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(54) **Title:** ABSORBENT ARTICLES WITH REFASTENABLY CONNECTED WAIST REGIONS

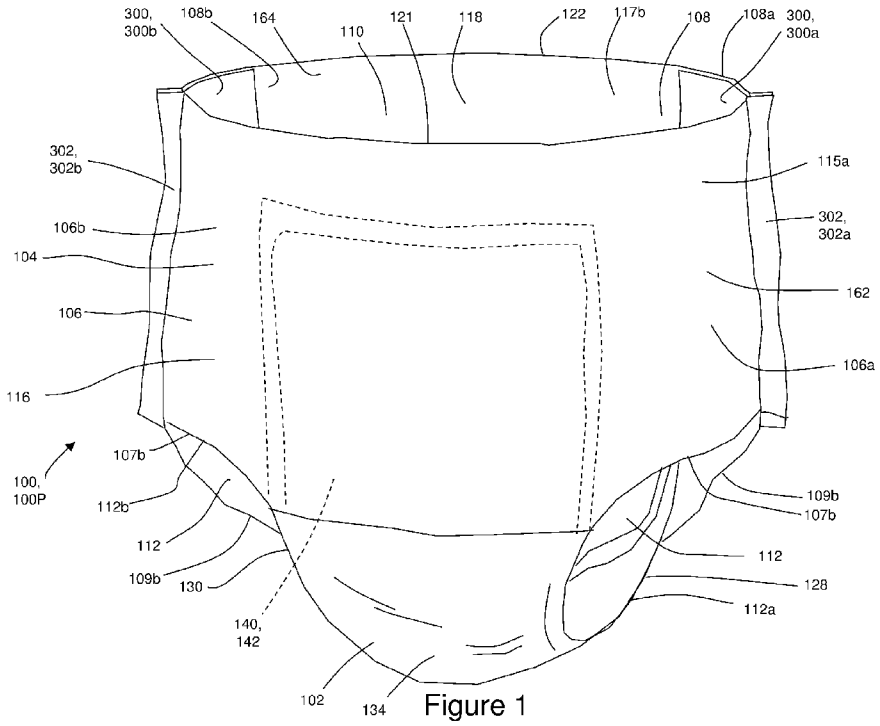

Figure 1

(57) **Abstract:** The present disclosure relates to absorbent articles having refastenably connected front and back waist regions. The absorbent article may comprise a first and second flanges, each flange comprising a first surface and a second surface, and each flange comprising a first end region and a second end region. The first surfaces of the first end regions of the first and second flanges are bonded with a wearer facing surface of a first belt. The second surfaces of the second end regions of the first and second flanges are in a facing relationship with a wearer facing surface of the second belt. The second end regions of the first and second flanges are refastenably connected with the second end region of the second belt.

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ABSORBENT ARTICLES WITH REFASTENABLY CONNECTED WAIST REGIONS

FIELD

The present disclosure relates to absorbent articles, and more particularly, to absorbent articles having refastenably connected front and back waist regions.

BACKGROUND

Along an assembly line, various types of articles, such as for example, diapers and other absorbent articles, may be assembled by adding components to and/or otherwise modifying an advancing, continuous web of material. For example, in some processes, advancing webs of material are combined with other advancing webs of material. In other examples, individual components created from advancing we;;bs of material are combined with advancing webs of material, which in turn, are then combined with other advancing webs of material. In some cases, individual components created from an advancing web or webs are combined with other individual components created from other advancing webs. Webs of material and component parts used to manufacture diapers may include: backsheets, topsheets, leg cuffs, waist bands, absorbent core components, front and/or back ears, fastening components, and various types of elastic webs and components such as front and/or back waist panels, leg elastics, barrier leg cuff elastics, stretch side panels, and waist elastics. Once the desired component parts are assembled, the advancing web(s) and component parts are subjected to a final knife cut to separate the web(s) into discrete diapers or other absorbent articles.

Some absorbent articles have components that include elastomeric laminates. Such elastomeric laminates may include an elastic material bonded to one or more nonwovens. The elastic material may include an elastic film and/or elastic strands. In some laminates, a plurality of elastic strands are joined to a nonwoven while the plurality of strands are in a stretched condition so that when the elastic strands relax, the nonwoven gathers, and in turn, forms corrugations and rugosities. The resulting elastomeric laminate is stretchable to the extent that the corrugations allow the elastic strands to elongate.

Absorbent articles in the form of diaper pants may also be configured with an absorbent chassis connected with front and back elastic belts, wherein opposing end regions of the front and back belts are connected with each other at side seams. In some instances, the elasticity of the front and back belts is removed in regions where the chassis connects with the belts. Thus, in some converting configurations adapted to assemble such diaper pants, stretched elastic strands

are glued between two continuous nonwoven webs to form an elastic laminate. Regions of the elastic strands may then be intermittently deactivated along the length of the elastic laminate by cutting the elastic strands in areas to be connected with the chassis, sometimes referred to as tummy elastic cutting.

Some caregivers of older incontinent babies or toddlers may prefer a closed, pant-style disposable absorbent article to enable application to, and removal from, a child while the child is in a standing position. One disadvantage of this product form is that the removal and disposal of feces-containing products may be unhygienic and inconvenient. For example, pulling the product down could cause feces to smear down the legs of a user. In other examples, a caregiver may tear open the bonded sides using force. In turn, the force used can lead to a rapid release of energy from the diaper, causing the caregiver to lose control of the product and allowing feces to spill out. In contrast, removal and disposal of traditional open or taped diaper forms with fasteners may be readily accomplished while the child is laying on their back. In this case, the fasteners are opened, the diaper is removed from under the child, rolled into a roughly cylindrical shape, and then the fasteners are secured around the rolled, soiled diaper, closing the leg openings for hygienic disposal.

In order to avoid having to remove soiled diaper pants from a wearer by sliding the soiled diaper pant down the wearer's legs or tearing bonded side seams, some diaper pants may be configured with refastenable seams between the front belt and the back belt. Such refastenable seams may allow a caregiver to more easily separate the belts from each other. Once the belts are separated, the diaper pant can be more easily removed from the wearer without having to slide the diaper pant down the wearer's legs, in a similar manner as a traditional open taped diaper form.

Consequently, it would be beneficial to create pant-style articles that provide the caregiver the ability to remove and dispose soiled products in a similar manner to traditional open diaper forms.

SUMMARY

In one aspect, an absorbent article comprises: a chassis comprising a topsheet, a backsheet, and an absorbent core positioned between the topsheet and the backsheet, the chassis further comprising a first end region and a second end region longitudinally separated from the first end region by a crotch region; a first belt comprising a first end region and a second end region laterally separated from the first end region by a central region, the first end region of the

chassis connected with the central region of the first belt, wherein the first belt further comprises a garment facing surface and an opposing wearer facing surface; a second belt comprising a first end region and a second end region laterally separated from the first end region by a central region, the second end region of the chassis connected with the central region of the second belt, wherein the second belt further comprises a garment facing surface and an opposing wearer facing surface; a first flange comprising a first surface and a second surface opposite the first surface, the first flange further comprising a first lateral end region and a second lateral end region, wherein the first surface of the first lateral end region of the first flange is bonded with the wearer facing surface of the first end region of the first belt, and wherein the second surface of the second lateral end region of the first flange is in a facing relationship with the wearer facing surface of the second belt, and wherein second lateral end region of the first flange is refastenably connected with the first end region of the second belt; a second flange comprising a first surface and a second surface opposite the first surface, the second flange further comprising a first lateral end region and a second lateral end region, wherein the first surface of the first end lateral region of the second flange is bonded with the wearer facing surface of the second end region of the first belt, and wherein the second surface of the second lateral end region of the second flange is in a facing relationship with the wearer facing surface of the second belt, and wherein second lateral end region of the second flange is refastenably connected with the second end region of the second belt; and wherein the first flange and the second flange are bonded with the first belt with a layer of substantially tackifier free adhesive.

In another aspect, an absorbent article comprises: a chassis comprising a topsheet, a backsheet, and an absorbent core positioned between the topsheet and the backsheet, the chassis further comprising a first end region and a second end region longitudinally separated from the first end region by a crotch region; a first belt comprising a first end region and a second end region laterally separated from the first end region by a central region, the first end region of the chassis connected with the central region of the first belt, wherein the first belt further comprises a garment facing surface and an opposing wearer facing surface; a second belt comprising a first end region and a second end region laterally separated from the first end region by a central region, the second end region of the chassis connected with the central region of the second belt, wherein the second belt further comprises a garment facing surface and an opposing wearer facing surface; a flange comprising a first surface and a second surface opposite the first surface, the flange further comprising a first lateral end region and a second lateral end region; a fastener component positioned on the second surface of the flange; wherein first surface of the first lateral

end region of the flange is bonded with the first end region of the first belt with a layer of substantially tackifier free adhesive; and wherein the fastener component is refastenably connected with the wearer facing surface of first end region of the second belt.

In yet another aspect, an absorbent article comprises: a chassis comprising a topsheet, a backsheet, and an absorbent core positioned between the topsheet and the backsheet, the chassis further comprising a first end region and a second end region longitudinally separated from the first end region by a crotch region; a first belt comprising a first end region and a second end region laterally separated from the first end region by a central region, the first end region of the chassis connected with the central region of the first belt, wherein the first belt further comprises a garment facing surface and an opposing wearer facing surface; a second belt comprising a first end region and a second end region laterally separated from the first end region by a central region, the second end region of the chassis connected with the central region of the second belt, wherein the second belt further comprises a garment facing surface and an opposing wearer facing surface; a flange comprising a first lateral end region and a second end region; wherein the first lateral end region of the flange is bonded with a layer of substantially tackifier free adhesive with the wearer facing surface of the first end region of the first belt; and wherein the second lateral end region of the flange is refastenably connected with the wearer facing surface of first end region of the second belt.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows a perspective view of a refastenable diaper pant in a pre-fastened configuration.

Figure 2A shows a top view of the diaper pant of Figure 1.

Figure 2B shows a top view of the diaper pant of Figure 2A in a compressed state.

Figure 2C1 is a cross-sectional view of the diaper pant of Figure 2B taken along line 2C-2C showing details of a flange connection with a first configuration of belt laminate structures.

Figure 2C2 is a cross-sectional view of the diaper pant of Figure 2B taken along line 2C-2C showing details of a flange connection with a second configuration of belt laminate structures.

Figure 2C3 is a cross-sectional view of the diaper pant of Figure 2B taken along line 2C-2C showing details of a flange connection with a third configuration of belt laminate structures.

Figure 2D is a detailed sectional view of a bond structure between substrates of the flange and first belt comprising substantially tackifier free adhesive.

Figure 2E is a detailed view of the bond structure of Figure 2D applied between two nonwoven substrates.

Figure 2F is a scanning electron microscope ("SEM") photograph of a cross sectional view of an example bond comprising a layer of substantially tackifier free adhesive between a first nonwoven and a second nonwoven.

Figure 2G is a detailed view of the bond structure of Figure 2D applied between two nonwoven substrates, wherein one of the nonwoven substrates comprises a meltblown layer.

Figure 2H is a detailed view of the bond structure of Figure 2D applied between two nonwoven substrates, wherein both of the nonwoven substrates comprise a meltblown layer.

Figure 3A shows a plan view of a diaper pant with the portion of the diaper that faces away from a wearer oriented toward the viewer.

Figure 3B shows a plan view of a diaper pant with the portion of the diaper that faces toward a wearer oriented toward the viewer.

Figure 3C shows a plan view of a diaper pant with the portion of the diaper that faces away from a wearer oriented toward the viewer, illustrating example elastic material arrangements in the first and second belts.

Figure 3D shows a plan view of a diaper pant with the portion of the diaper that faces away from a wearer oriented toward the viewer, illustrating first and second belt size and shape features.

Figure 3E shows a plan view of a diaper pant with the portion of the diaper that faces away from a wearer oriented toward the viewer, illustrating first and second belt size and shape features.

Figure 3F shows a plan view of a diaper pant with the portion of the diaper that faces away from a wearer oriented toward the viewer, illustrating first and second belt size and shape features.

Figure 4 is a cross-sectional view of the diaper pant of Figure 4A taken along line 4-4 showing first and second elastic belts provided with panel layers.

Figure 4A is a cross-sectional detailed view of a first belt provided with panel layers wherein one panel layer is folded over another panel layer.

Figure 4A1 is a cross-sectional detailed view of another example configuration wherein the first belt is provided with panel layers wherein one panel layer is folded over another panel layer.

Figure 4A2 is a cross-sectional detailed view of another example configuration wherein the first belt is provided with panel layers wherein one panel layer is folded over another panel layer.

Figure 4B is a cross-sectional detailed view of a second belt provided with panel layers wherein one panel layer is folded over another panel layer.

Figure 5A shows a perspective view of a diaper pant with a continuous outer cover in a pre-fastened configuration.

Figure 5B shows a plan view of a diaper pant with a continuous outer cover with the portion of the diaper that faces away from a wearer oriented toward the viewer.

Figure 5C is a cross-sectional view of the diaper pant of Figure 5B taken along line 5C-5C showing first and second elastic belts provided with panel layers and a continuous outer cover.

Figure 5D is a cross-sectional view of a diaper pant of showing first and second elastic belts provided with panel layers formed with a continuous inner layer and a continuous outer cover.

Figure 6A is a perspective view of the diaper pant of Figure 1 showing a first end region of the second belt partially disconnected from a first flange.

Figure 6B is a perspective view of the diaper pant of Figure 6A showing a second end region of the second belt partially disconnected from a second flange.

Figure 7A is a detailed view of a diaper pant showing a flange bonded with a first belt and refastenably connected with a second belt.

Figure 7B is a detailed view of the diaper pant of Figure 7A showing the second belt partially disconnected from the flange.

Figure 7C is a detailed view of the diaper pant of Figure 7B showing the second belt completely disconnected from the flange.

Figure 8 is a planar view of a fastener component on a flange.

Figure 9A cross-sectional view of an example configuration of the flange and fastener component of Figure 8 taken along line 9-9 showing a base of the fastener component bonded with the flange.

Figure 9B cross-sectional view of an example configuration of the flange and fastener component of Figure 8 taken along line 9-9 showing a base of the fastener component extrusion bonded with a backing layer that is bonded with the flange.

Figure 9C cross-sectional view of an example configuration of the flange and fastener component of Figure 8 taken along line 9-9 showing a base of the fastener component extrusion bonded with the flange.

Figure 9D cross-sectional view of an example configuration of the flange and fastener component of Figure 8 taken along line 9-9 showing a base of the fastener component extrusion bonded with the flange.

Figure 9E cross-sectional view of an example configuration of the flange and fastener component of Figure 8 taken along line 9-9 showing a fastener component comprising hooks formed directly from material of the flange.

Figure 10A is a detailed view of a diaper pant showing a belt directly refastenably connected with a fastener component on a flange.

Figure 10B is a detailed view of a diaper pant showing a fastener component on a belt directly refastenably connected with a flange.

Figure 10C is a detailed view of a diaper pant showing a fastener component comprising loops on a belt refastenably connected with a fastener component comprising hooks on a flange.

Figure 10D is a detailed view of a diaper pant showing a fastener component comprising hooks on a belt refastenably connected with a fastener component comprising loops on a flange.

DETAILED DESCRIPTION

DEFINITIONS

The following term explanations may be useful in understanding the present disclosure:

"Absorbent article" refers to devices, which absorb and contain body exudates and, more specifically, refers to devices, which are placed against or in proximity to the body of the wearer to absorb and contain the various exudates discharged from the body. Exemplary absorbent articles include diapers, training pants, pull-on pant-type diapers (i.e., a diaper having a pre-formed waist opening and leg openings such as illustrated in U.S. Pat. No. 6,120,487), refastenable diapers or pant-type diapers, incontinence briefs and undergarments, diaper holders and liners, feminine hygiene garments such as panty liners, absorbent inserts, menstrual pads and the like.

"Body-facing" and "garment-facing" refer respectively to the relative location of an element or a surface of an element or group of elements. "Body-facing" implies the element or surface is nearer to the wearer during wear than some other element or surface. "Garment-facing" implies the element or surface is more remote from the wearer during wear than some other element or surface (i.e., element or surface is proximate to the wearer's garments that may be worn over the disposable absorbent article).

The terms "elastic," "elastomer" or "elastomeric" refers to materials exhibiting elastic properties, which include any material that upon application of a force to its relaxed, initial length can stretch or elongate to an elongated length more than 10% greater than its initial length and will substantially recover back to about its initial length upon release of the applied force. Elastomeric materials may include elastomeric films, scrims, nonwovens, ribbons, strands and other sheet-like structures.

As used herein, the term "joined" encompasses configurations whereby an element is directly secured to another element by affixing the element directly to the other element, and configurations whereby an element is indirectly secured to another element by affixing the element to intermediate member(s) which in turn are affixed to the other element.

As used herein, the term "distal" is used to describe a position situated away from a center of a body or from a point of attachment, and the term "proximal" is used to describe a position situated nearer to a center of a body or a point of attachment.

The term "substrate" is used herein to describe a material which is primarily two-dimensional (i.e., in an XY plane) and whose thickness (in a Z direction) is relatively small (i.e., 1/10 or less) in comparison to its length (in an X direction) and width (in a Y direction). Non-limiting examples of substrates include a web, layer or layers or fibrous materials, nonwovens, films and foils such as polymeric films or metallic foils. These materials may be used alone or may comprise two or more layers laminated together. As such, a web is a substrate.

The term "nonwoven" refers herein to a material made from continuous (long) filaments (fibers) and/or discontinuous (short) filaments (fibers) by processes such as spunbonding, meltblowing, carding, and the like. Nonwovens do not have a woven or knitted filament pattern.

The term "machine direction" (MD) is used herein to refer to the direction of material flow through a process. In addition, relative placement and movement of material can be described as flowing in the machine direction through a process from upstream in the process to downstream in the process.

The term "cross direction" (CD) is used herein to refer to a direction that is generally perpendicular to the machine direction.

"Pre-strain" refers to the strain imposed on an elastic or elastomeric material prior to combining it with another element of the elastomeric laminate or the absorbent article. Pre-strain is determined by the following equation Pre-strain = ((extended length of the elastic-relaxed length of the elastic)/relaxed length of the elastic)*100.

"Decitex" also known as Dtex is a measurement used in the textile industry used for measuring yarns or filaments. 1 Decitex = 1 gram per 10,000 meters. In other words, if 10,000 linear meters of a yarn or filament weights 500 grams that yarn or filament would have a decitex of 500.

The term "taped diaper" (also referred to as "open diaper") refers to disposable absorbent articles having an initial front waist region and an initial back waist region that are not fastened, pre-fastened, or connected to each other as packaged, prior to being applied to the wearer. A taped diaper may be folded about the lateral centerline with the interior of one waist region in surface to surface contact with the interior of the opposing waist region without fastening or joining the waist regions together. Example taped diapers are disclosed in various suitable configurations U.S. Patent Nos. 5,167,897, 5,360,420, 5,599,335, 5,643,588, 5,674,216, 5,702,551, 5,968,025, 6,107,537, 6,118,041, 6,153,209, 6,410,129, 6,426,444, 6,586,652, 6,627,787, 6,617,016, 6,825,393, and 6,861,571; and U.S. Patent Publication Nos. 2013/0072887 A1; 2013/0211356 A1; and 2013/0306226 A1, all of which are incorporated by reference herein.

The term "pant" (also referred to as "training pant", "pre-closed diaper", "diaper pant", "pant diaper", and "pull-on diaper") refers herein to disposable absorbent articles having a continuous perimeter waist opening and continuous perimeter leg openings designed for infant or adult wearers. A pant can be configured with a continuous or closed waist opening and at least one continuous, closed, leg opening prior to the article being applied to the wearer. A pant can be preformed or pre-fastened by various techniques including, but not limited to, joining together portions of the article using any refastenable and/or permanent closure member (e.g., seams, heat bonds, pressure welds, adhesives, cohesive bonds, mechanical fasteners, etc.). A pant can be preformed anywhere along the circumference of the article in the waist region (e.g., side fastened or seamed, front waist fastened or seamed, back waist fastened or seamed). Example diaper pants in various configurations are disclosed in U.S. Patent Nos. 4,940,464; 5,092,861; 5,246,433; 5,569,234; 5,897,545; 5,957,908; 6,120,487; 6,120,489; 7,569,039 and U.S. Patent Publication Nos. 2003/0233082 A1; 2005/0107764 A1, 2012/0061016 A1, 2012/0061015 A1; 2013/0255861

A1; 2013/0255862 A1; 2013/0255863 A1; 2013/0255864 A1; and 2013/0255865 A1, all of which are incorporated by reference herein.

"Closed-form" means opposing waist regions are joined, as packaged, either permanently or refastenably to form a continuous waist opening and leg openings.

"Open-form" means opposing waist regions are not initially joined to form a continuous waist opening and leg openings but comprise a closure means such as a fastening system to join the waist regions to form the waist and leg openings before or during application to a wearer of the article.

The present disclosure relates to absorbent articles, and more particularly, to absorbent articles having refastenably connected front and back waist regions. In some configurations, an absorbent article may comprise: a chassis comprising a topsheet, a backsheet, and an absorbent core positioned between the topsheet and the backsheet. The chassis may further comprise a first end region and a second end region longitudinally separated from the first end region by a crotch region. The absorbent article may comprise a first belt and a second belt, each belt comprising a garment facing surface and an opposing wearer facing surface and each belt comprising a first end region and a second end region laterally separated from the first end region by a central region. The first end region of the chassis may be connected with the central region of the first belt, and the second end region of the chassis may be connected with the central region of the second belt. The absorbent article may also comprise a first flange and a second flange, each flange comprising a first surface and a second surface opposite the first surface, and each flange comprising a first end region and a second end region. The first surface of the first end region of the first flange is bonded with the wearer facing surface of the first end region of the first belt, and the second surface of the second end region of the first flange is in a facing relationship with the wearer facing surface of the second belt. The second end region of the first flange is refastenably connected with the first end region of the second belt. In addition, the first surface of the first end region of the second flange may be bonded with the wearer facing surface of the second end region of the first belt, and the second surface of the second end region of the second flange is in a facing relationship with the wearer facing surface of the second belt. The second end region of the second flange is refastenably connected with the second end region of the second belt.

Figures 1-3B show an example of an absorbent article 100 in the form of a diaper pant 100P that may include components constructed in accordance with the configurations disclosed herein. In particular, Figure 1 shows a perspective views of a diaper pant 100P in a pre-fastened

configuration. Figure 2A shows a top view of the diaper pant of Figure 1, and Figure 2B shows a top view of the diaper pant of Figure 2A in a compressed state. Figure 3A shows a plan view of the diaper pant 100P with the portion of the diaper that faces away from a wearer oriented toward the viewer, and Figure 3B shows a plan view of the diaper pant 100P with the portion of the diaper that faces toward a wearer oriented toward the viewer. The diaper pant 100P includes a chassis 102 and a ring-like elastic belt 104. As discussed below in more detail, a first elastic belt 106 and a second elastic belt 108 are refastenably connected together to form the ring-like elastic belt 104.

With continued reference to Figures 1-3B, the diaper pant 100P and the chassis 102 each include a first waist region 116, a second waist region 118, and a crotch region 119 disposed intermediate the first and second waist regions. It may also be described that the chassis 102 includes a first end region 116a, a second end region 118a, and a crotch region 119 disposed intermediate the first and second end regions 116a, 118a. The first waist region 116 may be configured as a front waist region, and the second waist region 118 may be configured as back waist region. The diaper 100P may also include a laterally extending front waist edge 121 in the front waist region 116 and a longitudinally opposing and laterally extending back waist edge 122 in the back waist region 118. To provide a frame of reference for the present discussion, the diaper 100P and chassis 102 of Figures 3A and 3B are shown with a longitudinal axis 124 and a lateral axis 126. In some embodiments, the longitudinal axis 124 may extend through the front waist edge 121 and through the back waist edge 122. And the lateral axis 126 may extend through a first longitudinal or right side edge 128 and through a second longitudinal or left side edge 130 of the chassis 102. As previously mentioned, the longitudinal axis 124 extends perpendicularly through the front waist edge 121 and the back waist edge 122, and the lateral axis 126 extends perpendicularly to the longitudinal axis 124. When the diaper pant 100P is worn, the longitudinal direction may extend from the wearer's front waist, through the crotch, to the wearer's back waist.

As shown in Figures 1-3B, the diaper pant 100P may include an inner, body facing surface 132, and an outer, garment facing surface 134. The chassis 102 may include a backsheet 136 and a topsheet 138. The chassis 102 may also include an absorbent assembly 140, including an absorbent core 142, disposed between a portion of the topsheet 138 and the backsheet 136. As discussed in more detail below, the diaper 100P may also include other features, such as leg elastics and/or leg cuffs to enhance the fit around the legs of the wearer.

As shown in Figure 3A, the periphery of the chassis 102 may be defined by the first longitudinal side edge 128, a second longitudinal side edge 130, a first laterally extending end edge 144 disposed in the first waist region 116, and a second laterally extending end edge 146 disposed in the second waist region 118. Both side edges 128 and 130 extend longitudinally between the first end edge 144 and the second end edge 146. As shown in Figure 3A, the laterally extending end edges 144 and 146 may be located longitudinally inward from the laterally extending front waist edge 121 in the front waist region 116 and the laterally extending back waist edge 122 in the back waist region 118. In some configurations, the laterally extending end edges 144 and 146 may be coterminous with or located longitudinally outward from the laterally extending front waist edge 121 in the front waist region 116 and the laterally extending back waist edge 122 in the back waist region 118. When the diaper pant 100P is worn on the lower torso of a wearer, the front waist edge 121 and the back waist edge 122 may encircle a portion of the waist of the wearer. At the same time, the side edges 128 and 130 may encircle at least a portion of the legs of the wearer. And the crotch region 119 may be generally positioned between the legs of the wearer with the absorbent core 142 extending from the front waist region 116 through the crotch region 119 to the back waist region 118.

As previously mentioned, the diaper pant 100P may include a backsheet 136. The backsheet 136 may also define the outer, garment facing surface 134 of the chassis 102. The backsheet 136 may also comprise a woven or nonwoven material, polymeric films such as thermoplastic films of polyethylene or polypropylene, and/or a multi-layer or composite materials comprising a film and a nonwoven material. The backsheet may also comprise an elastomeric film. An example backsheet 136 may be a polyethylene film having a thickness of from about 0.012 mm (0.5 mils) to about 0.051 mm (2.0 mils). Further, the backsheet 136 may permit vapors to escape from the absorbent core (i.e., the backsheet is breathable) while still preventing exudates from passing through the backsheet 136.

Also described above, the diaper pant 100P may include a topsheet 138. The topsheet 138 may also define all or part of the inner, wearer facing surface 132 of the chassis 102. The topsheet 138 may be liquid pervious, permitting liquids (e.g., menses, urine, and/or runny feces) to penetrate through its thickness. A topsheet 138 may be manufactured from a wide range of materials such as woven and nonwoven materials; apertured or hydroformed thermoplastic films; apertured nonwovens, porous foams; reticulated foams; reticulated thermoplastic films; and thermoplastic scrims. Woven and nonwoven materials may comprise natural fibers such as wood or cotton fibers; synthetic fibers such as polyester, polypropylene, or polyethylene fibers; or

combinations thereof. If the topsheet 138 includes fibers, the fibers may be spunbond, carded, wet-laid, meltblown, hydroentangled, or otherwise processed as is known in the art. Topsheets 138 may be selected from high loft nonwoven topsheets, apertured film topsheets and apertured nonwoven topsheets. Exemplary apertured films may include those described in U.S. Patent Nos. 5,628,097; 5,916,661; 6,545,197; and 6,107,539, all of which are incorporated by reference herein.

As mentioned above, the diaper pant 100P may also include an absorbent assembly 140 that is joined to the chassis 102. As shown in Figure 3A, the absorbent assembly 140 may have a laterally extending front edge 148 in the front waist region 116 and may have a longitudinally opposing and laterally extending back edge 150 in the back waist region 118. The absorbent assembly may have a longitudinally extending right side edge 152 and may have a laterally opposing and longitudinally extending left side edge 154, both absorbent assembly side edges 152 and 154 may extend longitudinally between the front edge 148 and the back edge 150. The absorbent assembly 140 may additionally include one or more absorbent cores 142 or absorbent core layers. The absorbent core 142 may be at least partially disposed between the topsheet 138 and the backsheet 136 and may be formed in various sizes and shapes that are compatible with the diaper. Exemplary absorbent structures for use as the absorbent core of the present disclosure are described in U.S. Patent Nos. 4,610,678; 4,673,402; 4,888,231; and 4,834,735, all of which are incorporated by reference herein.

Some absorbent core embodiments may comprise fluid storage cores that contain reduced amounts of cellulosic airfelt material. For instance, such cores may comprise less than about 40%, 30%, 20%, 10%, 5%, or even 1% of cellulosic airfelt material. Such a core may comprise primarily absorbent gelling material in amounts of at least about 60%, 70%, 80%, 85%, 90%, 95%, or even about 100%, where the remainder of the core comprises a microfiber glue (if applicable). Such cores, microfiber glues, and absorbent gelling materials are described in U.S. Patent Nos. 5,599,335; 5,562,646; 5,669,894; and 6,790,798 as well as U.S. Patent Publication Nos. 2004/0158212 A1 and 2004/0097895 A1, all of which are incorporated by reference herein.

As previously mentioned, the diaper 100P may also include elasticized leg cuffs 156. It is to be appreciated that the leg cuffs 156 can be and are sometimes also referred to as leg bands, side flaps, barrier cuffs, elastic cuffs or gasketing cuffs. The elasticized leg cuffs 156 may be configured in various ways to help reduce the leakage of body exudates in the leg regions. Example leg cuffs 156 may include those described in U.S. Patent Nos. 3,860,003; 4,909,803;

4,695,278; 4,795,454; 4,704,115; 4,909,803; and U.S. Patent Publication No. 2009/0312730 A1, all of which are incorporated by reference herein.

As mentioned above, diaper pants may be manufactured with a ring-like elastic belt 104 and provided to consumers in a configuration wherein the front waist region 116 and the back waist region 118 are connected to each other as packaged, prior to being applied to the wearer. As such, diaper pants may have a continuous perimeter waist opening 110 and continuous perimeter leg openings 112 such as shown in Figure 1. The ring-like elastic belt may be formed by joining a first elastic belt to a second elastic belt with an openable and reclosable fastening system disposed at or adjacent the laterally opposing sides of the belts.

As previously mentioned, the ring-like elastic belt 104 may be defined by a first elastic belt 106 connected with a second elastic belt 108. As shown in Figures 3A and 3B, the first elastic belt 106 extends between a first longitudinal side edge 111a and a second longitudinal side edge 111b and defines first and second opposing end regions 106a, 106b and a central region 106c. And the second elastic 108 belt extends between a first longitudinal side edge 113a and a second longitudinal side edge 113b and defines first and second opposing end regions 108a, 108b and a central region 108c. As measured in an extended state, the distance between the first longitudinal side edge 111a and the second longitudinal side edge 111b defines the pitch length, PL, of the first elastic belt 106, and the distance between the first longitudinal side edge 113a and the second longitudinal side edge 113b defines the pitch length, PL, of the second elastic belt 108. The central region 106c of the first elastic belt is connected with the first waist region 116 or first end region 116a of the chassis 102, and the central region 108c of the second elastic belt 108 is connected with the second waist region 118 or second end region 118a of the chassis 102.

As shown in Figures 1-2B, flanges 300 bonded with opposing end regions of the first belt 106 are refastenably connected with opposing end regions of the second belt 108 to define the ring-like elastic belt 104 as well as the waist opening 110 and leg openings 112. For example, a first flange 300a may be bonded with the first end region 106a of the first belt 106 at a first flange seam 302a, and a second flange 300b may be bonded with the second end region 106b of the first belt 106 at a second flange seam 302b. In turn, the first flange 300a may be refastenably connected with the first end region 108a of the second belt 108, and the second flange 300b may be refastenably connected with the second end region 108b of the second belt 108. For example, as shown in Figures 1-2B, a first fastener component 304a on the first flange 300a may refastenably connect the first flange 300a with the second belt 108, and a second fastener component 304b on the second flange 300b may refastenably connect the second flange 300b

with the second belt 108. In the configurations shown in Figures 2A and 2B, the fastener components 304 may be adapted to refastenably connect directly with the second belt 108. It is to be appreciated that various configurations of fastener components 304 may be located on the flanges 300, the first belt 106, and/or the second belt 108, as discussed in more detail below. It is also to be appreciated that in some configurations, flanges 300 may be bonded with the opposing end regions of the second belt 108 and may be adapted to refastenably connect with opposing end regions of the first belt 106. It is further to be appreciated that the first belt may be positioned in a front waist region or a back waist region, and the second belt may be positioned in a front waist region or a back waist region.

It is also to be appreciated that the fastener components 304 may be configured in various ways, such as hooks, loops, and/or adhesive. For example, the fastener components 304 may comprise hook elements or adhesive adapted to refastenably connect with another surface of the diaper pant 100P. In some configurations, the fastener component 304 may comprise loop elements adapted to refastenably connect with a hook surface on the diaper pant 100P. The fastener component 304 may be a separate element connected with the first bel 106, the second belt 108, and/or the flange 300 in various ways, such as mechanical bonding, adhesive bonding, or both. In some configurations, the fastener component 304 may be integrally formed from materials of the first bel 106, the second belt 108, and/or the flange 300. In some configurations, the flange 300 and/or fastener component 304 may be printed and/or comprise materials of various different colors to help enhance visibility from outside the diaper pant 100P.

It is to be appreciated that the flanges 300 may be constructed from various types of materials, such as plastic films; apertured plastic films; woven or nonwoven webs of natural materials (e.g., wood or cotton fibers), synthetic fibers (e.g., polyolefins, polyamides, polyester, polyethylene, or polypropylene fibers) or a combination of natural and/or synthetic fibers; or coated woven or nonwoven webs. In some configurations, the flanges 300 may comprise various types of nonwovens, such as spunbond, carded, wet-laid, meltblown, hydroentangled. The flanges 300 may be configured to be stretchable or non-stretchable and/or hydrophilic or hydrophobic. In some configurations, the flanges 300 may be configured as a single layer of material or a laminate comprising two or more layers of material.

It is also to be appreciated that various types of bonds 306 such as illustrated in Figures 2A and 2B may be used to bond the flanges 300 with the first belt 106 at the flange seams 302. For example, the bonds 306 at the flange seams 302 may comprise mechanical, thermal, pressure, and/or adhesive bonds.

In some configurations, the bonds 306 may comprise a bond structure 903 that comprises substantially tackifier free adhesives or tackifier free adhesives, such as discussed in U.S. Patent Application No. 63/540,448, which is incorporated herein by reference. The term "tackifier free adhesive" is used herein to refer to an adhesive composition comprising a polymer and/or a copolymer, wherein the adhesive composition if free of or devoid of tackifiers. Examples of such tackifier free adhesives are disclosed in U.S. Patent Publication Nos. 2019/0322900 A1; 2019/0322901 A1; 2019/0322909 A1; 2019/0321241 A1; 2019/0321242 A1; 2020 0047420 A1; and 2020/0108167 A1, all of which are incorporated by reference herein. "Devoid of," "free of," and the like, as those terms are used herein, means that the adhesive composition does not have more than trace amounts of background levels of a given material, ingredient, or characteristic following these qualifiers; the amount of the material or ingredient does not cause harm or irritation that consumers typically associate with the material or ingredient; or the material or ingredient was not added to the adhesive composition intentionally. In some applications, "devoid of" and "free of" can mean there is no measurable amount of the material or ingredient. For example, the adhesive composition in some forms can contain no measurable amount of a tackifier. "Substantially tackifier free adhesive" is used herein to refer to an adhesive composition comprising a polymer and/or a copolymer, wherein the adhesive composition comprises less than 10% tackifiers by weight. As such, a "tackifier free adhesive" is also a "substantially tackifier free adhesive." The term "tackifier" means those conventional tackifier resins commonly available in the adhesive art and industry that are used in typical hot melt adhesives. Examples of conventional tackifier resins include aliphatic hydrocarbon resins, aromatic modified aliphatic hydrocarbon resins, hydrogenated poly-cyclopentadiene resins, poly-cyclopentadiene resins, gum rosins, gum rosin esters, wood rosins, wood rosin esters, tall oil rosins, tall oil rosin esters, poly-terpene, aromatic modified poly-terpene, terpene-phenolic, aromatic modified hydrogenated poly-cyclopentadiene resins, hydrogenated aliphatic resins, hydrogenated aliphatic aromatic resins, hydrogenated terpene and modified terpene, and hydrogenated rosin esters.

When the flange 300 and the first belt 106 include nonwoven layers, penetration of the substantially tackifier free adhesive into the nonwovens may cause the tackifier free adhesive to intermesh with and bond with fibers within the nonwovens to help strengthen bonds therebetween. Figure 2D illustrates an example of a bond 306 comprising a bond structure 903 that comprises a substantially tackifier free adhesive 900 between a first substrate 800 of the flange 300 a second substrate 802 of the first belt 106. In particular, Figure 2D shows an example

of a detailed sectional view of a layer 901 of substantially tackifier free adhesive 900 after pressure has been exerted on the first and second substrates 800, 802 to form the bond structure 903 between the first and second substrates 800, 802. As shown in Figure 2D, the bond 903 comprises a first portion 901a of the layer 901 of substantially tackifier free adhesive 900 that has penetrated into the first substrate 800, and a second portion 901b of the layer 901 of substantially tackifier free adhesive 900 that has penetrated into the second substrate 802. In particular, the first portion 901a of the layer 901 substantially tackifier free adhesive 900 has penetrated through a second surface 808 of first substrate 800 without reaching or exiting a first surface 806 of the first substrate 800. And the second portion 901b of the layer 901 of the substantially tackifier free adhesive 900 has penetrated through a first surface 812 of the second substrate 802 without reaching or exiting a second surface 814 of the second substrate 802. As such, the first portion 901a of the layer 901 of the substantially tackifier free adhesive 900 does not penetrate entirely through the thickness of the first substrate 800, and the second portion 901b of the layer 901 of the substantially tackifier free adhesive 900 does not penetrate entirely through the thickness of the second substrate 802. With continued reference to Figure 2D, the bond 903 also comprises a central portion 901c of the layer 901, wherein the layer 901 of the substantially tackifier free adhesive 900 comprises a central portion 901c extends between the first portion 901a and the second portion 901b. As illustrated, the second surface 808 of the first substrate 800 and the first surface 812 of the second substrate 802 are separated from each other by the central portion 901c of the layer 901 of the substantially tackifier free adhesive 900.

As previously mentioned, the first substrate 800 may comprise a first nonwoven 800' and/or the second substrate 802 may comprise a second nonwoven 802' such as shown in Figure 2E, wherein the portions of the bond 903 comprises the substantially tackifier free adhesive 900 that is intermeshed with fibers of the first nonwoven 800' and the second nonwoven 802'. As shown in Figure 2E, the first nonwoven 800' may comprise first fibers 820, and the second nonwoven comprises second fibers 822. The first portion 901a of the layer 901 of substantially tackifier free adhesive 900 is intermeshed with the first fibers 820 at the second surface 808 of the first nonwoven 800', and the second portion 901b of the layer 901 of the substantially tackifier free adhesive 900 is intermeshed with the second fibers 822 at first surface 812 of the second nonwoven 802'. As shown in Figure 2E, one or more first fibers 820 at and/or adjacent the second surface 808 of the first nonwoven 800' may comprise an outer perimeter 821 that is completely surrounded by the substantially tackifier free adhesive 900 of the first zone 901a of the layer 901. And one or more second fibers 822 at and/or adjacent the first surface 812 of the

second nonwoven 802' may comprise an outer perimeter 823 that is completely surrounded by the substantially tackifier free adhesive 900 of the second zone 901b of the layer 901. It is to be appreciated that the substantially tackifier free adhesive 900 may completely surround the outer perimeters 821 of additional first fibers 820 positioned away from the second surface 808 and further into the interior thickness of the first nonwoven 800', and/or the substantially tackifier free adhesive 900 may completely surround the outer perimeters 823 of additional second fibers 822 positioned away from the first surface 812 and further into the interior thickness of the second nonwoven 802'. It is to be appreciated that the substantially tackifier free adhesive 900 may partially surround the outer perimeters 821 of additional first fibers 820 positioned away from the second surface 808 and further into the interior thickness of the first nonwoven 800', and/or the substantially tackifier free adhesive 900 may partially surround outer perimeters 823 of additional second fibers 822 positioned away from the first surface 812 and further into the interior thickness of the second nonwoven 802'. For additional perspective, Figure 2F shows a scanning electron microscope ("SEM") photograph of a cross sectional view of an example bond 903 comprising a layer 901 of substantially tackifier free adhesive 900 between a first nonwoven 800' and a second nonwoven 802'.

With continued reference to Figure 2E, the first fibers 820 may comprise first diameters D1, and the second fibers 822 may comprise second diameters D2. The first diameters D1 may be the same or different than the second diameters D1. It is to be appreciated that the central portion 901c of the layer 901 of substantially tackifier free adhesive 900 may comprise a thickness Tc. In some configurations, the thickness Tc is greater than the first diameters D1 and/or the second diameters D2. In some configurations, the thickness Tc may be greater than 3 times the first diameters D1 and/or 3 times the second diameters D2.

As discussed above, bond structures between two nonwoven substrates comprising substantially tackifier free adhesive 900 may be made with compressive pressures so as to avoid penetration of the substantially tackifier free adhesive 900 completely through the nonwovens. It is to be appreciated that control of process conditions and material variables such as compressive forces and properties of the substantially tackifier free adhesive, for example, temperature and basis weight, may need to be taken into consideration and/or controlled when creating such bond structures.

In some configurations, substrates comprising barrier properties may be used when creating bonds. Such barrier properties may help reduce the need to precisely control process conditions and material properties when creating bond structures while avoiding penetration

completely through the nonwovens. Some nonwovens may be configured with meltblown layers that provide such barrier properties. For example, some nonwoven fabric webs may comprise spunbond, meltblown, spunbond ("SMS") webs comprising outer layers of spunbond thermoplastics (e.g., polyolefins) and an interior layer of meltblown thermoplastics. Such SMS nonwoven fabric webs may comprise spunbond layers which are durable and an internal meltblown layer which is porous but which may inhibit fast strikethrough of fluids, such as bodily fluids, for example, or the penetration of bacteria through the fabric webs. In some configurations, the meltblown layer may have a fiber size and a porosity that assures breathability of the nonwoven fabric web while at the same time inhibiting the strikethrough of fluids. In some configurations, a nonwoven component layer may comprise fine fibers ("N-fibers") with an average diameter of less than 1 micron (an "N-fiber layer") that may be added to, or otherwise incorporated with, other nonwoven component layers to form a nonwoven web of material. For example, the N-fiber layer may be used to produce a SNS nonwoven web or a SMNS nonwoven web. As such, nonwoven web materials may be an SMS material, comprising a spunbonded, a melt-blown and a further spunbonded stratum or layer or any other combination of spunbonded and melt-blown layers, such as a SMMS or SSMMS. Some examples may include one or more layers of fibers with diameters below 1 micron (nanofibers and nanofiber layers); examples of these rise in combinations of SMS, SMNS, SSMNS or SMNMS nonwoven webs (where "N" designates a nanofiber layer). Various examples of nonwovens, fiber compositions, formations of fibers, and nonwovens and related methods are described in U.S. Patent Nos. 6,645,569; 6,863,933; 7,112,621; and 8,728,051, which are incorporated by reference herein.

Figure 2G illustrates a bond structure formed wherein the first substrate 800 comprises a first nonwoven 800' and/or the second substrate 802 comprises a second nonwoven 802', wherein the first nonwoven 800' comprises a first meltblown layer 824, such as discussed above. As such, the first nonwoven 800' may comprise a layered structure wherein the first meltblown layer 824 is sandwiched between layers of first fibers 820. Portions of the bond 903 comprise the substantially tackifier free adhesive 900 that is intermeshed with first fibers 820 of the first nonwoven 800' and the second fibers 822 of the second nonwoven 802'. The first portion 901a of the layer 901 of substantially tackifier free adhesive 900 is intermeshed with the first fibers 820 between the second surface 808 of the first nonwoven 800' and the first meltblown layer 824, and the second portion 901b of the layer 901 of the substantially tackifier free adhesive 900 is intermeshed with the second fibers 822 at first surface 812 of the second nonwoven 802'. As discussed above, one or more first fibers 820 at and/or adjacent the second surface 808 of the first

nonwoven 800' may comprise an outer perimeter 821 that is completely surrounded by the substantially tackifier free adhesive 900 of the first zone 901a of the layer 901. And one or more second fibers 822 at and/or adjacent the first surface 812 of the second nonwoven 802' may comprise an outer perimeter 823 that is completely surrounded by the substantially tackifier free adhesive 900 of the second zone 901b of the layer 901. As shown in Figure 2G, the first portion 901a of the layer 901 of substantially tackifier free adhesive 900 may penetrate into the first nonwoven 800' up to the first meltblown layer 824. In turn, the first meltblown layer 824 may act as a barrier to help prevent the substantially tackifier free adhesive 900 from penetrating completely through the first nonwoven 800'.

Figure 2H illustrates another example bond structure formed wherein the first substrate 800 comprises a first nonwoven 800' and/or the second substrate 802 comprises a second nonwoven 802', wherein the first nonwoven 800' comprises a first meltblown layer 824 and wherein the second nonwoven 802' comprises a second meltblown layer 826. As such, the first nonwoven 800' may comprise a layered structure wherein the first meltblown layer 824 is sandwiched between layers of first fibers 820, and the second nonwoven 802' may comprise a layered structure wherein the second meltblown layer 822 is sandwiched between layers of second fibers 822. The first portion 901a of the layer 901 of substantially tackifier free adhesive 900 is intermeshed with the first fibers 820 between the second surface 808 of the first nonwoven 800' and the first meltblown layer 824, and the second portion 901b of the layer 901 of the substantially tackifier free adhesive 900 is intermeshed with the second fibers 822 between first surface 812 of the second nonwoven 802' and the second meltblown layer 826. As shown in Figure 2H, the first portion 901a of the layer 901 of substantially tackifier free adhesive 900 may penetrate into the first nonwoven 800' up to the first meltblown layer 824, and the second portion 901b of the layer 901 of substantially tackifier free adhesive 900 may penetrate into the second nonwoven 802' up to the second meltblown layer 826. In turn, the first meltblown layer 824 and the second meltblown layer 826 may act as barriers to help prevent the substantially tackifier free adhesive 900 from penetrating completely through the first nonwoven 800' and the second nonwoven 802'.

As such, having a nonwoven with a meltblown layer, such as the various web constructions discussed above, may help ensure that sufficient amounts of substantially tackifier free adhesive 900 and higher compression may be used to form a bond structure while helping to reduce the risk of the substantially tackifier free adhesive 900 penetrating completely through the

nonwovens. It is also to be appreciated that other type of web constructions may be utilized to help achieve similar results, such as laminate structures comprising films, topical coatings, etc.

Referring now to Figures 3A and 3B, the first elastic belt 106 also defines an outer laterally extending edge 107a and an inner laterally extending edge 107b, and the second elastic belt 108 defines an outer laterally extending edge 109a and an inner laterally extending edge 109b. The outer edge 107a of the first belt 106 is positioned longitudinally outward of the inner edge 107b, and the outer edge 109a of the second belt 108 is positioned longitudinally outward of the inner edge 109b. As such, as shown in Figure 1, a perimeter edge 112a of one leg opening may be defined by portions of the inner laterally extending edge 107b of the first elastic belt 106, the inner laterally extending edge 109b of the second elastic belt 108, and the first longitudinal or right side edge 128 of the chassis 102. And a perimeter edge 112b of the other leg opening may be defined by portions of the inner laterally extending edge 107b, the inner laterally extending edge 109b, and the second longitudinal or left side edge 130 of the chassis 102. The outer laterally extending edges 107a, 109a may also define the front waist edge 121 and the laterally extending back waist edge 122 of the diaper pant 100P.

It is to be appreciated that the first elastic belt 106 and the second elastic belt 108 may define different sizes and shapes. In some configurations, the first elastic belt 106 and/or second elastic belt 108 may define curved contours. For example, the inner lateral edges 107b, 109b of the first and/or second elastic belts 106, 108 may include non-linear or curved portions in the first and second opposing end regions. Such curved contours may help define desired shapes to leg opening 112, such as for example, relatively rounded leg openings. In addition to having curved contours, the elastic belts 106, 108 may include elastic strands 168 that extend along non-linear or curved paths that may correspond with the curved contours of the inner lateral edges 107b, 109b.

Figure 3D shows a configuration wherein the first elastic belt 106 and the second elastic belt 108 both define generally rectangular shapes. For example, as shown in Figure 3D, the outer laterally extending edge 107a of the first elastic belt 106 may comprise a lateral width of W1D and the inner laterally extending edge 107b may comprise a lateral width of W1P, wherein W1D and W1P are equal or substantially equal. In addition, the outer laterally extending edge 109a of the second elastic belt 108 may comprise a lateral width of W2D and the inner laterally extending edge 109b may comprise a lateral width of W2P, wherein W2D and W2P are equal or substantially equal.

In some configurations, at least one of the first elastic belt 106 and the second elastic belt 108 may comprise lateral edges having different lengths. For example, Figure 3E shows a configuration wherein the first elastic belt 106 defines a generally rectangular shape, such as described with reference to Figure 3D, and wherein the outer laterally extending edge 109a of the second elastic belt 108 and the inner laterally extending edge 109b have different lengths. As shown in Figure 3E, the outer laterally extending edge 109a of the second elastic belt 108 may comprise a lateral width of W2D and the inner laterally extending edge 109b may comprise a lateral width of W2P, wherein W2D is greater than W2P.

In some configurations, both the first elastic belt 106 and the second elastic belt 108 may comprise lateral edges having different lengths. For example, Figure 3F shows a configuration wherein the outer laterally extending edge 107a of the first elastic belt 106 and the inner laterally extending edge 107b have different lengths, and wherein the outer laterally extending edge 109a of the second elastic belt 108 and the inner laterally extending edge 109b have different lengths. As shown in Figure 3F, the outer laterally extending edge 107a of the first elastic belt 107 may comprise a lateral width of W1D and the inner laterally extending edge 107b may comprise a lateral width of W1P, wherein W1D is greater than W1P, and wherein the outer laterally extending edge 109a of the second elastic belt 108 may comprise a lateral width of W2D and the inner laterally extending edge 109b may comprise a lateral width of W2P, wherein W2D is greater than W2P.

With reference to Figures 3D-3F, the first elastic belt 106 may define a longitudinal length LT1 extending between outer laterally extending edge 107a and the inner laterally extending edge 107b, and the second elastic belt 108 may define a longitudinal length LT2 extending between outer laterally extending edge 109a and the inner laterally extending edge 109b. In some configurations, LT1 may be equal to LT2. In some configurations, LT1 may be less or greater than LT2. With continued reference to Figures 3D-3F, in some configurations, W1D may be equal to W1P, or W1D may be different than W1P. In some configurations, W2D may be equal to W2P, or W2D may be different than W2P. In some configurations, W1D and/or W1P may be equal to or different W2D and/or W2P.

With reference to Figures 3A, 3B, and 4, the first elastic belt 106 and the second elastic belt 108 may also each include a first substrate 162 and a second substrate 164. The first substrates 162 may be oriented to define at least a portion of a garment facing surface 115a of the first elastic belt 106 and a garment facing surface 117a of the second elastic belt 108, and the second substrates 164 may be oriented to define at least a portion of a wearer facing surface 115b

of the first elastic belt 106 and a wearer facing surface 117b of the second elastic belt 108. The first substrate 162 may extend from a proximal edge 162b to a distal edge 162a for a maximum length L1, and the second substrate 164 may extend from a proximal edge 164b to a distal edge 164a for a maximum length L2. It is to be appreciated that the distal edge 162a and/or the proximal edge 162b of the first substrate 162 may be straight and/or curved and/or may be parallel or unparallel to each other. It is also to be appreciated that the distal edge 164a and/or the proximal edge 164b of the second substrate 164 may be straight and/or curved and/or may be parallel or unparallel to each other. As such, the maximum length L1 refers to the longest distance extending longitudinally between the distal edge 162a and the proximal edge 162b of the first substrate 162, and the maximum length L2 refers to the longest distance extending longitudinally between the distal edge 164a and the proximal edge 164b of the second substrate 164. In some configurations, L1 may be equal to, less than, or greater than L2. In some configurations, L1 may be equal to or less than LT1, and L2 may be equal to or less than LT2. In some configurations, the distal edge 162a of the first substrate 162 may define at least a portion of the front waist edge 121 and/or at least a portion of back waist edge 122, and/or the distal edge 164a of the second substrate 164 may define at least a portion of the front waist edge 121 and/or at least a portion of back waist edge 122. As such, in some configurations, the distal edge 162a of the first substrate 162 and/or the distal edge 164a of the second substrate 164 may define at least a portion of the waist opening 110.

It is to be appreciated that the first substrate 162 and the second substrate 164 may define various lateral widths that may or may not be equal. For example, as shown in Figure 3B, the first substrate 162 may extend laterally between a first longitudinal edge 162e and a second longitudinal edge 162f to define a first lateral width W1, and the second substrate 164 may extend laterally between a first longitudinal edge 164e and a second longitudinal edge 164f to define a second lateral width W2.

In some configurations, the proximal edge 162b of the first substrate 162 and/or the proximal edge 164b of the second substrate 164 may extend laterally across the backsheet 136. As shown in Figures 3A, 3B, and 4, the first substrate 162 includes a garment facing surface 162c and an opposing wearer facing surface 162d, and the second substrate 164 includes a garment facing surface 164c and an opposing wearer facing surface 164d.

In some configurations, the first elastic belt 106 and/or the second elastic belt 108 may include a folded portion of at least the first substrate 162 and/or the second substrate 164. For example, as shown in Figures 4A and 4B, the first elastic belt 106 and/or the second elastic belt

108 may include a folded portion 162g of the first substrate 162 extending longitudinally between a fold line 162h in the first substrate 162 and a lateral edge 162i. As such, the folded portion 162g of the first substrate 162 may be connected with the wearer facing surface 164d of the second substrate 164. In some configurations, the folded portion 162g of the first substrate 162 may also be connected with and/or overlap the chassis 102. In some configurations, the folded portion 162g of the first substrate 162 may also be connected with the wearer facing surface 162d of the first substrate 162. In some configurations, a portion of the folded portion 162g of the first substrate 162 may be left unbonded to the chassis 102 and/or the second substrate 164, forming a pocket having an opening oriented toward the lateral centerline 162c of the chassis 102. In another example, the first elastic belt 106 and/or the second elastic belt 108 may include a folded portion of the second substrate 164 extending longitudinally between a fold line in the second substrate 164 and a lateral edge. As such, the folded portion of the second substrate 164 may be connected with the garment facing surface 162c of the first substrate 162. As such, in some configurations, a fold line of the first substrate 162 and/or a fold line of the second substrate 164 may define at least a portion of the waist opening 110. It is to be appreciated that various waist configurations may be utilized. For example, as shown in Figure 4A1, the folded portion 162g may be sandwiched between the second substrate 164 and the backsheet 136. In another example shown in Figure 4A2, the second substrate 164 may be sandwiched between the folded portion 162g and the backsheet 136. Although Figures 4A1 and 4A2 show configurations of the first belt 106, it is to be appreciated that such configurations may be applied with the second belt 108.

It is to be appreciated that the first elastic belt 106 and the second elastic belt 108 may comprise the same materials and/or may have the same structure. In some embodiments, the first elastic belt 106 and the second elastic belt may comprise different materials and/or may have different structures. It should also be appreciated that components of the first elastic belt 106 and the second elastic belt 108, such as the first substrate 162, and/or second substrate 164 may be constructed from various materials. For example, the first and/or second belts may include a first substrate 162, and/or second substrate 164 that may be manufactured from materials such as plastic films; apertured plastic films; woven or nonwoven webs of natural materials (e.g., wood or cotton fibers), synthetic fibers (e.g., polyolefins, polyamides, polyester, polyethylene, or polypropylene fibers) or a combination of natural and/or synthetic fibers; or coated woven or nonwoven webs. In some configurations, the first and/or second belts may include a first substrate 162, and/or second substrate 164 comprising a nonwoven web of synthetic fibers, and

may include a stretchable nonwoven. In some configurations, the first and second elastic belts may include an inner hydrophobic, non-stretchable nonwoven material and an outer hydrophobic, non-stretchable nonwoven material. It is to be appreciated that the belts may configured in various ways, such as disclosed for example, in U.S. Patent Publication No. 2022/0142828 A1, which is incorporated by reference.

Elastic material 167 may be positioned between the wearer facing surface 162d of the first substrate 162 and the garment facing surface 164c of the second substrate 164. It is to be appreciated that the elastic material 167 may include one or more elastic elements such as strands, ribbons, elastic films, or panels extending along the lengths of the elastic belts. As shown in Figures 3C and 4, the elastic material 167 may include a plurality of elastic strands 168. In some configurations, the elastic material 167 may be an elastic film used to form a zero-strain elastic laminate comprising an elastic film bonded to one or more nonwoven layers and subsequently subjected to mechanical deformation or activation sufficient to weaken the nonwoven layer(s) and enable the laminate to stretch and recover elastically.

It is also to be appreciated that the first substrate 162, second substrate 164, and/or elastic material 167 of the first elastic belt 106 and/or second elastic belt 108 may be bonded together and/or with other components, such as the chassis 102, with adhesive and/or mechanical bonds. It is to be appreciated that adhesive and mechanical bonding methods may be utilized alone or in combination with each other.

In some configurations, adhesive may be applied to at least one of the first substrate 162, second substrate 164, and/or elastic material 167 when being combined to form the first elastic belt 106 and/or second elastic belt 108. In some configurations, mechanical bonding devices may apply mechanical bonds to the to at least one of the first substrate 162, second substrate 164, and/or elastic material 167 when being combined to form the first elastic belt 106 and/or second elastic belt 108. Such mechanical bonds may be applied with heat, pressure, and/or ultrasonic devices. In some configurations, mechanical bonding devices may apply bonds that bond the first substrate 162, second substrate 164, and/or elastic material 167 together and/or may act to trap or immobilize discrete lengths of the contracted elastic strands in the first elastic belt 106 and/or second elastic belt 108.

It is to be appreciated that components of the first elastic belt 106 and/or the second elastic belt 108 may be assembled in various ways and various combinations to create various desirable features that may differ along the lateral width and/or longitudinal length of the first elastic belt 106 and/or the second elastic belt 108. Such features may include, for example, Dtex

values, bond patterns, aperture arrangements, elastic positioning, Average Dtex values, Average Pre-Strain values, rugosity frequencies, rugosity wavelengths, height values, and/or contact area. It is to be appreciated that differing features may be imparted to various components, such as for example, the first substrate 162, second substrate 164, and elastic material 167 before and/or during stages of assembly of the first elastic belt 106 and/or the second elastic belt 108.

It is to be appreciated that the first elastic belt 106 and/or the second elastic belt 108 may include various configurations of belt elastic materials 167 arranged in relation to each other and to the first substrate 162, and the second substrate 164. As discussed above, the elastic material 167 may include configurations of one or more elastic elements such as strands, ribbons, films, or panels positioned in various arrangements. In some configurations, the elastic material 167 may comprise various elastics, elastic features and arrangements, and processes for assembly, such as described in 2018/0168889 A1; 2018/0168874 A1; 2018/0168875 A1; 2018/0168890 A1; 2018/0168887 A1; 2018/0168892 A1; 2018/0168876 A1; 2018/0168891 A1; 2019/0298586 A1; 2019/0070042 A1; 2018/0168878 A1; 2018/0168877 A1; 2018/0168880 A1; 2018/0170027 A1; 2018/0169964 A1; 2018/0168879 A1; 2018/0170026 A1; 2019/0070041 A1; 20210282979 A1; and 2021/0275362 A1, which are all incorporated by reference. It is also to be appreciated the elastic materials 167 herein may be configured with identical or different colors in various different locations on the first elastic belt 106 and/or the second elastic belt 108.

In some configurations, the elastic material 167 may be configured as elastic strands 168 disposed at a constant interval in the longitudinal direction. In other embodiments, the elastic strands 168 may be disposed at different intervals in the longitudinal direction. In some configurations, the Dtex values of the elastic strands 168 may be constant or varied along the longitudinal direction. In some configurations, the elastic material 167 in a stretched condition may be interposed and joined between uncontracted substrate layers. When the elastic material 167 is relaxed, the elastic material 167 returns to an unstretched condition and contracts the substrate layers. The elastic material 167 may provide a desired variation of contraction force in the area of the ring-like elastic belt. It is to be appreciated that the chassis 102 and elastic belts 106, 108 may be configured in different ways other than as depicted in attached Figures. It is also to be appreciated that the elastic material 167 material may be joined to the substrates continuously or intermittently along the interface between the elastic material 167 material and the substrates. In some configurations, the elastic strands 168 may be in the form of extruded elastic strands, which may also be bonded with the first substrate 162 and/or second substrate 164

in a pre-corrugated configuration, such as disclosed for example in U.S. Patent No. 5,681,302, which is incorporated by reference herein.

As discussed above for example with reference to Figures 3C and 4, the elastic material 167 discussed herein may be in the form of elastic strands 168. In some configurations, the elastic strands 168 may be parallel with each other and/or with the lateral axis 126. It is to be appreciated that the first elastic belt 106 and/or second elastic belt 108 may be configured to include various quantities of elastic strands 168. In some configurations, elastic strands 168 may be grouped in pairs. In some configurations, the first elastic belt 106 and/or second elastic belt 108 may comprise from about 10 to about 1500 elastic strands 168. It is also to be appreciated that elastic strands 168 herein may comprise various Dtex values, strand spacing values, and pre-strain values and such elastic strands 168 may utilized with other elastic strands to create first and second elastic belts 106, 108 comprising elastic strands 168 in various combinations of Dtex values, strand spacing values, and pre-strain values. For example, in some configurations, the Average-Dtex of one or more elastic strands 168 may be greater than 500. In some configurations, the Average-Dtex of one or more elastic strands 168 may be from about 10 to about 1500, specifically reciting all 1 Dtex increments within the above-recited range and all ranges formed therein or thereby. In some configurations, a plurality of elastic strands 168 may comprise an Average-Strand-Spacing of less than or equal to 4 mm. In some configurations, a plurality of elastic strands 168 may comprise an Average-Strand-Spacing from about 0.25 mm to about 4 mm, specifically reciting all 0.01 mm increments within the above-recited range and all ranges formed therein or thereby. In some configurations, a plurality of elastic strands 168 may comprise an Average-Strand-Spacing of greater than 4 mm. In some configurations, the Average-Pre-Strain of each of a plurality of elastic strands may be from about 50% to about 400%, specifically reciting all 1% increments within the above-recited range and all ranges formed therein or thereby. In some configurations, the elastic strands 168 comprise an Average-Strand-Spacing from about 0.25 mm to about 4 mm and an Average-Dtex from about 10 to about 500. In some configurations, the elastic strands 168 may comprise an Average-Pre-Strain from about 75% to about 300%.

In some configurations, a first plurality of elastic strands may comprise a first Average-Pre-Strain from about 75% to about 300%, and a second plurality of elastic strands may comprise a second Average-Pre-Strain that is greater than first Average-Pre-Strain. In some configurations, a first plurality of elastic strands comprises an Average-Strand-Spacing from about 0.25 mm to about 4 mm and an Average-Dtex from about 10 to about 500; and a second plurality of elastic

strands may comprise an Average-Strand-Spacing greater than about 4 mm and an Average-Dtex greater than about 450.

In some configurations, such as shown in Figure 3C, the elastic strands 168 may be referred to herein as outer waist elastics 170 and inner waist elastics 172. Elastic strands 168, such as the outer waist elastics 170, may continuously extend laterally between the first and second opposing end regions 106a, 106b of the first elastic belt 106 and between the first and second opposing end regions 108a, 108b of the second elastic belt 108. Some elastic strands 168, such as the inner waist elastics 172, may be configured with discontinuities in areas, such as for example, where the first and second elastic belts 106, 108 overlap portions of the chassis 102, such as the absorbent assembly 140. In some configurations, some outer waist elastics 170 and/or inner waist elastics 172 may be configured with discontinuities in areas adapted to refastenably connect with the flanges 300.

As shown in Figure 3C, the first elastic belt 106 and/or the second elastic belt 108 may be configured with low-stretch zones 701 and high-stretch zones 703. The first elastic belt 106 and/or the second elastic belt 108 may include a first high-stretch zone 703a and a second high-stretch zone 703b separated laterally by a central low-stretch zone 701a. Portions of the chassis 102, such as the backsheet 136 and absorbent assembly 140, may be connected with the first elastic belt 106 and/or the second elastic belt 108 in the central low-stretch zones 701a in the first waist region 116 and/or the second waist region 118. The first elastic belt 106 and/or the second elastic belt 108 may also include a first lateral low-stretch zone 701a and a second lateral low-stretch zone 701b. In some configurations, the second belt 108 may include first and second lateral low-stretch zones 701a, 701b located in areas where flanges 300 may be refastenably connected with the second belt 108. The high-stretch zones 703 are elasticated by the elastic material 167, such as the elastic strands 168, 172; and the low-stretch zones 701 may comprise cut lines separating the elastic material 167, such as the elastic strands 168, 172. In some configurations, the elastic material 167 may be cut in an unbonded region where the elastic material is not bonded with first substrate 162 and the second substrate 164. Thus, the elastic material 167 retracts from the unbonded region and form low-stretch zone 701. In some configurations, the elastic material 167 may be cut into several discrete pieces. In turn, the low-stretch zones 701 define regions of the first elastic belt 106 and/or the second elastic belt 108 that have relatively less elasticity than the high-stretch zones 703. The discrete elastic material 167 that has been cut and which are elastically contracted do not add any substantial amount of elastication to the low-stretch zone 701. As such, upon application of a force, the high-stretch

zones 703 will elongate more than the low-stretch zones 701. As provided above, the terms "elastic," "elastomer" or "elastomeric" refers to materials exhibiting elastic properties, which include any material that upon application of a force to its relaxed, initial length can stretch or elongate to an elongated length more than 10% greater than its initial length and will substantially recover back to about its initial length upon release of the applied force. In some configurations, the first elastic belt 106 and/or the second elastic belt 108 may be configured with high-stretch zones 703 that are elastic and may be configured with low-stretch zones 701 that are not elastic or "inelastic."

It is also to be appreciated diaper pants 100P may be configured with the first substrate 162 and/or the second substrate 164 that may extend continuously from the first belt 106 to the second belt 108. For example, the first substrate 162 may be configured to define a continuous outer cover 162` that extends contiguously from the first waist edge 121 to the second waist edge 122, such as shown in Figures 5A-5C. Figure 5D shows a diaper pant 100P with both the first substrate 162 configured to define a continuous outer cover 162` and the second substrate 164 configured to define a continuous inner layer 164` that extend contiguously from the first waist edge 121 to the second waist edge 122. It is also to be appreciated that diaper pants 100P with continuous outer covers, such as shown in Figures 5A-5D may also be configured to include various aspects of the elastic material 167, flanges 300, and fastener components 304 discussed herein as well as waist edge configurations described about with reference to Figures 4 though 4A2.

As discussed above, the diaper pant 100P may include flanges 300 bonded with opposing end regions of the first belt 106, and the flanges 300 may be refastenably connected with opposing end regions of the second belt 108. As shown in Figures 2A and 2B, the flanges 300 may each include a first surface 308 and an opposing second surface 310. The flanges 300 may further comprise a first lateral end region 312 and a second lateral end region 314. The first surface 308 of the first lateral end region 312 of the first flange 300a may be bonded with the first end region 106a of the first belt 106 at the first flange seam 302a, and the second surface 310 of the second lateral end region 314 of the first flange 300a may be refastenably connected with the first end region 108a of the second belt 108. In some configurations, a first fastener component 304a on the second surface 310 of the second lateral end region 314 of the first flange 300a may be refastenably connected with first end region 108a of the second belt 108. In addition, the first surface 308 of the first lateral end region 312 of the second flange 300b may be bonded with the second end region 106b of the first belt 106 at the second flange seam 302b, and the

second surface 310 of the second lateral end region 314 of the second flange 302b may be refastenably connected with the second end region 108b of the second belt 108. In some configurations, a second fastener component 304b on the second surface 310 of the second lateral end region 314 of the second flange 300a may be refastenably connected with second end region 108b of the second belt 108.

With reference to Figure 2B, when the diaper pant 100P is in a compressed, folded state, such as when placed in a package, with the wearer facing surface 115b of the first belt 106 placed in a direct facing relationship with the wearer facing surface 117b of the second belt 108, the first surfaces 308 of the first flange 300a and the second flange 300b are in a direct facing relationship with the wearer facing surface 115b of the first belt 106. In addition, the second surfaces 310 of the first flange 300a and the second flange 300b are in a direct facing relationship with the wearer facing surface 117b of the second belt 108. As shown in Figure 2A, when the diaper pant 100P is in an expanded state, such as when being worn or being placed on a wearer, with the wearer facing surface 115b of the first belt 106 separated from the wearer facing surface 117b of the second belt 108, the first surfaces 308 of the first flange 300a and the second flange 300b define wearer facing surfaces and may be in a direct facing relationship with a wearer. In addition, the second surfaces 310 of the first flange 300a and the second flange 300b define garment facing surfaces and are maintained in a direct facing relationship with the wearer facing surface 117a of the second belt 108.

As discussed herein and as illustrated in the accompanying figures, it is to be appreciated that the first belt 106 and/or second belt 108 may be configured as laminates that may comprise regions having different numbers of layers of substrates. As such, it is to be appreciated that flanges may be bonded with and refastenably connected with various arrangements of layers of substrates of the first belt 106 and/or the second belt 108.

For example, Figure 2C1 is a cross sectional view of first and second belts 106, 108 configured with laminate structures that correspond with laminate structures shown and described above with reference to Figure 4. As shown in Figure 2C1, the first surface 308 of the flange 300 may be bonded with the wearer facing surface 115b of the first belt 106, and the second surface 310 of the flange 300 may be refastenably connected with the wearer facing surface 117b of the second belt 108. More particularly, the first surface 308 of the flange 300 may be bonded with the second substrate 164 of the first belt 106, and a fastener component 304 on the second surface 310 of the flange 300 may be refastenably connected with the second substrate 164 of the second belt 108.

In other configurations described above, at least one substrate of a first belt 106 and/or a second belt 108 may be folded to partially overlap itself and/or another substrate, which in turn may define regions of the belt having different numbers of layers of substrates. For example, Figure 2C2 is a cross sectional view of first and second belts 106, 108 configured with laminate structures that correspond with laminate structures shown and described above with reference to Figures 4A, 4B, and 4A1. As shown in Figure 2C2, the first surface 308 of the flange 300 may be bonded with the second substrate 164 as well as the folded portion 162g of the first substrate 162 of the first belt 106. In addition, a fastener component 304 on the second surface 310 of the flange 300 may be refastenably connected with the second substrate 164 as well as the folded portion 162g of the first substrate 162 of the second belt 108.

Figure 2C3 shows yet another cross sectional of view of first and second belts 106, 108 configured with laminate structures that correspond with laminate structures shown and described above with reference to Figure 4A2. As shown in Figure 2C3, the first surface 308 of the flange 300 may be bonded with the second substrate 164 in regions where the second substrate 164 overlaps the folded portion 162g of the first substrate 162 of the first belt 106. In addition, a fastener component 304 on the second surface 310 of the flange 300 may be refastenably connected with the second substrate 164 in regions where the second substrate 164 overlaps the folded portion 162g of the first substrate 162 of the second belt 108.

It is to be appreciated that various types of materials may be used to construct the first belt 106 and/or the second belt 108. In some instances, it may be desirable to utilize materials that may help increase the strength of refastenable connection between the fastener component 304 and the first belt 106 and/or the second belt 108. In may also be desirable to utilize materials that not only increase the strength of refastenable connection but also maintain a desirable belt softness. For example, the first belt 106 and/or the second belt 108 may comprise a second substrate 164 in the form of a nonwoven adapted to refastenably connect with the fastener component 304.

Example nonwovens for the first substrate 164 may comprise: a 25gsm nonwoven that is available from PFN Znojmo, Czech Republic under tradename PFN: 32 25 00 00 05 00-70/30; a 20gsm nonwoven that is available from PFN Znojmo, Czech Republic under tradename PFN: 32 20 00 00 05 00-70/30; or a 15gsm nonwoven that is available from PFN Znojmo, Czech Republic under tradename PFN: 32 15 00 00 05 00-70/30, wherein the nonwoven is made of polypropylene and has SSS structure, i.e., has three layers spunbond, spunbond, spunbond, respectively, and wherein the nonwoven is thermally bonded and has “wave” shape bond pattern

that is oriented transverse to the machine direction of the nonwoven. In some configurations, the first substrate 164 may comprise: a 15gsm nonwoven that is available from Fibertex under the tradename A10150GT, wherein the nonwoven is made of polypropylene and has SSS structure, i.e., has three layers spunbond, spunbond, spunbond, respectively and includes additives to improve softness, and wherein the nonwoven is thermally bonded and has an oval shape bond pattern. Example fastener component 304 configurations may include an 80gsm hook (no adhesive coating on the backing) that is available from 3M USA under the tradename CHK07197, wherein the hooks are described by 3M as micro-replicated round-capped mushroom hooks, comprised of polypropylene, and have approximately 2,000 hooks per square inch, and wherein the hook is bonded to the flange 300 with 60 gsm of H4376 adhesive available from Bostik (Colombes, France).

As discussed above, the diaper pants 100P described herein may include one or more refastenable connections between the first belt 106 and the second belt 108. For example, Figures 1, 6A, and 6B show an example diaper pant 100P with a first belt 106 refastenably connected with the second belt 108. The refastenable connections between the belts may allow the first elastic belt 106 and the second belt 108 to be partially or completely separated from each other, such as when inspecting a diaper pant 100P while being worn in order to determine if the diaper pant 100P may be soiled. If it is determined that the diaper pant 100P is suitable for continued use, the first and second belts 106, 108 may be reconnected with each other. For example, Figure 6A is a perspective view of the diaper pant 100P of Figure 1 showing the first end region 108a of the second belt 108 partially disconnected from the first flange 300a. From the configuration shown in Figure 6A, it is to be appreciated that the disconnected portion of the first end region 108a of the second belt 108 may be reconnected with the first fastener component 304a with the application of forces to the second belt 108 generically represented by a bi-directional arrow. It is also to be appreciated that the remaining connected portion of the first end region 108a of the second belt 108 may be further disconnected from the first fastener component 304a with the application of forces to the second belt 108 generically represented by a bi-directional arrow.

Figure 6B is a perspective view of the diaper pant of Figure 6A showing the first end region 108a of the second belt 108 having been completely disconnected from the first fastener component 304a on the first flange 300a. Figure 6B also shows the second end region 108b of the second belt 108 partially disconnected from a second flange 300b. From the configuration shown in Figure 6B, it is to be appreciated that the disconnected portions of the first end region 108a and the second end region 108b of the second belt 108 may be reconnected with the first and

second fastener components 304a, 304b, respectively, with the application of forces to the second belt 108 generically represented by the bi-directional arrows. It is also to be appreciated that the remaining connected portion of the second end region 108b of the second belt 108 may be further disconnected from the second fastener component 304b with the application of forces to the second belt 108 generically represented by a bi-directional arrow.

As previously discussed, the refastenable connections between the belts 106, 108 may be configured to allow the first elastic belt 106 and the second belt 108 to be relatively easily and completely separated from each other, such as when removing the diaper pant 100P from a wearer. For example, Figures 7A-7C illustrate a progression whereby the first belt 106 and the second belt 108 may be completely disconnected from each other. In particular, Figure 7A is a detailed view of a diaper pant 100P showing a flange 300 bonded with a first belt 106 and refastenably connected with a second belt 108. Figure 7B is a detailed view of the diaper pant 100P of Figure 7A showing the second belt 108 partially disconnected from the flange 300, and Figure 7C is a detailed view of the diaper pant 100P of Figure 7B showing the second belt 108 completely disconnected from the flange 300. As such, once the opposing end portions of the first elastic belt 106 and the second elastic belt 108 are completely disconnected, the diaper pant 100P may be removed from a wearer in a similar fashion to a taped diaper.

It is to be appreciated that the flange 300 and/or the fastener component 304 may comprise any of a wide variety of shapes, including rectangles or other polygons, circles, ovals, shapes having exterior convexities or concavities or combinations thereof, or one or a plurality of lines or geometric shapes forming an array. It is also to be appreciated that more than fastener component 304 may be positioned on a flange. It is also to be appreciated that the fastener component 304 and the flange 300 may be configured with various sizes and shapes. For example, Figure 8 illustrates a detailed planar view of a fastener component 304 positioned on the second surface 310 of a flange 300. To provide a frame of reference, a longitudinal axis 124 and a lateral axis 126 are illustrated in Figure 8 and correspond with the directional frames of reference provided by the longitudinal axis 124 and lateral axis 126, respectively, shown in other figures herein. As shown in Figure 8, the flange 300 may define a long lateral width FW and longitudinal length FL, and the fastener component 304 may define a lateral width FTW and a longitudinal length FTL. In some configurations, FW may be equal to or greater than FTW, and FL may be equal to or greater than FTL. In some configurations, gap regions 340 may be defined on the flange 300 by the absence of portions of the fastener component 304.

With continued reference to Figure 8, the flange 300 may comprise a first side edge 316 laterally separated from a second side edge 318 and may comprise a first end edge 320 longitudinally separated from a second end edge 322. In addition, the fastener component 304 may comprise a first side edge 324 laterally separated from a second side edge 326 and may comprise a first end edge 328 longitudinally separated from a second end edge 330. In some configurations, the first side edge 324 of fastener component 304 may be coterminous with or laterally inboard from the first side edge 316 of the flange 300, and/or the second side edge 326 of the fastener component 304 may be coterminous with or laterally inboard from the second side edge 318 of the flange 300. In some configurations, the first end edge 328 of the fastener component 304 may be coterminous with or longitudinally inboard from first end edge 320 of the flange 300, and/or the second end edge 330 of the fastener component 304 may be coterminous with or longitudinally inboard from second end edge 322 of the flange 300.

It is also to be appreciated that the fastener component may be configured in various ways and may be connected with the flange in various ways. As discussed above, the fastener component may comprise a hook material that can refastenably engage with substrates, such as nonwovens for example. For example, the fastener component may comprise a base or laminate structure comprising hooks, wherein the base or laminate structure is bonded with the flange (or a belt), which may comprise a nonwoven. It is to be appreciated that the base or laminate structure may be bonded with the flange (or a belt) in various ways, such as for example, with mechanical bonds, thermal bonds, ultrasonic bonds, and/or adhesive bonds or combinations thereof.

For example, as shown in Figure 9A, the fastener component 300 may comprise hooks 332 protruding from a base 334, and adhesive 336 may connect the base 334 of the fastener component 304 with the second surface 310 of the flange 300. It is to be appreciated that the fastener component 304 may be connected with flange 300 by mechanical bonding in addition to or instead of adhesive 336. It is also to be appreciated that the base 334 may be configured in various ways. For example, the base 334 may comprise a thermoplastic film. In addition, the adhesive 336 between the base 334 and the flange 300 may extend longitudinally for the entire length FTL or less than the entire length FTL of the base. Further, the adhesive 336 between the base 334 and the flange 300 may extend laterally for the entire width FTW or less than the entire length FTW of the base.

In some configurations, the base 334 may comprise a laminate with various layers bonded together. It is also to be appreciated that such layers may be bonded together in various ways, such as with adhesive, mechanical bonding, and/or extrusion bonding. In some configurations,

layers of the base 334 may be bonded together with extrusion or melt type bonding such as disclosed for example in U.S. Patent Publication No. 2021/0045931 A1. For example, as shown in Figure 9B, the base 334 may comprise a thermoplastic film layer 334a and a nonwoven backing layer 334b, wherein the thermoplastic film layer 334a is bonded with the nonwoven backing layer 334b with extrusion bonds 338. In turn, the nonwoven backing layer 334b may be bonded with the flange 300 with adhesive 336.

In some configurations, such as shown in Figures 9C and 9D for example, the base may be bonded directly with the flange with extrusion or melt type bonding, such as disclosed for example in U.S. Patent Publication No. 2021/0045931 A1. For example, the base 334 may comprise a thermoplastic film layer and the flange 300 may comprise a nonwoven layer, wherein the thermoplastic film base 334 is bonded with the nonwoven flange 300 with extrusion bonds 338. In some configurations, such as shown in Figure 9C, the base 334 may extend longitudinally for the entire length FL of the flange 300, such as from the first end edge 320 of the flange 300 to the second end edge 322 of the flange 300, and the hooks 332 may extend longitudinally for less than the entire length FL of the flange 300. In addition, the extrusion bonds 338 between the base 334 and the flange 300 may extend longitudinally for the entire lengths FL, FTL of the flange 300 and base 334. Further, the extrusion bonds 338 between the base 334 and the flange 300 may extend laterally for the entire width FTW or less than the entire length FTW of the base 334. In some configurations, such as shown in Figure 9D, the base 334 may extend longitudinally for a length FTL that is less than the entire length FL of the flange 300. In addition, the extrusion bonds 338 between the base 334 and the flange 300 may extend longitudinally for the entire length FTL or less than the entire length FTL of the base 334. Further, the extrusion bonds 338 between the base 334 and the flange 300 may extend laterally for the entire width FTW or less than the entire length FTW of the base 334. As such, in some configurations, edge regions 342 of the base 334 adjacent the first side edge 324, the second side edge 326, the first end edge 328, and/or the second end edge 330 may not be bonded with the flange 300.

In some configurations, hooks 332 may be integrally formed from the flange 300, which may for example be in the form of a nonwoven. For example, as shown in Figure 9E, the fastener component 304 may be integrally formed from materials of the flange 300 or may be integrally formed from other materials that may then be attached with the flange 300.

It is to be appreciated that the discussions and descriptions above with regard to bonding arrangements and configurations between the fastener components 304 and the flange 300 are

also applicable to bonding arrangements and configurations between the fastener components 304 and materials of first and/or second belts 106, 108.

As discussed above, it is to be appreciated that the various arrangements and types of fastener components 304 and flanges 300 may be configured to refastenably connect opposing end regions of the first belt 106 with the second belt 108. For example, Figure 10A is a detailed view of a diaper pant 100P showing a second belt 108 directly refastenably connected with a fastener component 304 on a flange 300. The fastener component 304 may comprise hooks 332 adapted to directly refastenably connect with material defining the wearer facing surface 117b of the second belt 108, such as for example the first substrate 162 and/or 164 of the second belt 108. In another example, Figure 10B shows a detailed view of a diaper pant 100P with a fastener component 304 comprising hooks 332 on a wearer facing surface 117b of the second belt 108 that may be adapted to directly refastenably connect with material defining the second surface 310 of the flange 300. In yet another example, Figure 10C shows a detailed view of a diaper pant 100P with a fastener component 304 comprising hooks 332 on the second surface 310 of the flange 300 and a fastener component 304 comprising loops 344 on the wearer facing surface 117b of the second belt 108, wherein the hooks 332 are adapted to refastenably connect with the loops 344. In still another example, Figure 10D a detailed view of a diaper pant 100P with a fastener component 304 comprising loops 332 on the second surface 310 of the flange 300 and a fastener component 304 comprising hooks 344 on the wearer facing surface 117b of the second belt 108, wherein the hooks 332 are adapted to refastenably connect with the loops 344. It is to be appreciated that in some configurations, adhesive may be used in place of or in addition to the hooks as described above with reference to Figures 10A-10D.

AVERAGE DECITEX (AVERAGE-DTEX)

The Average Decitex Method is used to calculate the Average-Dtex on a length-weighted basis for elastic fibers present in an entire article, or in a specimen of interest extracted from an article. The decitex value is the mass in grams of a fiber present in 10,000 meters of that material in the relaxed state. The decitex value of elastic fibers or elastic laminates containing elastic fibers is often reported by manufacturers as part of a specification for an elastic fiber or an elastic laminate including elastic fibers. The Average-Dtex is to be calculated from these specifications if available. Alternatively, if these specified values are not known, the decitex value of an individual elastic fiber is measured by determining the cross-sectional area of a fiber in a relaxed state via a suitable microscopy technique such as scanning electron microscopy (SEM),

determining the composition of the fiber via Fourier Transform Infrared (FT-IR) spectroscopy, and then using a literature value for density of the composition to calculate the mass in grams of the fiber present in 10,000 meters of the fiber. The manufacturer-provided or experimentally measured decitex values for the individual elastic fibers removed from an entire article, or specimen extracted from an article, are used in the expression below in which the length-weighted average of decitex value among elastic fibers present is determined.

The lengths of elastic fibers present in an article or specimen extracted from an article is calculated from overall dimensions of and the elastic fiber pre-strain ratio associated with components of the article with these or the specimen, respectively, if known. Alternatively, dimensions and/or elastic fiber pre-strain ratios are not known, an absorbent article or specimen extracted from an absorbent article is disassembled and all elastic fibers are removed. This disassembly can be done, for example, with gentle heating to soften adhesives, with a cryogenic spray (e.g., Quick-Freeze, Miller-Stephenson Company, Danbury, CT), or with an appropriate solvent that will remove adhesive but not swell, alter, or destroy elastic fibers. The length of each elastic fiber in its relaxed state is measured and recorded in millimeters (mm) to the nearest mm.

Calculation of Average-Dtex

For each of the individual elastic fibers f_i of relaxed length L_i and fiber decitex value d_i (obtained either from the manufacturer's specifications or measured experimentally) present in an absorbent article, or specimen extracted from an absorbent article, the Average-Dtex for that absorbent article or specimen extracted from an absorbent article is defined as:

$$\text{Average-Dtex} = \frac{\sum_{i=1}^{n}(L_i \times d_i)}{\sum_{i=1}^{n} L_i}$$

where n is the total number of elastic fibers present in an absorbent article or specimen extracted from an absorbent article. The Average-Dtex is reported to the nearest integer value of decitex (grams per 10 000 m).

If the decitex value of any individual fiber is not known from specifications, it is experimentally determined as described below, and the resulting fiber decitex value(s) are used in the above equation to determine Average-Dtex.

Experimental Determination of Decitex Value for a Fiber

For each of the elastic fibers removed from an absorbent article or specimen extracted from an absorbent article according to the procedure described above, the length of each elastic fiber L_k in its relaxed state is measured and recorded in millimeters (mm) to the nearest mm. Each elastic fiber is analyzed via FT-IR spectroscopy to determine its composition, and its density ρ_k is determined from available literature values. Finally, each fiber is analyzed via SEM. The fiber is cut in three approximately equal locations perpendicularly along its length with a sharp blade to create a clean cross-section for SEM analysis. Three fiber segments with these cross sections exposed are mounted on an SEM sample holder in a relaxed state, sputter coated with gold, introduced into an SEM for analysis, and imaged at a resolution sufficient to clearly elucidate fiber cross sections. Fiber cross sections are oriented as perpendicular as possible to the detector to minimize any oblique distortion in the measured cross sections. Fiber cross sections may vary in shape, and some fibers may consist of a plurality of individual filaments. Regardless, the area of each of the three fiber cross sections is determined (for example, using diameters for round fibers, major and minor axes for elliptical fibers, and image analysis for more complicated shapes), and the average of the three areas a_k for the elastic fiber, in units of micrometers squared (μm^2), is recorded to the nearest 0.1 μm^2. The decitex d_k of the kth elastic fiber measured is calculated by:

$$d_k = 10\,000 \text{ m} \times a_k \times \rho_k \times 10^{-6}$$

where d_k is in units of grams (per calculated 10,000 meter length), a_k is in units of μm^2, and ρ_k is in units of grams per cubic centimeter (g/cm^3). For any elastic fiber analyzed, the experimentally determined L_k and d_k values are subsequently used in the expression above for Average-Dtex.

AVERAGE-STRAND-SPACING

Using a ruler calibrated against a certified NIST ruler and accurate to 0.5 mm, measure the distance between the two distal strands within a section to the nearest 0.5 mm, and then divide by the number of strands in that section – 1

Average-Strand-Spacing = d/(n-1) where n>1

report to the nearest 0.1 mm.

AVERAGE-PRE-STRAIN

The Average-Pre-Strain of a specimen are measured on a constant rate of extension tensile tester (a suitable instrument is the MTS Insight using Testworks 4.0 Software, as available

from MTS Systems Corp., Eden Prairie, MN) using a load cell for which the forces measured are within 1% to 90% of the limit of the cell. Articles are conditioned at 23 ℃ ±2 C°and 50% ±2% relative humidity for 2 hours prior to analysis and then tested under the same environmental conditions.

Program the tensile tester to perform an elongation to break after an initial gage length adjustment. First raise the cross head at 10 mm/min up to a force of 0.05N. Set the current gage to the adjusted gage length. Raise the crosshead at a rate of 100 mm/min until the specimen breaks (force drops 20% after maximum peak force). Return the cross head to its original position. Force and extension data is acquired at a rate of 100 Hz throughout the experiment.

Set the nominal gage length to 40 mm using a calibrated caliper block and zero the crosshead. Insert the specimen into the upper grip such that the middle of the test strip is positioned 20 mm below the grip. The specimen may be folded perpendicular to the pull axis, and placed in the grip to achieve this position. After the grip is closed the excess material can be trimmed. Insert the specimen into the lower grips and close. Once again, the strip can be folded, and then trimmed after the grip is closed. Zero the load cell. The specimen should have a minimal slack but less than 0.05 N of force on the load cell. Start the test program.

From the data construct a Force (N) verses Extension (mm). The Average-Pre-Strain is calculated from the bend in the curve corresponding to the extension at which the nonwovens in the elastic are engaged. Plot two lines, corresponding to the region of the curve before the bend (primarily the elastics), and the region after the bend (primarily the nonwovens). Read the extension at which these two lines intersect, and calculate the % Pre-Strain from the extension and the corrected gage length. Record as % Pre-strain 0.1%. Calculate the arithmetic mean of three replicate samples for each elastomeric laminate and Average-Pre-Strain to the nearest 0.1%.

COMBINATIONS

A1. An absorbent article comprising: a chassis comprising a topsheet, a backsheet, and an absorbent core positioned between the topsheet and the backsheet, the chassis further comprising a first end region and a second end region longitudinally separated from the first end region by a crotch region; a first belt comprising a first end region and a second end region laterally separated from the first end region by a central region, the first end region of the chassis connected with the central region of the first belt, wherein the first belt further comprises a garment facing surface and an opposing wearer facing surface; a second belt comprising a first end region and a second end region laterally separated from the first end region by a central

region, the second end region of the chassis connected with the central region of the second belt, wherein the second belt further comprises a garment facing surface and an opposing wearer facing surface; a first flange comprising a first surface and a second surface opposite the first surface, the first flange further comprising a first lateral end region and a second lateral end region, wherein the first surface of the first lateral end region of the first flange is bonded with the wearer facing surface of the first end region of the first belt, and wherein the second surface of the second lateral end region of the first flange is in a facing relationship with the wearer facing surface of the second belt, and wherein second lateral end region of the first flange is refastenably connected with the first end region of the second belt; a second flange comprising a first surface and a second surface opposite the first surface, the second flange further comprising a first lateral end region and a second lateral end region, wherein the first surface of the first end lateral region of the second flange is bonded with the wearer facing surface of the second end region of the first belt, and wherein the second surface of the second lateral end region of the second flange is in a facing relationship with the wearer facing surface of the second belt, and wherein second lateral end region of the second flange is refastenably connected with the second end region of the second belt; and wherein the first flange and the second flange are bonded with the first belt with a layer of substantially tackifier free adhesive.

A2. The absorbent article of paragraph A1, further comprising a fastener component positioned on the second surface of the first flange.

A3. The absorbent article of paragraph A2, wherein the fastener component comprises hooks protruding from a base.

A4. The absorbent article of paragraph A3, wherein the base is adhesively bonded with the first flange.

A5. The absorbent article of paragraph A3, wherein the base is mechanically bonded with the first flange.

A6. The absorbent article of paragraph A3, wherein the base is adhesively and mechanically bonded with the first flange.

A7. The absorbent article of paragraph A3, wherein the base is extrusion bonded with the first flange.

A8. The absorbent article of paragraph A2, wherein the fastener component comprises hooks integrally formed from material of the first flange.

A9. The absorbent article of paragraph A2, wherein the fastener component is adapted to refastenably connect directly with material of the second belt.

A10. The absorbent article of paragraph A2, further comprising a second fastener component positioned on the wearer facing surface of the second belt, and wherein the second fastener component on the second belt is adapted to refastenably connect directly with the fastener component on the first flange.

A11. The absorbent article of paragraph A10, wherein the second fastener component comprises hooks.

A12. The absorbent article of paragraph A1, further comprising a front waist region and a back waist region, wherein the first belt is positioned in the front waist region and the second belt is positioned in the back waist region.

A13. The absorbent article of paragraph A1, wherein the first flange and the second flange comprise first nonwovens and the first belt comprises a second nonwoven, wherein a first portion of the layer of the substantially tackifier free adhesive penetrates into the first nonwovens; wherein a second portion of the layer of the substantially tackifier free adhesive penetrates into the second nonwoven; and wherein the first nonwovens are separated from the second nonwoven by a central portion of the layer of the substantially tackifier free adhesive.

A14. The absorbent article of paragraph A13, wherein at least one of the first nonwovens and the second nonwoven comprises a meltblown layer.

A15. The absorbent article of paragraph A1, wherein the second belt further comprises: elastic strands positioned between and connected with a first substrate and a second substrate, wherein the first substrate defines at least a portion of the wearer facing surface of the second belt.

A16. The absorbent article of paragraph A1, further comprising a fastener component positioned on the wearer facing surface of the second belt, wherein the fastener component is adapted to refastenably connect directly with the second surface of the first flange.

B1. An absorbent article comprising: a chassis comprising a topsheet, a backsheet, and an absorbent core positioned between the topsheet and the backsheet, the chassis further comprising a first end region and a second end region longitudinally separated from the first end region by a crotch region; a first belt comprising a first end region and a second end region laterally separated from the first end region by a central region, the first end region of the chassis connected with the central region of the first belt, wherein the first belt further comprises a garment facing surface and an opposing wearer facing surface; a second belt comprising a first end region and a second end region laterally separated from the first end region by a central region, the second end region of the chassis connected with the central region of the second belt,

wherein the second belt further comprises a garment facing surface and an opposing wearer facing surface; a flange comprising a first surface and a second surface opposite the first surface, the flange further comprising a first lateral end region and a second lateral end region; a fastener component positioned on the second surface of the flange; wherein first surface of the first lateral end region of the flange is bonded with the first end region of the first belt with a layer of substantially tackifier free adhesive; and wherein the fastener component is refastenably connected with the wearer facing surface of first end region of the second belt.

B2. The absorbent article of paragraph B1, wherein the flange comprises a first nonwoven and the first belt comprises a second nonwoven, wherein a first portion of the layer of the substantially tackifier free adhesive penetrates into the first nonwoven; wherein a second portion of the layer of the substantially tackifier free adhesive penetrates into the second nonwoven; and wherein the first nonwoven is separated from the second nonwoven by a central portion of the layer of the substantially tackifier free adhesive.

B3. The absorbent article of paragraph B1, wherein the second belt further comprises: elastic strands positioned between and connected with a first substrate and a second substrate, wherein the first substrate defines at least a portion of the wearer facing surface of the second belt.

C1. An absorbent article comprising: a chassis comprising a topsheet, a backsheet, and an absorbent core positioned between the topsheet and the backsheet, the chassis further comprising a first end region and a second end region longitudinally separated from the first end region by a crotch region; a first belt comprising a first end region and a second end region laterally separated from the first end region by a central region, the first end region of the chassis connected with the central region of the first belt, wherein the first belt further comprises a garment facing surface and an opposing wearer facing surface; a second belt comprising a first end region and a second end region laterally separated from the first end region by a central region, the second end region of the chassis connected with the central region of the second belt, wherein the second belt further comprises a garment facing surface and an opposing wearer facing surface; a flange comprising a first lateral end region and a second end region; wherein the first lateral end region of the flange is bonded with a layer of substantially tackifier free adhesive with the wearer facing surface of the first end region of the first belt; and wherein the second lateral end region of the flange is refastenably connected with the wearer facing surface of first end region of the second belt.

C2. The absorbent article of paragraph C1, wherein the flange comprises a first nonwoven and the first belt comprises a second nonwoven, wherein a first portion of the layer of the substantially tackifier free adhesive penetrates into the first nonwoven; wherein a second portion of the layer of the substantially tackifier free adhesive penetrates into the second nonwoven; and wherein the first nonwoven is separated from the second nonwoven by a central portion of the layer of the substantially tackifier free adhesive.

Bio-Based Content for Components

Components of the absorbent articles described herein may at least partially be comprised of bio-based content as described in U.S. Pat. Appl. No. 2007/0219521 A1. For example, the superabsorbent polymer component may be bio-based via their derivation from bio-based acrylic acid. Bio-based acrylic acid and methods of production are further described in U.S. Pat. Appl. Pub. No. 2007/0219521 and U.S. Pat. Nos. 8,703,450; 9,630,901 and 9,822,197. Other components, for example nonwoven and film components, may comprise bio-based polyolefin materials. Bio-based polyolefins are further discussed in U.S. Pat. Appl. Pub. Nos. 2011/0139657, 2011/0139658, 2011/0152812, and 2016/0206774, and U.S. Pat. No. 9,169,366. Example bio-based polyolefins for use in the present disclosure comprise polymers available under the designations SHA7260™, SHE150™, or SGM9450F™ (all available from Braskem S.A.).

An absorbent article component may comprise a bio-based content value from about 10% to about 100%, from about 25% to about 100%, from about 40% to about 100%, from about 50% to about 100%, from about 75% to about 100%, or from about 90% to about 100%, for example, using ASTM D6866-10, method B.

Recycle Friendly and Bio-Based Absorbent Articles

Components of the absorbent articles described herein may be recycled for other uses, whether they are formed, at least in part, from recyclable materials. Examples of absorbent article materials that may be recycled are nonwovens, films, fluff pulp, and superabsorbent polymers. The recycling process may use an autoclave for sterilizing the absorbent articles, after which the absorbent articles may be shredded and separated into different byproduct streams. Example byproduct streams may comprise plastic, superabsorbent polymer, and cellulose fiber, such as pulp. These byproduct streams may be used in the production of fertilizers, plastic articles of manufacture, paper products, viscose, construction materials, absorbent pads for pets or on hospital beds, and/or for other uses. Further details regarding absorbent articles that aid in

recycling, designs of recycle friendly diapers, and designs of recycle friendly and bio-based component diapers, are disclosed in U.S. Pat. Appl. Publ. No. 2019/0192723, published on June 27, 2019.

The dimensions and values disclosed herein are not to be understood as being strictly limited to the exact numerical values recited. Instead, unless otherwise specified, each such dimension is intended to mean both the recited value and a functionally equivalent range surrounding that value. For example, a dimension disclosed as "40 mm" is intended to mean "about 40 mm."

Every document cited herein, including any cross referenced or related patent or application and any patent application or patent to which this application claims priority or benefit thereof, is hereby incorporated herein by reference in its entirety unless expressly excluded or otherwise limited. The citation of any document is not an admission that it is prior art with respect to any invention disclosed or claimed herein or that it alone, or in any combination with any other reference or references, teaches, suggests or discloses any such invention. Further, to the extent that any meaning or definition of a term in this document conflicts with any meaning or definition of the same term in a document incorporated by reference, the meaning or definition assigned to that term in this document shall govern.

While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the spirit and scope of the invention. It is therefore intended to cover in the appended claims all such changes and modifications that are within the scope of this invention.

CLAIMS

What is claimed is:

1. An absorbent article comprising:

a chassis (102) comprising a topsheet (138), a backsheet (136), and an absorbent core (140) positioned between the topsheet (138) and the backsheet (136), the chassis (102) further comprising a first end region (116a) and a second end region (118a) longitudinally separated from the first end region (116a) by a crotch region (119);

a first belt (106) comprising a first end region (106a) and a second end region (106b) laterally separated from the first end region (106a) by a central region (106c), the first end region (116a) of the chassis (102) connected with the central region (106c) of the first belt (106), wherein the first belt (106) further comprises a garment facing surface (115a) and an opposing wearer facing surface (115b);

a second belt (108) comprising a first end region (108a) and a second end region (108b) laterally separated from the first end region (108a) by a central region (108c), the second end region (118a) of the chassis (102) connected with the central region (108c) of the second belt (108), wherein the second belt (108) further comprises a garment facing surface (117a) and an opposing wearer facing surface (117b);

a first flange (300a) comprising a first surface (308) and a second surface (310) opposite the first surface (308), the first flange (300a) further comprising a first lateral end region (312) and a second lateral end region (314), wherein the first surface (308) of the first lateral end region (312) of the first flange (300a) is bonded with the wearer facing surface (115b) of the first end region (106a) of the first belt (106), and wherein the second surface (310) of the second lateral end region (314) of the first flange (300a) is in a facing relationship with the wearer facing surface (117b) of the second belt (108), and wherein second lateral end region (314) of the first flange (300a) is refastenably connected with the first end region (108a) of the second belt (108);

a second flange (300b) comprising a first surface (308) and a second surface (310) opposite the first surface (308), the second flange (300b) further comprising a first lateral end region (312) and a second end region (314), wherein the first surface (308) of the first lateral end region (312) of the second flange (300b) is bonded with the wearer facing surface (115b) of the second end region (106b) of the first belt (106), and wherein the second surface (310) of the second lateral end region (314) of the second flange (300b) is in a facing relationship with the wearer facing surface (117b) of the second belt (108), and wherein second lateral end region (314)

of the second flange (300b) is refastenably connected with the second end region (108b) of the second belt (108); and

wherein the first flange (300a) and the second flange (300b) are bonded with the first belt (106) with a layer (901) of substantially tackifier free adhesive (900).

2. The absorbent article according to claim 1, further comprising a fastener component (304) positioned on the second surface (310) of the first flange (300a).

3. The absorbent article according to claim 2, wherein the fastener component (304) comprises hooks (332) protruding from a base (334).

4. The absorbent article according to claim 3, wherein the base (334) is adhesively bonded with the first flange (300a).

5. The absorbent article according to claim 3, wherein the base (334) is mechanically bonded with the first flange (300a).

6. The absorbent article according to claim 3, wherein the base (334) is adhesively and mechanically bonded with the first flange (300a).

7. The absorbent article according to claim 3, wherein the base (334) is extrusion bonded with the first flange (300a).

8. The absorbent article according to claim 2, wherein the fastener component (304) comprises hooks (332) integrally formed from material of the first flange (300a).

9. The absorbent article according to any of claims 2-8, wherein the fastener component (304) is adapted to refastenably connect directly with material of the second belt (108).

10. The absorbent article according to any of claims 2-9, further comprising a second fastener component (304) positioned on the wearer facing surface (117b) of the second belt (108), and wherein the second fastener (304) component on the second belt (108) is adapted to refastenably connect directly with the fastener component (304) on the first flange (300a).

11. The absorbent article according to claim 10, wherein the second fastener component (304) comprises hooks (332).

12. The absorbent article according to any of the preceding claims, further comprising a front waist region (116) and a back waist region (118), wherein the first belt (106) is positioned in the front waist region (116) and the second belt (108) is positioned in the back waist region (118).

13. The absorbent article according to any of the preceding claims, wherein the first flange (300a) and the second flange (300b) comprise first nonwovens (800) and the first belt (106) comprises a second nonwoven (802), wherein a first portion (901a) of the layer (901) of the substantially tackifier free adhesive (900) penetrates into the first nonwovens (800); wherein a second portion (901b) of the layer (901) of the substantially tackifier free adhesive (900) penetrates into the second nonwoven (802); and wherein the first nonwovens (800) are separated from the second nonwoven (802) in by a central portion (901c) of the layer (901) of the substantially tackifier free adhesive (900), preferably at least one of the first nonwovens (800) and the second nonwoven (802) comprises a meltblown layer (824, 826).

14. The absorbent article according to any of the preceding claims, wherein the second belt (108) further comprises: elastic strands (168) positioned between and connected with a first substrate (164) and a second substrate (162), wherein the first substrate (164) defines at least a portion of the wearer facing surface (117b) of the second belt (108).

15. The absorbent article according to any of the preceding claims, further comprising a fastener component (304) positioned on the wearer facing surface (117b) of the second belt (108), wherein the fastener component (304) is adapted to refastenably connect directly with the second surface (310) of the first flange (300a).

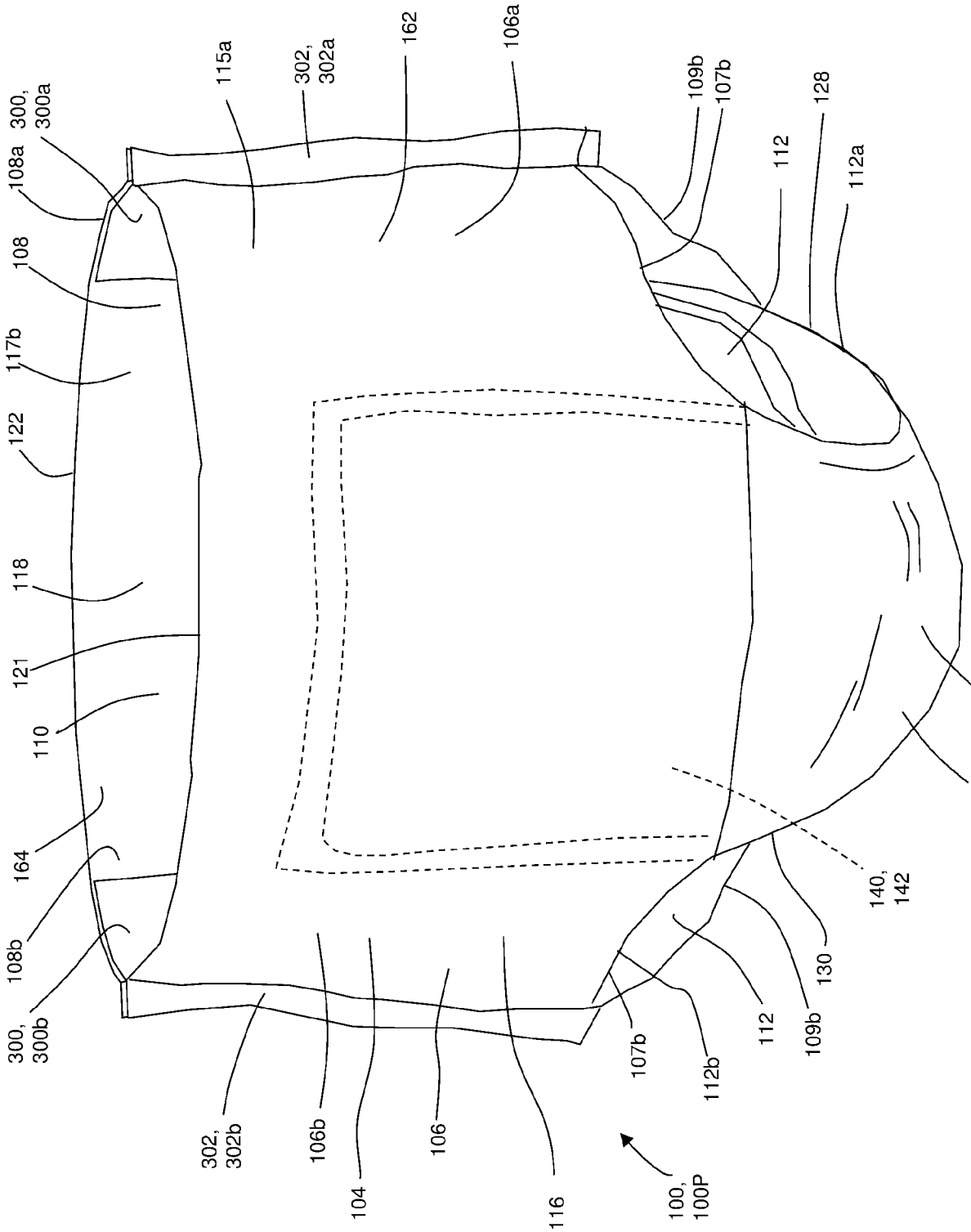

300, 300a
108a
108
117b
122
118
121
110
164
108b
300, 300b
302, 302b
106b
104
106
116
100, 100P
107b
112b
112
109b
130
140, 142
102
134
112a
128
112
109b
107b
162
106a
115a
302, 302a

Figure 1

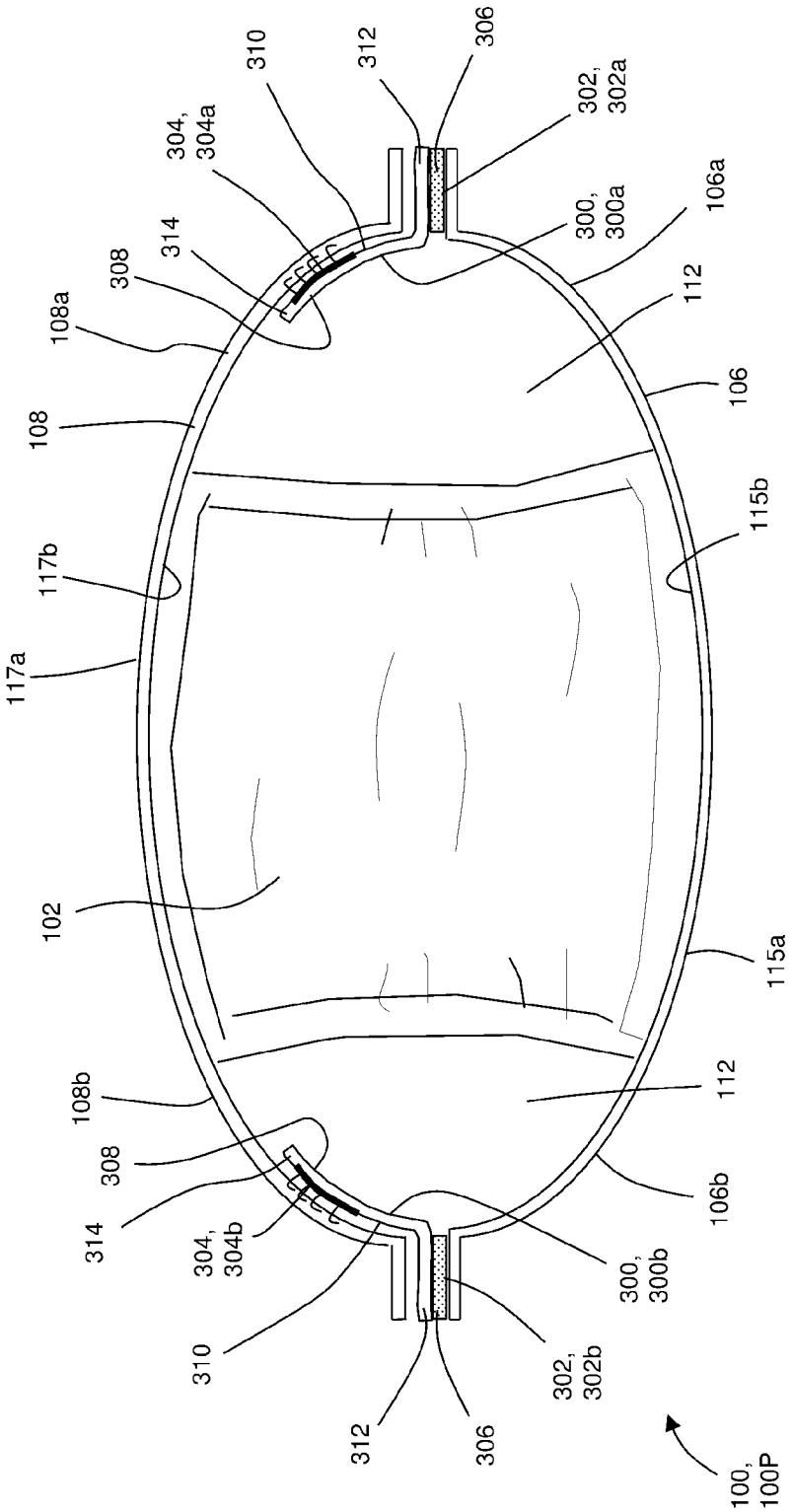

310
312
306
304,
304a
302,
302a
314
308
300,
300a
106a
108a
112
108
106
117b
115b
117a
102
115a
108b
112
308
314
106b
304,
304b
300,
300b
310
302,
302b
312
306
100,
100P

Figure 2A

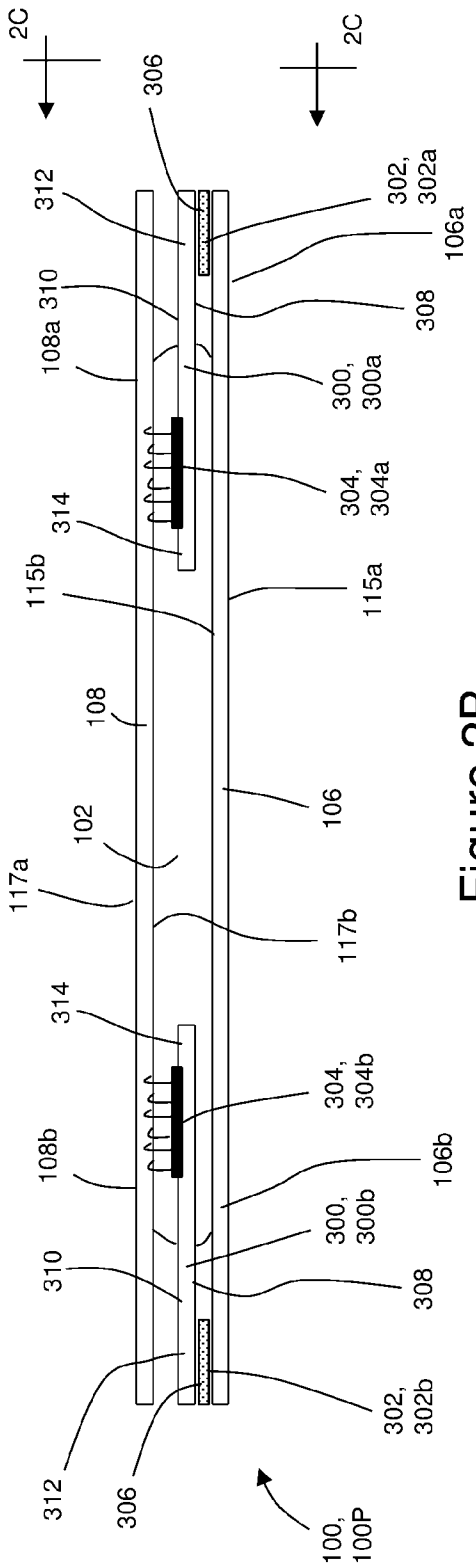

2C
2C
306
312
302, 302a
106a
310
308
108a
300, 300a
304, 304a
314
115b
115a
108
106
102
117a
117b
314
304, 304b
108b
106b
300, 300b
310
308
302, 302b
312
306
100, 100P

Figure 2B

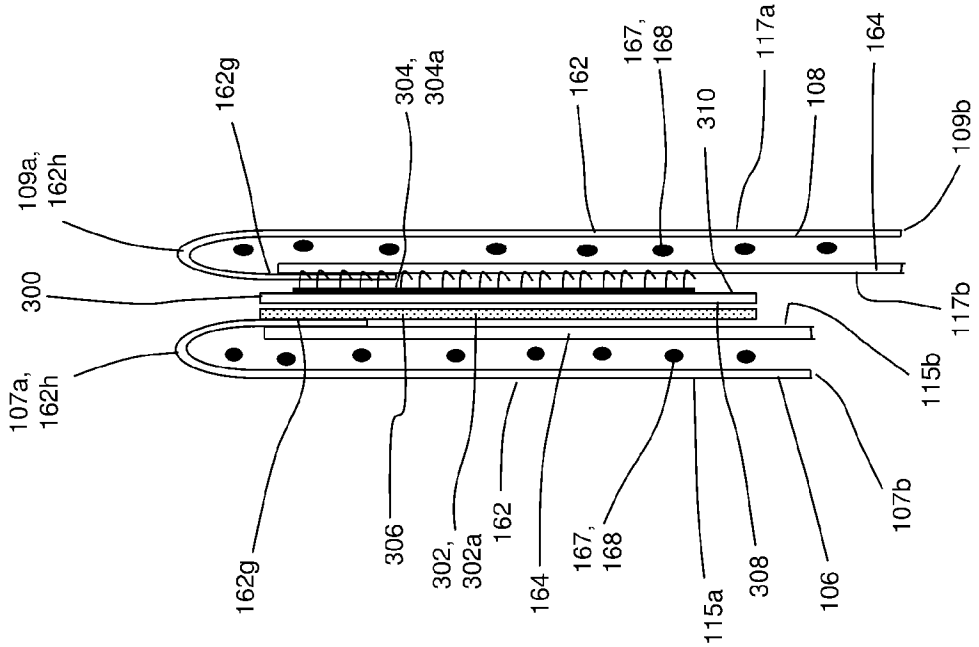


Figure 2C2

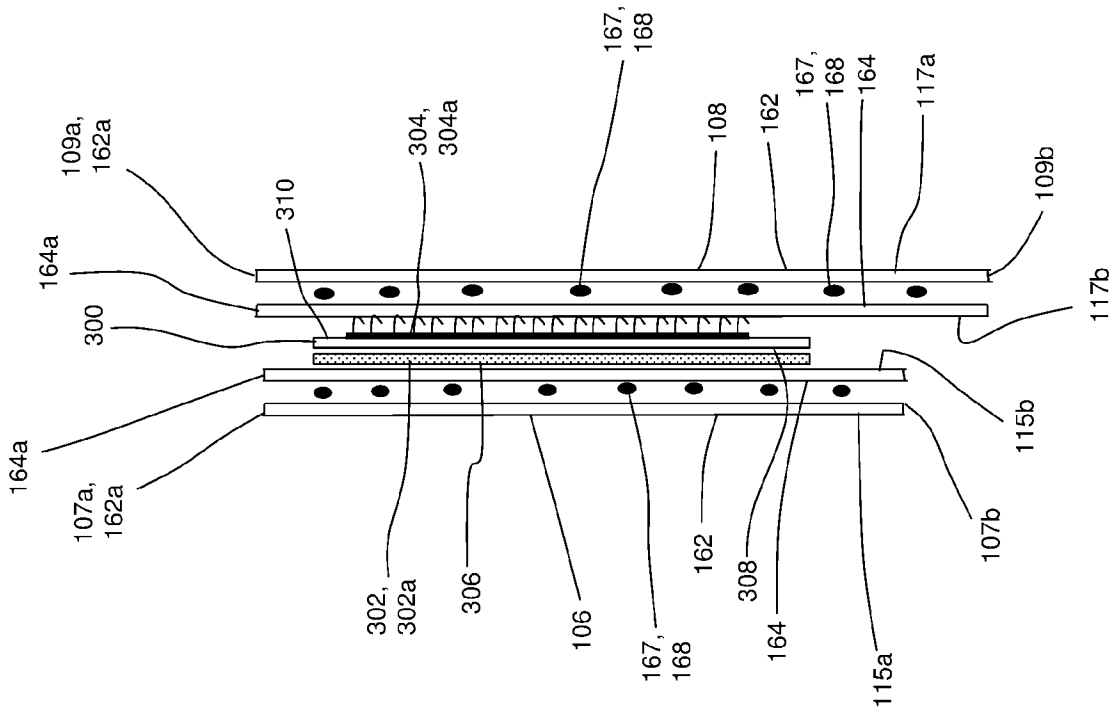
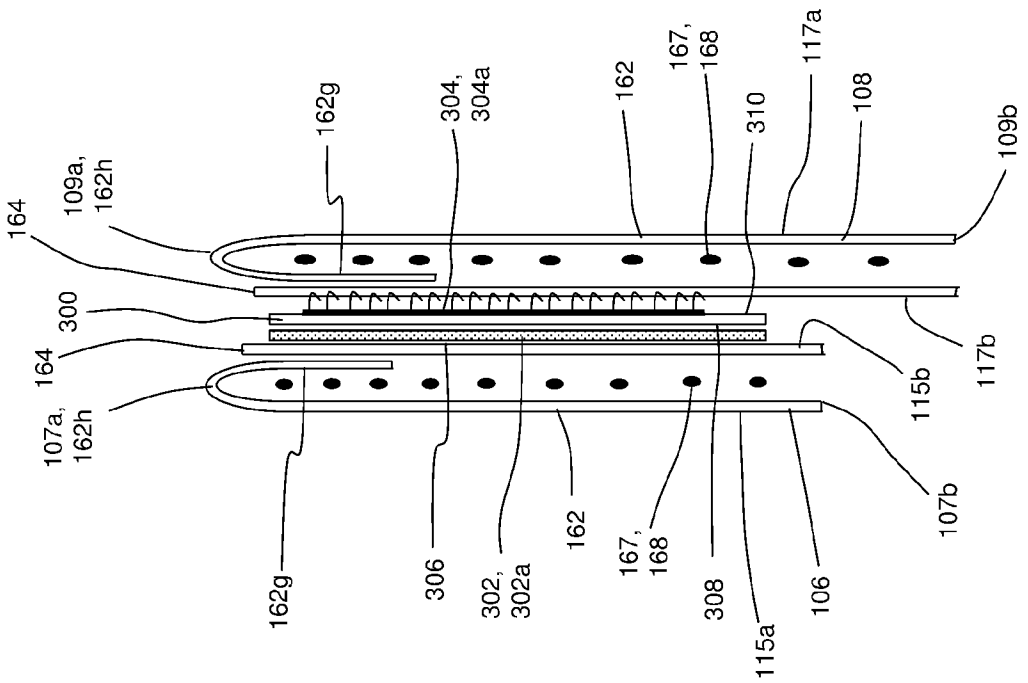


Figure 2C1


164
109a,
162h
162g
304,
304a
162
167,
168
310
117a
108
109b
300
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107a,
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162
167,
168
308
115a
106
115b
117b
107b

Figure 2C3

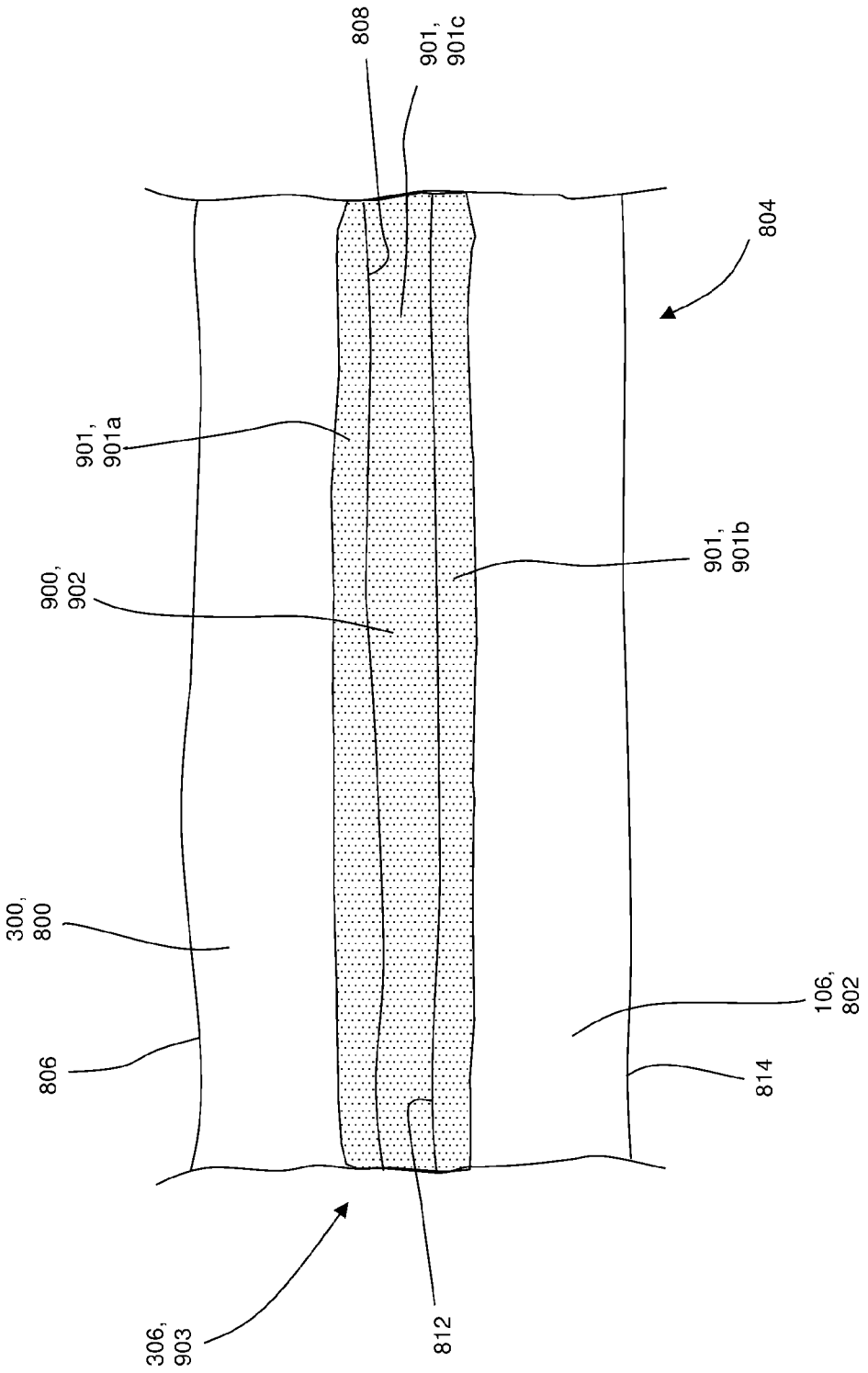
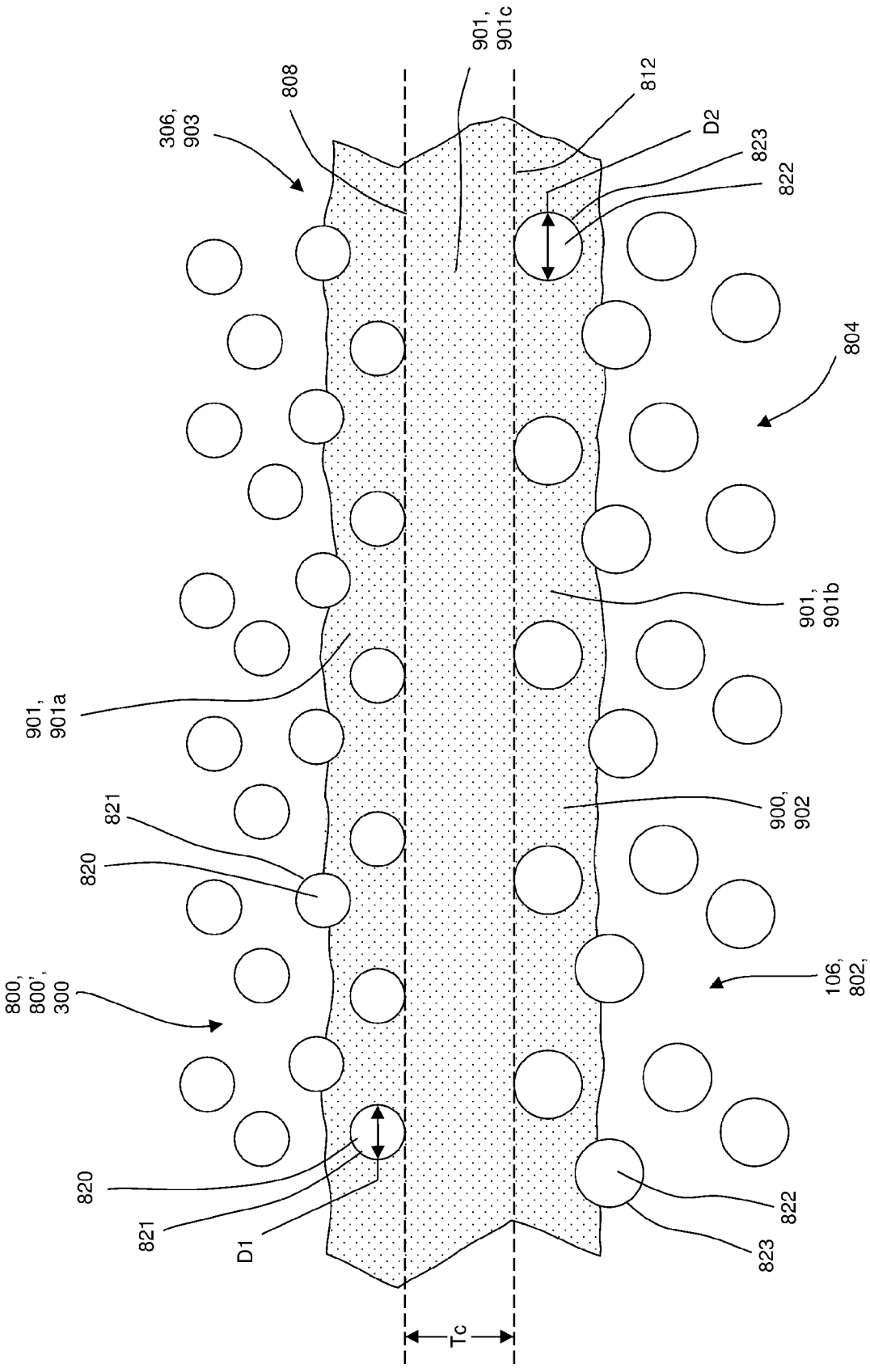

808
901, 901c
804
901, 901a
900, 902
901, 901b
300, 800
806
106, 802
814
306, 903
812

Figure 2D


306, 903
808
901, 901c
812
D2
823
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804
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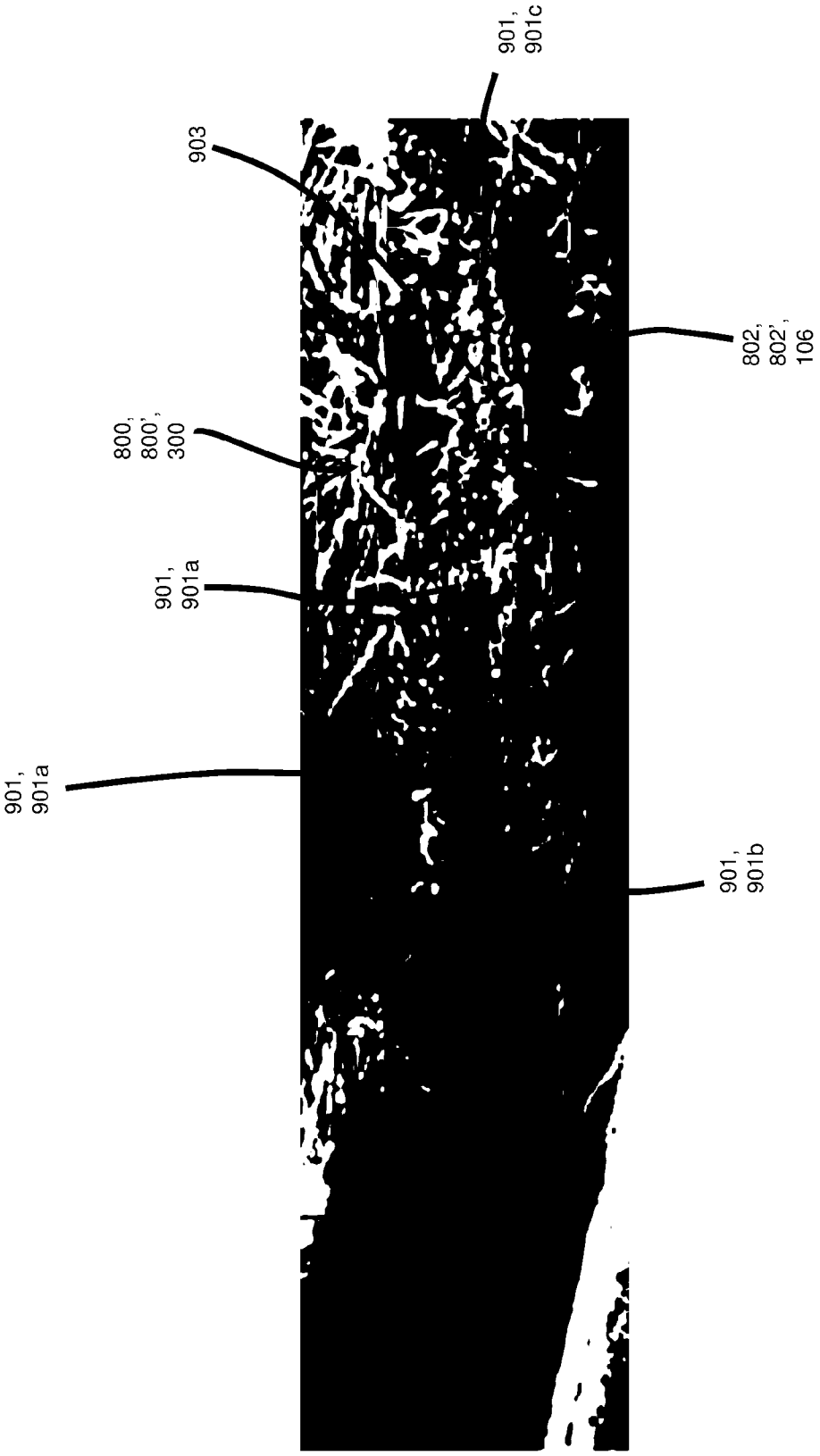
901, 901a

Figure 2E



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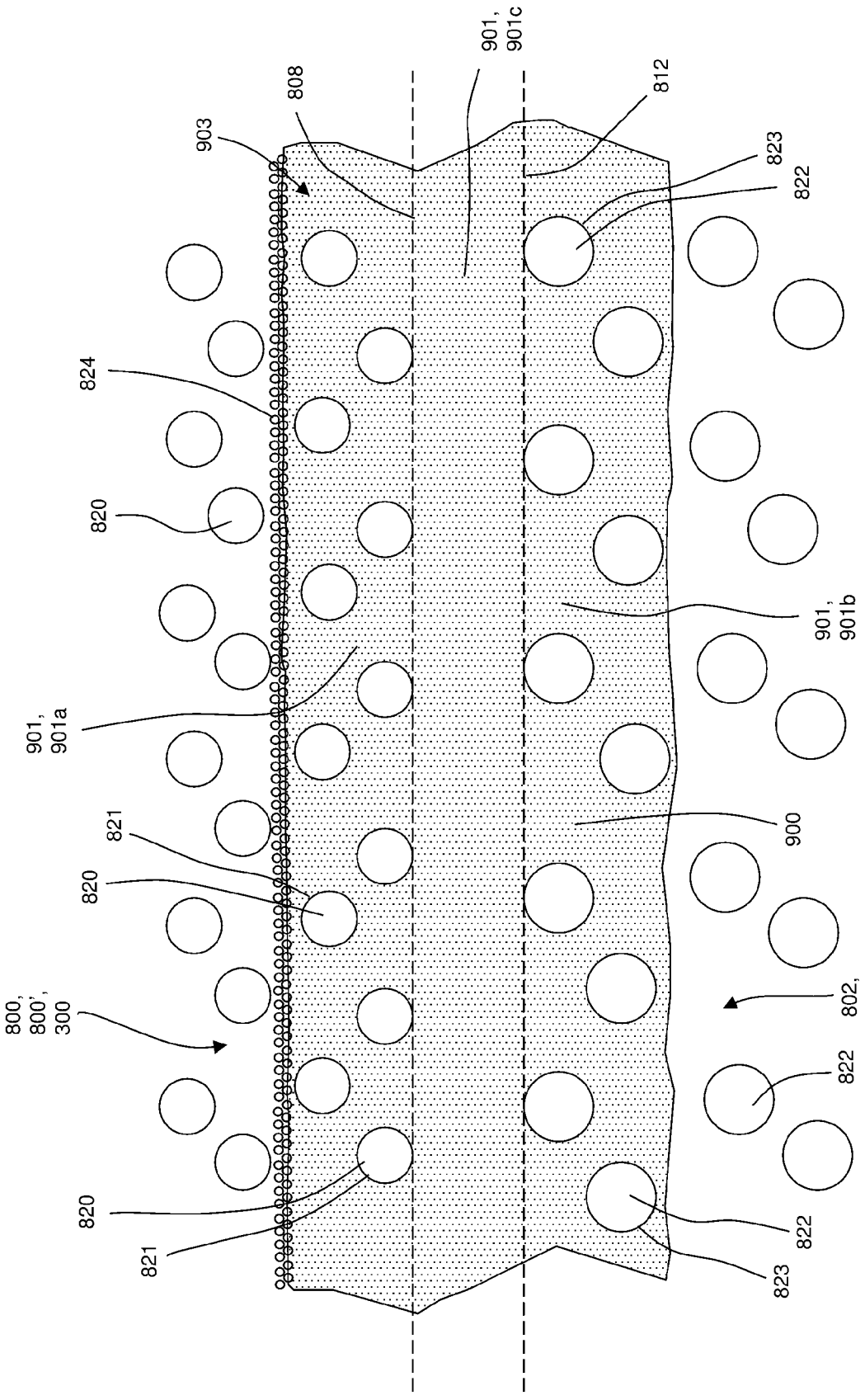
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800, 800', 300
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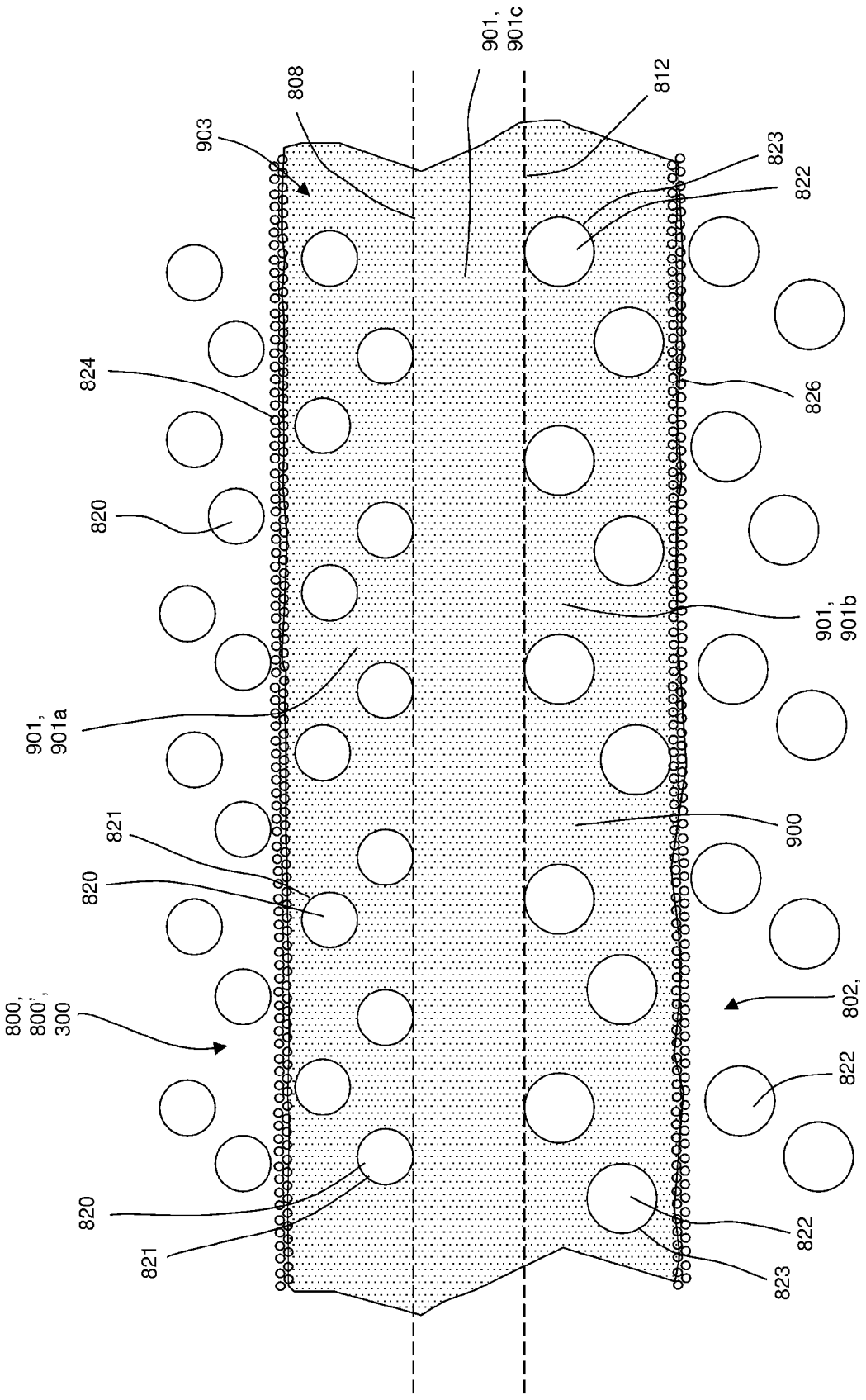
823

Figure 2G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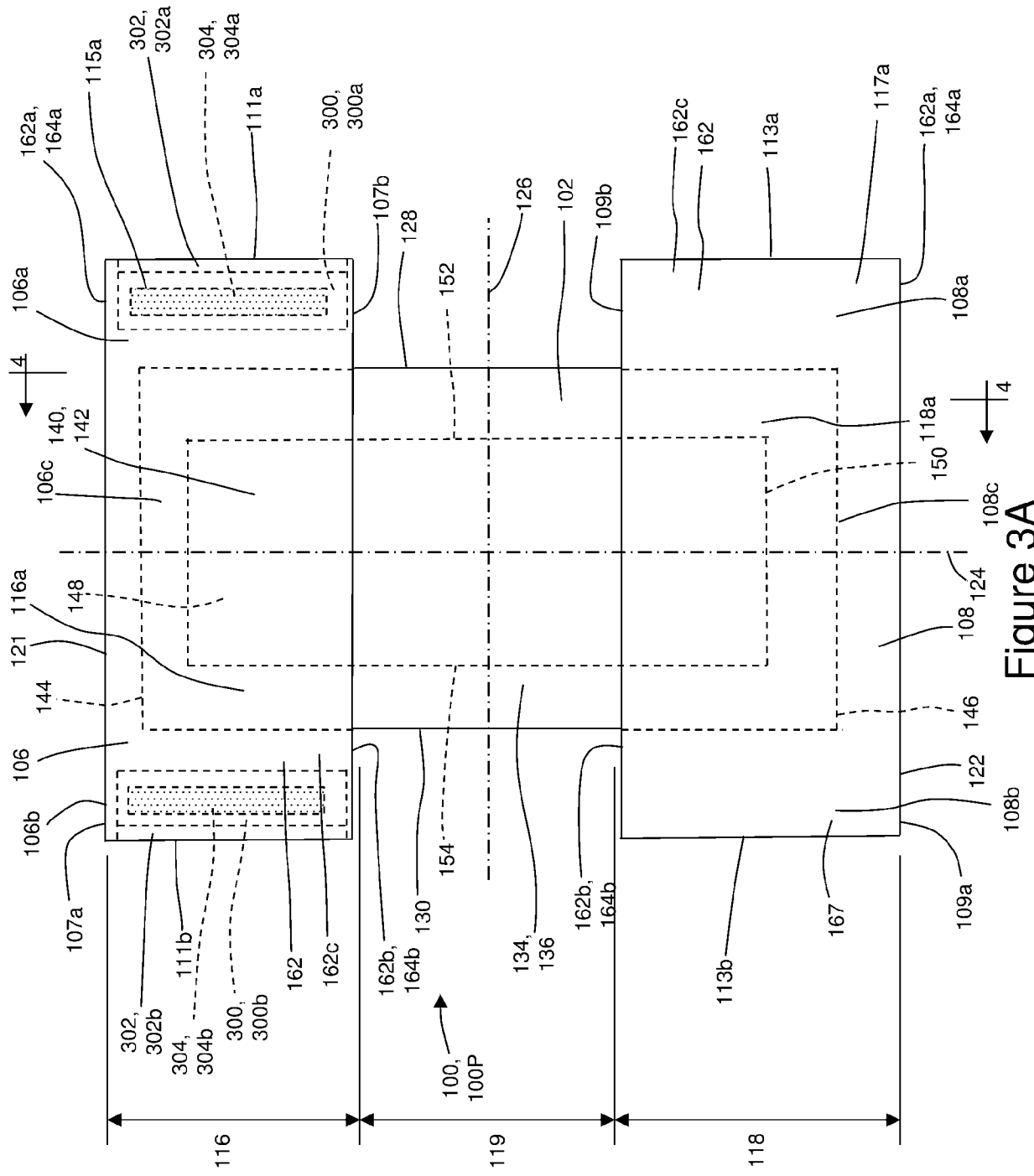
823

Figure 2H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162a,
164a
162b,
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162c
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302b
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304b
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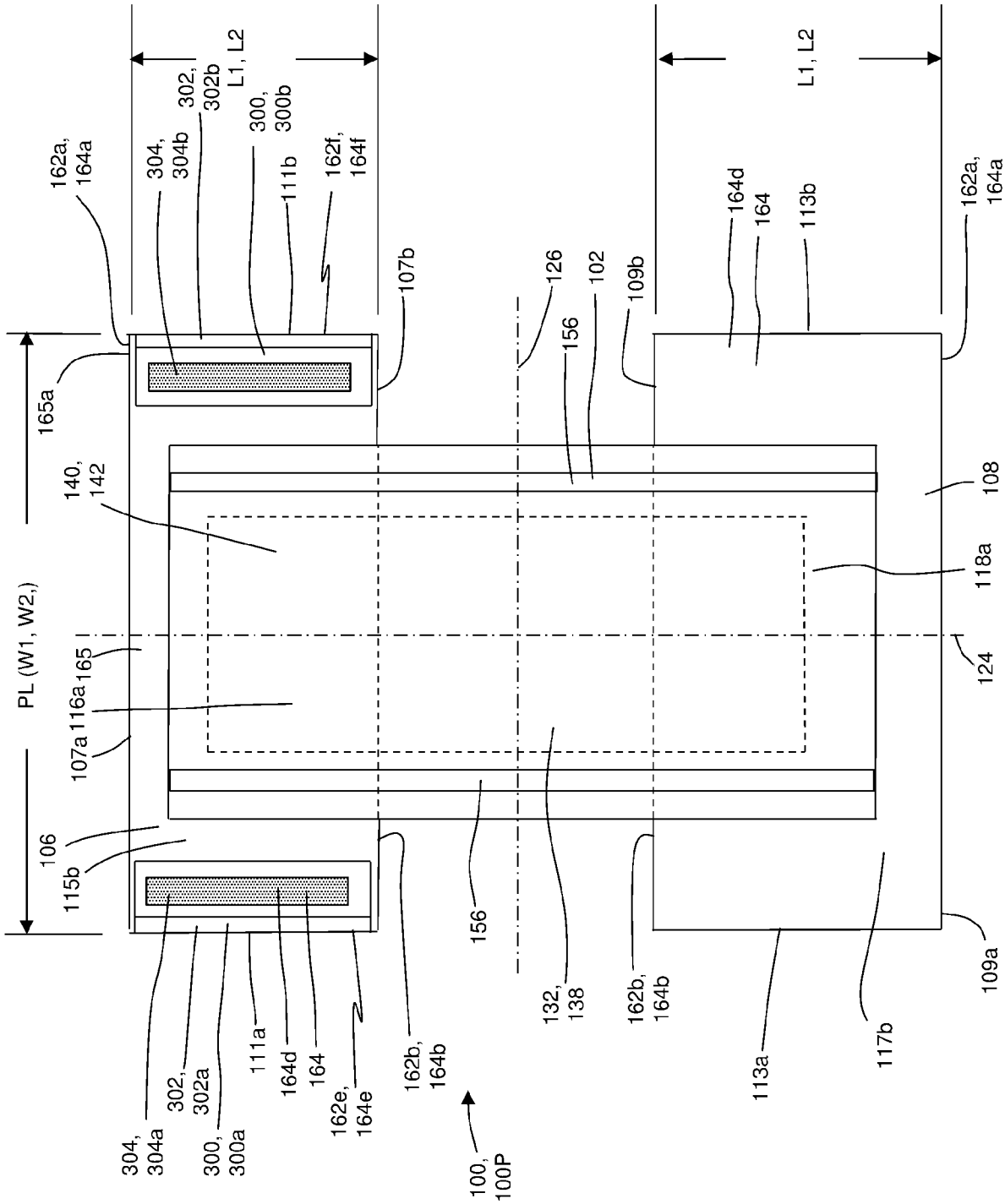
100P

Figure 3A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L1, L2
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302, 302b
300, 300b
111b
162f, 164f
107b
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109b
164d
164
113b
162a, 164a
165a
140, 142
108
118a
PL (W1, W2,)
165
116a
124
107a
106
115b
156
132, 138
162b, 164b
109a
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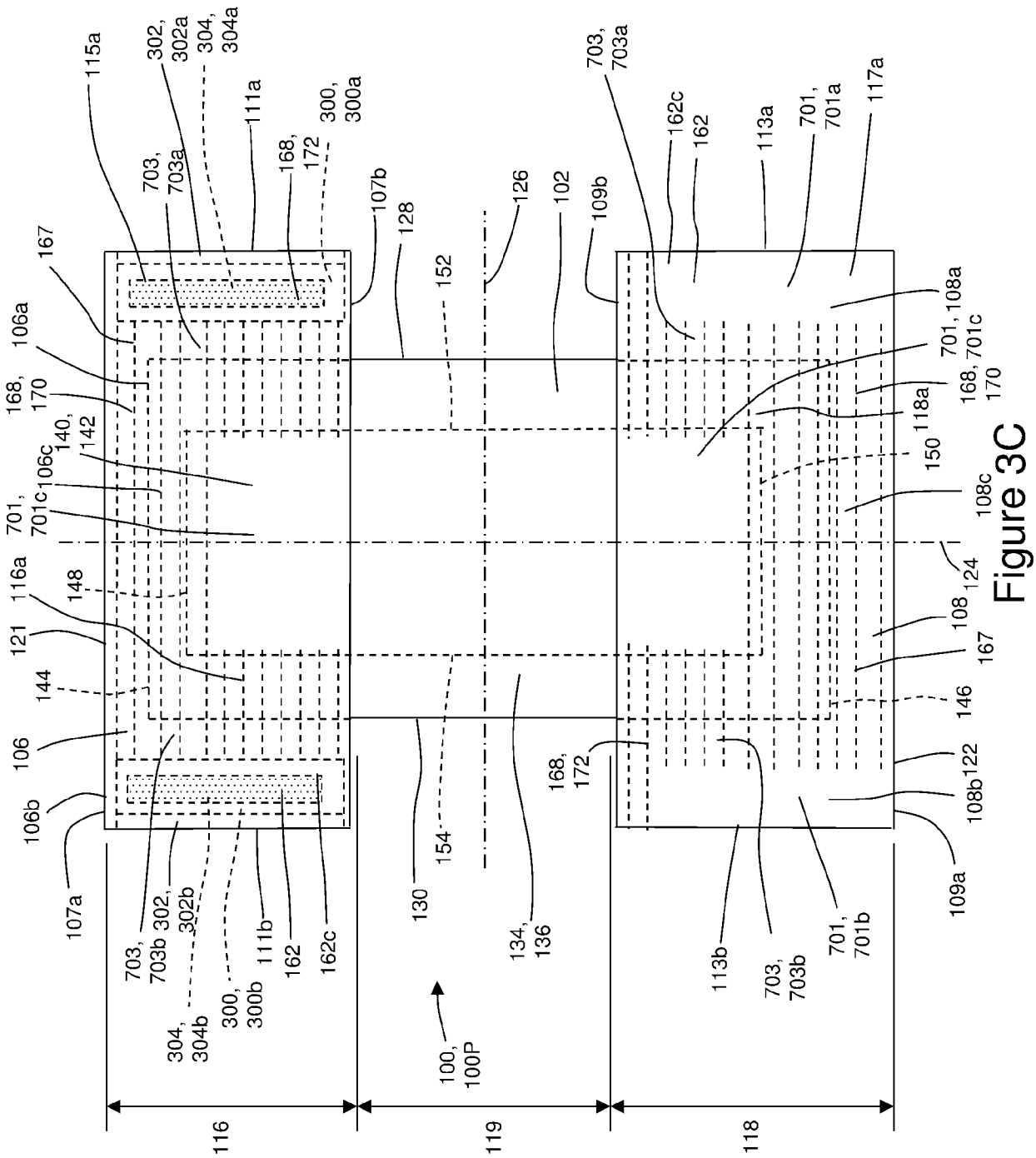
113a
117b
100, 100P

Figure 3B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162
113a
701, 701a
117a
167
106a
168, 170
140, 142
106c
701, 701c
116a
148
121
144
106
106b
107a
703, 703b
302, 302b
304, 304b
300, 300b
111b
162
162c
130
154
134, 136
100, 100P
168, 172
113b
703, 703b
701, 701b
109a
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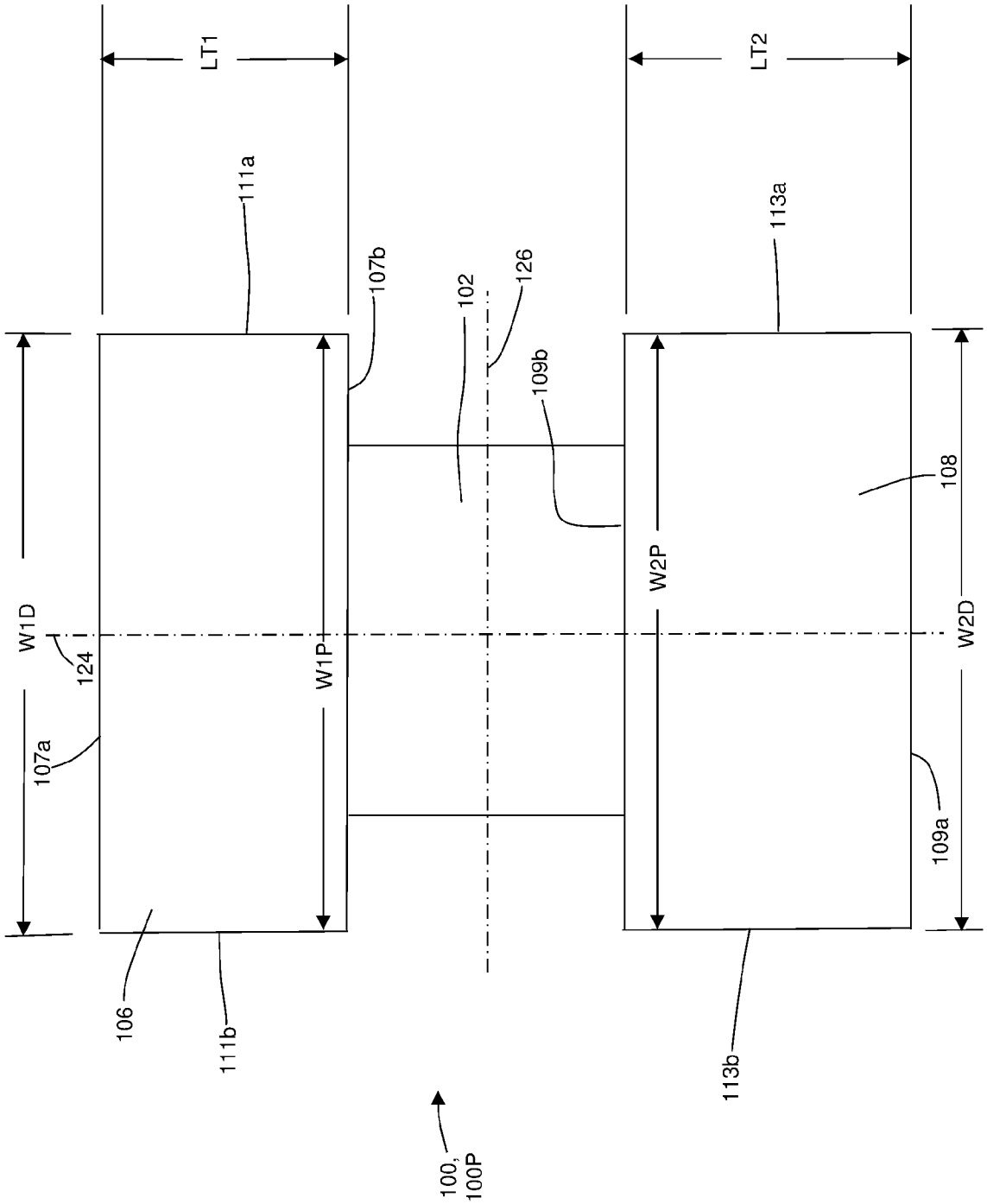
Figure 3C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W1D
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W2P
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100,
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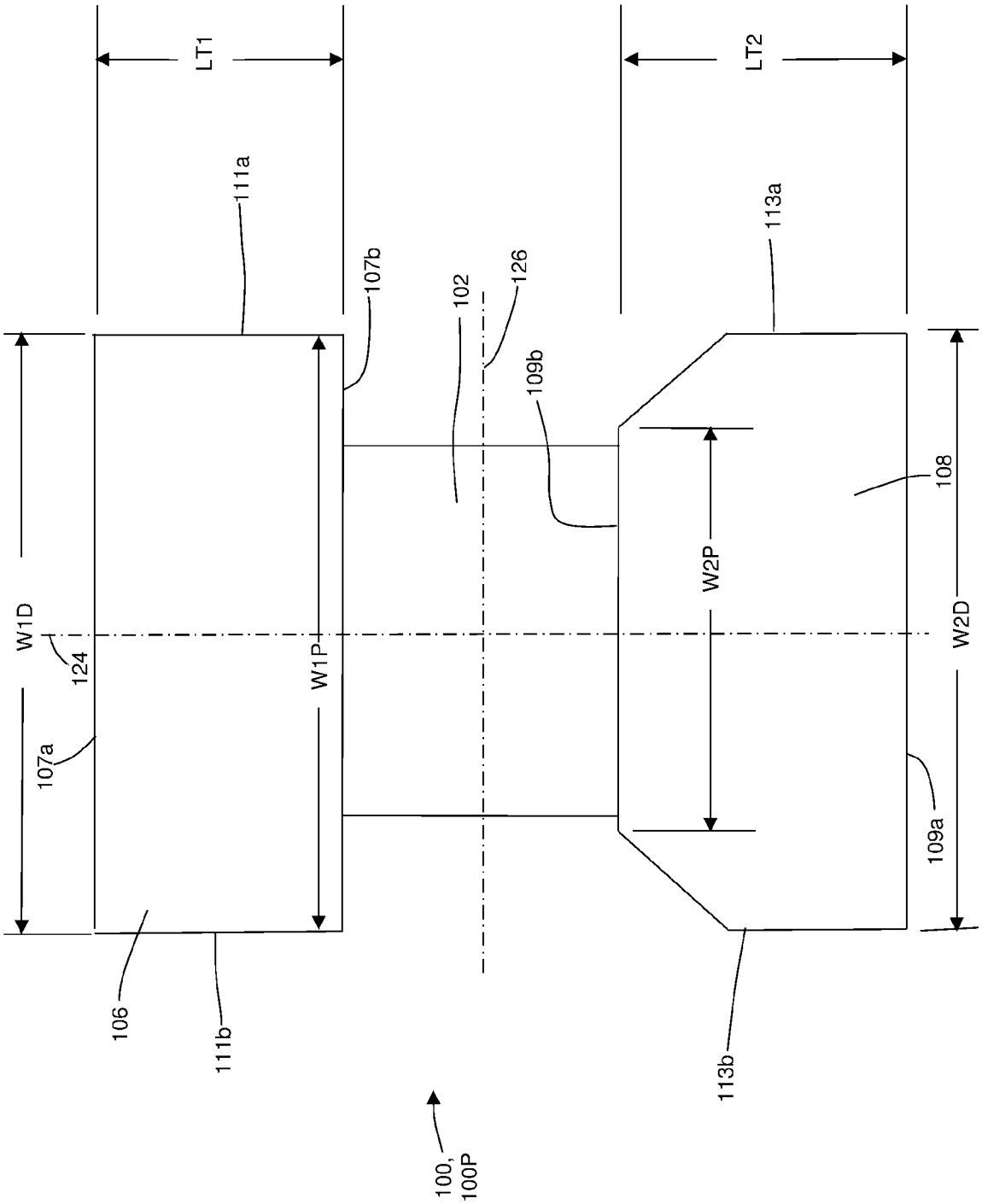
Figure 3D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W1P
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111b
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100,
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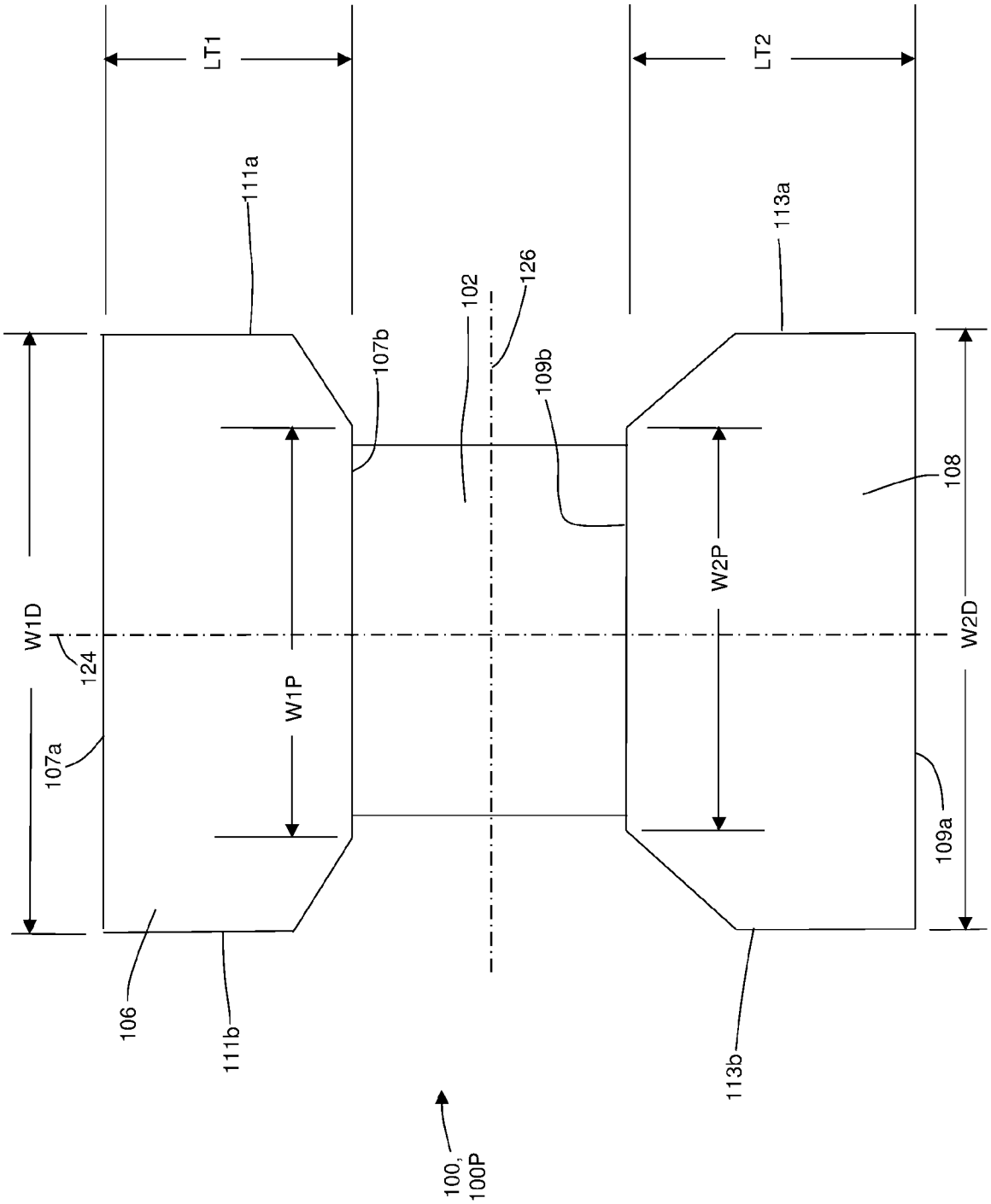
Figure 3E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W1P
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113b
100,
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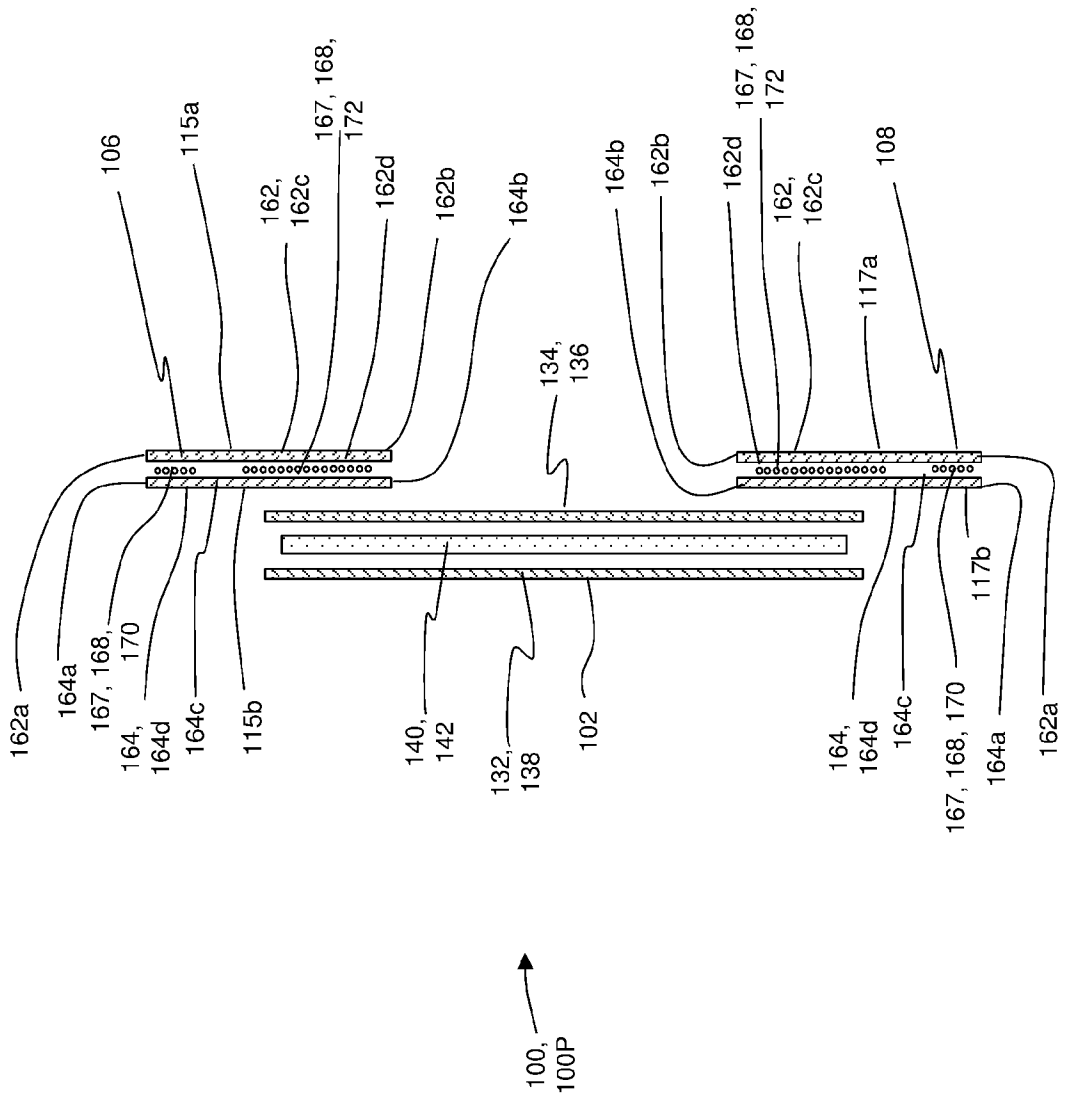
Figure 3F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117a
162a
164a
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164, 164d
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117b
162a
100, 100P

Figure 4

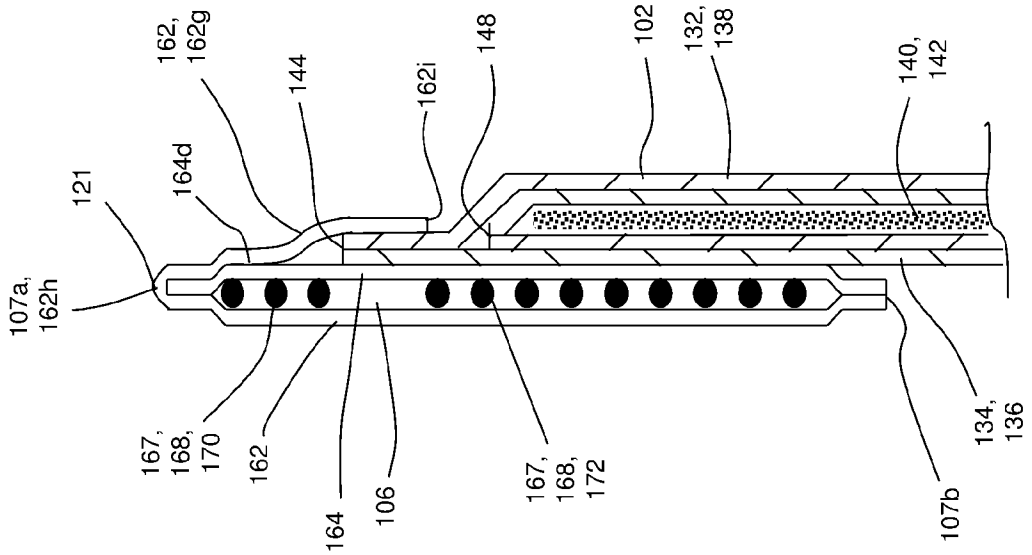


Figure 4A

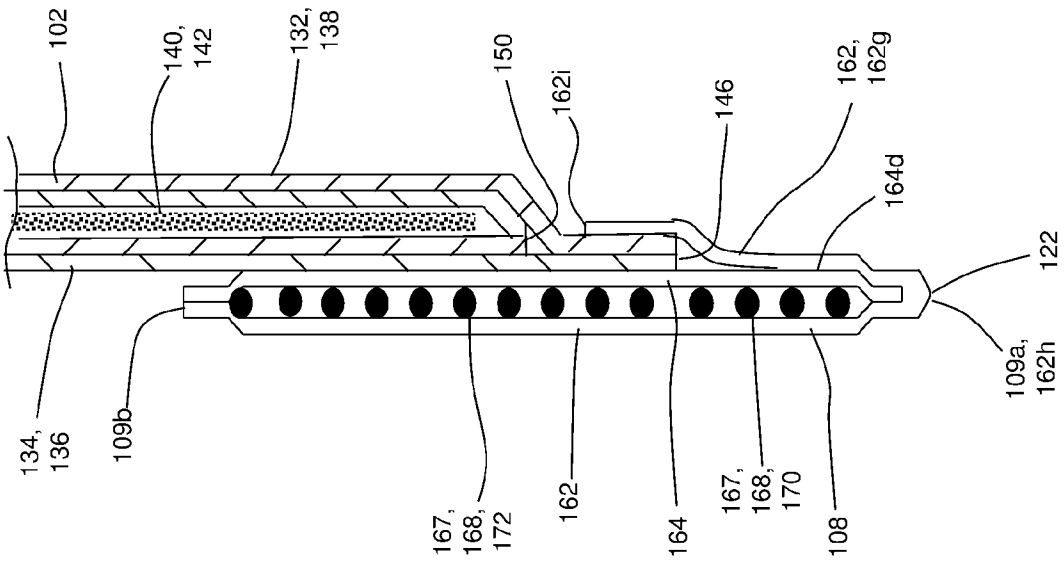


Figure 4B

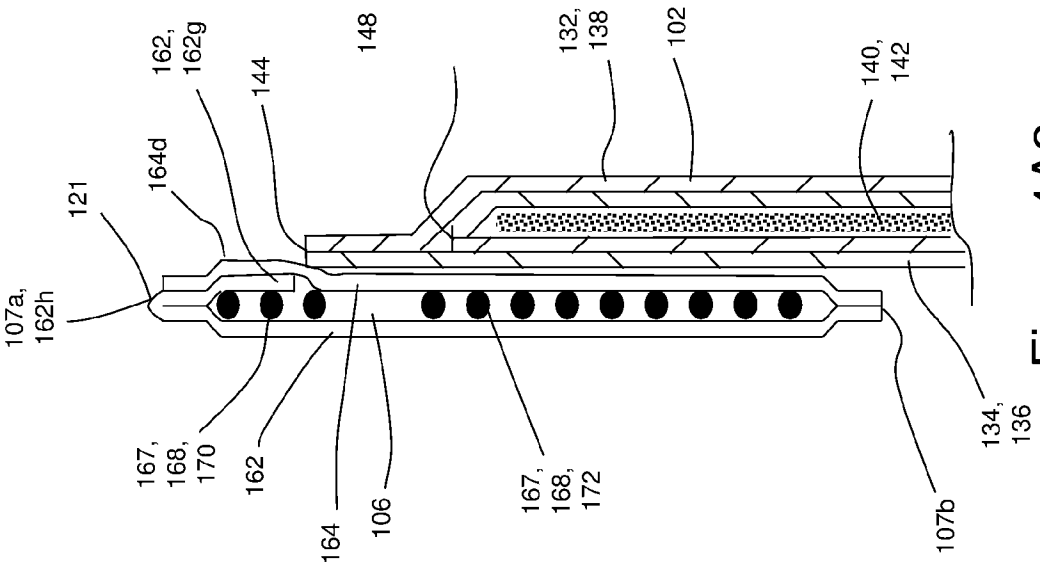


Figure 4A2

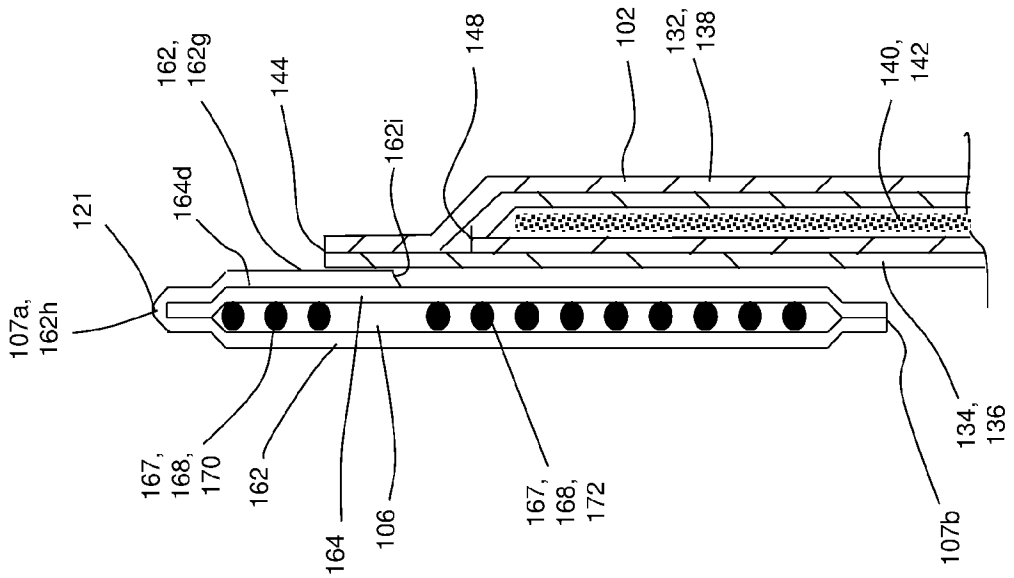
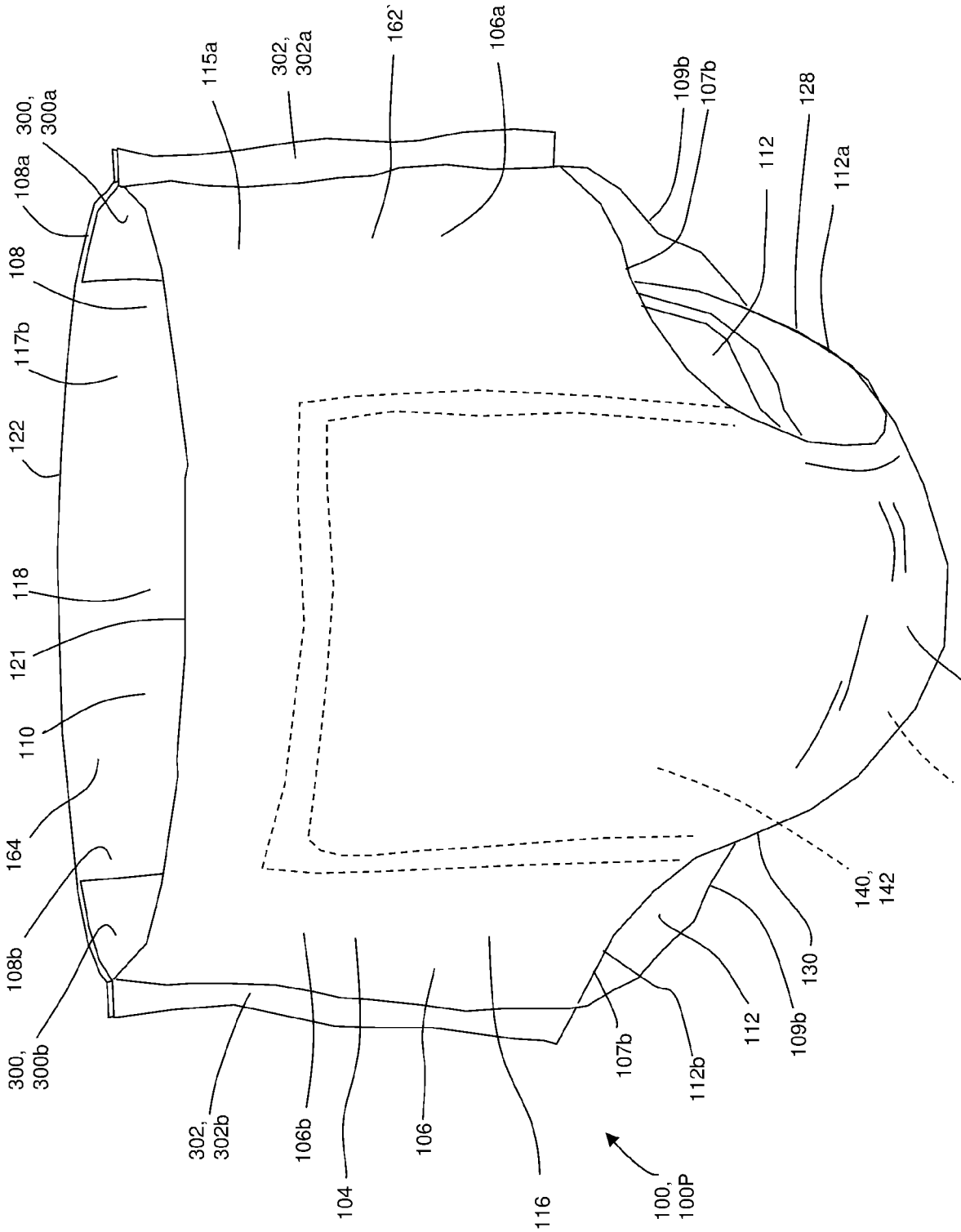


Figure 4A1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162`
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115a

Figure 5A

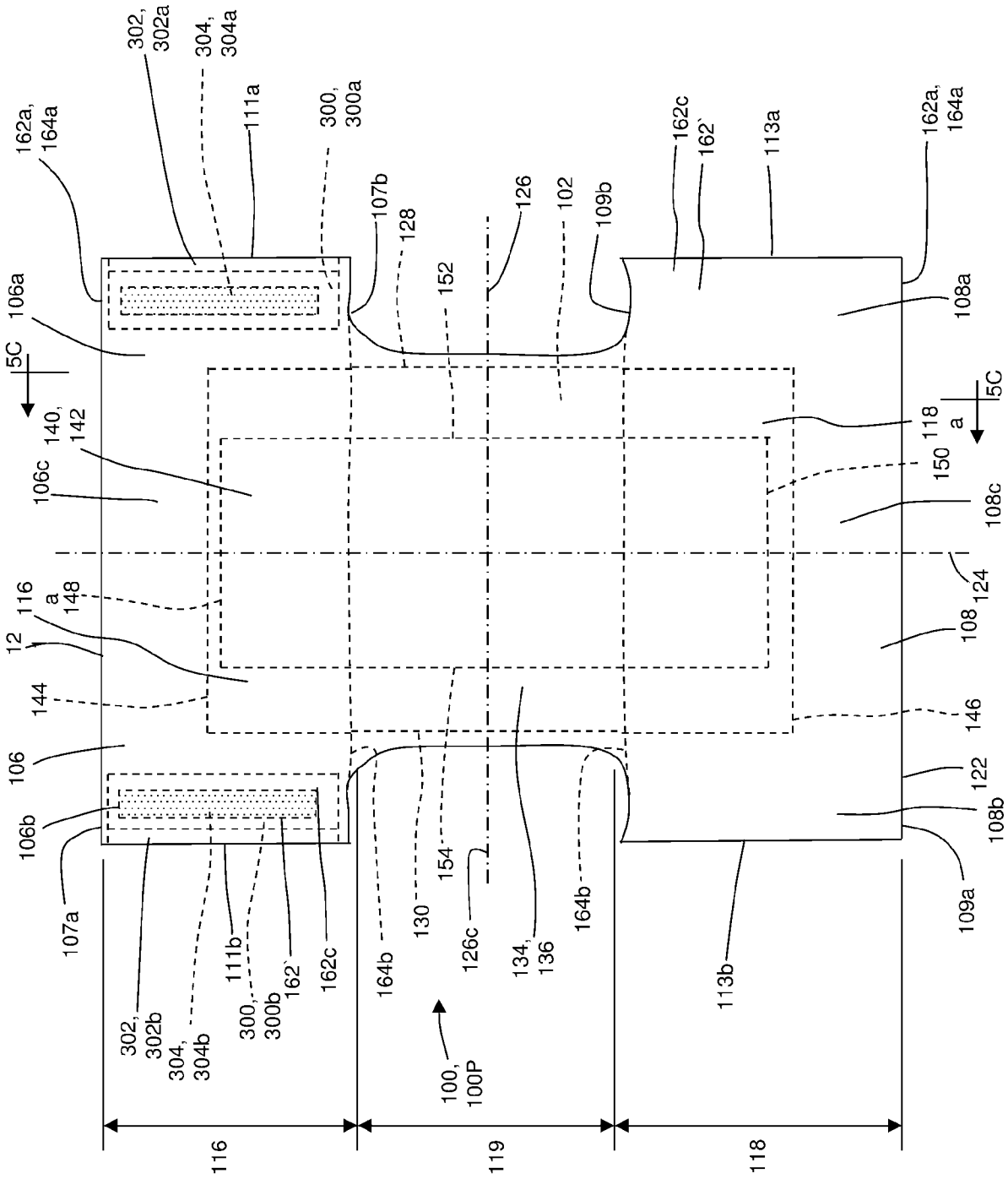
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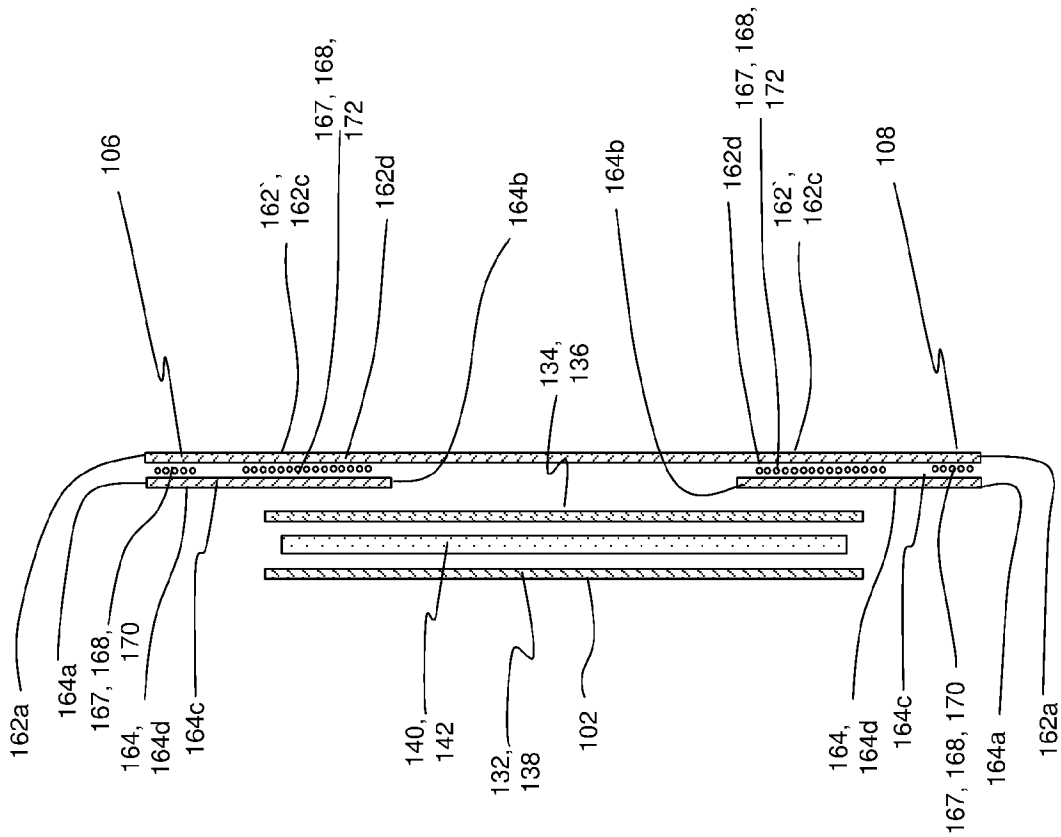
Figure 5B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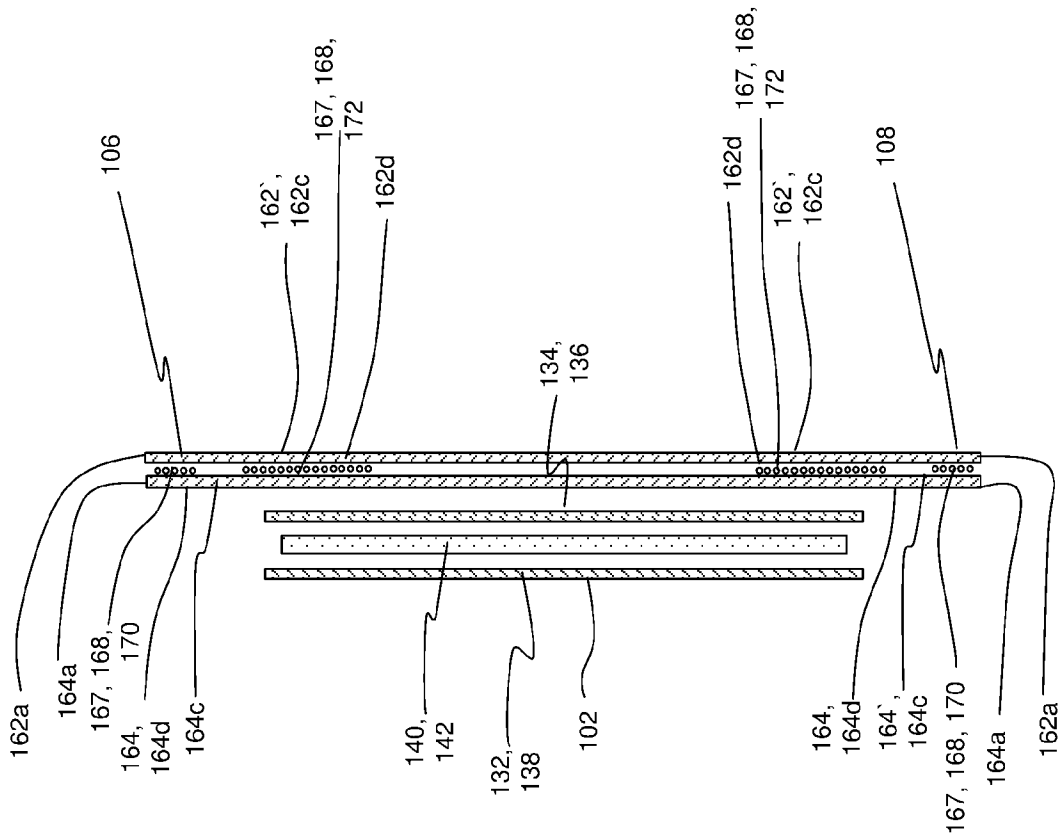
162a

Figure 5C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162a

Figure 5D

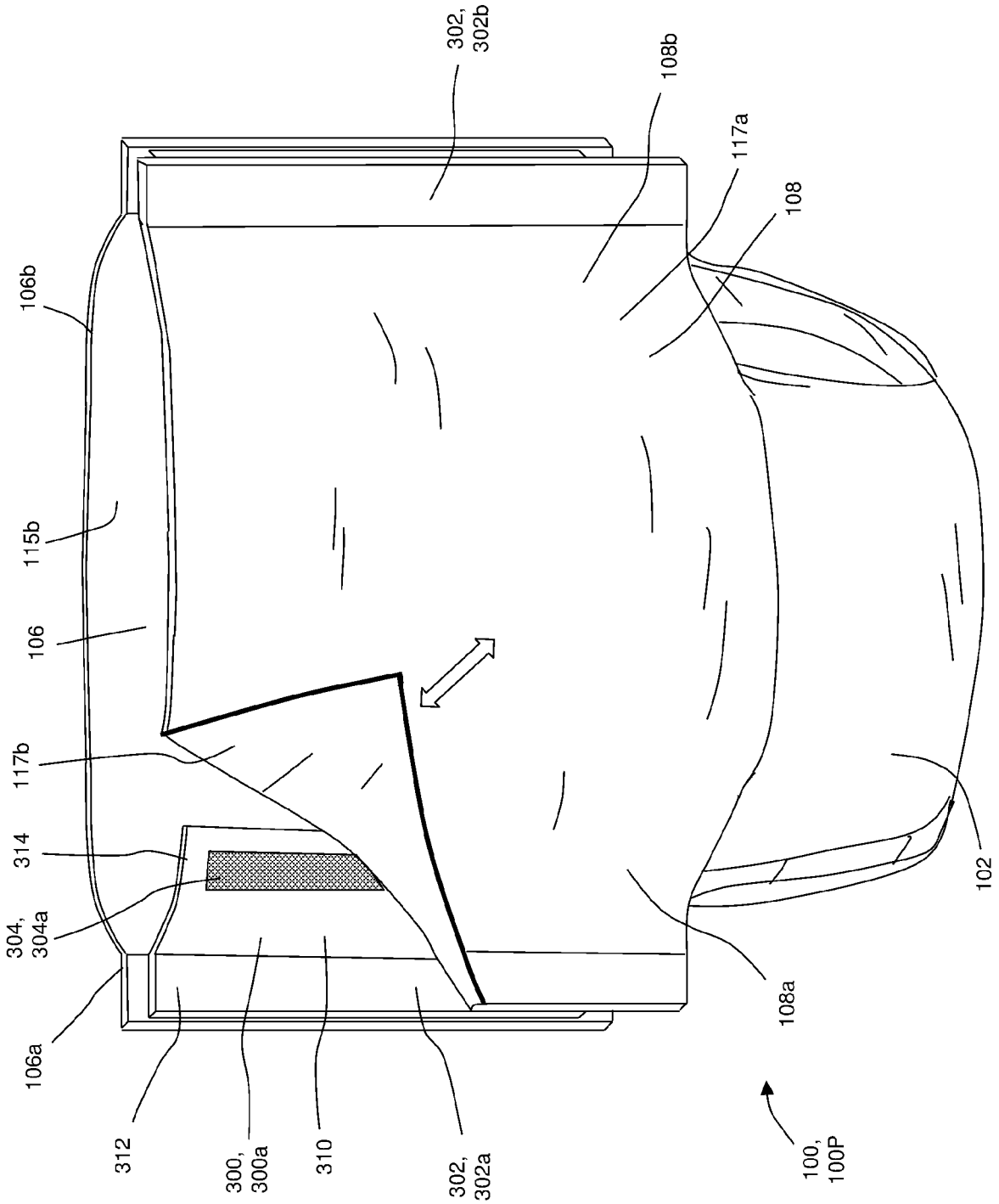
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Figure 6A

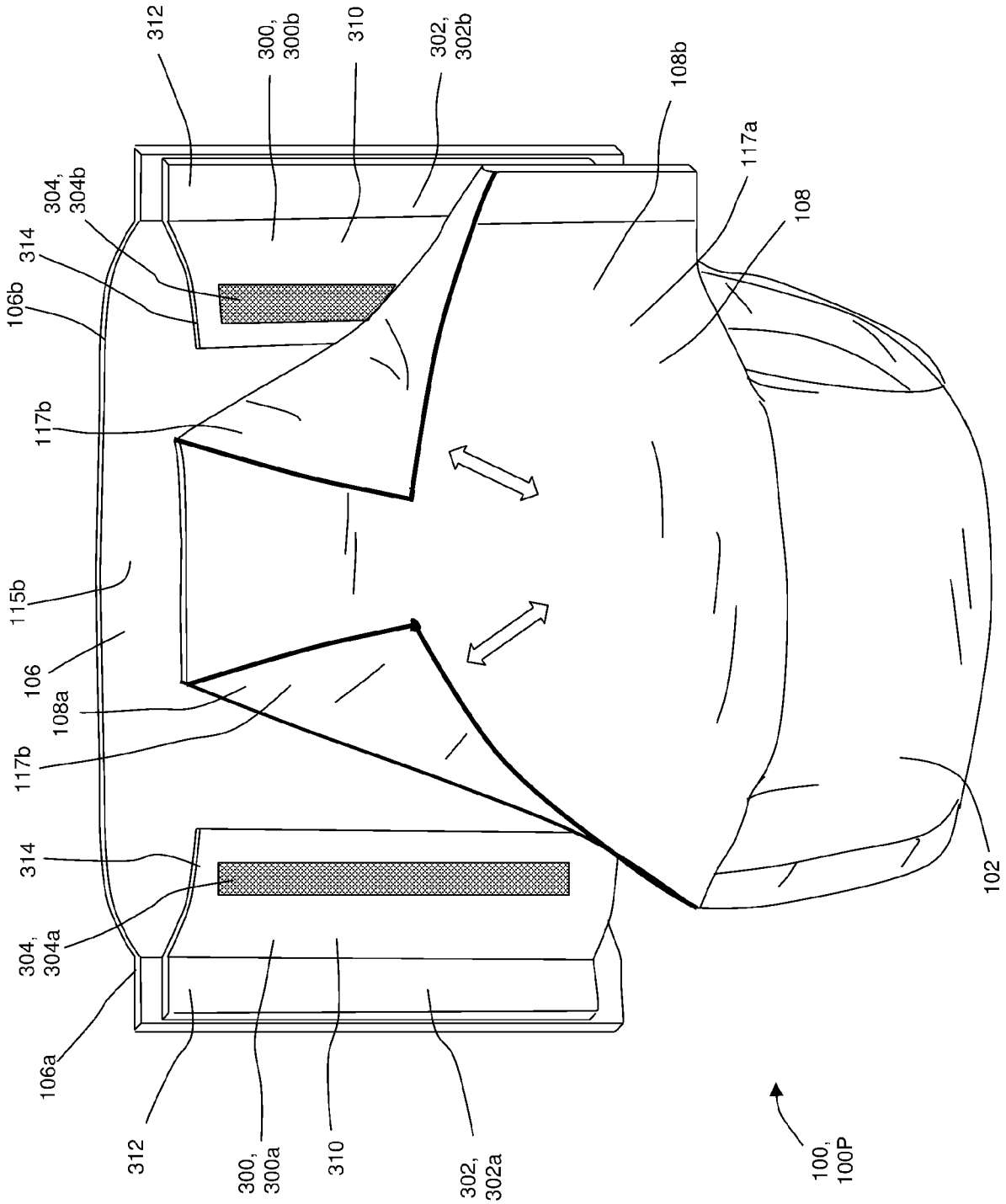
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Figure 6B

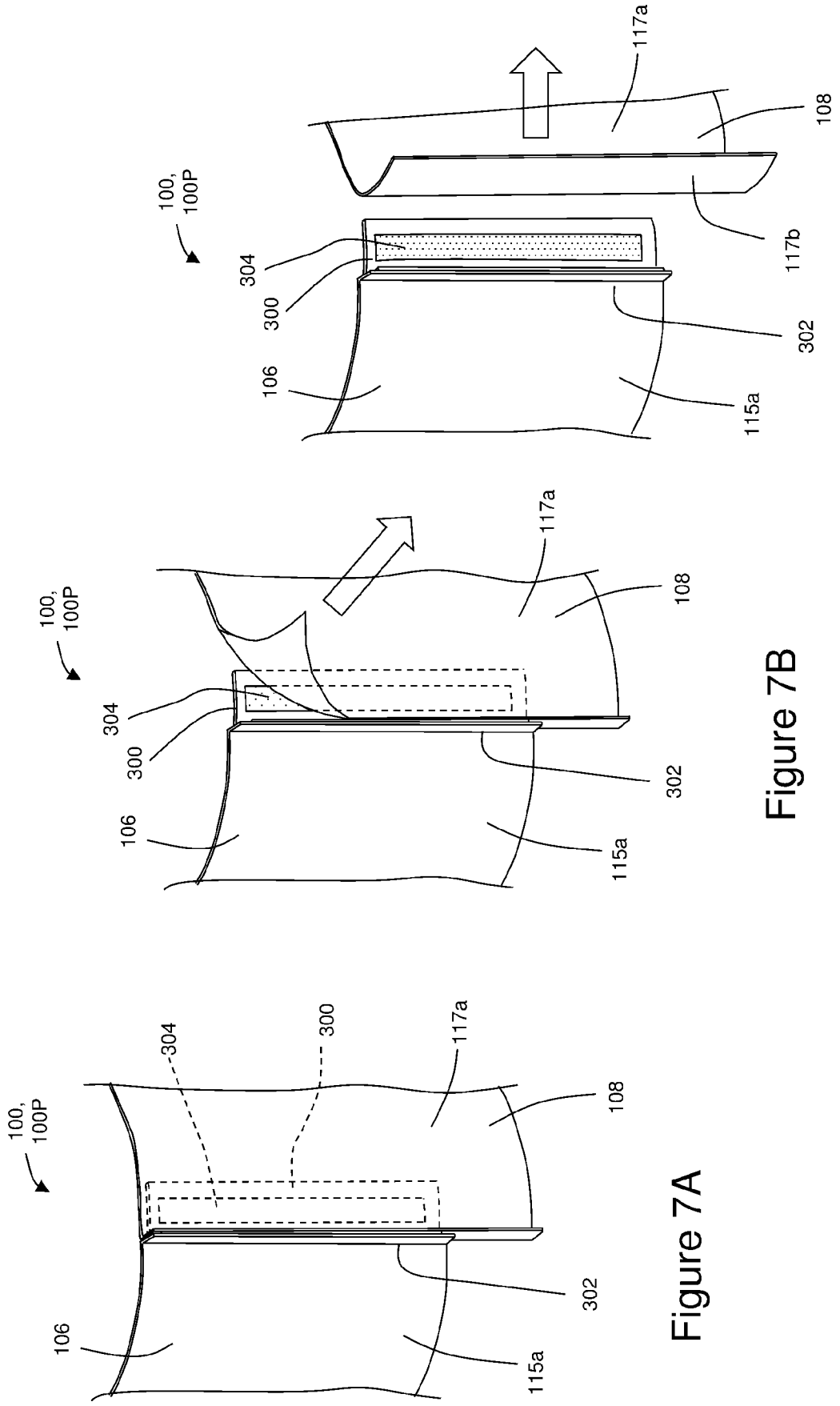

Figure 7A

Figure 7B

Figure 7C

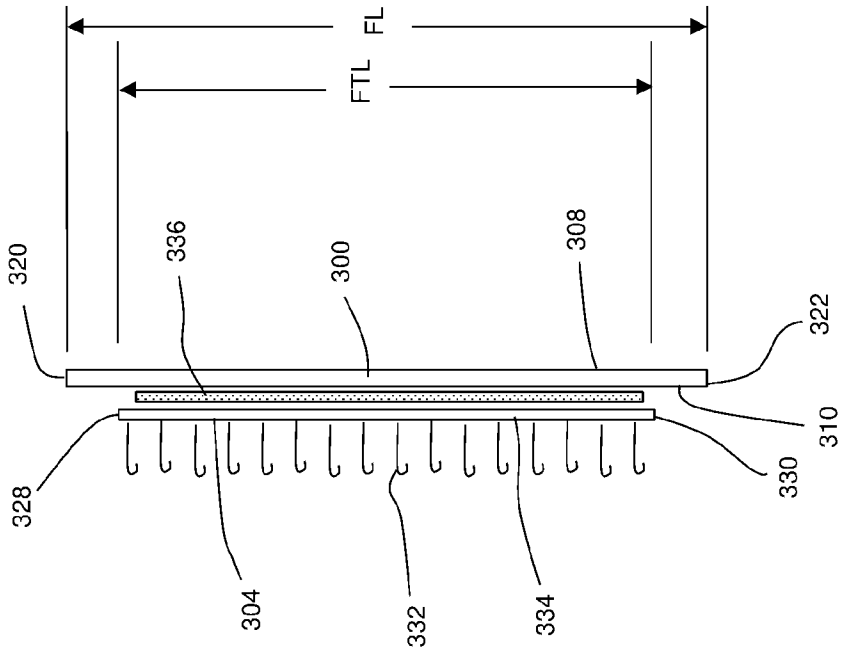

Figure 9A

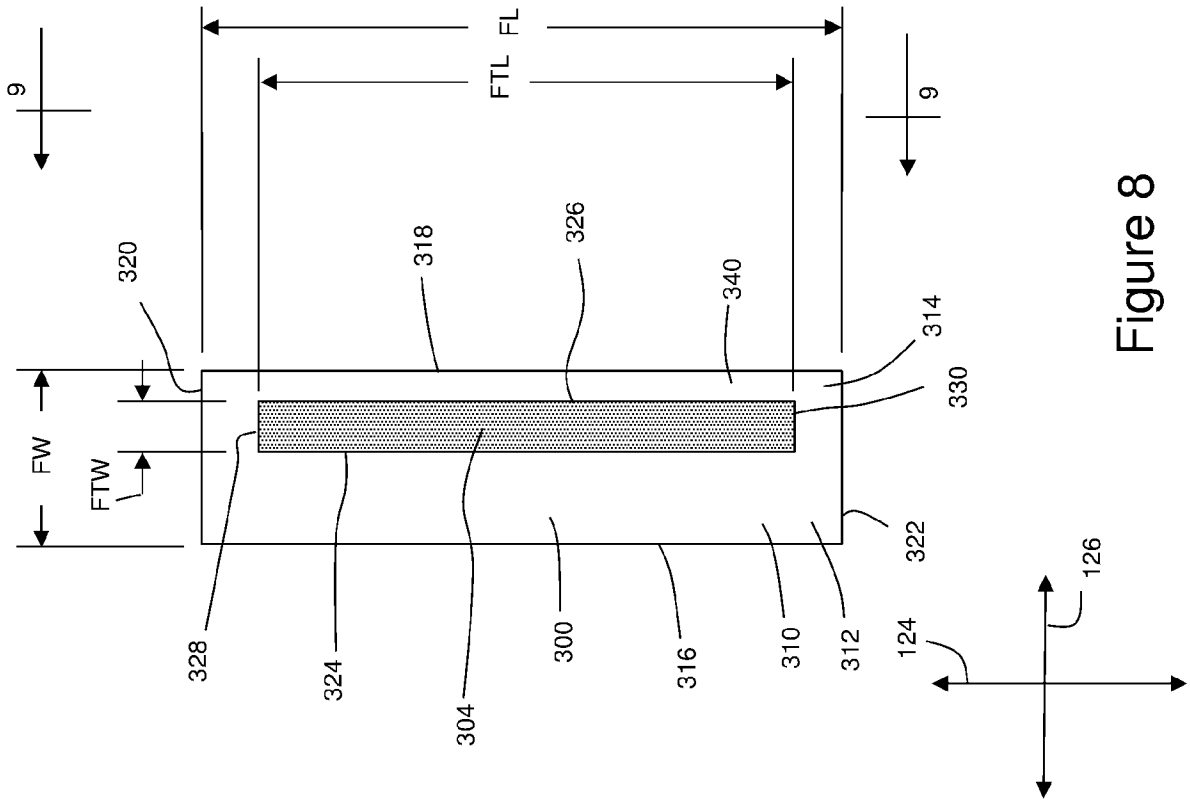

Figure 8

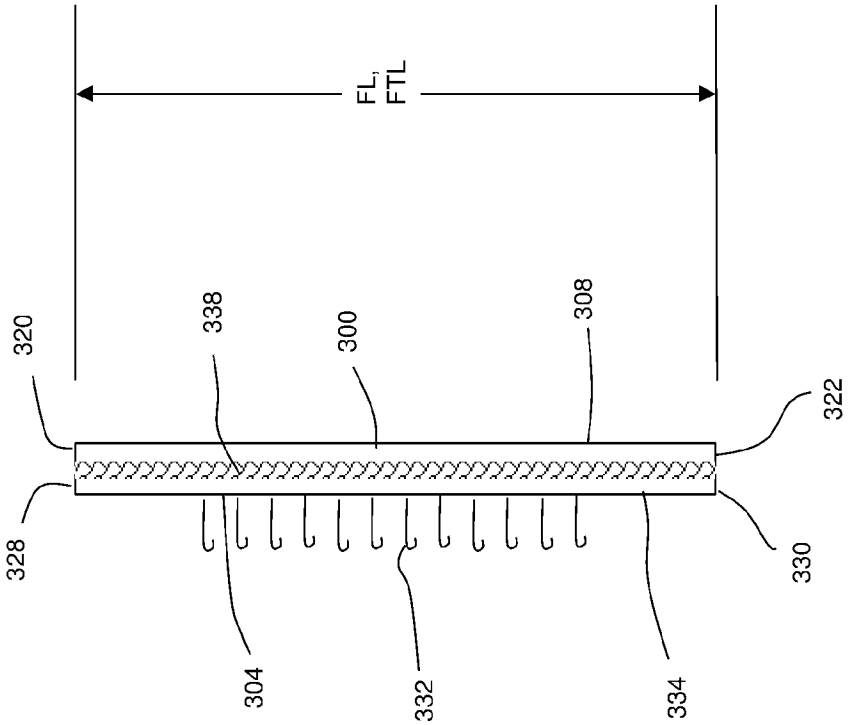

Figure 9C

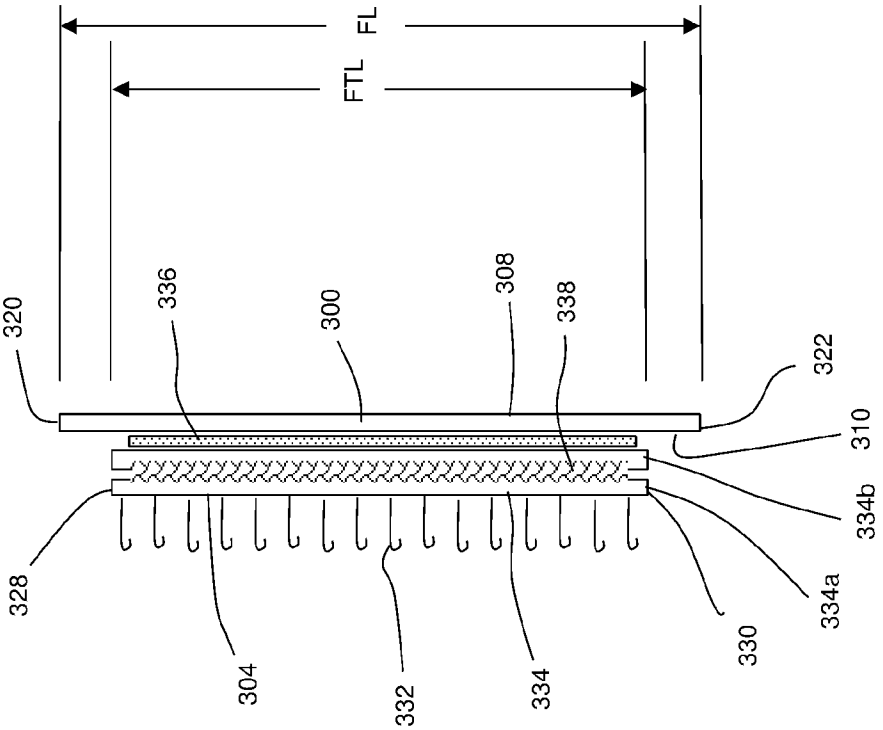

Figure 9B

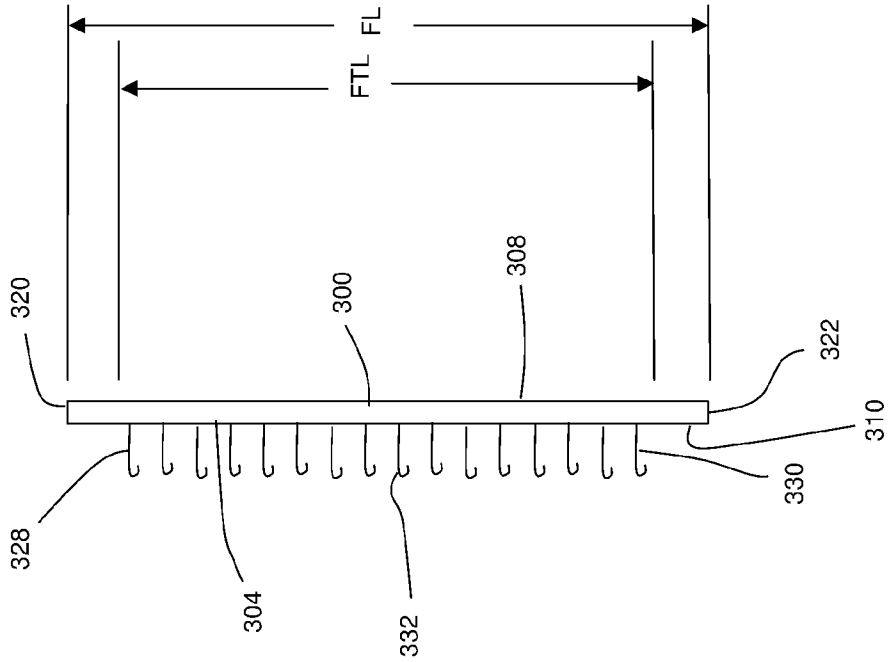

Figure 9E

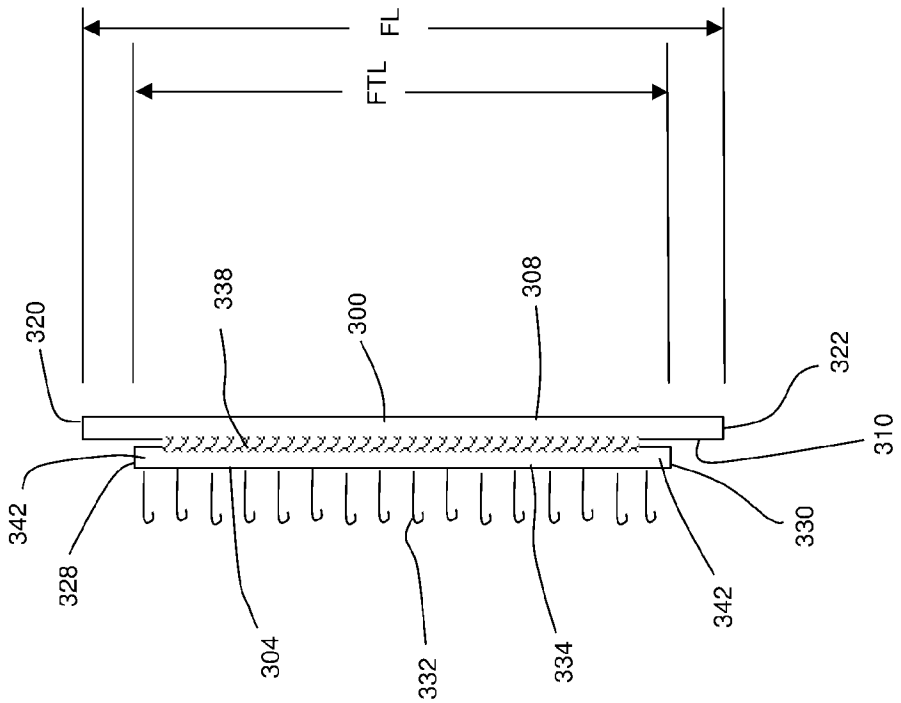

Figure 9D

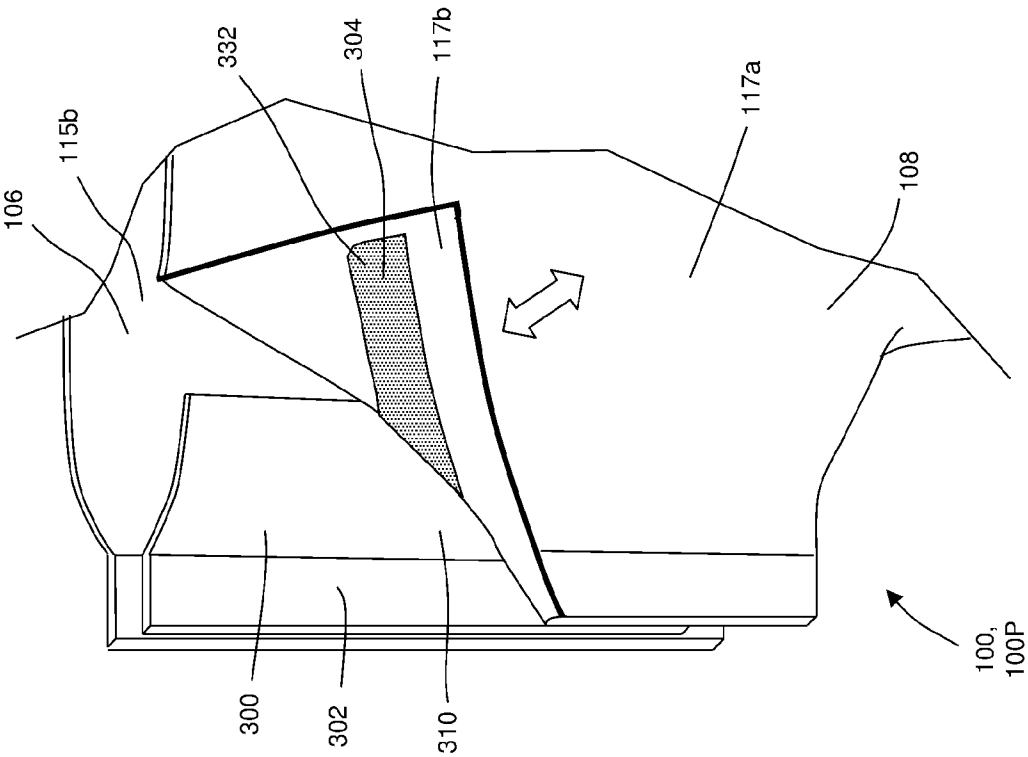

Figure 10B

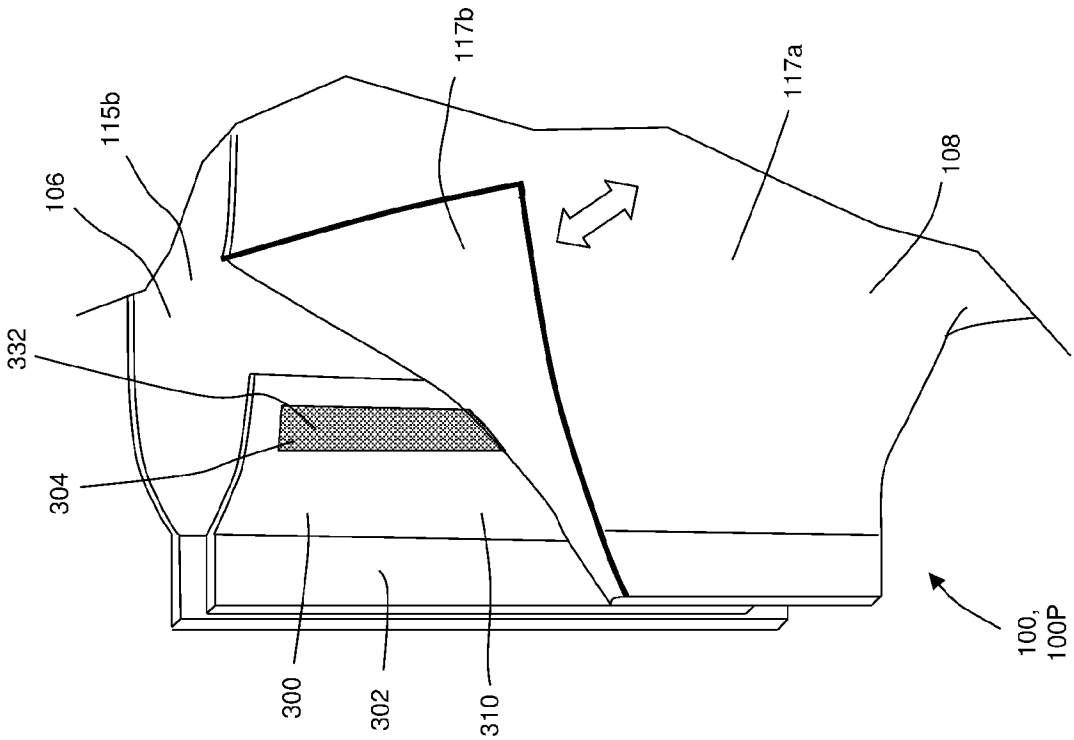

Figure 10A

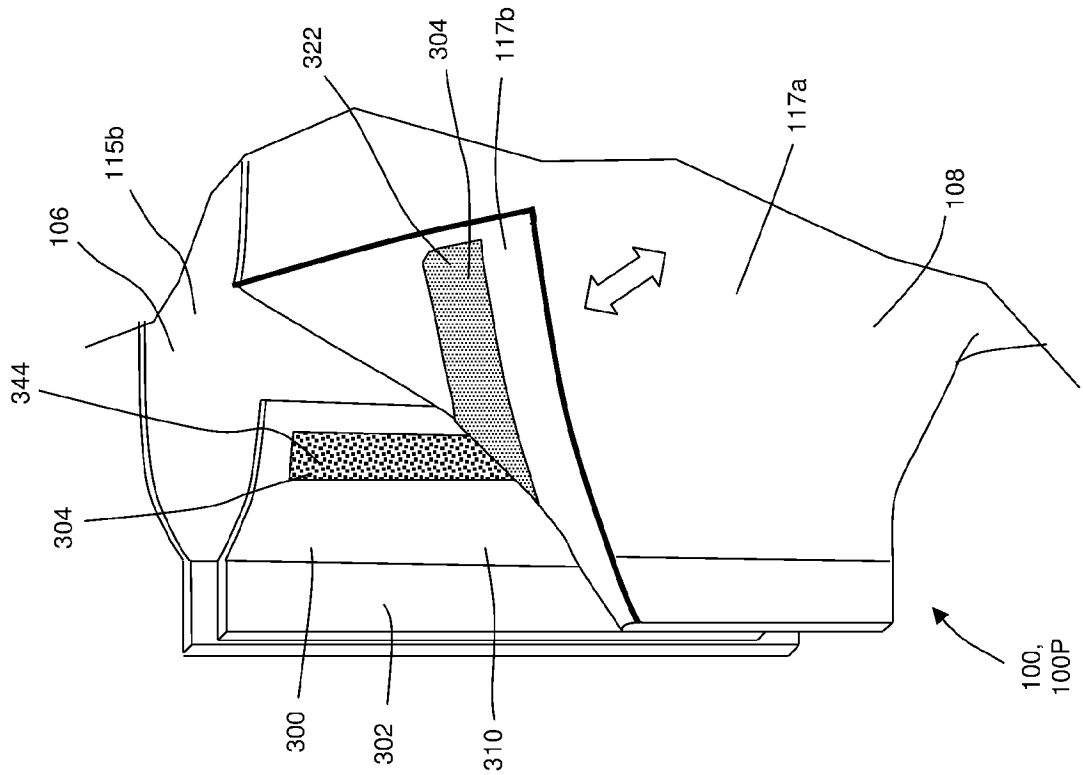

Figure 10D

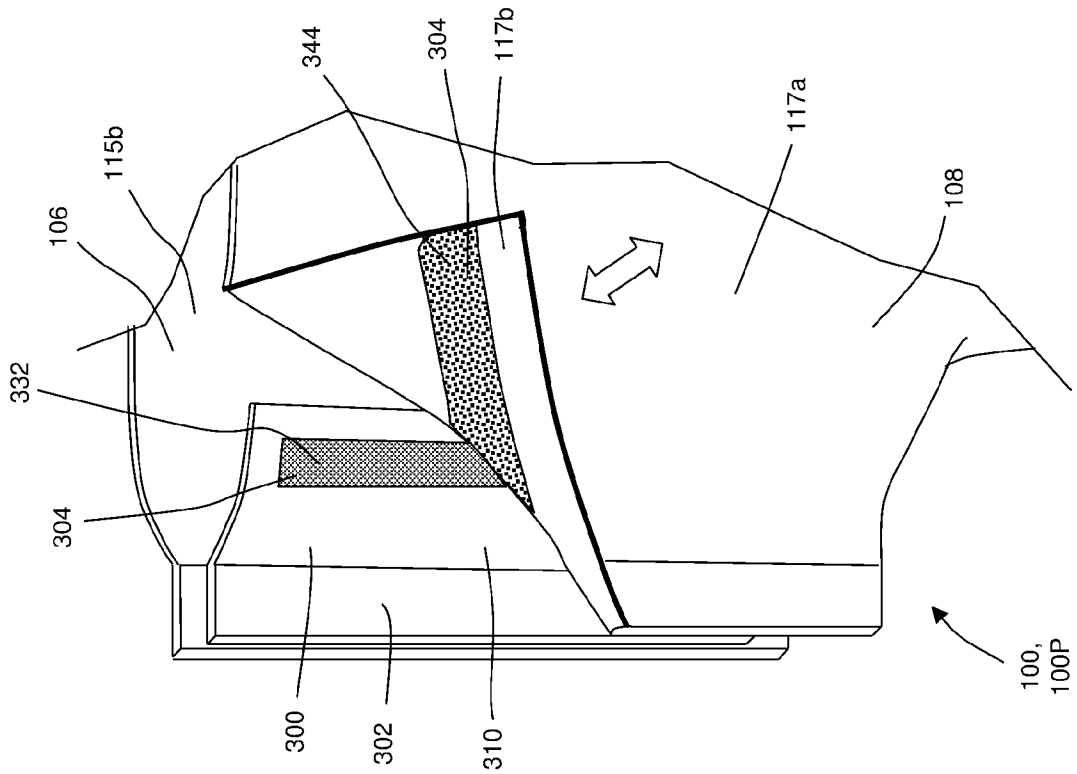

Figure 10C

INTERNATIONAL SEARCH REPORT

International application No
PCT/CN2023/123219

A. CLASSIFICATION OF SUBJECT MATTER

INV. A61F13/49 A61F13/56 A61F13/58
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A61F

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2017/165130 A1 (TURNER ROBERT HAINES [US]) 15 June 2017 (2017-06-15) paragraphs [0001], [0002], [0034], [0036], [0040], [0041], [0094], [0095], [0096], [0097], [0098]; claim 1; figure 2	1-15
X	US 2022/396037 A1 (SCHNEIDER UWE [US]) 15 December 2022 (2022-12-15) paragraphs [0007] - [0009], [0030], [0042], [0059] - [0061], [0074], [0081] figures 8,9	1-15

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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

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

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

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
6 June 2024	24/06/2024

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

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

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/CN2023/123219

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2017165130 A1	15-06-2017	BR 112018011900 A2	27-11-2018
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		CN 108472182 A	31-08-2018
		EP 3389586 A2	24-10-2018
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		US 2020222251 A1	16-07-2020
		WO 2017106153 A2	22-06-2017
US 2022396037 A1	15-12-2022	EP 3836875 A1	23-06-2021
		EP 4212137 A1	19-07-2023
		US 2020047420 A1	13-02-2020
		US 2022396037 A1	15-12-2022
		WO 2020036795 A1	20-02-2020