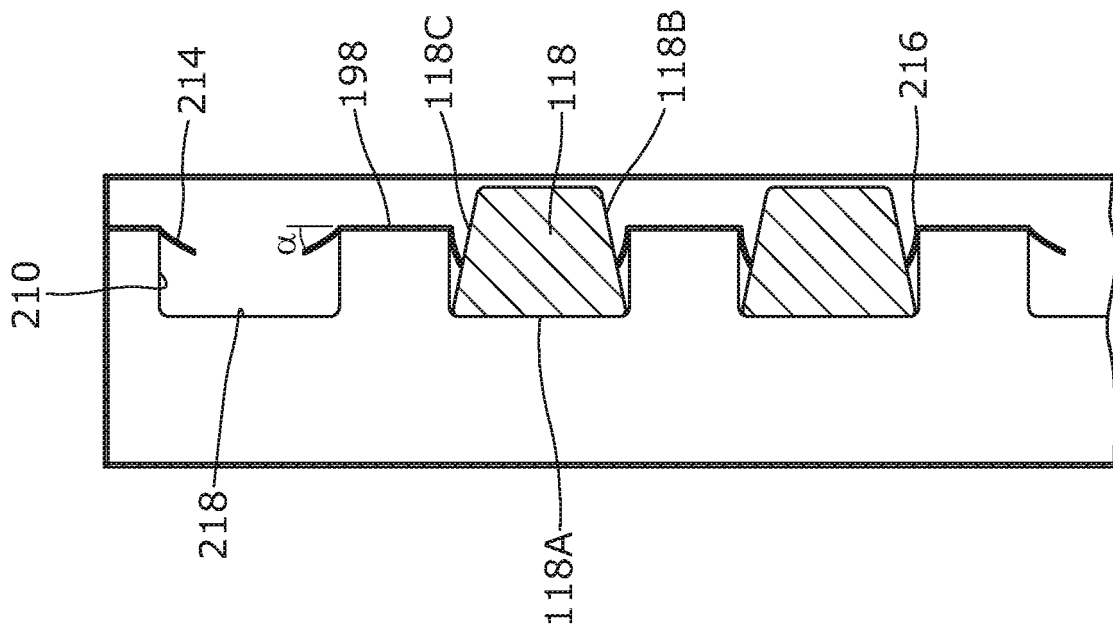


Fig. 14

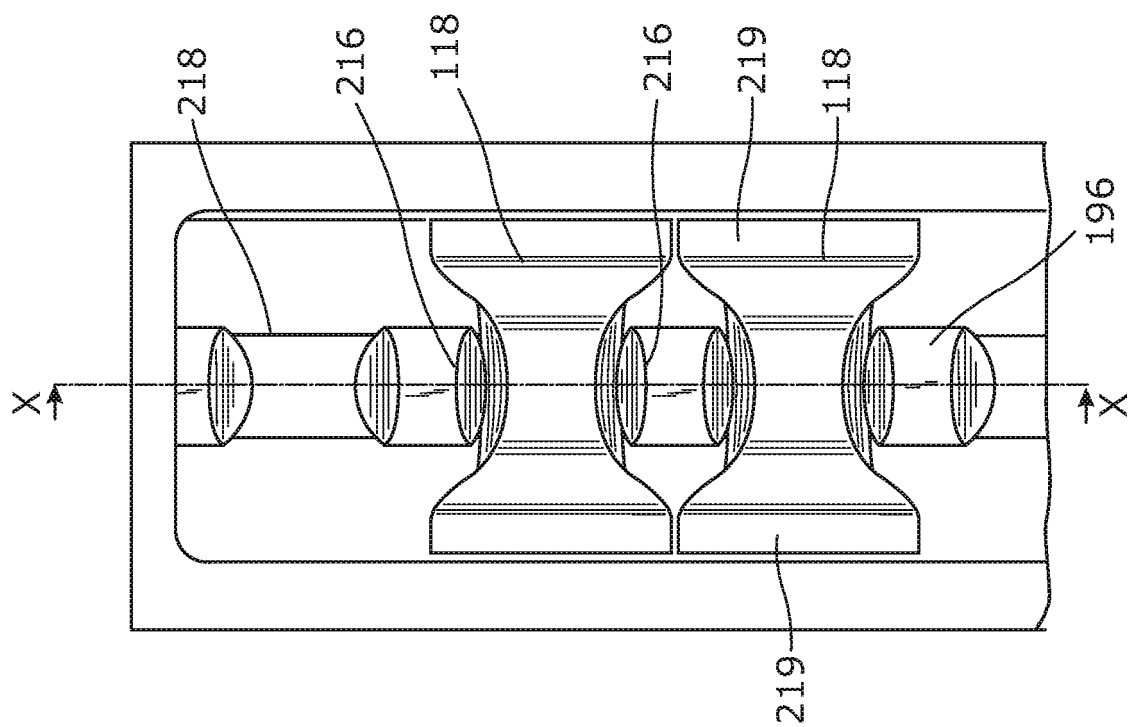


Fig. 13

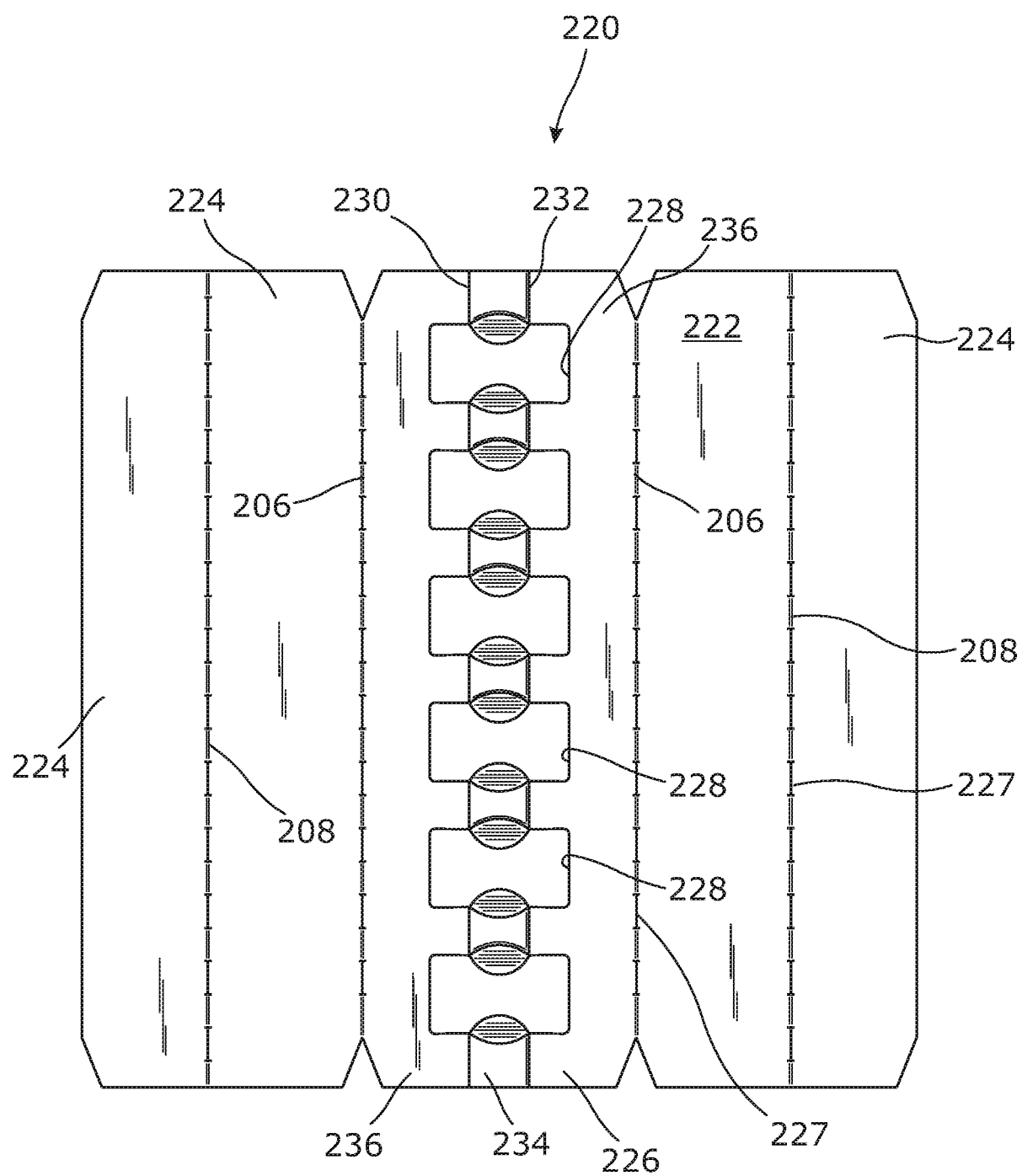


Fig. 15

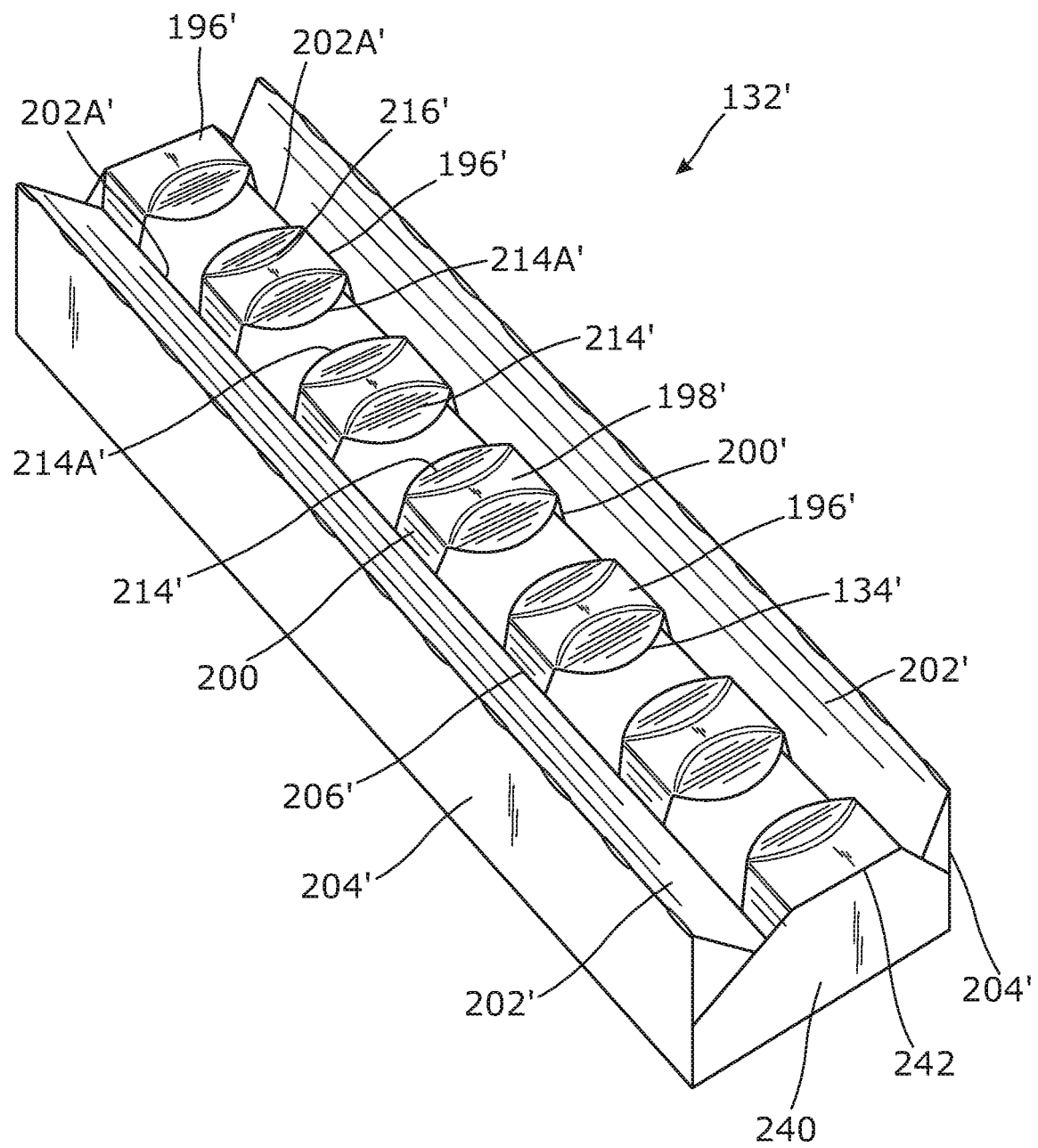


Fig. 16

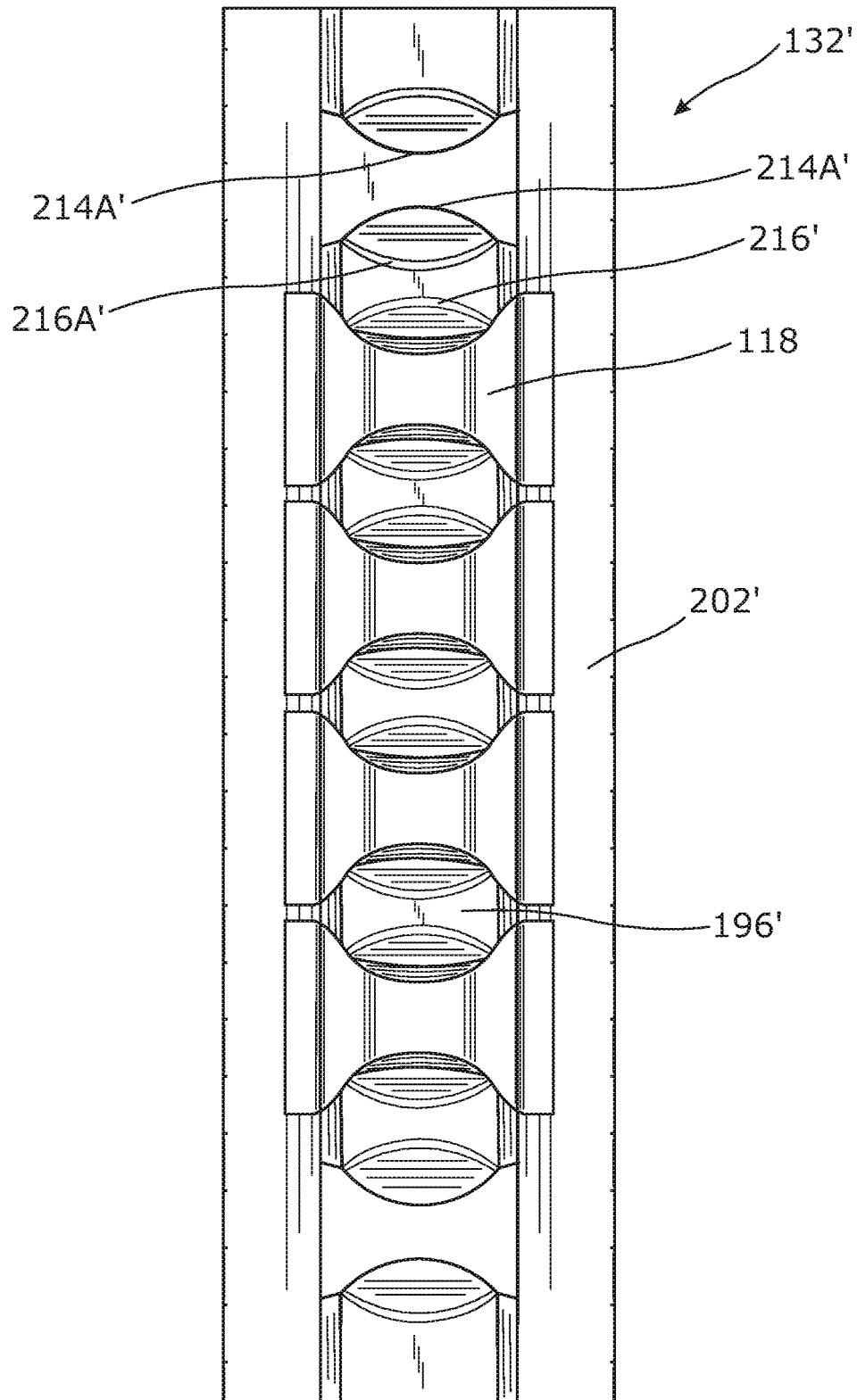


Fig. 17

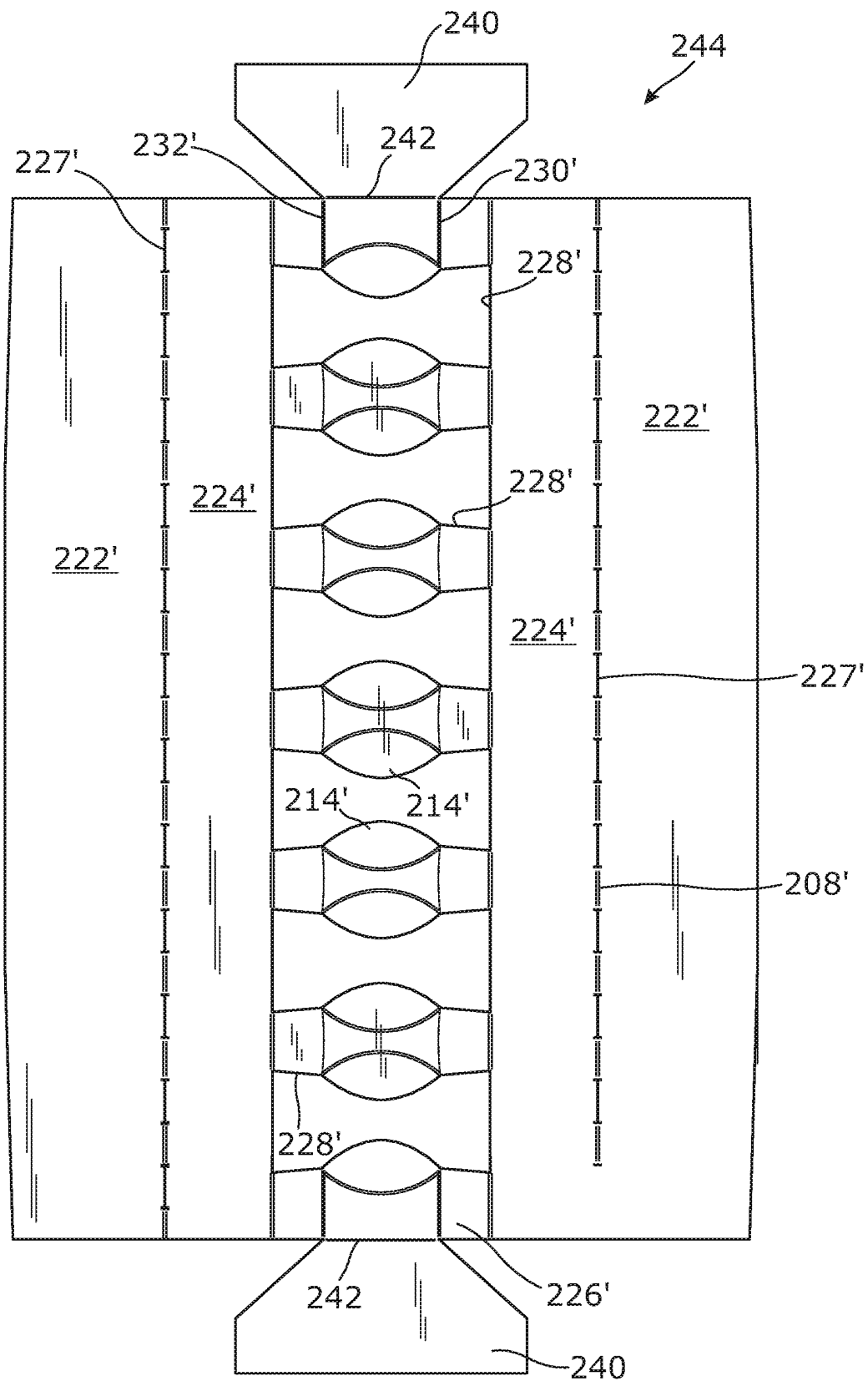


Fig. 18

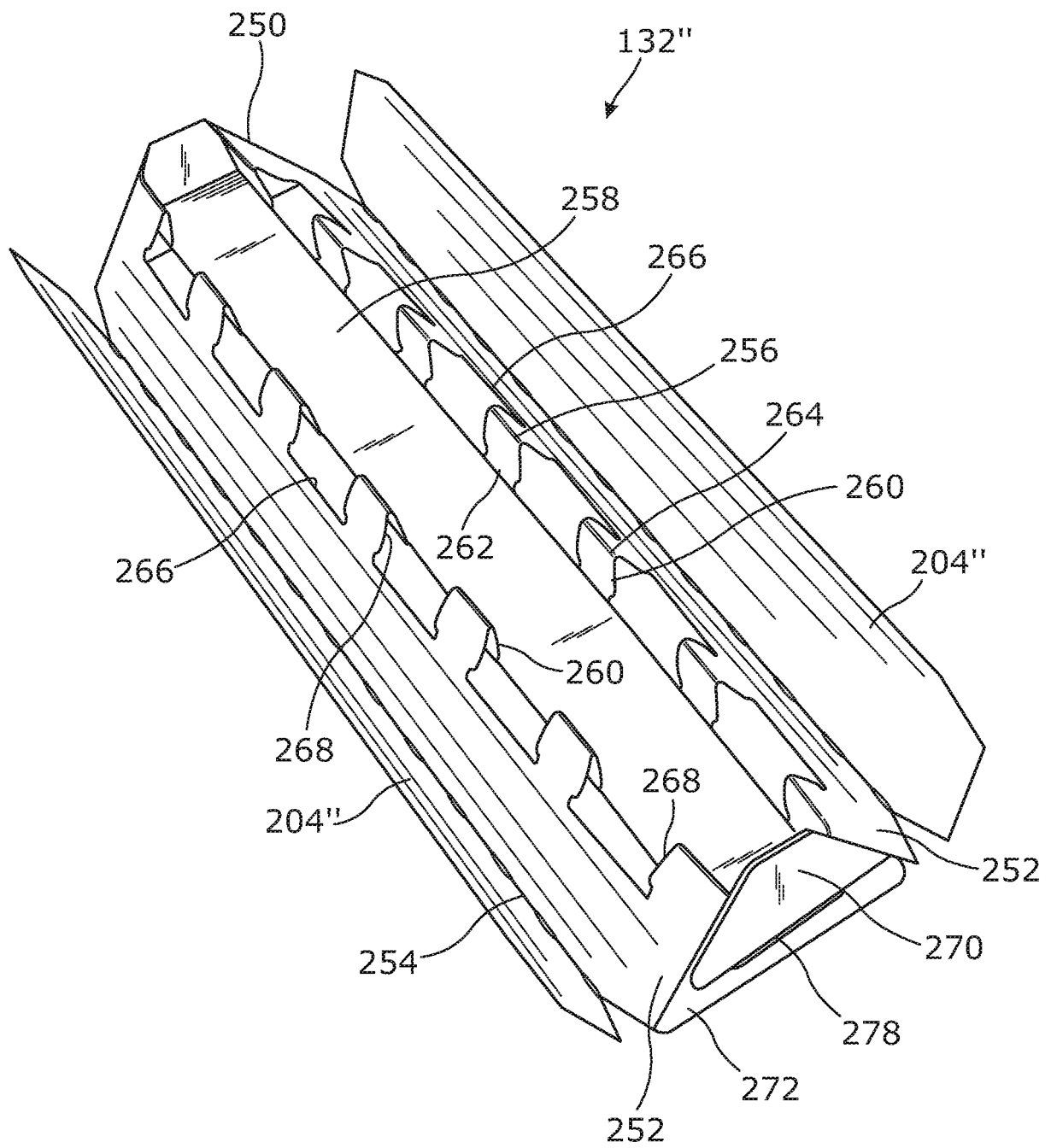


Fig. 19

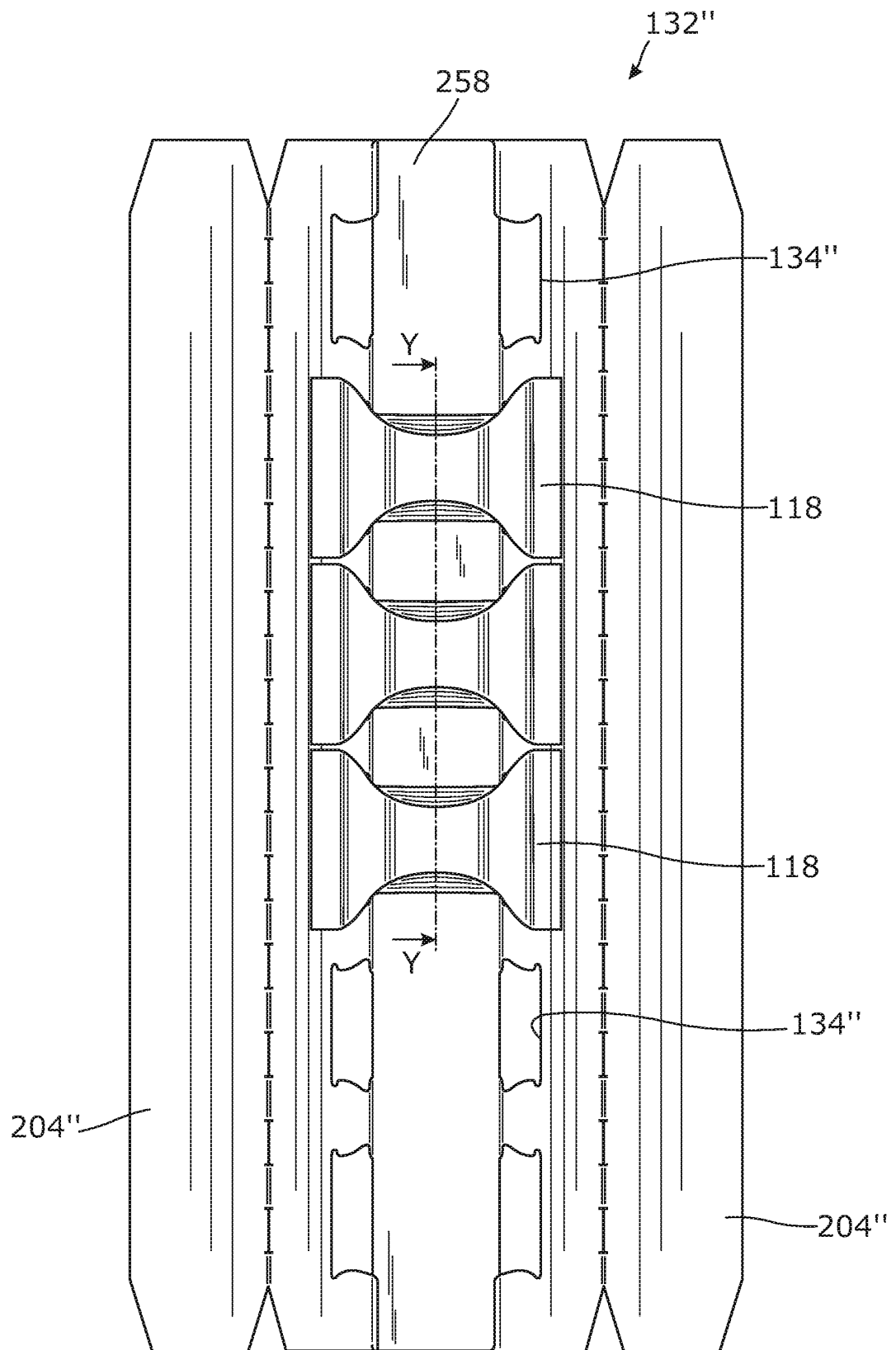


Fig. 20

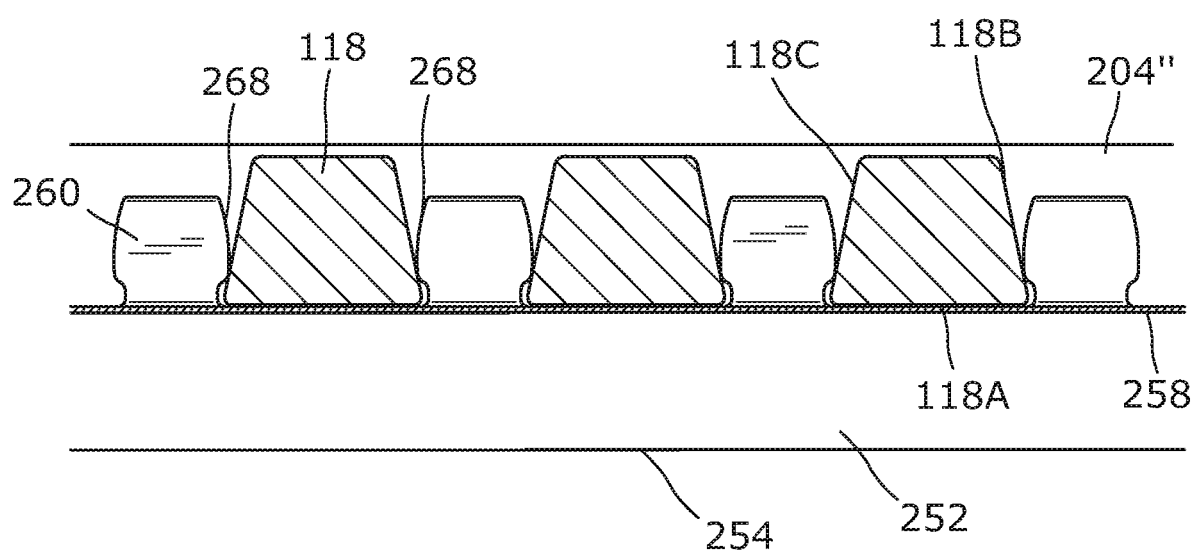


Fig. 21

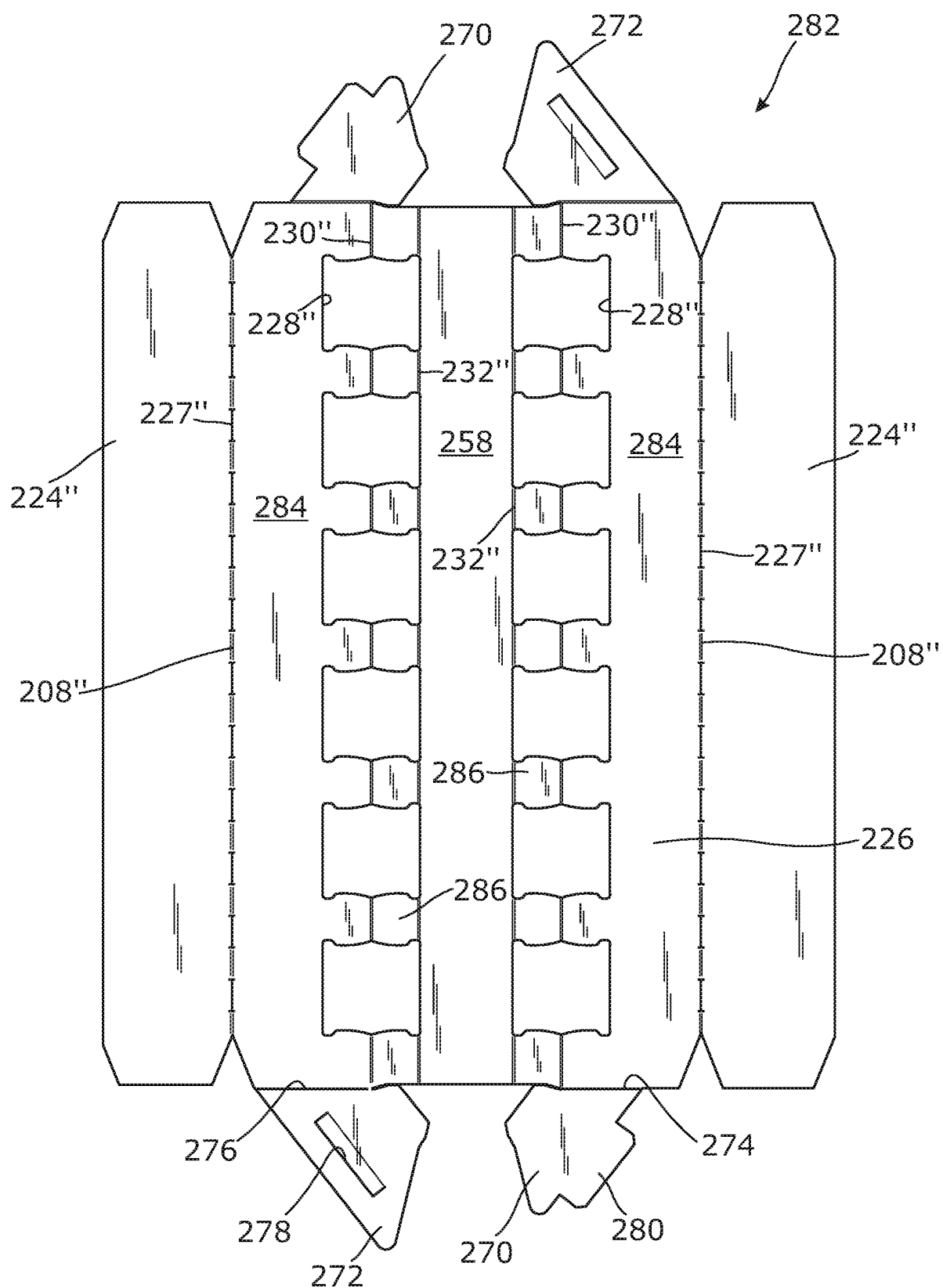


Fig. 22

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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